MOTHERS AND BABIES : INTERACTION AND THE IMPACT OF HANDICAP

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Thesis submitted in accordance with the requirements of the University of Liverpool for the degree of Doctor in Philosophy.

September, 1992

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ACKNOWLEDGEMENTS

There are many stages in the completion of a PhD, and at each step along the way I received the most generous help from many different people. I would like to thank Mersey Regional Health Authority who financed my work (Research Scheme Number 583). I would also like to thank the grantholders: Tony Cox, Bloomfield Clinic Guy's Hospital, for his support and advice most particularly in the early phases; Michael Weindling, University of Liverpool, who not only helped in the recruitment of the sample and gave me access to the SCBU records, but supported me through the difficult middle phases; and Rachel Calam, University of Manchester, for the help she has given me throughout.

The data on which the thesis is based came from 65 mothers who welcomed me into their homes, answered my questions even when they could see no point to them, and allowed me to assess their babies. Though the sessions were sometimes painful, the mothers were always co-operative and helpful. I feel priveleged to have known them all.

The Department of Child Psychiatry provided my "home" at the Royal Liverpool Children's Hospital, Alder Hey for three years. I am most grateful for the assistance I received there. Technical help in particular came from Charlie Scott in Medical Photography, who taught me what I know about camcorders and how to make competent videorecordings.

When I reached the analysis stage two people were invaluable. Christine Puckering, University of Glasgow, was magnanimous in sharing her coding system with me, and in teaching me how to use it. (Christine was also my instructor in the use of the Bayley assessment.) Mike Dewey, University of Liverpool, was my statistical advisor throughout. Such proficiency as I achieved on the mainframe is due to Mike's patient tuition.

Finally I must acknowledge my debt to Adrian. Without his intervention I would never have started this thesis - I certainly would never have finished it. I dedicate the finished product to him!

ABSTRACT **MOTHERS AND INFANTS: INTERACTION AND THE IMPACT OF HANDICAP**

This thesis deals with mother-infant interactions as expressed in play behaviours. These behaviours were recorded on videotape when the infants were 1 year old.

Two groups of infants were studied, one of which was developing motor disabilities. The 65 dyads in the sample were recruited from SCBU records. Mothers and infants were assessed at 6 weeks, 6 months and 1 year post term. The infants' motor and mental development and their temperaments were monitored, together with aspects of the mothers' personality and mental health. The level of psychosocial adversity was also calculated. Relationships between these variables show considerable complexity with infant motor, but not mental, development associated with mothers' symptoms of depression and levels of neuroticism. Neuroticism in mothers was also associated with measures of infant difficultness, though mothers' mental health was not. The only infant variable showing an association with mother characteristics was temperament. Difficult infants were more likely to have depressed mothers. The most striking finding was the pervasive impact of psychosocial adversity, especially in the presence of a disabled child. The interplay between these mother and infant variables describes both the development of, and the contemporaneous context for, the investigation of behaviours.

24 mother, infant and interactive behaviours were measured by means of frequency counts and ratings from the videotape recordings of standardised play sessions. Examination of individual behaviours showed little variation between disabled and nondisabled groups. Correlation analysis between the variables for the whole sample identified several behaviour networks. Further analysis showed that the relationships between context variables and behaviour variables are complex, and different for disabled and nondisabled groups.

This variable by variable analysis is followed by an attempt to devise multivariate classifications of the mothers and the babies. 5 categories of each were identified. The results of an analysis of the patterns of co-occurence suggest two important trends. Firstly less competent mothering precludes the development of more competent babies. Secondly the response to infant disability tends to produce extremes in mothering styles.

When the categories were considered in relation to the context variables, the over riding impact of psychosocial adversity was again emphasised. Important clinical implications are apparent.

Prologue

Mrs. A sits in a corner of the sofa, emaciated, sunken-eyed, fighting to hold back her tears. Clutched in her arms lies her baby daughter. Born thirteen weeks early, Gemma weighed only 998 grammes. After watching her fight for life and gradually improve, Mrs. A finally brought Gemma home six weeks ago. The time since has been traumatic, and Mrs. A is near breaking point. The baby cries almost constantly, is extremely difficult to feed and resists any efforts at soothing. Motherhood is proving a very difficult role to become accustomed to. Despite having been told by the doctors in the neonatal special care unit, of haemorrhage and resulting lesions in the brain, Mrs. A denies that there could be any lasting effects of her daughter's premature birth. If only the child would stop crying and take her feeds everything would be fine. Mr. A with a five-year old son from his previous marrige, is quiet and noncommital, but raises worries about his new daughter. Finally he vents his anger about the poor medical attention his wife received during pregnancy and the early stages of labour. He is looking for someone to blame.

Four and a half months later, Gemma remains irritable, aroused to crying by any kind of stimulation, difficult to sooth. Her mother is the only person who can feed her successfully. Both mother and father consider that, all indications to the contrary, their daughter will outgrow her current temperament, learn to crawl and sit, and eventually be like any other little girl. Mrs. A's day revolves around the unpredictable responses of Gemma, who has no established routine, feeding irregularly and sleeping fitfully both day and night. Mrs. A rarely sits down for a meal, and the parents have spent no time alone together since the return home of their baby.

Having passed her first birthday, Gemma is a tall girl. She sits strapped into a special baby buggy, unable to hold her head up or voluntarily move her limbs. For the most part she makes few sounds and her eyes remain closed, though she is not asleep. Mrs. A has put on weight, and appears more relaxed than on previous visits. She reports that she reached "rock bottom" three months earlier, having struggled to maintain the facade that there was nothing wrong with Gemma, refusing professional help and advice. She was going to prove everyone wrong, and cope with Gemms alone. Finally the little girl had been admitted to hospital where her problems were assessed, medication prescribed, and weekly respite relief arranged for Mrs. A. Gemma is now much easier to care for, and Mrs. A is leading a more normal life. She is able to have time to herself, and goes out with her husband (once a week) when Gemma is in hospital. Tears still choke her voice occasionally as she talks about Gemma, and she is still bitter and angry at the GP who attended her pregnancy. Now she can talk about Gemma's obvious handicaps though, and express her worries about the future. She also raises the question of what the presence of a severely handicapped child means for her. "My life can't be over. There must be more to it than this", she remarks as she gestures towards her immobile, silent child.

CHAPTER 1

BACKGROUND AND GENERAL LITERATURE REVIEW

Introduction

The interaction between mother and child is crucial to developmental processes (Stern, 1977; Bowlby, 1988). The child's earliest relationship develops as a result of mother/child interaction, and early attachments have been seen as models for later relationships (Bowlby, 1969). Socialization (Kaye, 1984; Murray, 1992), and particularly the development of language (for example Snow, 1991) depend on the child being in close proximity with an adult, usually with his mother. Cognitive development in the child can be affected by maternal problems such as depression (Murray and Stein, 1991; Murray, 1992). Disturbed interactions due to maternal depression have also been implicated in the development of raised levels of psychiatric disturbance and behaviour problems in preschool and school age children (Werner, Welner, Donald, McCrany and Leonard, 1977; Weissman, Prusoff, Gammon, Merinkangas, Leckman and Kid, 1984; Cox, Pound, Mills and Puckering, 1991; Murray, 1992). There are also developmental implications arising from child characteristics such as temperament traits (Chess and Thomas, 1984).

Transactional models of development have been devised that take into account the interconnections among mother, child and environmental factors (Bell, 1968; Clarke and Clarke, 1986). Sameroff and Chandler (1975) suggested a continuum of caretaking casualty such that poor environnment has a negative impact on infant development. Using a transactional model, developmental outcomes are viewed as the product of a dynamic interplay between mother and child characteristics in the context of the environment in which both exist (Sameroff, 1987).

So far, transactional models of development have not been devised that are based on behaviour nor that take into consideration the effects of prematurity and motor disability in infants. This thesis is a contribution to these neglected areas. It deals with one year old preterm infants' interactions with their mothers, and assesses the impact of motor disability resulting from cerebral palsy. The central analysis is based on behaviours coded from videotaped standardised play sessions. These behaviours, recorded at one year, are set within the psychosocial context that has developed over the first year of life. Two groups of preterm infants are compared: one that was identified to be at risk for the development of cerebral palsy and a control group that was not at risk. Over the first year, infant temperament, motor and cognitive development, and emerging disability were monitored, together with maternal personality and mental health characteristics. These provided the setting for the analysis of interactive behaviours, from which a typology of mother and baby styles was devised. The impact of disability on mother/infant interactions was assessed in this context.

This chapter provides a literature review, first of the general field of mother infant interactions, and then of the potential impact of prematurity and disability. More detailed specific literature is reviewed elsewhere in the thesis, as appropriate.

How mothers know how to interact with their babies

The "ordinary devoted mother" has a deepseated knowledge of what to do with and what to do for her baby (Winnicott, 1965). Winnicott suggested that this special knowledge builds through pregnancy, culminating in a period of "primary maternal preoccupation" in the perinatal interlude. He described a state of "heightened sensitivity" lasting at least into the first few weeks after birth. This primary maternal preoccupation enables the mother to instinctively know what is best for her baby (Winnicott, 1968). After this initial period the ordinary devoted mother provides an environment where her baby can interact with her, leading to the establishment of a good relationship.

Winnicott's ideas suggest that good enough mothering behaviour is a naturally occuring phenomenon. However, as the twentieth century has unfolded another phenomenon has developed, that of the "expert" in child development. Mothers in western societies have been much influenced by these" experts", following first one and then another's advice, as they sought to incorporate the latest in scientific knowledge into their child rearing practices.

One of the earliest influences was the work of the behaviourists such as Watson (1928) for example. He advocated well thought out strict training regimes for the infant, who was seen as a piece of clay to be moulded and formed by parents. Watson extended this objective management style to prescribe how mothers should relate to their children. A mother should be objective and firm, not indulging in displays of affection nor sentimentality. Evidence of these ideas can be seen in mothers' strict adherence to feeding schedules for example.

Later, at midcentury, the developmental psychologist, Geselle emphasised the importance of maturation in children's development, introducing the concept of fixed times for developmental milestones to be reached (Geselle and Ilg, 1943). He perceived mothers as guides, encouraging their children to accomplish in their own time their preordained potential. From the work carried out by Geselle and his team at the Yale Child Study Centre, emerged the idea that all spheres of development followed their own set of maturational stages (Ilg and Ames, 1955).

These ideas of biological maturation were developed further into formal assessments of infant development, for example, Bayley (1969) in the United States and Griffiths (1976) in the United Kingdom. Modern medical well baby care in the United Kingdom uses adaptions of these developmental tests.

Paediatricians, GPs and health visitors chart the development of individual babies in terms of their performance on such tests. One result is that mothers have a set of expectations for their babies, developmental milestones which "should" be reached by particular ages.

One of the most influential post-war "experts" has been Dr. Benjamin Spock, whose work has influenced the upbringing of several generations of western children (Spock, 1968). His advice came to be interpreted as a licence to allow the child to do exactly as he/she pleased. One of the possible effects of this on mothers was to undermine their confidence that they knew what was best for their baby.

More recently there has been a trend in developmental research back to regarding interaction between mothers and babies as a naturally occurring phenomenon. Technological advances such as videorecording have been used to overcome many of the problems of recording and analysing observed behaviours. Preverbal interactions between mother and child have demonstrated that mothers and their infants are attuned to each other from a very early age (Papousek and Papousek, 1977; Johnson, Emde, Pannabecker, Stenberg and Davis, 1982; Murray and Trevarthen, 1985). The debate still continues over the extent to which mothers instinctively know how to interact with a baby, or how much of this behaviour is culturally mediated.

How preterm birth affects the mother/infant relationship

So far, only full term babies have been discussed. Mothers in fact, seldom consider the possibility of preterm birth, even during a hazardous pregnancy. A preterm birth is usually followed by admission of the baby into a Special Care Baby Unit (SCBU). In a modern unit interaction between mother and child is actively encouraged from the time that the mother is physically able to visit (see for example Levy-Shiff, Sharir and Mogilner, 1989). Despite this, the period that the baby spends on the SCBU is often traumatic for the parents (Silcock, 1984). Even if the baby's medical status is good, the parents may go through an acute emotional crisis (Kaplan and Mason, 1960), where they must adjust to the shock of the preterm birth and grieve for the full term baby who is not to be. Once the baby is taken home, further adjustments must be made. Blake, Stewart and Turcan (1975) have described a "honeymoon" phase where mothers are euphoric about their babies, followed by a period of exhaustion, until the mothers arrive at a more realistic level of interaction with their babies.

Apart from the emotional adjustment the parents must make, they have to learn how to interact with an infant with an immature nervous system. Parents have powerful needs to get to know their baby through physical contact. However, holding, touching, talking, and holding face to face, have been found to be significantly associated with increased physiological and behavioural distress in premature infants

(Gorski, Davison and Brazelton, 1979). Appropriate levels of interaction that satisfy the needs of both infant and adult are sometimes difficult to find. The result may be a disrupted interaction pattern.

Microanalysis of mother infant behaviours has shown that there is normally a synchroneity of interaction with full term babies. Mothers are sensitive to their infants' cues (Murray and Trevarthen, 1986), mirroring and shaping their children's behaviour. Babies are attuned to the tone of voice (Remick, 1976), and to the visual stimulation of a human face (Murray, 1988).

Goldberg (1977) has observed that if infants are difficult to "read", then the interaction between mother and child can be stressful. Preterm infants do tend to be unpredictable, unreadable and unresponsive (Brachfield, Goldberg and Sloman, 1980). For full term babies, eye to eye contact is one of the important ways that mothers have of establishing pre-verbal interaction with their babies. In full terms, such behaviour peaks between three and six months of age (Cohen and Beckwith, 1976). Preterm babies do not initiate eye to eye contact with their mothers as much as do full term babies (Lester, Hoffman and Brazelton, 1985). Once contact is established, preterm babies tend to break eye to eye contact after a few seconds, and do not respond to mother's attempts to re-establish eye to eye contact (Magyary, 1983). Overall, there is much less eye contact between mother and preterm infant, as opposed to full term infant, over the first year of life (Field, 1980a).

If babies are gaze aversive, as preterms are, then mothers adjust their own behaviour. For example, Field (1980a) has observed less "optimal" holding of preterms in general. In the feeding situation, mothers show different feeding behaviours with preterms, with much more coaxing activity (Field, 1977; di Vitto and Goldberg, 1979). Mothers of preterms react to the lowered levels of interactive behaviours by increasing their own efforts. This change has been observed as early as one month (Beckwith and Cohen, 1978).

Thus, for preterms a pattern of asynchronous interaction is set up early in the first year (di Vitto and Goldberg, 1979), and continues for at least eight months (Magyary, 1983). By this time, social interaction between mother and infant is disrupted. Though the babies may display less negative affect than full terms, and indeed may be available for interaction, the mothers have now become less responsive. Malatesta, Gregoryev, Lamb, Albin and Culver (1986) found that mothers displayed less matching or imitation of infants' facial expressions, and a decrease in contingent responses to the infant's pain expressions. Those mothers also showed random rather than contingent responsiveness to sadness and ignored anger in their infants. It is as if, having expended all their ingenuity in the first few months to achieve some interaction with their babies, mothers of preterms tend to give up trying. The result, as Field (1979), has said, is often "a gaze averting, fussy, squirming infant, and an overactive, intrusive, frustrated mother".

Older preterm infants reveal difficulties that may be a consequence of this earlier period of asynchrony. Developmental lags and emotional withdrawal in two year old preterms have been reported by Ungerer and Sigman (1983). Drillien (1964) found that 22% of the low birth weight survivors he followed up, had serious behaviour problems. Dunn and his co-workers in Vancouver examined low birth weight survivors at 6.5 years of age. 68% of the sample had short attention spans, were hyperactive, had learning difficulties and showed associated emotional disorders (Dunn, 1986).

The withdrawal on the part of the mothers may even result in increased levels of neglect (Hunter, Kilstrom, Kraybill and Loda, 1978), battering (Klein and Stern, 1971; Schmitt and Kempe, 1979) and abuse (Elmer and Gregg, 1967; Goldston, Fitch, Wendell and Knapp, 1978) that have been found in groups of older preterm children.

Preterm birth sets up a train of asynchronous interactions between mother and child. There is evidence that the sicker the baby the more asynchronous the levels of interaction (Brachfeld, Goldberg and Sloman, 1980; Barnard, Bee and Hammond, 1984; Anderson, Coll, Vohr, Emmons, Brann, Shaul, Mayfield and Oh, 1989; di Vitto and Goldberg, 1979; Jarvis, Myers and Creasy, 1989). The added complication of disability could disrupt the interaction even further.

How the birth of a disabled child may affect the mother/infant relationship.

The birth of a child with a physical disability can be a traumatic event for a family, and each parent adjusts in different ways. However, little is known about the subsequent processes at work in the building of relationships between mother and child and the extent to which these may differ between nondisabled and disabled cases. In the case of a disabled child it is likely that the developing relationships are shaped not only by the child's disability but also the effect this impairment has on the mother (Bell, 1968; Sameroff and Chandler, 1975).

Most pregnant women at some stage consider the possibility that the child they bear may not be perfect (Wright, 1976). With the birth of a baby with a disability, these fears are confirmed and a process of adjustment must begin (Quine and Pahl, 1987). How this process takes place is open to interpretation, but clinicians have noted a series of stages that parents pass through (Drotar, Baskiewicz, Irvin, Kennell and Klaus, 1975; Blacher, 1984). These have been likened to the stages of grief as parents mourn the loss of their expected healthy child (Solnit and Stark, 1961). The sequence of emotional reactions usually noted following the birth of a disabled baby is depression, rejection, anger, and finally acceptance (for example see Broussard and Hartner, 1970; Kimpton, 1990). During the rejection phase, strong denial reactions have been observed, which in some cases, lead to parents shopping around for a cure, moving from one professional to another (Anderson, 1971; Mandelbaum and Wheeler, 1960; Wolfensberger, 1965; Cottam and Sutton, 1986).

As the baby grows older the parents move towards acceptance, though a prevailing sense of guilt often lingers (Love, 1973; Menolascino, 1968; Wolfensberger, 1967; Wright, 1976). Kennedy (1970) also describes feelings of disappointment, loss, hopelessness, anger, futility and detatchment that develop along with the parents' growing awareness and acceptance of the disability. Mothers in particular express lowered self-esteem and lack of confidence in their ability to care for their baby (Cummins, Bayley and Rie, 1966; Waisbren, 1980).

Such reactions by the parents affect the developing relationship between mother and child. As Kogan (1980) has pointed out, few if any guidelines exist to help parents set appropriate behavioural goals for their disabled children. Parents must arrive at their own accomodation to the disability.

Most of the research to date has been with mentally handicapped or sensorily deprived babies, rather than with motor disability (for example see the review by Byrne and Cunningham, 1985). It has been assumed that information about one disability and how it affects babies and their mothers is applicable to other disabilities. However, disability is a generic term that subsumes great variability, and even amongst families coping with the same disability the responses differ according to the severity of the affliction.

Mothers are sensitive to babies' disabilities, adopting contingent responses, that compensate for the babies' inabilities (Cicchetti and Schneider-Rosen, 1985). The types of adaptation vary with the types of disability (Rogers, 1988). For example, mothers of children with hearing difficulties compensate for the children's greater passivity and less active involvement by being more dominant (Wedell-Monning and Lumley, 1980). However, babies with disabilities provide fewer, less readable cues to their mothers (Walker, 1982). This is true for children with Downs Syndrome (Cichetti and Sroufe, 1978; Emde and Brown, 1978), for autistic children (Wetherby, 1986; Sigman and Ungerer, 1984), and for blind children (Fraiberg, 1977).

Little research has been carried out with children who develop motor disabilities. Brookes-Gunn and Lewis (1982) have shown that for children, aged 12 to 36 months with cerebral palsy, there was less positive affect exhibited in interactions with their mothers, and both mothers and babies smiled less than the controls. The babies cried more than controls though this decreased over time. The mothers did not respond as contingently to their disabled children, talking less as the children's vocalisations increased and responding less to smiling behaviour as that increased. Overall, they found that mothers of children with cerebral palsy were less facilitative of positive affect in the children.

Adverse effects on mother infant interactions have been demonstrated for children with physical disability. Maternal withdrawal from disabled children has been observed during the child's second year (Wassermen and Allen, 1985). Where interactions do occur, the mothers are more controlling and intrusive (Kogan, 1980). Kogan, Tyler and Turner (1974) demonstrated that mothers of children with cerebral palsy developed progressively fewer positive feelings in their interactions with their children over the first three years of life. This decrease in expression of warmth was found in both therapy and play situations and did not reflect changes in the children's behaviour. In a later study Kogan (1980) reported that participation in reciprocal relationships was difficult for three to five year olds with physical disabilities. At this stage both mothers and children exhibited high negative and low positive affect.

In a number of families interaction between parent and child can break down completely (Frodi, 1981; Diamond and

Jaudes, 1983). A survey in the United States of the general nonclinical population of children with cerebral palsy, revealed that 10.9% had signs of known or possible physical abuse (Cohen and Warren, 1987). Jaudes and Diamond (1985) reported that 14% of their sample of children were abused after the diagnosis of physical disability was made.

At best, it would appear that childen with cerebral palsy have less warmly interactive relationships with their mothers. At worst they are at risk for physical abuse. This maladjustment has already taken place by the second year. Since diagnosis of cerebral palsy has been difficult during the first year of life until recently (Illingworth, 1966; Ellenberg and Nelson, 1981), little is known about how relationships deteriorate.

The diagnosis of cerebral palsy is not usually made before the age of twelve months in standard clinical practice. The advent of ultrasound and magnetic resonance scanning, has made it possible to detect brain heamorrhage in the neonatal period. Research with preterm neonates has shown that haemorrhage of particular types is likely to lead to motor problems and a diagnosis of cerebral palsy. With early diagnosis, babies can be studied before neurological signs of motor disability are evident and as the motor problems emerge.

One problem with this procedure is that parents are told of the liklihood of disability whilst the babies appear unaffected. This could influence parent's perception of and expectations for their children. McCormick, Shapiro and Starfield (1982) showed that mothers' perceptions of their infants' slow development was determined by their concerns about the infants' past and present health rather than by the infants' actual developmental level. Cayler, Lynn and Stein (1973) noted depressed intellectual and perceptual development in healthy children, misdiagnosed as having heart disease. These findings may have been the result of a "vulnerable child syndrome" (Green and Solnit, 1964). Kearsley (1979) has described iatrogenic retardation, whereby the child becomes retarded in response to the treatment and interaction experienced. Buda, Rothney and Rabe (1972) have demonstrated that the mother child relationship affects aspects of physical functioning in the child such as muscle tone. If parents' expectations are depressed then the diagnosis of handicap may become self fulfilling.

The consequences of poor locomotion during the second half of the first year of life are great. The child with cerebral palsy needs a sense of self identity, of motivation to achieve, and curiosity about the environment. Without these a child with a physical disability is at a double disadvantage. As Walker (1982) has pointed out, disabilities tend to be cumulative, extending into areas where there is no direct disability.

If the processes at work in the first year are to be examined, children at risk for the development of cerebral palsy must be identified at an early stage and then studied prospectively. In order for the impact of disability to be fully assessed, within the context of prematurity, the development of the mother-infant relationship has to be understood.

The Thesis Context

This thesis was developed within the constraints of a medical study set up to compare the motor development of two groups of preterm infants, all of whom were predicted to be at risk for the development of cerebral palsy (Chapter 2, the physiotherapy study). One group received an early physiotherapy intervention, the other did not. A parallel project was added to that study to examine the impact of the intervention in nonmotor areas of development, and also to compare the development of the babies judged to be at risk, with the development of a group of preterms who were not at risk (Chapter 2, the physiotherapy impact project).

The study which forms the basis of this thesis was developed concurrently with the physiotherapy impact project. Much of the statistical information presented here was collected in relation to that project, though the analysis presented here is selective and specific to this thesis. The behavioural information relating to mother-infant interactions, and based on the analysis of videotaped standardised play sessions at age 1 year, was additional to the project material and was designed and carried out specifically for this thesis.

The broad aim of the thesis was to observe and analyse the behaviour of mothers and infants in play situations. It was hypothesised that mother's style of parenting and baby's style of behaving would combine together to give predictable outcomes in play.

Following this chapter, Chapter 2 describes the context of the thesis, and outlines the research design, paying particular attention to the nature of the sample. This leads on to three chapters that deal with the characteristics of the mothers (Chapter 3), the infants (Chapter 4), and the statistical relationships between them (Chapter 5). The central part of the thesis is concerned with an analysis of mother and child behaviours recorded during the videotaped, standardised play sessions (Chapter 6), followed by characterisation of mothers, infants and interactions (Chapter 7). Chapter 8 relates the findings to the wider context.

CHAPTER 2

THE SAMPLE: METHODOLOGY

Background

The Physiotherapy Study

With the application of ultrasound scanning techniques, rapid advances have been made in the detection of cerebral periventricular haemorrhage and its sequelae in preterm neonates (Pape, Cusick, Houang, Blackwell, Sherwood, Thorburn and Reynolds, 1979; Cooke, 1979). Infants of 28 weeks or less gestational age have been found to be particularly vulnerable (See Appendix I). There is a growing body of research showing that cranial sonographic evidence can be reliably used to predict the development of cerebral palsy (Cooke, 1985; Bennett, Silver, Leung and Mack, 1990; Bozynski, Nelson, Genaze, Skertich, Matalon, Vasan and Naughton, 1988; Pidock, Graziani, Stanley, Mitchell and Merton, 1990). Moreover the timing and location of parenchymal lesions are thought to be associated with different manifestations of cerebral palsy (Powell, Pharoah, Cooke and Rosenbloom, 1988a; Powell, Pharoah, Cooke and Rosenbloom, 1988b).

Usually the diagnosis of cerebral palsy is not made before the end of the first year of life or later (Taft, 1984; Harris, 1987; Park and Owen, 1992). However, modern advances in imaging techniques have meant that parents can be informed of the possibility of motor developmental problems at a very early stage. With early diagnosis, early treatment also becomes a possibility. A number of studies have been set up to investigate the impact of several kinds of early intervention. Results so far are equivocal (for example, Kanda, Yuge, Yamori, Suzuki and Fakase, 1984; Goodman, Rothberg, McMillan, Cooper, Cartwright and Van der Velde, 1985; Piper, Kunos, Willis, Mazer, Ramsay and Silver, 1986; Palmer, Shapiro, Wachtel, Allen, Hiller, Harryman, Mosher, Meinert and Capute, 1988).

One major problem with the studies mentioned is loose sample definition. In 1987 a longitudinal study was set up in Liverpool to determine whether early physiotherapy reduces the degree of motor and other disabilities in children who develop cerebral palsy due to perinatal brain injury (funded by an award from Action Research for the Crippled Child to A.M. Weindling, University of Liverpool).

All babies admitted to the Special Care Baby Units (SCBU) at three Mersyside maternity facilities are routinely screened by ultrasound scans for cerebral haemorrhaging. Transfontanelle, real time, ultrasound scanning is a non-invasive technique that does not disturb the baby (for a description of the technique see Appendix I)(Figure 2.1).

The scans of the neonates were examined, and infants with intraventricular haemorrhage with ventricular dilation, porencephalic cysts and periventricular leukomalacia were

identified. These babies, together with those experiencing post-haemorrhegic hydrocephaly severe enough to warrant a shunt emplacement, were eligible to be entered into the early physiotherapy study. The other criterion for entry was that the babies were considered grossly neurologically normal by clinical medical staff on the SCBU, that is not in a coma, not apathetic, not fitting and with no overt disturbance of muscle tone.

Once selected, the babies and their parents were recruited into the study by the consultant paediatricians attached to the SCBUs. The babies were then allocated blindly in random order to either an early physiotherapy treatment group or to a group receiving standard clinical care. Babies in the standard care group received well baby care from their local community health team and routine follow up visits to the SCBU. Referral for physiotherapy at the local hospital took place if any of the professionals involved detected abnormal neurological signs developing. The early intervention group also received standard well baby care and visits to the SCBU, but in addition they were seen regularly from their estimated date of birth by a physiotherapist. Once discharged from hospital the babies were visited at home. The intervention was aimed at establishing correct handling of the infant and the development of normal posture and patterns of movement, using the Bobath method (Bobath, 1967). The intervention continued for one year from the baby's estimated date of birth.

The babies were assessed at 4 months, 8 months and 1 year (corrected age) by a research team comprising a pediatrician and a physiotherapist. Outcome was measured in terms of developmental test results and tests of motor functioning and reflexes.

The physiotherapy impact project

In order to assess the impact of the intervention on nonmotor areas of development and the effects on mothers as they adjust to emerging disability, a subsidiary project was also set up. Prior to the main work, a short pilot study was undertaken to examine the most relevent assessments for in depth study. The present author was responsible for the pilot study. Eight of the babies from the main physiotherapy study, four from the early intervention group and four from the standard care group, were recruited together with eight matched preterms from the SCBU who were deemed to be not at risk for the development of cerebral palsy. The mothers were interviewed at home when the infants were six months old (corrected age). A semi-structured interview schedule was constructed and administered together with a number of standardised questionaires. No developmental testing was undertaken at this stage (Lambrenos, 1988).

The pilot work demonstrated the importance of a control group. At six months several effects that might have been attributed to disability were also observed in the infants who were not at risk. It also became obvious that disabilities were manifested in some children before they were six months old. Therefore a first interview would have to be conducted at an earlier age to establish predisability baselines. Adjustments were made to the interview schedule and to the assessments used on the basis of insight gained during the pilot study.

Following pilot work the project received funding from the Mersey Regional Health Authority (Research Scheme Number 583: The influence of early physiotherapy on children who develop cerebral palsy due to perinatal brain injury: a collaborative investigation to assess the effects of intervention on parents and families; Grant holders A.D. Cox, A.M. Weindling and R.M. Calam, University of Liverpool). The present author was appointed as research assistant to the project. The present PhD thesis was designed to take advantage of the opportunity presented by the project to investigate mother-infant interaction.

The project had as its aims an assessment of the impact of emerging disability on the infants and their mothers over the first year of life, and how this impact was ameliorated by the introduction of an early physiotherapy intervention. In order to achieve these aims it was decided to monitor the infants and their mothers at three time periods over the first year of the infants' posterm life. They were seen first when the babies were 6 weeks old, when there were no overt neurological signs of motor problems. The babies could all move freely, stretching and kicking their arms and legs. The mothers and children were assessed again when the infants were 6 months and 1 year old. (All ages given are corrected for prematurity.) The assessments were completed in the subjects' homes.

Babies recruited into the physiotherapy study, both treatment and standard care groups, from July, 1988 to February, 1990 were included in the project. The only exceptions were multiple births who were excluded on the basis that their developmental course is affected by increased pressure on mother's time. The random allocation into treatment and standard care groups was maintained. A matched control group was also recruited specifically for the project. Each child from the physiotherapy study was matched for sex, gestational age, birthweight and singleton birth status. To attempt to match for illness level on the SCBU, all the control babies had suffered from respiratory distress syndrome (RDS) severe enough for them to have been placed on a ventilator. However, none of the control babies had suffered from intraventicular haemorrhage. Thus there were three groups for comparison.

At each of the three assessments a semi-structured interview schedule was followed which elicited information on the mother's thoughts, feelings and expectations during pregnacy, birth and the subsequent year of her child's life. Her relationships with her partner, her family, her wider social network and with professionals were investigated. Information was also gathered on the infant's problems and treatment.

A number of standardised questionaires was completed by the mother to gather further data on her mental health, her personality, her relationship with her partner, the infant's physical health and feeding, his/her temperament, his/her social development, and the presence of behaviour problems.

At 6 months and 1 year, developmental tests of motor and cognitive achievements were performed by the author on each of the infants. Though the babies from the physiotherapy study were monitored by a research team, the testing was performed on a different time scale. The control babies, of course were not seen by that team. Table 2.1 gives details of the particular assessments and the time at which they were administered.

The thesis

This thesis deals with mother-infant interactions. Its primary purpose is to identify how particular types of mother and baby combine to produce particular styles of interaction. It seeks to assess within this context, how disability influences the developing relationship. It is not primarily concerned with the narrower question of the influence of early physiotherapy.

Table 2.1 Table of assessments administered by the author over the first year of the physiotherapy impact project

Instrument administered to mother	6w	6m	1y
Semi-structured interview schedule			
Demographic information	*		
Mother's experience of pregnancy	*		
Mother's experience of birth	*		
Changes in conditions		*	*
Future predictions about baby	*	*	*
Support networks		*	*
Ability to cope	*	*	*
Assessment of depressive symptoms		*	*
[S] Infant Characteristics Questionaire (Bates)	*	*	*
[S] Vineland Adaptive Behaviour Scale		*	*
[S] Mental Development Index (Bayley)		*	*
[S] Psychomotor Development Index (Bayley)		*	*
Testers Rating of Infant Behaviour (Wolke)		*	*
[S] Malaise Inventory	*	*	*
[S] Eysenck Personality Inventory	*		*
[S] Dyadic Adjustment Scale (Spanier)	*	*	*
Instrument administered to Father			
[S] Malaise Inventory		*	*
[S] Dyadic Adjustment Scale (Spanier)		*	*
Video assessment of Mother and Infant at play	*	*	*

[S] indicates a standardised assessment

Though the thesis was designed to take advantage of the opportunity presented by the project to investigate mother-infant interaction, this situation created a number of constraints. Both the sample and the timing of assessment were fixed by the project. Similarly, the exhaustive nature of the data collection for the project precluded modification of or additions to the database. However, the comprehensive nature of the database itself allowed selection for analysis of specific background data directly relevent to the thesis.

The main thrust of the thesis was an examination of the mother-infant interaction in play when the children were one year old (corrected age). This was done by analysis of videotaped standardised play sessions, carried out in addition to the project-related data collection, supplemented by selected data from the project.

Aims

The aims of the thesis were :

1) To observe and analyse the behavioural characteristics and interactions of mothers and infants in standardised play situations;

2) To study the development of selected mother and infant characteristics over the first year of the infant's life;

3) To examine the effect of emerging motor disability on motor and cognitive development and temperament in the infant and mental health in the mother;

4) To assess the impact of mother and baby characteristics on behaviours in the play situation, particularly the extent to which disability modifies the style of interaction.

The impact of the physiotherapy intervention was not the primary purpose of the thesis. Though it was considered in the analysis, no significant impact was found.

The sample

85 mothers were contacted for inclusion into the thesis sample. Three mothers refused to participate. One baby died before the 6 week interview date, and one more died between the 6 month and 1 year interviews. After the initial 6 week interview only two mothers withdrew from the study. However, at the 6 month follow up, two families could not be traced, and before the 1 year interview one family had returned to their home in the Middle East and could not be contacted. Five babies did not meet the criteria for recruitment into the sample once complete information had been gathered at the 6 week interview. The sample therefore consisted of 65 babies and their mothers (Figure 2.2).

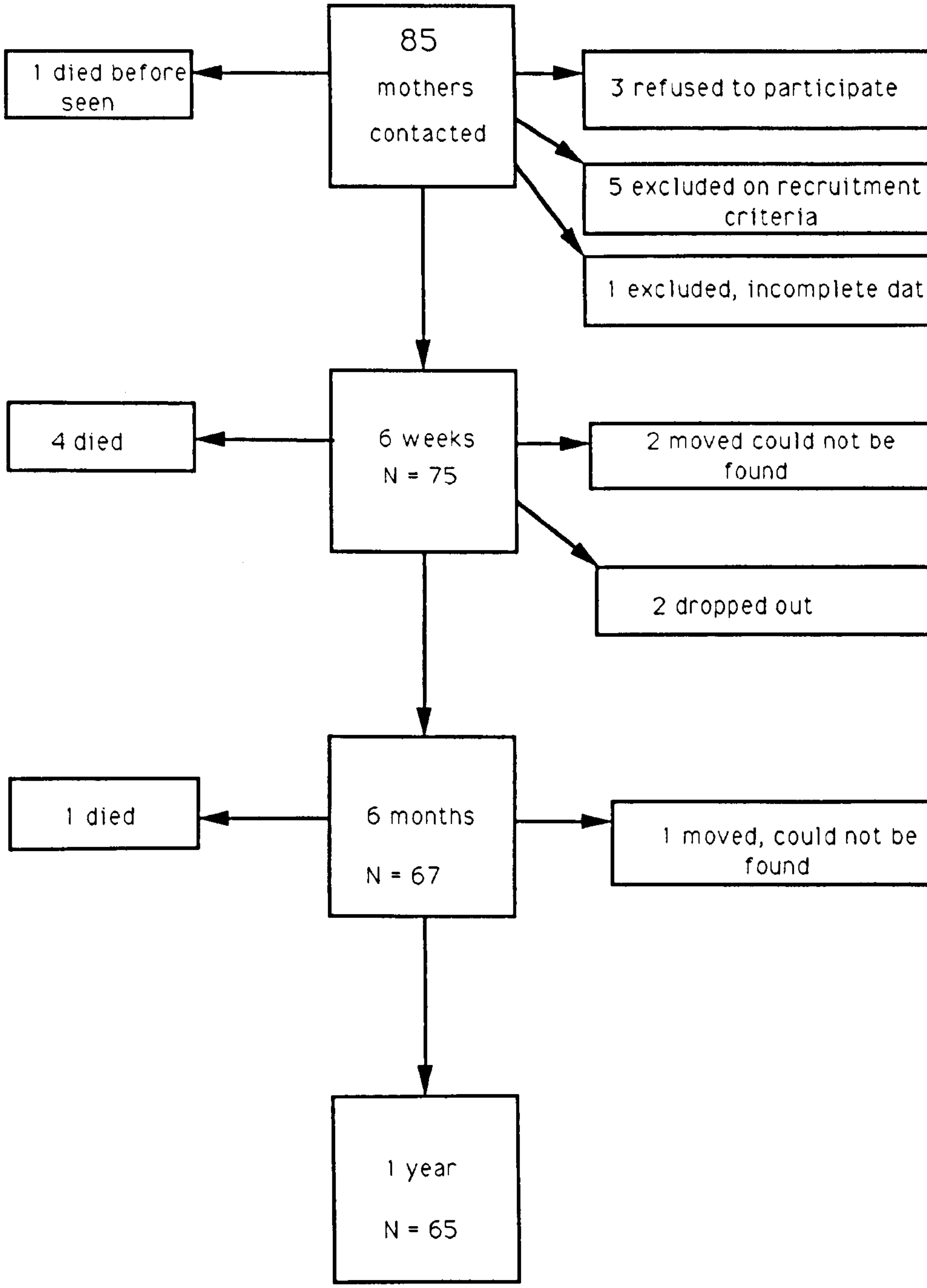


Figure 2.2 Recruitment of 65 babies who make up the sample

Table 2.2 Characteristics of 65 babies and their mothers

		Abnormal brain scans N=30	No scan abnormalities N=35
Baby			
Birthweight[a]			
	mean	1231 grms	1217 grms
	SD	409 grms	347 grms
Gestational age[a]			
	mean	28 weeks	29 weeks
	SD	3 weeks	2 weeks
Number of males[b]		14 (47%)	21 (60%)
Singleton births[a]		30	35
RDS neonatally[a]		30	35
Mother			
Age at birth of baby[c]			
	mean	27 years	25 years
	SD	5 years	5 years
Social class[c]	I	0	0
	II	4	5
	III	9	10
	IV	6	11
	V	3	1
Unemployed head of household[c]		8	8
Primiparous[c]		12 (40%)	20 (57%)

a Variable on which babies were matched
b Unmatched baby variable
c Unmatched mother variable

N.B. There were no significant differences between groups in either matched or unmatched variables.

Of the 65 babies recruited, 30 had abnormal brain scans and were members of the physiotherapy study (the Index babies). The other 35 had scans that had not given rise to concern on the SCBU (the Control babies). The characteristics of the sample at time of recruitment are detailed in Table 2.2.

Hypotheses

The broad hypotheses of the thesis relate to three main areas - the bases of mother infant interaction in play, the effects of prematurity and the effects of disability. From the previous literature (see Chapter I) two broad hypotheses can be proposed.

1. The style of interaction might be expected to reflect the characteristics of the mother and the baby. Within the context of the personality of the mother, poor psychosocial environment and poor maternal mental health would lead to disrupted interactions. Similarly, developmental delay and difficult temperament in the infant would also contribute to disrupted interactions.

2. Within the general context of prematurity, the impact of disability might be expected to be expressed by interactions involving lowered levels of positive affect, increased levels of maternal control and intrusiveness, coupled with overall maternal withdrawal.

Research design

A prospective, short term, longitudinal design was set up. The mothers were contacted soon after discharge of the babies from the SCBU. The project/thesis was explained to them and they were asked to agree to three visits from the research psychologist (the author). Once recruited, the mothers were interviewed three times at 6 weeks, 6 months and 1 year corrected age. The interviews all took place within two weeks of the target date. In addition the babies were assessed at 6 months and 1 year and the standardised play sessions were videotaped at 1 year. The assessments administered at each time that are relevent for the thesis are summarised in Table 2.3. Each individual assessment is described in detail in the appropriate chapter.

Analysis

The first stage in the analysis of the assessment data was coding the questionaires, followed by the derivation of descriptive statistics relating to mother and baby variables. Analyses were carried out by computer using the SPSS package of programs (see Chapters 3, 4 and 5). The behaviours recorded on the videotapes were coded and analysed first in the context of the relationships between the variables (Chapter 6), then for the characterisation of mother and infant types (Chapter 7).

Table 2.3 Table of assessments administered by the author used in the analysis for the thesis

Instrument administered to mother	6w	6m	1y
Semi-structured interview schedule			
Demographic information	*		
Changes in conditions		*	*
Support networks		*	*
Ability to cope	*	*	*
Assessment of depressive symptoms		*	*
[S] Infant Characteristics Questionaire (Bates)	*	*	*
[S] Mental Development Index (Bayley)		*	*
[S] Psychomotor Development Index (Bayley)		*	*
[S] Malaise Inventory	*	*	*
[S] Eysenck Personality Inventory	*		*
[S] Dyadic Adjustment Scale (Spanier)	*	*	*
Video assessment of Mother and Infant at play			*

[S] indicates a standardised assessment

CHAPTER 3

CHARACTERISTICS OF THE MOTHERS

The purpose of the chapter is to present a description of the mother and what she brings to the interaction with her child. Of particular importance are the internal characteristics of the mother, her personality and mental health, and the external characteristics governed by her environment, and how both may be stable or change over the baby's first year of life.

The young infant is entirely dependent on, and experiences the world through, those who care for him. Not suprisingly the infant is selectively attuned to specific human qualities from a very early age. There appear to be mechanisms for the perception of human language evident from as early as one hour after birth (Alegria and Noirot, 1978; Ockleford, Vince, Layton, & Reader, 1988), and the infant rapidly refines his ability to detect human speech (Friedlander, 1970; Eisenberg, 1975; Eimas, Siqueland, Jusczyk and Vigorito, 1971; Eimas, 1985). Infants also seem to respond to images of the human face (Fantz, 1963; Goren, Sarty and Wu, 1975), again refining their perceptions within a short time span so they can for example detect emotion (Field, Woodson, Greenberg and Cohen, 1982; Field, 1985; Harris, 1989).

Not only do infants have these innate abilities, but they rapidly learn to prefer the particular characteristics of the one person who most often cares for them. Preference for the mother's face is observable soon after birth (Field, 1985) and her voice is preferred by 1 - 2 days of age (De Casper and Fifer, 1980). An infant can also pick out mother's smell by 6 days of life (McFarlane, 1975). It would seem that infants are preprogrammed to identify a caregiver.

During the first year of life when the child is so dependent, the attributes of the mother will directly influence the infant and the quality of the emerging relationship between mother and child. This chapter will first examine the mother's personality traits, how her extraversion/neuroticism characteristics relate to each other and how stable they remain over the period. This is followed by an examination of the mother's mental health, in particular whether or not she is depressed, and whether these conditions change over time. The third section of the chapter examines the pychosocial environment of the mother and the extent to which this remains stable over the year. This takes into account the physical and economic environment and her social support network ie. her relationships with partner, family and friends. Finally the chapter deals with relationships between these three sets of characteristics.

The methodology depends on the analysis of data collected during the 6 weeks, 6 months and 1 year interviews. Some of the data relate to standard questionaires, other data to semistructured interviews designed specifically for this study (see Chapter 2). The data have been coded and analysed statistically, primarily through the SPSS packages.

Personality traits

While, in everyday life, there is general acceptance of the concept of personality, what this encompasses and how it should be defined objectively has produced fierce debate within psychology. If the mother's personality influences her emotional state, this in turn could be expected to influence the infant's emotional state (for example Haviland and Lelwica, 1987; Termine and Izard, 1988) and behaviour (for example Klinnert, 1984). Both will influence the quality of interaction between mother and infant. Eysenck, amongst others, has provided a means of descibing some aspects of personality, which he suggests reflect broad underlying dispositions that remain stable over time (Eysenck and Eysenck, 1969).

The assessment instrument chosen for this study was the Eysenck Personality Inventory (EPI: Eysenck and Eysenck, 1964). This was partly a decision related to the design of the larger physiotherapy impact project (see Chapter 2), and partly because of time constraints precluding the use of alternative methods. The EPI identifies two dimensions of personality - introversion/extraversion and neuroticism. In a later refinement of the EPI, Eysenck added a third dimension, psychotism (Eysenck Personality Questionaire:

Eysenck and Eysenck, 1975).

In a community population, the distribution of extraversion and neuroticism is normal; most people score in the middle range. The distribution of psychotism however is highly skewed, the majority of people scoring very low and being located at the stable end of the dimension. Neuroticism and extraversion/introversion have been shown in independent replications to be robust concepts (for example Barrett and Kline, 1982), though the psychotism scale has proved to be more controversial. Psychotism has been investigated in a prison population, where it might be expected that individuals would score highly (Launey and Slade, 1981; Hare, 1982). However, those diagnosed as psychotic do not necessarily score highly on the Psychotism scale (Bishop, 1977; Block, 1977). With the present community-based sample of mothers, none of whom had a previous psychiatric history, it was decided that the less controversial, two dimension EPI would be used.

The EPI is a self-report questionaire, with items constructed so that they are easily readable by poorly educated subjects, an important consideration in the present sample with a preponderance of inner city subjects. There are two parallel forms consisting of 57 items each. This made it possible to administer Form A at the 6 weeks interview and Form B at the one year interview, without interference from a memory factor. Eysenck has reported test - retest reliabilities to be high for a normal population, between 0.84 and 0.94 for the whole test (Eysenck and Eysenck, 1964).

The Inventory was given to each mother with the instructions that she must answer every question either with 'Yes' or 'No'. It was stressed that there were no right or wrong answers, and that every person answers in their own way. The form was completed during the course of the interview at a point when it was convenient for the mother to fill it in without undue interuption.

Forms were subsequently evaluated using the EPI scoring keys. 1 point was allocated for each E or N answer revealed by the key. These were then summed to give each mother a score on the E and N scales. There were also 18 EPI items which gave a score on a Lie Scale. Eysenck included this to help in the detection of individuals who were 'faking good'. Subjects were also scored on the Lie Scale in order to give some indication of those mothers showing a 'desirability response set'.

According to Eysenck the N and E scales measured by the EPI are orthogonal. On a sample of 2000 normal individuals he reported correlations between E and N using Form A of $r = -0.013$ and between E and N using Form B of $r = -0.116$. In the present sample of mothers this was not found. At 6 weeks 22% of the variation in N could be explained by E scores, and at 1 year this was still at 17% (Table 3.1).

Table 3.1 Results of correlation analysis to show the independence of E and N scores for 65 mothers.

6 weeks N with E	1 year N with E
$r = -0.47$	$r = -0.42$
$r^2 = 0.22$	$r^2 = 0.17$
$p < 0.0001$	$p < 0.0007$

Plotting 6 weeks E scores against N scores revealed no subjects scoring low on both the E and N scales. There were also very few subjects scoring high on both scales (Figure 3.1). At 1 year there were even fewer low scorers on both scales, though the number scoring high on both scales increased (Figure 3.2). The mean scores for the E and N scales at 6 weeks and 1 year are given in Table 3.2.

Table 3.2 Means and standard deviations for N and E scores for 65 mothers together with standardised scores from EPI manual (Eysenck and Eysenck, 1964)

	6 weeks (1)	1 year (2)	Standardised means (1)	(2)
N Scale mean	9.7	11.5	9.0	10.5
SD	5.1	5.2	4.8	4.7
E Scale mean	13.5	15.5	12.0	14.3
SD	5.4	3.8	4.4	3.9

(1) Form A
(2) Form B

Figure 3.1 Relationship between Eysenck E and N at 6 weeks

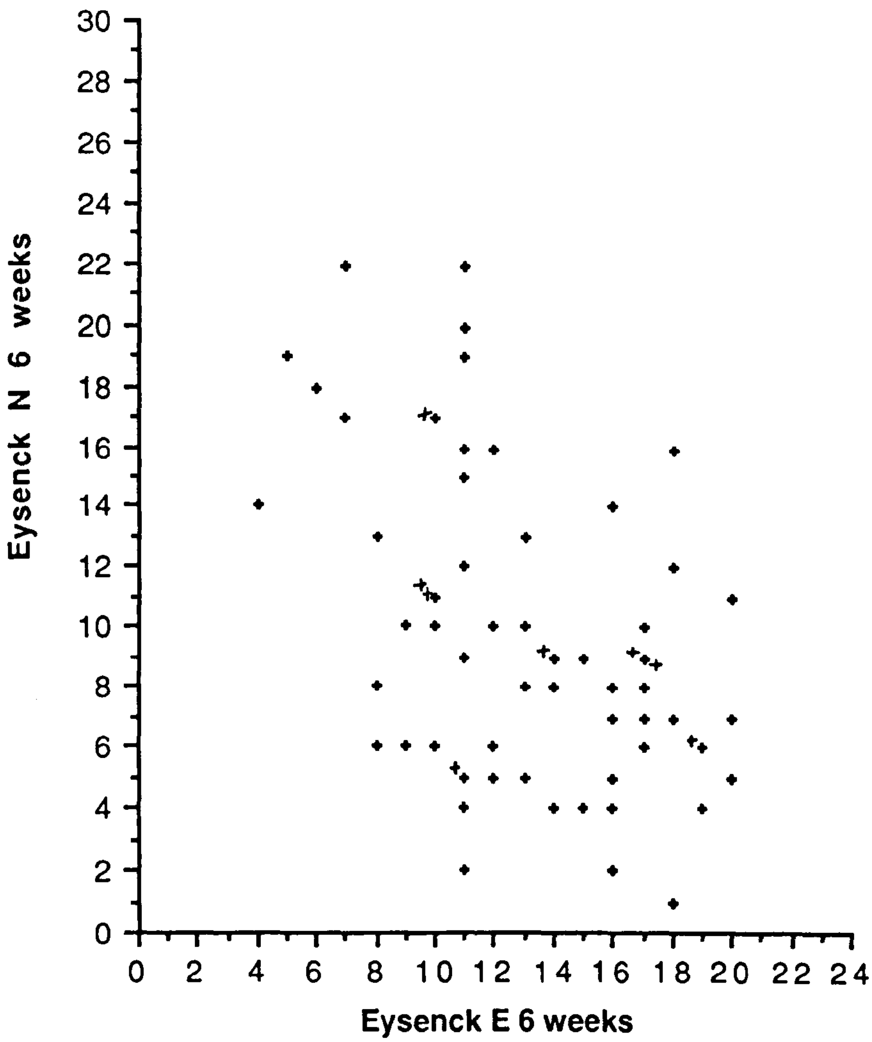
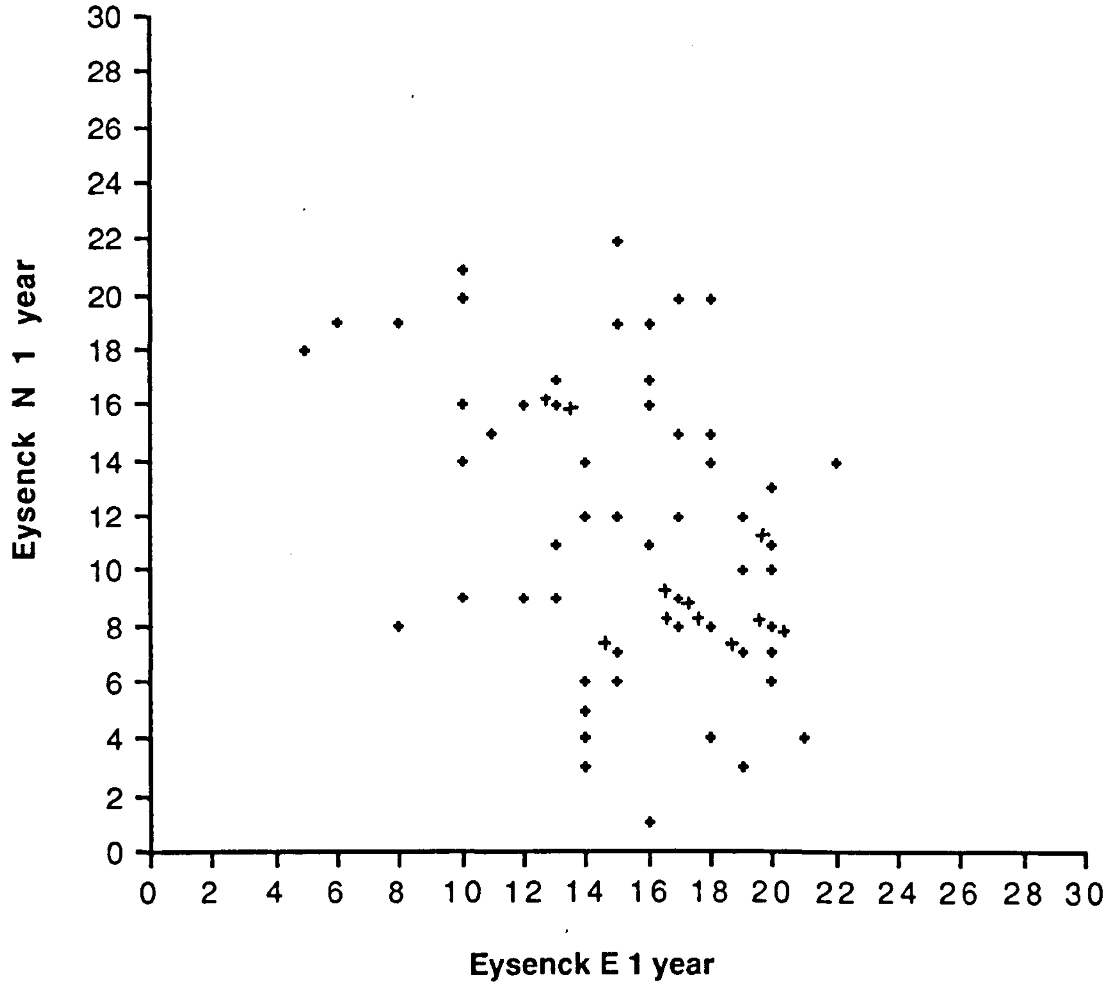


Figure 3.2 Relationship between Eysenck E and N at 1 year



There were no significant differences between the sample means and the standardised means, either at 6 weeks or at 1 year. This however does not show whether these populations are stable. On examination, different patterns were revealed in the distribution of scores for individual mothers at different times for both extraversion and neuroticism. At 6 weeks E scores were normally distributed but there were more high scoring mothers than would be expected. This pattern was repeated at 1 year where the distribution was skewed towards extraversion (Figures 3.3 and 3.4). This was probably a cultural effect. Liverpool people have a reputation for being rather brash and outspoken. The high extraversion scores could well have been a measure of the "Scouse" personality! The distribution of N scores was skewed towards stability at 6 weeks, whilst at 1 year there was a trend for the mothers to become more neurotic (Figures 3.5 and 3.6). Increasing neuroticism could perhaps be a feature of motherhood, as the baby develops into a mobile toddler there are more things for a mother to worry about on the child's behalf. It could also be the effect of the infant's temperament interacting with the mother's personality, but this will be discussed in Chapter 5.

In this sample, although levels of stability were high, there were changes in the E and N dimensions over the period of study.

Figure 3.3 Distribution of Eysenck E scores (Form A) for 65 mothers when babies were 6 weeks old

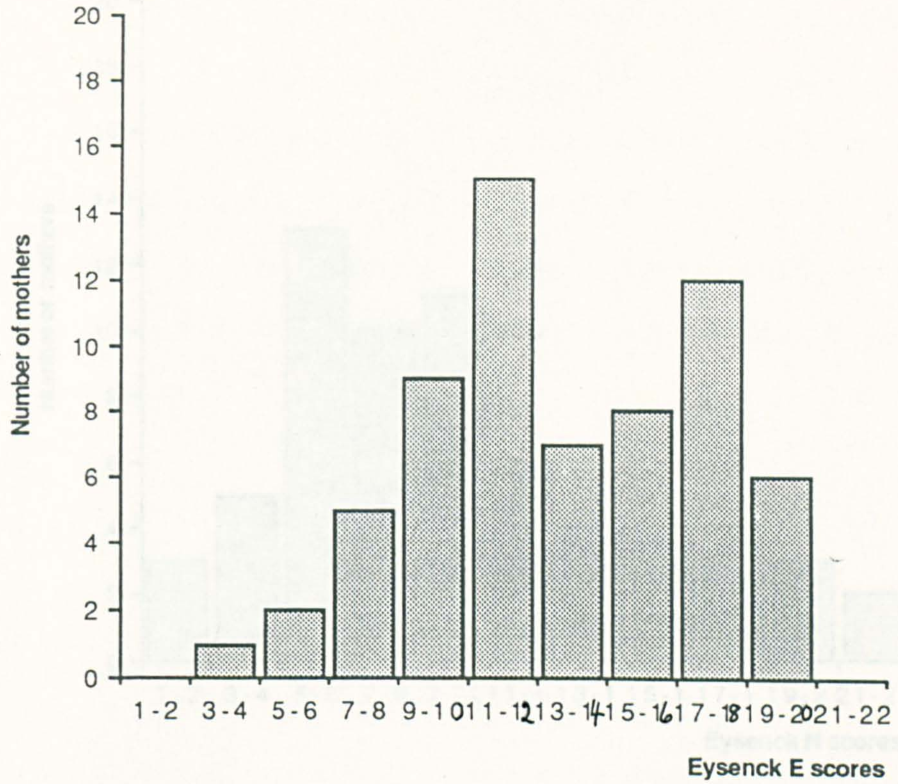


Figure 3.4 Distribution of Eysenck E scores (Form B) for 65 mothers when babies were 1 year old

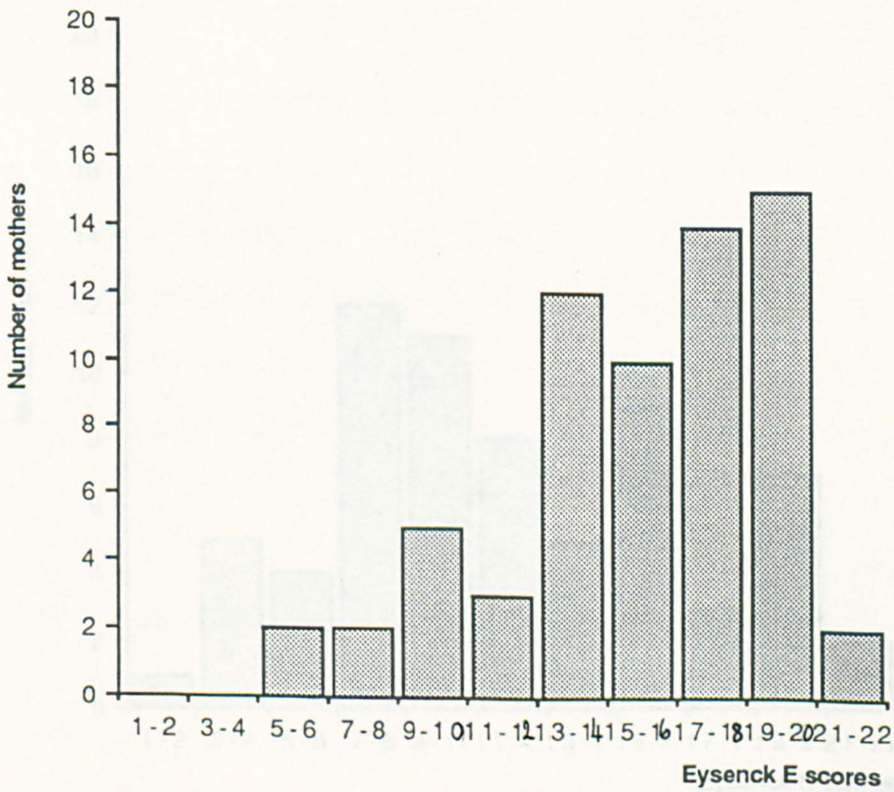


Figure 3.5 Distribution of Eysenck N scores (Form A) for 65 mothers when babies were 6 weeks old

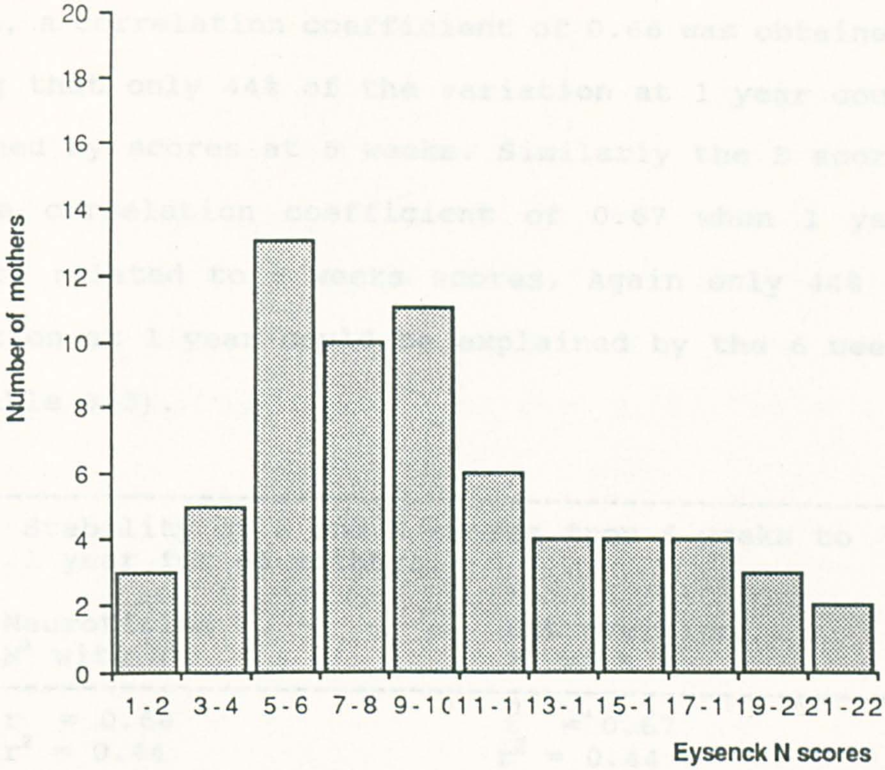
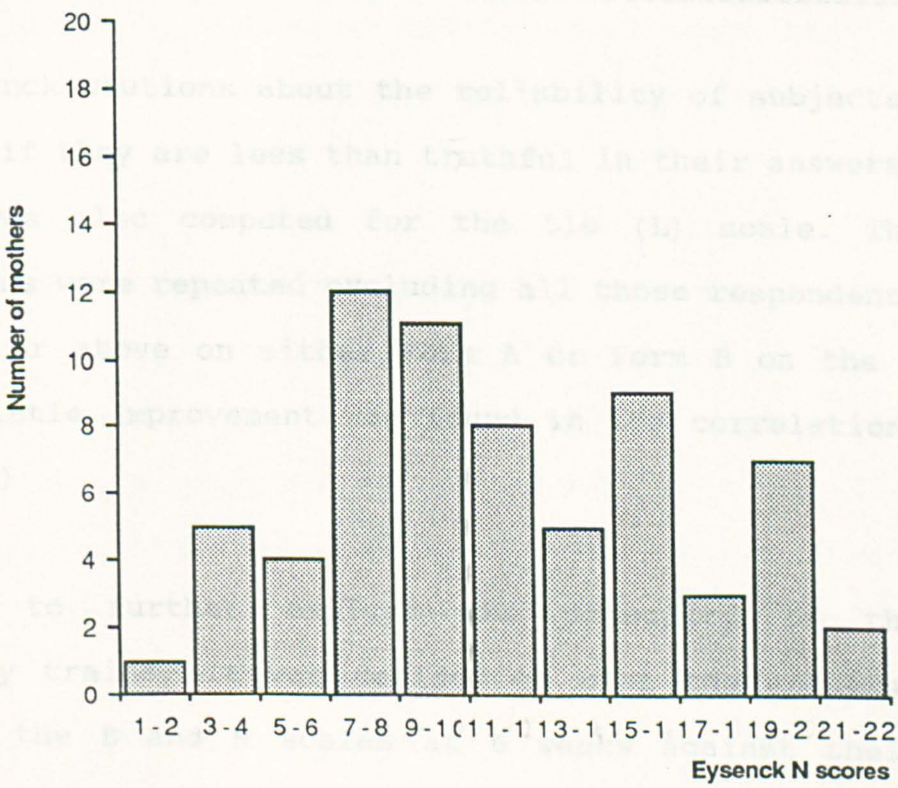


Figure 3.6 Distribution of Eysenck N scores (Form B) for 65 mothers when babies were 1 year old



In a correlation analysis of N scores at 1 year on N scores at 6 weeks, a correlation coefficient of 0.66 was obtained, suggesting that only 44% of the variation at 1 year could be explained by scores at 6 weeks. Similarly the E scores produced a correlation coefficient of 0.67 when 1 year scores were related to 6 weeks scores. Again only 44% of the variation at 1 year could be explained by the 6 weeks scores (Table 3.3).

Table 3.3 Stability of E and N scores from 6 weeks to 1 year for 65 mothers.

Neuroticism N^A with N^B	Extraversion E^A with E^B
$r = 0.66$ $r^2 = 0.44$ $p < 0.0001$	$r = 0.67$ $r^2 = 0.44$ $p < 0.0001$

N^A = Scores for neuroticism from Form A
N^B = Scores for neuroticism from Form B
E^A = Scores for extraversion/introversion from Form A
E^B = Scores for extraversion/introversion from Form B (Eysenck and Eysenck, 1964)

Since Eysenck cautions about the reliability of subjects' responses if they are less than truthful in their answers, a score was also computed for the Lie (L) scale. The correlations were repeated excluding all those respondents scoring 4 or above on either Form A or Form B on the L scale. Little improvement was found in the correlations (Table 3.4)

In order to further explore the stability of the personality traits, it was decided to plot the mothers' scores on the E and N scales at 6 weeks against their scores at 1 year. The standardised data presented in the scoring manual revealed slightly higher scores on both scales when Form B was used rather than Form A. The picture revealed by the plots for this sample was very complex. The majority moved in the direction predicted but most by more than would be expected. Many of the mothers showed major shifts in one or both dimensions over time. Some moved totally in the opposite direction to that predicted by the EPI (Figure 3.7).

Table 3.4 Stability of Eysenck E and N scores from 6 weeks to 1 year excluding high L scorers ($L > 4$).

Eysenck N	Eysenck E
$r = 0.65$	$r = 0.69$
$r^2 = 0.43$	$r^2 = 0.48$
$p < 0.0001$	$p < 0.0001$

Eysenck and Eysenck, 1964.

Why this instability? Many theorists would argue that it was the influence of situational effects that were being observed.

When assessed at 6 weeks, the mothers had just been through a stressful preterm birth followed by a worrying period when the baby was hospitalised. Nearly half the sample were first time mothers. Many had stopped working when they gave birth. Perhaps what was observed in the changes from 6 weeks to 1 year was at least partly due to the mothers adjusting to a totally new situation. Each person was affected to a greater or lesser degree.

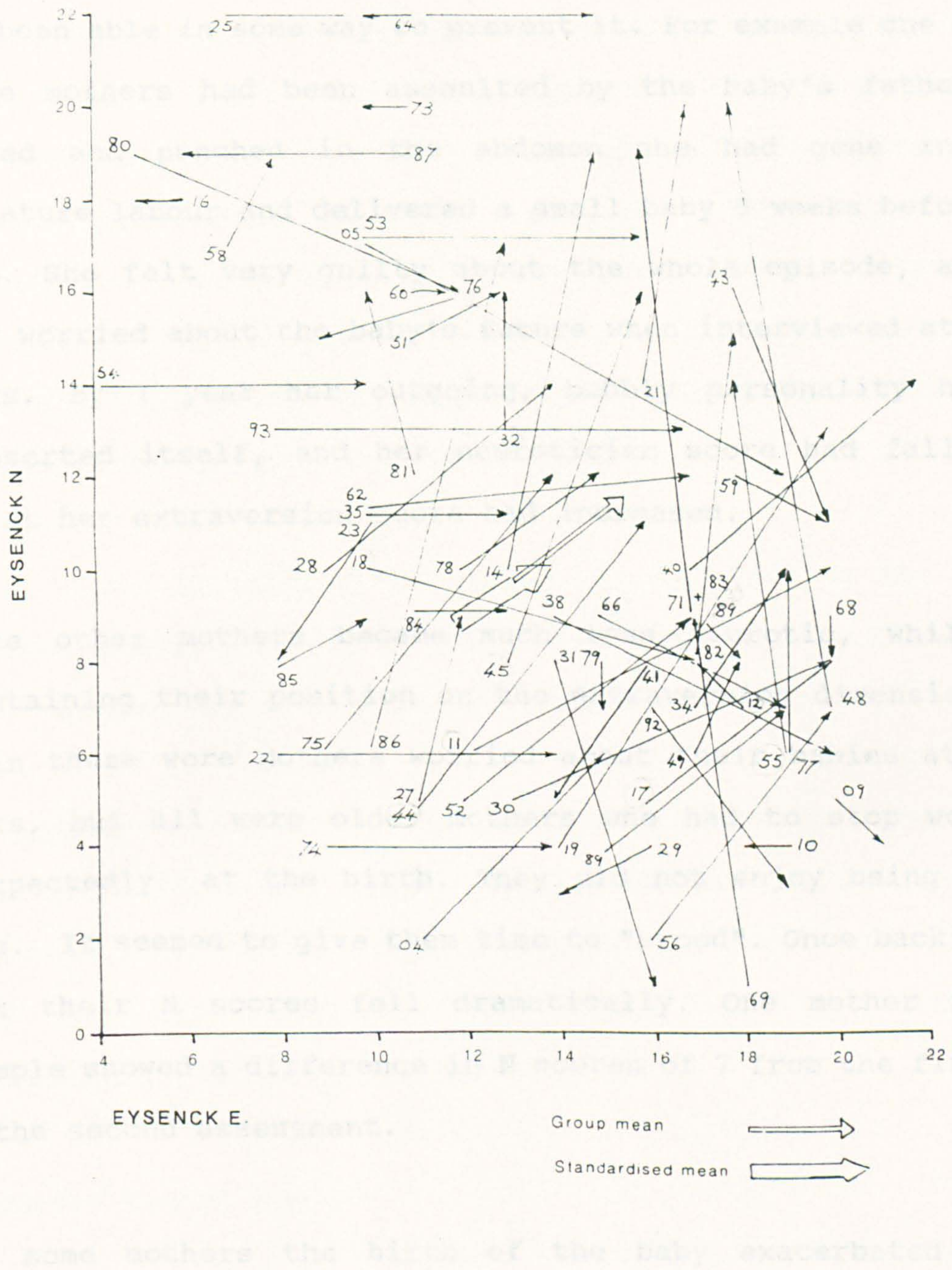


Figure 3.7 Stability of Eysenck E & N scores from 6 weeks to 1 year

One group of mothers displayed less neuroticism than would be expected at 1 year. At 6 weeks they were feeling guilty that they had 'caused' the birth to be early, that they had not been able in some way to prevent it. For example one of these mothers had been assaulted by the baby's father. Kicked and punched in the abdomen she had gone into premature labour and delivered a small baby 5 weeks before term. She felt very guilty about the whole episode, and very worried about the baby's future when interviewed at 6 weeks. By 1 year her outgoing, bubbly personality had reasserted itself, and her neuroticism score had fallen whilst her extraversion score had increased.

Three other mothers became much less neurotic, whilst maintaining their position on the extraversion dimension. Again these were mothers worried about their babies at 6 weeks, but all were older mothers who had to stop work unexpectedly at the birth. They did not enjoy being at home. It seemed to give them time to "brood". Once back at work their N scores fell dramatically. One mother for example showed a difference in N scores of 7 from the first to the second assessment.

For some mothers the birth of the baby exacerbated an already difficult situation. 9 mothers showed marked increases in N scores. All had problems either with housing, lack of money or with their partner. One mother had hidden her pregnancy right up until the emergency room admittance. She was having problems with her boyfriend throughout the pregnancy. After the birth, with no prior preparation having taken place, they went to live with his parents in their small council house. The situation rapidly deteriorated until finally she was forced to leave with the baby. After a short stay with her parents, who did not make her welcome, she found a home with a girlfriend, supporting herself on social security benefits. The boyfriend continued to harass her, as he wanted custody of the baby. The whole situation was unresolved by the time the one year interview took place. Her neuroticism score had risen by 10 points since the previous assessment.

These cases illustrate the effect of situation on the EPI scores, and go some way to explain the instability found in these scores for this particular sample of mothers.

In summary, despite both E and N scores maintaining the same overall pattern for the sample, most of the scores for the individual mothers show considerable variation between the two time periods. There is thus considerable instability within the personality data.

Mothers' Mental Health

This section deals with the mothers mental health, particularly with the extent to which this group of mothers were depressed for part or the whole of their babies' first year of life. People who are depressed speak less often and with low intensity; they respond slowly; and they look at the other person infrequently, often gazing floorwards. They are irritable in interactions and sometimes are inappropriately hostile. Their facial expressions are sad and downcast, though expressiveness overall is reduced. They also have a slack posture. All these are behaviours that other people find uncomfortable to deal with (Youngren and Lewinsohn 1980; Coyne 1990). Since these symptoms of depression make adults feel uncomfortable (Coyne 1976), then it appeared to be important that the mothers in the present sample who were depressed be identified, in order that the impact on their infants could be subsequently examined.

The term maternal depression can cover a wide ranging set of problems of mood. The most common form, estimated to affect between 50 and 80% of all newly delivered women, is the "Baby Blues". Though an unpleasant set of mood changes is evident, the symptoms fade after the 7-10th day (Yalom, Lunde, Moos and Hamburg, 1968; Pitt, 1968; Stein, 1980; Vandenberg, 1980; Paykel, Emms, Fletcher and Rassaby, 1980; Kendell, McGuire, Connor and Cox, 1981; Cox, Connor and Kendell, 1982; Stein, 1982; Iles, Gath and Kennerley, 1989; York, 1990). In this sample where the mothers were first assessed 6 weeks after the estimated date of birth, when the babies ranged from 12 to 23 weeks chronological age, "Baby Blues" would no longer have been in evidence.

The least common form of maternal depression is post-partum psychosis (Kendall, Chalmers and Platz, 1987; Brockington, Winokur and Dean, 1982; Brockington and Cox-Roper, 1988). This severe mental illness also has its onset soon after birth; within two weeks has been suggested by Brockington and Cox-Roper (1988). Recruitment criteria for the present study excluded women with post-partum psychosis. Therefore, where depression occurred in the current sample it was an affective disorder whose severity fell somewhere between the "Blues" and psychosis.

Depressive symptoms were assessed in the mothers at all three time periods. The choice of assessment proved problematical. It was felt originally that a screening questionaire would be sufficient to identify women with emotional disorders. However, since many of the women were several months into motherhood, and all would be assessed 1 year post term, it was felt that a questionaire such as the Edinburgh Postnatal Depression Scale (Cox, Holden and Sagorsky, 1987), specific to the identification of postnatal depression, would not be appropriate. In the wider context of the main project, where follow-up was to be carried out until the children were 5 years old, this was an even more important consideration. It was therefore decided to use the Malaise Inventory, a 24 item self report questionaire designed to detect emotional disorder, primarily depression and anxiety, in community samples (Rutter, Tizard and Whitmore, 1970). The Malaise has been shown to have a sensitivity of between 68 and 81%, and a specificity of 81% in research with a community sample of mothers with young children in London (Cox, personal communication).

At the 6 month and 1 year assessments the results of the Malaise were validated by use of a modified version of the depression section of the Present State Examination (PSE: Wing, Cooper and Satorius, 1974). This is a semi-structured interview schedule covering information on depressed mood, eating and sleeping disturbances, psychomotor functioning, suicidal ideations and loss of pleasure or interests. The interviewer was trained in the use of the instrument by a psychiatrist, himself trained at the Institute of Psychiatry. By using the interview format the shortcomings of questionaires could be taken into account. For example, social class biases could be checked - middle class women have been shown to be more conscientious in self reporting minor symptoms than working class women (Brown and Harris, 1978). The interviewer could be more assured that the women were interpreting questions in similar ways, and that answers were appropriately assigned.

Mothers were given the Malaise Inventory to complete during the course of the interview when it could be completed without undue interuption. The timing always preceded the semi-structured interview on depression. The mothers were asked to complete the questions on the basis of how they had been feeling in the last 10 days. A few mothers were unhappy with the forced choice format, but all answered the questions without any great difficulty. The questionaire was collected and placed at the front of the interview schedule, care being taken not to read any of the answers, which might have biased any subsequent questioning.

The questionaires were coded, scoring each affirmative answer one point. The sum of affirmatives gave the total score. The interview answers were scored, and a designation of depression was given on the basis of DSM III criteria for a depressive episode (Diagnostic and Statistical Manual: American Psychiatric Association, 1980).

Mothers who scored 7 or more on the Malaise Inventory were deemed to be suffering from what Rutter et al (1970) called "emotional disorder". DSM III classification of these women revealed that they were all depressed at 6 months and 1 year. It would seem that the Malaise was identifying depression too. The rates of disorder detected by the Malaise remained constant throughout the study period: 28% at 6 weeks; 29% at 6 months and 26% at 1 year. Median scores on the Malaise did not vary either: 4 at 6 weeks; 4 at 6 months and 3 at 1 year.

These summary figures mask a more complex picture of the occurance of depression within the group (Figure 3.8). Nine mothers became depressed at 6 months whilst 8 recovered. At 1 year, 5 mothers became depressed, 3 for the first time, whilst 7 mothers recovered. In other words the constant percentages hide the fact that a differing set of mothers were depressed at each time. Possible reasons for this will be explored in the next section.

Despite the fact that there was evidence of complex processes at work, there was a great deal of continuity within the mothers' mental health scores. The correlation coefficient was 0.70 between Malaise scores at 6 weeks and 6 months, and of 0.78 between scores at 6 months and 1 year. Between 48% and 60% of the variation in scores could be explained by scores at the previous time of assessment. These high levels of explanation resulted from the fact that 47 out of the 65 mothers did not change their status from 6 weeks to 6 months, and 51 out of the 65 did not change from 6 months to 1 year (Table 3.5).

Table 3.5 Change of depressive state for 65 mothers from 6 weeks to 1 year, based on a Malaise Inventory cut-off score of 7.

	6 weeks-6 months	6 months-1 year
Stayed depressed	n = 9	n = 12
Stayed not depressed	n = 38	n = 39
Total	47	51

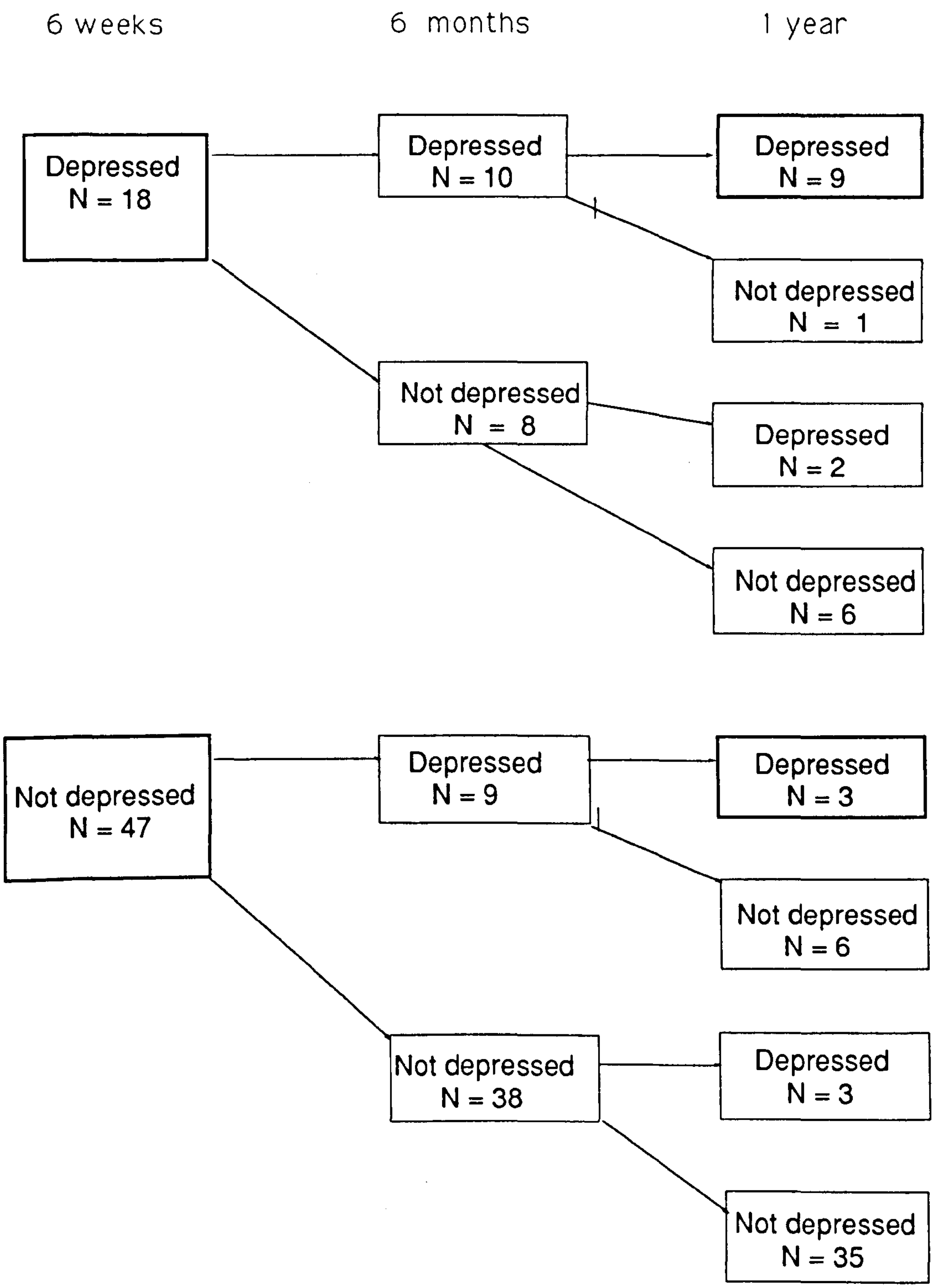


Figure 3.8 Occurence of depression in the 65 mothers over the first year of their babies' lives.

In summary, from 6 weeks to 6 months 38 mothers remained not depressed, 8 mothers recovered from their initial depression, 9 mothers became depressed and 10 mothers stayed depressed through both time periods. From 6 months to 1 year 40 mothers remained not depressed, 8 mothers recovered from their 6 month state of depression, 5 mothers became depressed, and 12 of the mothers remained depressed throughout the 6 month period.

Psychosocial sources of distress and support

Mothering does not take place in isolation. The context in which a mother finds herself can either provide an environment from which she can draw support, or can be stressful and sap her ability to mother. There are three components that make up this environment: her relationship with a partner; her living conditions; her social network of family and friends.

A stable relationship, whether or not the parents are formally married, gives a foundation for good mothering (Winnicott, 1988; Belsky, Spanier and Rovine, 1983). An unhappy relationship or the absence of a partner can be a source of stress. The socio-economic conditions of the household could be important. For instance, lack of money that accompanies unemployment of the head of the household, poor housing, a threatening neighbourhood or crime are some stresses that could be considered. Any one of these is more likely to be experienced by a working class mother than by a middle class one, by an inner city mum than by a mother who lives in a rural area (Rutter and Quinton, 1977; Brown and Harris, 1978). Also important is her social network. Support can be found within a close family or from a friend. Of great importance is for the mother to feel that someone understands her situation and what she is going through (Escalona, 1987; Belsky, 1984).

Individually each facet of life could be coped with or could provide some measure of support, but there is a constellation of factors that together act in an additive fashion either negatively or positively. This section will outline the psychosocial sources of distress and support for the mothers, and attempt to derive an index that summarises adversity. Relationship with a partner will be discussed first, followed by other sources of psychosocial support.

Partner

Information on the mothers' relationships with their partners came from the demographic data collected at the beginning of each interview and from a standardised questionaire.

At the beginning of the study period 63% of the 65 mothers were married, although 53 out of the 65 had been in a stable relationship with the father of the child for at least 2 years. Thus 82% of the mothers had a cohabiting relationship of a permanent nature. A further 14% of the sample had a steady boyfriend, the father of the child, but were not cohabiting. Only three of the mothers had no relationship at all. The fathers of their babies were not involved during the pregnancy, nor the birth and had no contact with mother or child after birth.

The relationships of the mothers remained remarkably stable over the study period. The 3 mothers with no partner at 6 weeks remained partnerless throughout the year. Only 3 partnerships broke up, one between the 6 weeks and 6 months interviews, the other two between 6 months and 1 year. However, 11 of the mothers spontaneously revealed difficulties with their relationships during the course of the interview at 1 year - though they were not questioned specifically on this topic.

The two women married to previously divorced men, reported quite severe problems over dealings with the first wife and offspring of that marriage. Two couples were having problems related to inadequate housing and unemployment. All 4 women were hopeful that their problems could be dealt with. On the positive side, two mothers married their babies' fathers, one more became engaged.

Any assessment of parental relationship had to accomodate a number of cohabiting styles. An instrument designed solely for married couples could have been offensive to some mothers. Interview assessments are often clinically oriented, whereas in this sample no undue level of problems was anticipated. It was decided to use the Dyadic Adjustment Scale (DAS; Spanier, 1976), which was designed for use with either married or cohabiting couples. This is a 32 item self-report questionaire that measures the respondent's perception of the relationship in four separate areas: consensus, satisfaction, cohesion and affectional expression. It also gives an overall score for the relationship. Belsky's group had shown the DAS to be a reliable way of measuring the change in marital assessment that occurs over time, and they assert that there is little improvement over DAS discrimination by using more conceptually differentiated measures (Belsky, Spanier and Rovine, 1983; Belsky, Lang and Rovine, 1985).

The DAS was completed by the mothers before any questioning was commenced on family relationships. Only those mothers who were cohabiting were asked to complete the questionaire, since the DAS has not been standardised on 'courting' couples. Previous piloting of the instrument had shown that mothers were puzzled by the wording of some of the items. Standardised explanations were worked out in simple English, and these were given to mothers, but only if they raised queries. There may have been times when mothers did not understand items fully and did not query the meaning. This was well illustrated by one mother who, despite an obviously loving relationship with her partner, circled 'Never' in response to 'Do you kiss your mate?' This seemed worth querying, and back came the response that "Me mate would think me queer if I started kissing her!"

Most mothers managed to transpose partner for mate though, despite the local colloquial use of mate for friend.

Over the year there was a slight fall in total DAS scores, but the differences from first to last interview are not statistically significant. The means at each time period were well within the range for the standardised sample given by Spanier (1976)(see Table 3.6).

Table 3.6 Mean (SD) scores obtained from the mothers' ratings of the DAS (Spanier 1976) for 6 weeks, 6 months and 1 year.

	6 weeks		6 months		1 year		SM[a]
DAS total	111	(16.9)	106	(20.9)	107	(17.8)	114
Subscales:							
Affection	9	(2.6)	9	(2.4)	9	(2.3)	9
Consensus	48	(8.4)	46	(8.7)	46	(7.7)	58
Cohesion	15	(3.3)	14	(3.7)	14	(3.9)	13
Satisfaction	39	(6.4)	37	(8.5)	38	(7.1)	40

[a] Standard means given by Spanier, 1976.

There was a high level of stability in the quality of the relationships over the year of assessment. Correlation between 6 weeks and 6 months DAS scores produced a correlation coefficient of 0.62 which improved to 0.81 for the correlation between 6 months and 1 year scores (Table 3.7).

Mean scores for each of the subscales, Affection, Consensus, Cohesion and Satisfaction, did not change over the study period (Table 3.6). Comparison of the means for this sample with the standardised means (Spanier, 1976) revealed only one difference, that for the Consensus subscale. This was found at all three assessments. The means for this sample scored 10-12 points below the standardised means on the Consensus subscale.

Table 3.7 Stability of Mothers' ratings (DAS total scores) of their relationships with partners from 6 weeks to 1 year.

6 weeks to 6 months	6 months to 1 year
$r = 0.62$	$r = 0.81$
$r^2 = 0.39$	$r^2 = 0.65$
$p < 0.0001$	$p < 0.0001$

Table 3.8 Stability of Mothers' ratings (DAS Satisfaction scores) of their satisfaction with their relationships with partners from 6 weeks to 1 year.

6 weeks to 6 months	6 months to 1 year
$r = 0.76$	$r = 0.81$
$r^2 = 0.58$	$r^2 = 0.66$
$p < 0.0001$	$p < 0.0001$

The Satisfaction subscale revealed the mothers' current level of happiness with the relationship. High levels of correlation were obtained from one time to the next (see Table 3.8). A regression analysis was carried out on the 6 month to 1 year relationship resulting in the following regression equation:

$$y = 0.73 + 0.81x$$

where y is the 1 year score and x is the 6 month score. An examination of the residuals from this regression revealed two groups of mothers in quite different situations. Mothers with high positive residuals (one or more standard deviations above the regression line) all had markedly improved relationships. One couple had moved into their own flat, another was on the verge of marriage. The other 5 mothers all had specific areas which they saw as improvements in their lives, for example a husband who had found a job which relieved a lot of stress from the marriage.

The 5 mothers with high negative residuals were much less satisfied with their relationships than might have been expected on the basis of their 6 months' scores. The mean Satisfaction score for this group was 25, 15 points below the standard mean. These were relationships that were in trouble. As one young mother put it, "We only stay together for the baby."

Although the means for the Satisfaction subscale were slightly below the standard mean the mothers as a whole were not unhappy. When they were asked directly to indicate their level of happiness with their relationship, only 6 mothers expressed unhappiness, at 1 year (see Table 3.9).

Finally, results were tabulated at 1 year for the last item on the DAS, which Spanier indicates is a measure of the committment to the relationship (Spanier, 1976). Levels of committment were high, with 40 out of the 55 mothers very much committed to making the relationship work. Five of the mothers were fairly despairing however.

Table 3.9 Mothers' level of happiness with their relationship (Item 31, DAS: Spanier, 1976).

Description of relationship	Number of mothers agreeing
Fairly unhappy	2
A little unhappy	4
Happy (indicated as the norm for a partnership)	9
Very happy	21
Extremely happy	16
Perfect	2

Table 3.10 Mothers' committment to relationship with partner (Item 32, DAS: Spanier, 1976)

Description of Committment	Number of Mothers
Desperate, do anything to make it work	12
Very much want it to work, do all I can	28
Very much want it to work, do my fair share	10
Nice if it worked, can't do more	2
Nice if it worked, refuse to do any more	2
It can't succeed	1
Total	55

Other Sources of Psychosocial Support

Information on sources of psychosocial support apart from the partner, came from semi-structured interviews administered during each visit, and using the methodology advocated by Brown and Rutter (1966). In the course of each interview many different aspects of the mothers' lives were discussed. Where events and activities concerning the mother were investigated, a set of firmly structured codings, and detailed instruction on the information needed was used, rather than a set of standard questionaires. The interviewer continued questioning until the coding could be completed. Thus for example, a coding of how often the mother saw her own mother would need a number of follow up probes to elicit the exact frequency of contact. When the mothers' feelings and attitudes were being dealt with a different approach was used. Standard open ended questions were used ("How did you feel about ...?"). If necessary, a number of neutral probes could then be used for follow-up, until a coding could be made (Appendix II).

Of necessity this interview schedule covered ground that was primarily of use in the main project. Only those aspects of relevence to the present study will be presented here.

Rather than attempt to assess the impact of each of a wide range of variables individually, it was decided to summarise the mother's psychosocial adversity by a numerical index based on 10 variables. In this way it would be possible to identify mothers who were most at risk. The reasoning behind such an index was based on work by Rutter discussing the etiology of disturbance in children (Rutter and Quinton, 1977; Rutter and Madge, 1976) and from Brown and Harris' (1978) work on depression, which discusses vulnerability and provoking factors. Since adversity factors have been shown to be important in a wide range of studies of children and their mothers (see Stevenson and Graham, 1983; Belsky, 1984; Fendrich, Warner and Weissman, 1990; Fergusson, Horwood and Lawton, 1990), it seemed appropriate that they should be measured here. Only then could their input into the evolving mother/child relationship be fully assessed.

Of the 12 variables selected to form the scale the first five related to the mothers' socio-economic situation, the second five to her wider social network, and two to her relationship with a partner (Table 3.11).

The two variables relating to a partner were - whether or not the mother had a stable relationship, and the quality of this relationship, based on DAS scores (see previous section). Brown and Harris work (1978) suggested that there were two further variables that could have been included - the presence of at least one young child in the home and the occurence of a recent major life event. However, since all the mothers had a young baby, and all babies had been very sick infants, it was felt that these two variables could be excluded from the scale without loss of discrimination.

For each source of adversity that was present the mother scored one point. Scores were summed to arrive at a total. This was calculated for the 6 week, 6 month and 1 year assessment times. Each variable will be discussed in turn.

Table 3.11 Variables incorporated into the psychosocial adversity scale.

An inner city address	(Rutter & Quinton 1977)
Housing problems	(Brown & Harris 1978)
Social Class	(Rutter & Quinton 1977; Brown & Harris 1978)
Unemployment of head of household	(Brown & Harris 1978)
Mother's employment status	(Brown & Harris 1978)
Difficulties with family of origin	(This thesis)
4 or more children in the family aged under 10 years	(Rutter & Quinton 1977; Brown & Harris 1978)
Isolation from social contacts	(Brown & Harris 1978)
Feelings of loneliness	(Brown & Harris 1978)
A close confidante	(Brown & Harris 1978)
Stable relationship with partner	(This thesis)
Quality of relationship with partner	(This thesis)

First, the location of the home was examined. The Special Care Units where the babies spent their first weeks of life were located in hospitals serving the inner city, the suburbs, including run-down public housing estates, and a broad swathe of rural Lancashire and North Wales. There were mothers from all these types of location in the sample. Forty-five of the mothers lived in leafy suburbs or small towns and villages. Nine lived in inner city areas. The remaining 11 lived in rundown suburban housing estates, which have many of the characteristics of poor, inner city areas, often with few of the facilities that are available to inner city mothers. 38% (25 of 65) of the mothers lived in areas they considered to be threatening.

Twenty four mothers had housing problems at the 6 week interview. These were of various kinds, from roofs that leaked through inadequate heating facilities to overcrowding. The latter was usually a problem for the young, unmarried mothers who had returned to their parental home with their babies. For example one young mum shared her double bed with her younger sister and had the baby in a cot beside her bed. 10 of the 65 mothers (15%) lived in circumstances where there was less than one room per person in the dwelling, a ratio often taken as an index of overcrowding. Housing problems did not necessarily co-exist with inner city or poor suburban estate locations, although this was true in 15 of the 20 cases from these environments.

Overall at 6 weeks, 12 out of the 65 mothers (18%) were dissatisfied with their accomodation to a greater or lesser extent. Half of these really wanted to move. However, by 1 year most remained where they were and 11 out of 65 were still dissatisfied. Some had managed to solve their troubles as only 18 families reported housing problems at 1 year.

As might be expected amongst a group of women who had given birth to a preterm baby, there was a skewed median for social class. Socioeconomic status is a variable that is associated with a number of factors such as maternal nutrition, prenatal care and general lifestyle. It is these factors that put a mother at risk for preterm birth (Kaye, 1984). Using the Registrar General's classification, each head of household was assigned to a social class group according to occupation. If the woman herself was the head of the household then her own social class according to her occupation prior to the birth of the baby was used. Table 3.12 shows the results.

Table 3.12 Social class of heads of households.

Social class	Number of heads of household
I	0
II	9
III	19
IV	17
V	4
Unemployed	16

At 6 weeks, 16 (25%) of the total sample had an unemployed head of household. This figure remained constant over the study period. These were long term unemployed. The mothers were asked what was their main source of income. Here a discrepancy revealed itself, since 22 of the 65 claimed that the family's main source of income was the DHS, that is social security payments. Obviously 6 heads of household were working and claiming payments at the same time!

At the time of the 6 week interview only 4 of the mothers had returned to work, but 16 others were on maternity leave. By 1 year, 21 mothers were working. Four others had returned to work, but found either that they could not cope with the dual roles, or that they missed the baby too much, and had subsequently terminated employment before the 1 year interview.

Sometimes the ending of a job was linked with inadequate baby minding facilities. Since in this sample, minding was performed almost exclusively by family members, this was an illustration of the support that a close extended family could provide. However, families could also be sources of stress. 21 of the mothers reported difficulties with their own family of origin, such that contact was lessened, or in some cases cut all together - they "weren't speaking". Sometimes it was disagreement with parents that caused the problems. Young, unmarried mothers often felt they were not welcome in the parental home, but had no feasible alternative accomodation. Sometimes siblings were the source of discord, as in one case where a brother literally evicted the mum from their mother's house, leaving her nowhere to live but the local social services hostel, a less than adequate environment in which to rear a tiny preterm baby. Sometimes the discord was of long standing, as with one mother coping with her own mother who was mentally ill and who had thrown herself from a first floor window the week before the 6 month interview. The difficulties with families of origin were many and varied, but all were severe before coded as such, and were considered by the mothers themselves to be stressful.

One further source of family stress was found only in mothers who had 4 or more young children to care for. For 32 of the mothers the index baby was their first child. For 3 mothers however, this was their fourth child, and for one mother the index baby was her seventh (Table 3.13).

Table 3.13 Number of children in the household.

Number of children	Number of mothers (%)
1	32 (49)
2	22 (34)
3	7 (11)
4	3 (5)
7	1 (1)
	65 (100)

Just over half the mothers (34 out of 65) reported that they felt lonely on a regular basis. As one first-time mother put it, "I miss the girls at work, we used to have a laugh together". Other mothers felt lonely because they missed their families. One mother, recently relocated to the study area because of her husband's job, never saw her parents who lived abroad, and had had no time to make friends before the birth of the baby.

Mothers were classified according to their degree of isolation from family and friends. Those deemed not isolated saw close family <u>and</u> friends frequently, usually on a daily basis. Others saw only close family as frequently as this. These two categories accounted for 73% of the mothers in the sample (47 out of 65). The extended family is alive and thriving in Liverpool and its environs. It was not uncommon for the grandmother and aunts of the index baby to live within walking distance, and for daily visiting back and forth to take place. The remaining mothers saw other people less frequently. They saw either close friends or family only once a week or even less often (10 mothers). A further 8 mothers were classified as isolated: 4 of them had no friends or family with whom they communicated regularly; the other 4 were psychologically isolated even though they were living in their parental home. Their presence was resented by the family and they had no family confidante. Because of the baby, they had no peer contact either. This classification was made by the interviewer on the basis of information provided by the mother on her regular social contacts.

The mothers were also asked who they thought understood their situation the best. For the majority it was their own mother who was their main confidante. Some mentioned their partners, others mentioned sisters or friends. For 14 of the mothers, however, there was no-one to whom they could turn, knowing that that person would try and understand their problem (Table 3.14).

Table 3.14 Mothers' main confidantes.

Confidante	Cited by mothers N(%)
Own mother	23 (35%)
Partner	12 (18%)
Relative (usually sister)	7 (11%)
Close friend	5 (8%)
Another mum with a preterm baby	2 (3%)
Other (eg mother-in-law)	2 (3%)
No-one	14 (22%)

Derivation of the psychosocial adversity index

The main psychosocial stresses faced by the mothers were lack of a good relationship, low social class, poor housing, unemployment, large families to care for, problems with their own family of origin, isolation and loneliness. On this basis a psychosocial adversity score was calculated for each mother. She scored one if there was a problem in any one area, zero if there was none.

If there was a partner present, this scored zero. Absence of a partner was assessed as a lack of support, and scored one. The quality of the relationship was scored on the basis of total score on the DAS. Spanier (1976) provides standardised means for his scales and these were used to establish a cutoff for a good or a poor relationship (Table 3.15).

Table 3.15 Cut off points for good and poor relationship based on standardised figures from DAS (Spanier, 1976).

	DAS total score	(SD)
Standardised mean for cohabitees	114.8	(17.8)
One SD below cohabiting mean	97.0	
Standardised mean for recently divorced people	70.7	(23.8)
One SD above divorced mean	94.5	

	Cut-off point
Good relationship	97 or more
Poor relationship	96 or less

Poor relationships were seen as a source of stress and hence scored one. Where there was a good relationship or no partner then this was not seen as a source of stress and hence scored zero.

The postal address of the mother was used to establish an inner city location which was assessed as a vulnerability and thus scored one. Those living in outer suburbs or in small towns in the country scored zero.

If there were housing problems reported by the mother, this scored one.

Social Class I and II mothers were scored zero, whilst those in class III, IV and V scored one. If the head of the household was unemployed this was scored one, as a source of stress for the mother.

If she herself was not working, at home all day with the baby this was also scored as stressful.

If there were four or more children in the family, this was judged to be a large family, scored as one, a further source of stress.

The remaining variables assessed the social support available to the mother and her utilization of such a network. If the mother was isolated psychologically, she scored one. If she herself felt lonely, even though in some cases there was support available, she scored one. The absence of a close confidante scored one. Finally, if there was discord reported with her family of origin the mother scored one. The ones were summed to arrive at an adversity score for each mother (Table 3.16).

Table 3.16 Distribution of adversity scores for the 65 mothers when the babies were 1 year old (corrected age).

Scores on adversity index	Number of mothers (%)
0 - 3	33 (51)
4 - 7	25 (39)
8 - 11	7 (10)

The possible range on the adversity scale was 0-12. Some mothers were singularly well off and did score 0. For example, one mother was married to a very supportive husband, working in a managerial position. They lived in their own semi-detached home in a leafy suburb. The baby was a long awaited first grandchild on both sides of the family, and the mother had close contact on a daily basis with both grandmas. There were also a number of close friends that she continued to see regularly. When the baby was 6 months old (corrected age), she returned to work, and the grandmothers took turns to provide first class minding.

At the other extreme was the mother of a large family, living with the baby's father but not particularly close to him. Her own family lived at the other end of the country, but there had been years of discord with them before the index baby was born. The baby did not meet either grandmother over the study period. Both parents were unemployed, and the large family lived in overcrowded conditions in a small house on a run down public housing estate. Despite her large family the mother was not close to anyone, had no friends, and felt lonely and isolated. Her adversity score at the 1 year assessment was 10.

For the vast majority of the mothers there was little change in adversity scores over time. If the mother was vulnerable at 6 weeks she was likely to remain so at 6 months and at 1 year (See Appendix III). In summary, when the babies were 1 year old, 10% of the mothers had high levels of psychosocial problems, and a further 39% were also vulnerable for psychosocial stress.

Interrelationships between mother variables

The characteristics of the mothers have been identified and described in terms of personality traits, mental health and psychosocial adversity. On the basis of the previous discussion it could be hypothesised that these characteristics might be related to each other. For instance, personality traits, especially neuroticism might predispose some mothers to depressive responses. Similarly, some of the variables taken into account in the adversity scale might be expected to influence both measured personality traits and depression. The final section of this chapter considers the relationships between neuroticism, extraversion/introversion, mental health and psychosocial adversity. The aim is to establish how such relationships develop and change over the first year of the baby's life, and to what extent they are independent of each other. In so doing, the maternal context for interaction will have been described.

First the relationships between the mothers' degree of psychosocial adversity and personality traits are examined, then those between personality and depression and finally those between psychosocial adversity and depression.

Personality traits and psychosocial adversity.

There are significant but low correlations between both personality measures, extraversion/introversion and neuroticism, and the psychosocial adversity scale. The correlation coefficient between neuroticism and psychosocial adversity scores was 0.40 (significant at the 0.05 level of probability). This suggests that the more items of adversity the mothers were experiencing, the more neurotic they were. Extraversion/introversion scores were negatively correlated with psychosocial adversity ($r = -0.40$, $p = 0.05$). The tendency was for the mothers with higher levels of adversity to display the higher levels of introversion. In fact examining mean scores shows that mothers with low adversity scores were comparable with the standardised norms for neuroticism, whereas mothers with higher adversity scores tended to be more neurotic.

These significant correlations seem to be considerably influenced be the extremes. When the mothers as a whole are examined by comparing those with higher and lower adversity scores than a central value, the picture is rather different. For example, mothers with high adversity scores were not necessarily more introverted than the standardised norm. Mothers with low levels of adversity in this sample were more extroverted than the Eysenck standardisation sample (Table 3.17).

Table 3.17 EPI mean scores for 65 mothers with varying levels of psychosocial adversity when their babies were 1 year old.

		Eysenck N score	Eysenck E score
Psychosocial adversity score = 4 or more	Mean	13.3	14.4
	SD	5.3	3.9
Psychosocial adversity score = 3 or less	Mean	9.9	16.6
	SD	4.5	3.4
Eysenck standardised scores for Form B	Mean	10.0	14.0
	SD	4.7	3.9

In fact there was no significant difference between the scores for extraversion/introversion for the two groups of mothers (student t = 0.6858 with 63 degrees of freedom), nor for neuroticism (student t = 1.2211 with 63 degrees of freedom) on the basis of how much adversity there was in their lives.

Personality traits and mothers' mental health

This section examines the relationship between personality traits and symptoms of depression at the beginning and end of the study period. There appeared to be little correlation between extraversion/introversion and symptoms of depression at 6 weeks (see Table 3.18). Only 7% of the variation in the mother's Malaise score could be explained by her Eysenck E score ($r^2 = 0.07$). However, analysis of scores at 1 year showed that the correlation coefficient between E scores and the Malaise had risen to 0.45, a 20% explanation of the variation in mental health scores (see Table 3.18).

The mothers' scores on neuroticism were much more closely correlated (see Table 3.18). At 6 weeks $r = 0.72$ and at 1 year $r = 0.69$, both highly significant. A multiple correlation of scores at 1 year revealed that the addition of Eysenck E scores barely improved on the correlation achieved with Eysenck N alone (see Table 3.18).

Table 3.18 Correlation of Eysenck E and N scores (Eysenck and Eysenck, 1964) with Malaise scores for 65 mothers

	6 weeks	1 year
Eysenck E score with Malaise	$r = -0.28$ $r^2 = 0.07$ $p = 0.025$	$r = -0.45$ $r^2 = 0.20$ $p = 0.0002$
Eysenck N score with Malaise	$r = 0.72$ $r^2 = 0.51$ $p = 0.0001$	$r = 0.69$ $r^2 = 0.48$ $p = 0.0001$
Eysenck E + N scores with Malaise	$r = 0.72$ $r^2 = 0.52$ $p = 0.0001$	$r = 0.71$ $r^2 = 0.51$ $p = 0.0001$

When the mothers were divided into those who showed depressive symptoms (Malaise score = 7 or more) and those who did not (Malaise score = 6 or less), the depressed mothers scored higher on average than the nondepressed mothers on the neuroticism scale, N (Table 3.19). This was a significant difference both at 6 weeks (student t = 3.82, df = 63, p = 0.05), and at 1 year (student t = 2.14, df = 63, p = 0.05).

Table 3.19 Mean scores on Eysenck N scale for depressed and nondepressed mothers at 6 weeks and 1 year

	6 weeks[1]	1 year[2]		Eysenck N[1]	Eysenck N[2]
Depressed					
Mean	15.0	17.0			
SD	5.0	3.3	Mean	9.0	10.5
			SD	4.8	4.7
Nondepressed					
Mean	8.0	10.0			
SD	3.7	4.2			

[1] Assessed using Eysenck Form A
[2] Assessed using Eysenck Form B

On the extraversion/introversion scale, E, depressed mothers scored slightly lower than nondepressed mothers at both 6 weeks and 1 year. However, these differences were not statistically significant (6 weeks t = 0.41, df = 63, p = 0.05: 1 year t = 0.78, df = 63, p = 0.05. See Table 3.20).

The chances of a mother being depressed were affected by how neurotic she was. At 6 weeks, of the mothers who were depressed only 4 out of 18 (22%) had average or more stable scores on the N scale. This compares with 38 out of 47 (81%) of those who were not depressed. Of the mothers who were depressed, 78% (14/18) were more neurotic than average, compared to 19% (9/47) who were not depressed (Table 3.21).

Table 3.20 Mean scores on Eysenck E scale for depressed and nondepressed mothers at 6 weeks and 1 year

	6 weeks[1]	1 year[2]
Depressed		
Mean	12.0	13.0
SD	4.7	4.2
Nondepressed		
Mean	14.0	16.0
SD	3.7	3.3

	Eysenck E[1]	Eysenck E[2]
Mean	12.0	14.0
SD	4.3	3.9

[1] Assessed using Eysenck Form A
[2] Assessed using Eysenck Form B

At 1 year these trends were even more pronounced (Table 3.21). In both cases the differences are significant at greater than 0.0001. (At 6 weeks Fisher's exact p = 0.00001 and at 1 year Fisher's exact p = 0.0000007.)

Table 3.21 Numbers of mothers with high and low Eysenck N scores who also showed depression on the Malaise, at 6 weeks and 1 year

6 weeks	N = 11 or more	N = 10 or less	Total
Depressed	14	4	18
Not depressed	9	38	47
Total	23	42	65

1 year	N = 13 or more	N = 12 or less	Total
Depressed	16	2	18
Not depressed	10	37	47
Total	26	39	65

Extraversion has less impact. At 6 weeks, of the depressed mothers, 33% are more extrovert than average, compared to

40% of the nondepressed mothers. This difference is not significant ($X^2 = 0.27$, 1 df, $p = 0.05$: Table 3.22). However, at 1 year the trends are more pronounced. Only 8% (5/65) of the mothers were both depressed and more extravert than average. Of the mothers who were depressed, 72% were likely to be either average or more introverted, whilst only 28% were likely to be more extroverted. If the mother was not depressed then there was little difference in whether she was introverted or extraverted (21/47 versus 26/47). The difference between extraverted, and average and introverted mothers is a significant one though ($X^2 = 5.82$, 1 df, $p = 0.05$).

Table 3.22 Numbers of mothers with high and low Eysenck E scores who also showed depression on the Malaise, at 6 weeks and 1 year

6 weeks	E = 15 or more	E = 14 or less	Total
Depressed	6	12	18
Not depressed	19	28	47
Total	25	40	65

1 year	E = 17 or more	E = 16 or less	Total
Depressed	5	13	18
Not depressed	26	21	47
Total	31	34	65

Thus it would appear that being neurotic is a risk factor for depression. However, this result masks problems in the assessment instruments. An examination of the individual items on the Malaise Inventory reveals that many of them are very similar in wording to other items found in the

Eysenck Inventory (Both Forms A and B). A positive answer on an item in the EPI would be scored as neurotic, whilst a positive answer for the similarly worded item on the Malaise would contribute towards a positive depression score. This in itself would explain the high levels of correlation between N scores and depression, and the much greater likelihood of the neurotic mother being at risk for depression. These results must be treated with caution.

The fact that Extraversion seems to act as a protective factor against depression carries more weight. The correlation between EPI E scores and Malaise depression scores is low (though significant). One conclusion that could be drawn is that once the mothers' extravert tendencies have reasserted themselves by 1 year, the mothers are less likely to become depressed. Introverted mothers, keeping their feelings to themselves, are more likely to become depressed. Extraverted mothers are more likely to be outward looking, and may find it easier to talk to someone, which may be one route to better mental health.

Mothers' mental health and psychosocial adversity

The mothers were asked at the 1 year interview a general question about whether they had any problems in their lives, things not to do with the baby. 42% answered 'yes'. Three areas were perceived as problematical: matters to do with partners and relationships; unemployment, which was usually accompanied by money problems; and problems arising from relations with family of origin. The last took several forms varying from withdrawal of support by parents, through living long distances from parents, to quarrels and general discord. In these cases the mothers reported a sense of isolation from the support they felt they needed, or that which was their right as the mother of a new baby. All these factors have been considered to be risk factors for maternal depression (for example see Stein, Cooper, Campbell, Day and Altham, 1989). Each was considered individually in this section.

First of all the impact of not being in a stable relationship was examined (Table 3.23). Three of the mothers were not in a relationship at all over the study period. There was no consistent association between depression scores and the presence or absence of a partner.

Table 3.23 Impact of not having a partner on maternal depression.

Subject ID number	Depressed on assessment at 6 weeks	6 months	1 year
60	Yes	Yes	Yes
71	No	Yes	No
78	Yes	No	No

A minority of the mothers had a boyfriend but were not co-habiting. The number in this category varied at each time period as some relationships broke up and others matured into cohabitation. Again no consistent pattern is evident, and numbers are too small for a significant statistical analysis (Table 3.24).

Table 3.24 Impact of having a non-cohabiting boyfriend on mother's mental health.

	Assessment time 6 weeks	6 months	1 year
Depressed (28%)	1	4	2
Not depressed (72%)	3	1	5

Of the 7 mothers not cohabiting at 1 year, 3 had separated from their partners, and each had found new boyfriends with whom they were very happy. A fourth mother had established a new relationship between the 6 months and the 1 year interview times. She was extremely happy. The remaining 3 mothers were unhappy with their relationships. All were young teenage mothers, and they felt that they were not as close to their boyfriends as they had been. They did not see them as often, and they saw no chance of their moving in together in the near future.

Of the mothers who were cohabiting at 1 year, 14 (27%) were depressed, 39 (73%) were not. There was no significant difference in the proportion of noncohabiting and cohabiting mothers who were depressed at 1 year ($X^2 = 1.12$ with 1 df: nonsignificant). Living with a partner was not an important distinguishing feature for depression.

For those who were cohabiting, the importance of the quality of the relationship for mental state could be assessed. Correlation of Malaise Inventory scores on total DAS scores revealed only low levels of correlation which fluctuated over the year reaching maximum significance at the end of the study period (see Table 3.25).

Table 3.25 Relationship of Malaise Inventory scores with DAS total scores for 54 mothers at three time periods

	6 weeks	6 months	1 year
r	-0.27	-0.15	-0.43
r^2	0.07	0.01	0.18
p	0.03	NS	0.001

Furthermore there were no significant differences between the mean DAS total scores for those who were depressed and those who were not, at any of the three time periods. How a mother felt about her relationship was not related to whether she was depressed or not. (At 6 weeks student's t = 1.74, df = 55, non significant; at 6 months t = 0.42 df = 55, non significant; at 1 year t = 0.58, df = 53, non significant) There was however a trend for the depressed mothers to score lower on average than the mothers who were not depressed (Table 3.26).

Table 3.26 Mean DAS total scores for depressed and non-depressed mothers over the 1 year study period

		6 weeks	6 months	1 year
Depressed	Mean	104.9	104.5	93.4
	SD	15.6	19.6	24.9
Nondepressed	Mean	112.1	106.4	112.6
	SD	17.3	21.6	10.4

Satisfaction with the relationship was assessed by the DAS Satisfaction subscale. 71% of those who scored 39 or less on the Satisfaction scale (the standardised mean is 40 :

Spanier 1976), were depressed. Mothers who scored high on the Satisfaction scale tended to be not depressed (29 out of 33, see Table 3.27).

Table 3.27 Number of depressed and nondepressed mothers in satisfying or nonsatisfying relationships

	*Satisfied with relationship	Not satisfied with relationship	Total
+Depressed	4	10	14
Nondepressed	29	15	44
Total	33	25	58

+ Depressed mothers scored 7 or more on Malaise Inventory
* Satisfied mothers scored 40 or more on the DAS Satisfaction subscore

By 1 year there had been little change. 3 relationships had been broken and one additional couple no longer lived together. There was no pattern to these mothers' depression at 6 months; one was depressed, two were not. There were no DAS scores for one of the mothers - she did not ackowledge her live-in boyfriend. One mother had started to cohabit with her partner. The number of mothers who were depressed remained constant. The proportion of these in a satisfactory relationship remained at 29%. Within the nondepressed group of mothers there was a slightly higher proportion who were not satisfied with their partner (40% compared to 34% at 6 weeks).

Thus it would appear that being in a satisfactory relationship significantly reduced a mother's chances of becoming depressed (Fisher's exact $p = 0.01$ at 6 weeks and 0.03 at 1 year).

Turning next to unemployment, at 6 weeks there were 19 families where the head of the household was unemployed. There was an almost equal chance of the mothers of these families being depressed (8 out of 19) or not (10 out of 19). However, where the head of the household was working only 10 out of the 46 mothers (22%) were depressed. This same pattern is repeated at 1 year (Table 3.28 and 3.29). A X^2 test on the frequencies at 1 year showed that if the head of the household is employed there is significantly less chance of a mother being depressed (X^2 = 4.53, significant at the 0.05 level).

Table 3.28 Numbers of depressed and non-depressed mothers compared to employed and unemployed heads of household when babies were 6 weeks old.

	Unemployed[1]	Employed[1]	Total
Depressed[2]	8	10	18
Nondepressed	11	36	47
Total	19	46	65

1 signifies employment status of head of household
2 depressed mothers scored 7 or above on Malaise Inventory

Table 3.29 Numbers of depressed and non-depressed mothers compared to employed and unemployed heads of household when babies were 1 year old.

	Unemployed[1]	Employed[1]	Total
Depressed[2]	9	9	18
Non-depressed	11	36	47
Total	20	45	65

1 signifies employment status of head of household
2 depressed mothers scored 7 or above on Malaise Inventory

If employment is coupled with social class then the protective value is emphasised even more. Only nine of the sample's heads of households were from social class II. Of these nine mothers, only one became depressed by 1 year, and her partner became unemployed during the previous six months. Of the 56 mothers who were in social classes III, IV and V, 17 were depressed at 1 year (30%), leaving 39 working class mothers not depressed (70%).

Middle class mothers were also not isolated socially, all 9 having family and friends in whom they could confide. Forty eight of the working class mothers also had a close social network. Of these only 12 (25%) were depressed. Eight mothers were isolated from family and friends, and of these 5 (63%) were depressed (Table 3.30). Mothers who had close social links were characterised by lower levels of depression (Fisher's exact p = 0.03).

Table 3.30 Numbers of depressed and non-depressed mothers compared to Isolation or Non-Isolation.

	Isolated	Not Isolated	Total
Depressed	5	12	17
Non-depressed	3	36	39
Total	8	48	56

To summarise, despite the differences found, levels of correlation between mothers' Malaise scores and individual measures of psychosocial stress were low, though usually significant. It would appear that individual psychosocial factors were acting in a protective way against depression. A stable partner, a good relationship, no unemployment, good social contacts, all were characteristics of the non-depressed mothers. However, between poor relationships, no partner, unemployment and isolation and depression there was no clear association. Though these could be risk factors, mothers characterised by any one of them were not necessarily depressed.

It could be that mothers could cope with one factor alone, but the risk for depression increased in an additive fashion as more and more problems occurred together. When the full psychosocial adversity scale was correlated with depression a correlation coefficient of 0.59 was found.

To use the adversity scale to identify high risk mothers, a cut-off needs to be identified. If the cut-off is taken as 4, then 32 of the 65 mothers scored 4 or above (49%). Of these nearly half were depressed (14 out of 32). This compares to 3 (9%) of the low risk mothers.

Using the full scale, the protective nature of low psychosocial adversity is evident once more. If the mother is depressed she is significantly characterised by high levels of psychosocial adversity (14 out of 17 mothers : Fisher's exact $p = 0.0005$).

Conclusions

The general hypotheses proposed at the beginning of the previous section have been partially born out by an examination of the relationships between the three groups of variables describing the characteristics of the mothers. Of the personality traits, extraversion/introversion was not related either to mental health or psychosocial adversity. The strong relationship found between neuroticism and depression was at least in part an artefact of measurement. A relationship between neuroticism and psychosocial adversity was identified. There were clear and consistent relationships between depression and the components of the psychosocial adversity scale.

The overall patterns within the data remained consistent over the study period. This was a stable sample of mothers. They were mostly in long term relationships to which they were highly committed. They did not move house. Most had close supportive families around them. However they were a disadvantaged sample, 55% having high or very high levels of psychosocial adversity.

The mothers could be characterised as follows:
i) They were more extraverted than one would expect - 26% were more than one standard deviation above the standardised norm whilst only 5% were one standard deviation below. ii) They became increasingly more neurotic over the year of study - 20% were more than one standard deviation above the standardised norm at 1 year. iii) They

had high levels of depression - 26% were depressed at 1 year and 46% had been depressed at some stage of the study.

When the mothers' personalities, their mental health and their levels of psychosocial adversity were examined together, it became obvious that these were not independent of each other.

CHAPTER 4

INFANT CHARACTERISTICS

It has been shown that all adults seem preprogrammed to respond to babies in certain ways. For example, Zeskind, Sale, Maio, Huntington and Weiseman (1985) demonstrated that unrelated adults as well as parents could pick out the cries of a baby in distress. The Papoušeks have shown that the way adult women talk to babies is very similar no matter what the language or culture. There seems to be a 'babyese' that adults use, which at times runs counter to their normal speech patterns (Papoušek, 1989). Furthermore, there appears to be an array of intuitive nonverbal behaviours which are used to stimulate young infants (Koester, Papoušek and Papoušek, 1989).

A new mother, it has been suggested, is uniquely capable of caring for her baby, of knowing his needs and reacting to them (Winnicott, 1988). However it has been shown that a mother's reactions to her baby can be affected by the baby's particular characteristics. Field has shown that demonstrating a newborn's capabilities with the Brazelton Neonatal Assessment, altered the mother's perceptions of her infant and raised expectations about capabilities. The infants, tested twelve months later, had fulfilled these higher expectations (Widmayer and Field, 1981). Mothers' interactive behaviours could also be affected negatively, as a result of their perceptions of their babies. Babies misdiagnosed as suffering from heart problems became developmentally delayed even though there was no physical cause. It was the parents' perceptions that had lowered their expectations (Cayler et al., 1973). Kearsley (1979) has called this iatrogenic retardation. Thus the perceived characteristics of the infants make an important contribution to interactions with the mother.

The infants in the present study were recruited from the records of Special Care Baby Units, so all had been ill, the majority to the point where it was not known whether they would live or die. They were followed up until they reached their first birthday (corrected age)(Chapter 2).

Three aspects of development are important to mothers: temperament, whether the baby is easy and sunny-natured or difficult and demanding; cognitive development, whether the baby learns to look for the mother's approach, to play, to begin to communicate; and motor development, whether the child sits, crawls, and begins to stand in preparation for walking. For some of the infants in this study, development was atypical, as visual, hearing and motor disabilities manifested themselves.

This chapter examines these three areas of development; cognitive and motor development, and temperament, taking into account the impact of emerging disability. It concludes with a discussion of the interactions between these variables within the context of prematurity. The analysis is based on data collected at the 6 weeks, 6 months and 1 year interviews. These relate to the corrected ages of the infants. The choice of corrected over chronological age is discussed within this chapter.

The development of disability

It is only in the last 10 years that the use of ultrasound scans has enabled pediatricians to make early diagnoses of cerebral palsy. Until well into the 1980s doctors were relying on clinical examinations to detect the first signs of disturbed motor development (Ellenberg and Nelson, 1981; Lord, 1984). It was often a parental concern that brought the child to the clinic initially, with parents worried about the child's failure to sit, crawl or walk by the appropriate age.

The clinical signs of cerebral palsy may include persistence of primitive reflexes, failure of mature postural mechanisms to appear, spasticity of limbs, often with scissoring of the lower extremeties, and abnormalities of muscle tone (Cruickshank, 1976). However, the presence of these signs is not specific to the development of cerebral palsy. Often the diagnosis of cerebral palsy without supporting brain scan evidence is not made until the child is about 12 months old, though there may be suspicions long before this on both doctor's and parents' parts.

Diagnosis of cerebral palsy is further complicated in that it varies in severity. It may take the form of generalised clumsiness and poor fine motor control. There may be minimal involvement of one arm only; it may be only the legs that are involved. Severe cases of quadreplegia are more easy to recognise and are diagnosed earlier.

The Sample Babies

In this study all the babies had been scanned during their stays on the Special Care Units. Some (35 out of 65) had scans that were normal, usually a reliable indicator of subsequent normal motor development (Graham, Levene, Trounce and Rutter, 1987; Stewart, Hope, Hamilton, Costello, Baudin, Bradford, Amiel-Tison and Reynolds, 1988). Others (30 out of 65) had scans showing echodensities that gave the pediatricians cause for concern. This was the group that was at risk for the development of motor problems. All 65 babies were followed up routinely by the SCBU's pediatricians over the whole of the study period. This follow-up care began with a review meeting with the parents just before the baby left the unit.

Usually around the estimated date for delivery the babies were well enough and strong enough to go home to their families. Before discharge from the SCBU each family was seen by a consultant who summarised for them the events of the neonatal stay. Where haemorrhaging had been found the possible consequences were explained to the family. Thus 30 mothers were warned of the possibility of motor problems developing as the baby matured. The remaining 35 mothers had no particular reason to be vigilant for motor delay.

Of the 30 mothers of babies at risk for motor delay, 16 were placed in an early physiotherapy intervention programme. The remaining 14 would be offered help as and when neurological signs developed - standard treatment (Chapter 2). The babies then left the SCBU. They could all kick, stretch their arms, wriggle and cry. The mothers without exception reported that this was a wonderful day, when they first had their baby all to themselves.

Six weeks later, during the first interview, the babies were not assessed for delay nor for emerging disabilitiy. They were seen separately by the pediatric team and no gross abnormalities were found.

By 6 months a variety of motor problems had begun to appear, but how to define disability was difficult. Some of the babies were severely affected, and had been diagnosed as suffering from cerebral palsy. A few had visual problems. Others were developmentally behind, but with only the first indications of disability to come.

Since all the babies were assessed during the 6 months interview for motor development using the Bayley PDI (Bayley, 1969), it was decided to use an item from this scale as a gross indicator of delayed development. According to the Bayley scoring manual the average age for sitting independently is 6 months. Whether or not the babies were sitting up at the time of the 6 month (corrected age) assessment was therefore used as an indicator of motor developmental delay. Of the 30 babies who had been diagnosed as at risk for motor disability, only 5 (11%) had reached this milestone. However, when the 35 babies who were not at risk were examined only 12 of these could sit independently at 6 months. There was no significant difference between the two groups (X^2 = 1.6716 with 1 degree of freedom). 74% of the total sample had not reached the sitting milestone by 6 months.

By the 1 year interview the two groups had begun to diverge (see Appendix IV). Of the 35 babies who had normal brain scans during their SCBU stay, none were disabled in any obvious way. One of the babies had developed bronchopulmanory displasia and remained on nasal oxygen. She had learned to sit steadily and had no problem with trunk control or use of her upper limbs. She had not tried to pull to stand, but this was probably a combination of lack of muscle tone and generalised weakness due to oxygen deficiency and lack of experience.

25 of the group (of 30) who had been diagnosed by scan to be at risk for motor problems, had developed some form of observable disability by the 1 year interview. Twelve of these disabilities were **mild** and the babies had reached their motor milestones, but were delayed. Three of these babies had mild hemiplegia, but were crawling well and were beginning to prepare for walking. Three babies had

developed visual problems, one of which was a severe squint in both eyes. The other two of these three babies with visual problems had varying degrees of retinal scarring as a result of high levels of oxygen delivered to them in the incubator on the SCBU (retrolental fibroplasia). All three babies with visual problems were cruising around the furniture and appeared on target for motor development. Two babies of the 12 with mild disability, had poor fine motor co-ordination and were rather clumsy but were pulling to stand and preparing for walking. The remaining three were crawling well, but when they tried to pull to stand, it was obvious that they had the lower extremity weakness and poor trunk control that can signal the development of spastic diplegia.

The 13 babies diagnosed as at risk for disability and who had developed **severe** motor or visual disabilities or both, had disabilities that were impeding development. They had failed to achieve their motor milestones. 10 could not sit independently nor crawl.

The remaining 5 babies of the 30 diagnosed as at risk were not showing observable functional disability. They had learned to sit and were effective at moving around on all fours. However 3 of these could not stand by the furniture. The remaining 2 appeared to be developing normally (Table 4.1).

Table 4.1 Frequency of functional disability observed at 1 year.

Degree of disability	Controls n=35	At risk n=30
Mild	0	12
Severe	0	13
None	35	5

Deciding on an objective measure of disability was difficult. The 12 months motor milestone can be considered to be walking a short way independently (Bayley, 1969). Since only 16 out of the whole sample of 65 (25%) were walking and all of these in the control group, this did not seem to be a very useful criterion. It was therefore decided to take the lower milestone of pulling to stand by the furniture. 32 out of the 35 control babies could stand in this way, but only 15 out of the 30 at risk babies. This is a significant difference between the two groups (Fisher's exact p=0.0002). Furthermore those who had reached this milestone in the at risk group were on the whole at the lower limits for acceptably passing this assessment.

Thus by 1 year 93% of those diagnosed as at risk for disability were falling behind in their motor development in some way. The diagnosis proved accurate in all but 2 cases.

Cognitive and Motor Developmental Functioning of the Infants

The mothers of the preterm infants in this study seemed no different from any other group of mothers in their concerns. During the course of the interviews, they all discussed their babies and it became obvious from their comments that they compared their own infants to other babies they knew. To begin with they excused any lack of development on the grounds of prematurity. By the 1 year assessemnt they were on the whole much more demanding, expecting their children to perform closer to their chronological age. During the course of these revelations it became clear that, to the mothers the achievement of motor milestones was very important. Cognitive developments that manifested themselves in social settings, for example babbling and the ability to play peek-a-boo, were also anticipated achievements.

Developmentalists have been interested and have attempted to measure the same broad areas that most concern mothers - motor and cognitive milestones. The results of investigations are difficult to interpret. Some show that preterms may experience delay during the first year of life (Crnic, Greenberg, Ragozin, Robinson and Basham, 1983a; Field, Dempsey and Shuman, 1981; Siegel, 1982) or may show no significant difference to full term developmental courses (Rauh, Achenbach, Nurcombe, Howell and Teti, 1988). Some research has suggested that whilst there may be initial developmental delay, the children catch up in cognitive development by 18 months (O'Connor, 1980), by 24 months (Greenberg and Crnic, 1988) or by 3 years (Bakeman and Brown, 1980).

The existing results do show however, that motor development lags behind cognitive development, even though the levels reported for preterms are within the normal range when compared to full term infants (Greenberg and Crnic, 1988; Ross, 1985; Gaiter, 1982; Siegel, 1981).

Many of the studies do not report on initial characteristics of their preterm samples. This may account for the variability of the results. For example, Gorga, Stern, Ross and Nagler (1988) demonstrated that motor development of preterm infants who had been ill lagged behind that of healthy preterm infants. Moreover, the sick preterms exhibited many of the characteristics of sick full term infants, suggesting that the degree of impairment was a result of illness rather than of prematurity. Other researchers have demonstrated the negative impact of specific conditions, such as respiratory distress syndrome (RDS) or intraventricular haemorrhage (IVH), on the developing abilities of the preterms (Landry, Fletcher, Zarling, Chapieski, Francis and Denson, 1984; Lewis and Bendersky, 1989; Bennett et al., 1990; Gaiter, 1982). In all of the above work the Bayley scales of infant development were used.

It was decided to use the Bayley assessment for the present sample too. The Gesell schedules (Gesell and staff, 1949), the Cattell Infant Intelligence Scales (Cattell, 1960) and Griffith's Developmental Scales (Griffiths, 1976) were also considered, but rejected. Gesell's scale gives a set of empirically determined norms for patterns and rates of development, from which intelligence could be estimated. However, directions for administration are vague, the standardisation sample was small and unrepresentative, and there are no figures available for reliability or validity. The Cattell scale is also based on normative developmental data, and purports to measure intelligence in infants aged from 2 to 30 months. It suffers from having been standardised on a small nonrepresentative sample almost 50 years ago. The main drawback of the Griffith's scale is that it is a closed assessment. Time constraints prohibited the investigator from waiting for a place on a training course.

Development Assessed by Bayley Developmental Scales

The Bayley assessment is based on normative maturational developmental data, and produces two scores, one for mental (cognitive) and one for motor development (Bayley, 1969). To assess mental functions the Bayley uses measures such as the infant's response to a bell, the ability to follow an object with the eyes, and later, the ability to follow instructions. The motor scale assesses steps towards major milestones, such as sitting independently, weight bearing, and walking. Standardisation was very thorough, and reliability is high (0.88 for mental scale, 0.84 for motor scale). Thus the Bayley was the most psychometrically sound of the available assessments.

Furthermore it had been used previously with disabled populations. Self and Horowitz (1979) used the Bayley scales to predict mental retardation. Infants scoring two standard deviations below the mean on the Bayley cognitive scale have also been shown to have a high probability of testing in the retarded range when reassessed at a later stage (Simon and Bass, 1956; Ames, 1967). Since it was predicted that the infants in this study would display a wide range of abilities at 1 year, this was an important consideration. Scales specifically designed to assess capabilities in a population with disability (for example Uzgiris and Hunt, 1975) were rejected since these were inappropriate for use with the control group. Assessment had to be comparable across the whole sample. The Bayley scales also have the advantage that the raw scores can be converted to age equivalents for those testing at a very low level.

The infants were assessed at 6 months and 1 year (corrected age), in their own homes. Mothers were always present and the testing was carried out after the baby had become used to the presence of the examiner. Time of assessment varied, but wherever possible it was carried out when the baby was alert, rested and not hungry. Sometimes this necessitated a return visit. Wherever possible for the cognitive testing the baby was seated in a high chair with an attached tray. If this was not available the child was seated on the mother's knee with a table to work on within reach. On the occasions when no table was available, children who could not sit independently were propped upright, or use was made of a specialised chair if this was the infant's normal seat. Motor assessments always followed cognitive testing.

Once the infant had been assessed, scores on motor and mental scales had to be calculated. The Bayley is standardised at monthly age intervals to a norm of 100 with a standard deviation of 16. It was therefore important to decide whether to use conceptional or chronological age for assigning standardised scores. There is little agreement amongst the main researchers in the field. Some have suggested that to correct for prematurity gives a more realistic picture of the infant's abilities (Tilford, 1976; Miller, Dubowitz and Palmer, 1984; Palisano, 1986). Hunt and Rhodes (1977) found that correcting for prematurity gave preterm infants a significant advantage over term infants who were outperformed on the Bayley scales. However, if no correction is made preterm infants lag well behind term groups, especially in motor assessments (Saint-Anne Dargassies, 1979; Matilainen, 1987). On the other hand, Barrerra, Rosenbaum and Cunningham (1987) imply that it is the mental scale of the Bayley that most needs to be corrected for prematurity in its calculation. Blasco (1989) sits firmly on the fence and asserts that half correction for prematurity is best! There is considerable evidence that correcting for prematurity, at least over the first twelve months, gives results that are comparable to full term infants (Siegel, 1983; Saint-Anne Dargassies, 1979; Allen, 1988).

After considering the pros and cons of correction for prematurity it was decided to use a full correction factor. Thus an infant born at 24 weeks gestational age would have an actual chronological age of 40 weeks when first assessed on the Bayley scales at the 6 months interview. An infant born at 33 weeks gestation would be chronologically 31 weeks old. Both would have a corrected age of 24 weeks.

All the babies received a raw score for both motor and cognitive development. The motor score was converted to a score on the Perceptuomotor Development Index (PDI), the cognitive raw score was converted to a score on the Mental Development Index (MDI). Both are converted using tables standardised to a norm of 100 with a possible range of 50 to 150. At 6 months three babies were scoring less than 50 on the PDI, and therefore could not be assigned a standardised PDI score. By 1 year, 13 babies, could not be assigned a PDI score. Similarly at 6 months, 9 babies, and at 1 year, 8 babies, were unscorable on the MDI.

Cognitive and Motor Development: Results

Table 4.2 presents the mean MDI and PDI scores for those infants whose assessments were scorable. At 6 months the group means were similar for both PDI and MDI scores, and almost one standard deviation below the standardised norm of 100. By 1 year the group as a whole was still lagging behind in physical development. However, the mean MDI score (99.9) shows that for cognitive development, the babies as a group were performing at a comparable level to that of the standardisation sample of full term babies. These group means however, mask a wide range of abilities and do not include the more severely disabled babies at all.

All the babies were assessed within 2 weeks of their 6 month and 1 year corrected age. Thus raw scores should be comparable at each time period, at least as indicators of levels of capabilities. If raw scores are used, then all 65 babies are assessable at both time periods. The PDI raw scores (PDIR) ranged from 3 to 35 at 6 months and from 10 to 52 at 1 year. MDI raw scores (MDIR) were just as variable, from 10 to 84 at 6 months, and from 6 to 115 at 1 year. The mean values are given on Table 4.2.

From a regression analysis, there is a correlation coefficient of 0.78 for z scores from PDIR assessments at 6 months and 1 year (Figure 4.1), and 0.81 for z scores on the MDIR (Figure 4.2). So, just using raw scores would appear to give good predictability of both cognitive and motor development, since 60-65% of the variance at 1 year can be explained by the performance six months earlier.

Figure 4.1 Relationship between PDIR at 6 months and at 1 year

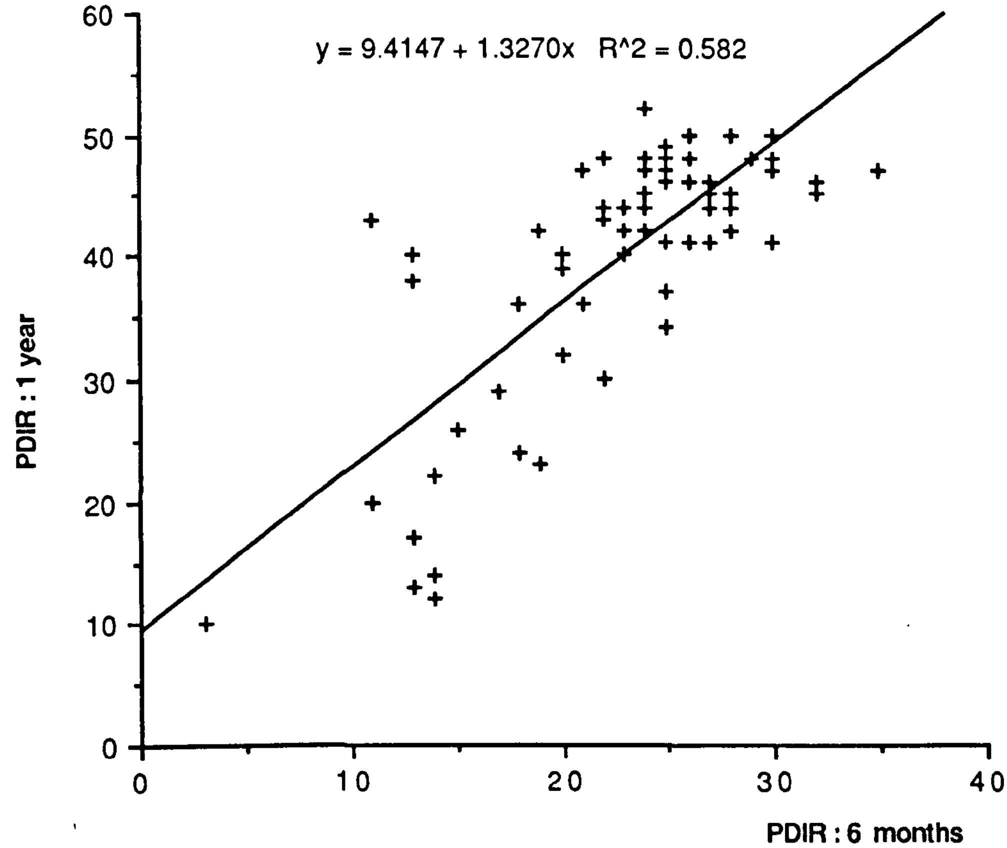


Figure 4.2 Relationship between MDIR at 6 months and 1 year

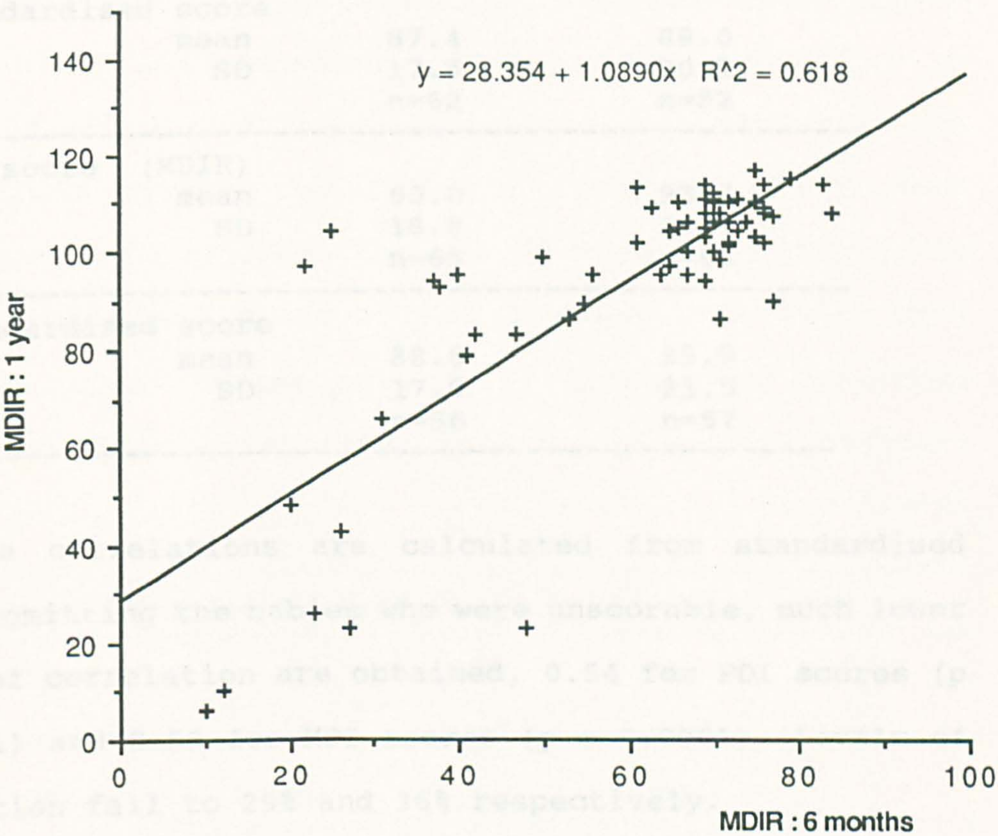


Figure 4.2 Relationship between MDIR at 6 months and 1 year

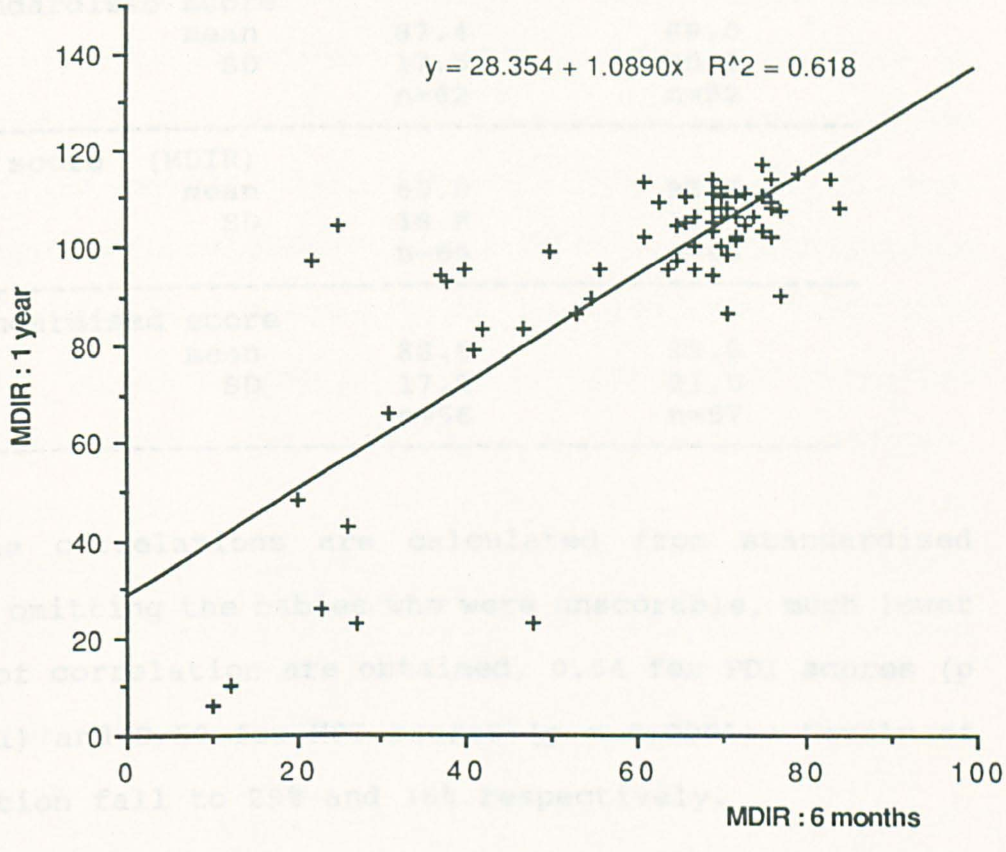


Table 4.2 Mean Bayley scores at 6 months and 1 year

		6 months	1 year
PDI raw score (PDIR)			
	mean	22.7	39.6
	SD	6.1	10.5
		n=65	n=65
PDI standardised score			
	mean	87.4	89.0
	SD	17.5	20.1
		n=62	n=52
MDI raw score (MDIR)			
	mean	60.0	93.7
	SD	18.8	26.1
		n=65	n=65
MDI standardised score			
	mean	88.8	99.9
	SD	17.9	21.5
		n=56	n=57

When the correlations are calculated from standardised scores, omitting the babies who were unscorable, much lower levels of correlation are obtained, 0.54 for PDI scores (p = 0.0001) and 0.59 for MDI scores (p = 0.0001). Levels of explanation fall to 29% and 36% respectively.

Examination of the high negative residuals from the PDIR regression (Figure 4.1) reveals a group of very disabled babies. If the babies are far behind at 6 months, they are likely to be far behind at 1 year. Maisto and German (1986) also found high levels of predictive validity for 11 month Bayley scales when they assessed developmentally delayed infants. It would appear that the PDIR is better at predicting ongoing motor disability than levels of "normal" development. For babies who are not disabled the Bayley motor assessment is not a good predictive indicator of future development (Kaplan and Saccuzo, 1989).

Correlations were also run of MDI raw scores (MDIR) on PDI raw scores (PDIR) for all 65 babies, using the 6 month and the 1 year data (Tables 4.3). At 6 months there was a correlation of 0.83 between the two scores, and of 0.69 at 1 year. If MDI standardised scores are correlated with PDI standardised scores, then for the 50 babies who were scorable at both assessments, the correlation coefficients were 0.79 at 6 months and 0.55 at 1 year (Table 4.4). Thus what the Bayley scales purport to measure as cognitive performance depends, at least in part, on motor ability.

Table 4.3 Correlation of MDIR on PDIR for all 65 babies.

	r	r^2	p
6 months	0.83	0.68	0.0001
1 year	0.69	0.48	0.0001

Table 4.4 Correlation of MDIR on PDIR for 50 babies. (excluding those severely disabled)

	r	r^2	p
6 months	0.79	0.63	0.0001
1 year	0.55	0.30	0.0001

This can be demonstrated by a closer examination of part of the 6 months assessment. For example, as part of the cognitive assessment (MDI), the baby's behaviour, when offered one, two or three cubes, is scored for a maximum of 10 points. The first behaviour in the series is "regarding the cube". The progression then is through unco-ordinated reaching, co-ordinated reaching, picking up the cube, retaining 2 cubes when they are placed in the hands, reaching out for the cubes persistently, reaching for a second cube, picking up the cube with dexterity, retaining 2 cubes when offered a third, and attempting to secure a third cube (Bayley, 1969, p. 37). A child who has limited use of the hands can only score 1 point! He may well show that he is aware of all the cubes, and indeed show frustration at <u>not</u> being able to secure them. None of this is scorable. Suffice it to say that the disabled babies were penalised when their cognitive assessments were made. Examination of mean scores for the diagnosed at risk and control groups must be made with this in mind.

For the control group the mean MDI is 94.0 at 6 months, and 109.1 at 1 year, indicating that the group as a whole is catching up towards their chronological age. Their mean PDI remained depressed though, 95.0 at 6 months, 93.3 at 1 year. This lag in motor development has been reported in several other studies (for example Bennett et al., 1990; Resnick, Eyler, Nelson, Eitzman and Bucciarelli, 1987), and has come to be expected in studies of preterms who have suffered from RDS.

For the group at risk for disability, mean scores were depressed in both mental and motor spheres. For the 22 at risk babies who could be scored, there was some overall improvement from 6 months to 1 year; mean MDI increased from 80.7 to 85.7, mean PDI from 77.6 to 80.2.

In order to include all 65 babies, mean raw scores were calculated. At 6 months the mean raw score for motor development (PDIR) for the 35 babies in the control group was 25.6, and for the 30 in the at risk group was 19.3. The difference between the two groups doubled by 1 year (control mean 45.0, at risk mean 33.2). The same pattern emerges when mean raw scores for mental development (MDIR) are compared. At 6 months the difference between the control and at risk means was 18, which increased to 27 by 1 year. Palmer, Dubowitz, Levene and Dubowitz (1982) also found overall developmental differences between babies with IVH and those without.

In both mental and motor development the two groups were diverging. The extent of this divergence could be estimated by using the pediatric diagnosis of developmental delay. Pediatricians (e.g. Resnick et al., 1987; Portnoy, Callias, Wolke and Gamsu, 1988) use a cutoff score of 70 on the Bayley scales, i.e. approximately 2 standard deviations below the standardised norm, to delimit delay. At 6 months, 16 (53%) of the 30 babies in the at risk group were scoring below 70 on the MDI. This compares with only 2 out of 35 (5%) of the control group. By 1 year 14 (47%) of the at risk babies were cognitively delayed, but all of the control group were within normal limits for mental development.

In motor development 12 of the 30 at risk children were developmentally delayed at 6 months, compared to none of the controls. At 1 year, 18 at risk babies were scoring below 70 on the PDI (60%). Interestingly, 8 of the controls (23%) had also become developmentally delayed in the motor area by this time. The Bayley assessment places great weight on being able to walk a few steps by 1 year, and few of the babies had reached this milestone. The rest were heavily penalised.

It will be remembered that 16 of the babies in the group at risk for disability had received regular physiotherapy from term (the early intervention group of the physiotherapy study, see Chapter 2). There were no significant differences between these babies and those receiving standard treatment, either in motor developmental delay ($X^2 = 1.09$, df = 1) or in mental developmental delay ($X^2 = 0.12$, df = 1), at the 1 year assessment.

Development Measured by Age Equivalents

It is perhaps useful to think of what development actually means to mothers. Most mothers are looking for motor milestones and increasing cognitive skills that are shown in social situations. Inevitably the mothers in the study compared their preterm babies to other babies they knew or to what they thought of as the norm for development.

Bayley scores as such do not hold much meaning for the average mother. However, the Bayley manual provides instructions for converting raw scores to an "age equivalent". Though this is primarily used for children unscorable at their chronological age level, it could also be used across the ability levels. Thus a 6 month old baby who has a raw score of 25 on the MDI assessment has well below the minimum convertable score of 38. The age equivalent can be obtained by using the norm tables, and looking across the rows corresponding to an MDI of 100 to find the age-group column in which the given raw score is nearest to that obtained by the child. The age at the head of this column is the age equivalent for the scale concerned. In the case above, a raw score of 25 on the MDI gives a mental developmental age equivalent of 2 months (Bayley, 1969, p33). In this way age equivalents, in months, for mental and for motor development could be calculated for each baby at both assessment times.

The babies were first assessed on the Bayley scales when they were 6 months old (corrected age). The mean age equivalent (AE) for both mental (MDI) and motor (PDI) development for the whole group (N=65) was 5 months. The range in AE varied from newborn to 8 months for physical development and from one month to eight months for mental development. When the AEs were derived for the 30 at risk children alone, the means for this group were 4 months for motor and 4 months for mental development, whilst the AE means for the controls was 6 months in each sphere. In other words the control group children were at their corrected age in both areas of development (6 months), whilst the group diagnosed to be at risk for disability was 2 months behind. The same pattern is observed at the 1 year assessment. The control babies were performing at or above their chronological age. The babies in the disability diagnosis group were on average 4 months behind their chronological age in both mental and motor development (Table 4.5).

At 6 months, the two groups were on average 2 months apart whether mental or motor development is considered. At 1 year they were 4 months apart in motor development and 5 months apart in mental development. Mean AEs for the at risk group were not significantly different from those for the control group.

Table 4.5 Mean age equivalents (AE) for mental (MDI) and motor (PDI) development at 6 months and 1 year.

		Total group (N=65)		Controls (N=35)		Predicted to be at risk (N=30)	
		6 mths.	1yr.	6 mths.	1yr.	6 mths.	1yr.
PDI AE	mean	5.0	10.0	6.0	12.0	4.0	8.0
	SD	1.5	3.5	0.8	2.2	1.7	3.5
MDI AE	mean	5.0	11.0	6.0	13.0	4.0	8.5
	SD	1.6	3.8	1.0	1.6	1.8	4.1

AE Age equivalent in months
PDI Perceptuomotor Developmental Index
MDI Mental Developmental Index

The reason lies in the variability within the at risk group. It will be remembered that the at risk group at 1 year had three subgroups - those who were severely disabled (N=13), those who had mild disabilities (N=12), and a small group who were not exhibiting functional disability (N=5). The group where disabiliity had been diagnosed as possible was examined using these three subgroups.

Table 4.6 Mean age equivalents in months for 4 groups of babies according to degree of disability evident at 1 year.

	(N)	6 months Motor AE	6 months Mental AE	1 year Motor AE	1 year Mental AE
Severe disability	(13)				
Mean		3	3	5	6
SD		1.5	1.6	2.5	3.8
Mild disability	(12)				
Mean		5	5	10	10
SD		1.7	1.6	1.4	3.2
At risk but no overt disability	(5)				
Mean		6	5	12	11
SD		0.6	1.0	2.3	2.1
Controls	(35)				
Mean		6	6	12	13
SD		0.8	1.0	2.2	1.6

AE = Age equivalent in months

Table 4.6 summarises the AEs for the sample taking severity of disability into account. At 6 months there was no difference between controls and the 5 at risk babies who were not showing any disability. The 12 babies who had only mild disabilities were also not significantly different in their development from controls (Motor AE = 5 months; Mental AE = 5 months). The severely disabled babies were significantly behind (Motor AE = 3 months; Mental AE = 3 months).

By 1 year all three of the subgroups were behind. In mental development the 5 babies showing no overt disability were 2 months behind the mean for the control group, though they were no different in motor development. The babies with mild disability were 3 months behind the control group in their mean mental development AE and 2 months behind in their mean motor development AE. The severely disabled group had fallen much further behind. In motor development their mean AE was 5 months. In mental development it was 6 months. In both cases the group mean was 7 months behind that of the control group.

It may be useful to illustrate what age equivalents mean in particular babies. Baby 40, diagnosed to be at risk for disability, had an age equivalent of 6 months on both mental and motor assessments, when he was seen at 6 months corrected age. He could hitch himself around on his belly, pulling with his arms and beginning to push with his knees. In this way he could go where he wanted and explore at floor level. Changing direction was no problem and he could turn over from back to front and front to back quite easily. He could not sit very well and even when propped his back remained rounded. His head control was very good. On his back or front he enjoyed playing with the toys. He interacted well with his father but less successfully with his mother. Social smiling was well established.

By 1 year he could crawl freely about the room on his hands and knees. Although he was not yet walking, he could climb unaided onto the sofa and chairs, and climb down over the arms. He was active and curious, babbling expressively and beginning to use words. His age equivalent at this time was 12 months for motor and 11 months for mental development.

Baby 87, also diagnosed to be at risk, appeared to show normal development up to 6 months, when his age equivalent was 6 months for both mental and motor development. He sat independently to play, usually supporting himself with one hand on the corresponding knee. His balance was variable (Mother placed a cushion behind him "just in case"). He used his hands freely to explore objects, and babbled playfully. He had not begun to move around the floor. By 1 year he was using a couple of single words, could crawl freely, though with balled hands, and was "into everything". His favourite "toys" were the buttons on the video recorder, from which he had broken off the cover to get at them. He was pulling himself up by the furniture but was not walking, prefering to push his wagon around from a kneeling position. His mental AE was 12 months but his motor AE was only 10 months.

Baby 55 was behind on both 6 month and 1 year assessments, changing little over the 6 month intervening period. Her AE at the 6 month assessment was 3 months for both physical and mental development. She had some head control and could use her arms. She played with her fingers, but could not grasp a rattle. There were no signs of her gaining any trunk control. She could not remain upright even when propped in a corner of an easy chair by cushions. Her legs did not move very much, and when her mother dangled her above her head in a game her legs hung straight down. She did not respond to her mother speaking her name nor could she track objects. There was social interaction between mother and baby as the infant cooed and gurgled in response to her mother's overtures. When she was 1 year (corrected age) her motor capabilities had actually deteriorated (AE = 2 months). She sat, a petite child, propped in the corner of the settee by cushions. She rarely moved, but gradually slid down and sideways, where she remained, uncomplaining until her mother propped her up again. She made only a few isolated noises and did not cry. She gazed serenely out at the blue sky through the window and occasionally on her brother and sister in the room, but with what volition it was impossible to tell. She could hold a rattle with a very immature grasp, but did not play with it. She did have head control, but no trunk control. There was very little in the way of feedback to her mother in social interactions (mental AE = 3 months). Essentially this child was like a young 3 month old baby in needs and actions. Her chronological age was almost 16 months. She had made few developmental advances in the previous 6 months.

Catching up or Falling Behind?

As a group, less than half (21 out of 65) had reached the 12 month age equivalent in both motor and mental development by the time of the 1 year assessment. 39 of the 65 babies were at or above 12 months AE using the MDI, but only 25 of the 65 were at 12 months using the PDI. Of the 21 who were at or above their AE in both mental and motor development, 19 were in the control group and only 2 in the at risk group.

By the time of the 1 year assessment, on the whole the mothers had ceased to make allowances for prematurity, and were looking for chronological age milestones. This change in attitude has also been reported by others (see for example Goldberg, Brachfield and Di Vitto, 1980). In this respect, the infants as a whole were catching up faster in mental development than in motor development. In order to estimate who was catching up or falling behind, mental and motor AEs were tabulated for both 6 months and 1 year. AEs were compared to corrected age at both times and the differences were listed. If these differences increased in numerically real terms the infant was catching up towards chronological age. If on the other hand the differences decreased in real terms then the baby was falling behind in development.

Two infants can be described to illustrate this. Baby 93 had a mental AE of 6 months at the 6 months (corrected age) assessment (difference = 0). By 1 year his mental AE was 14 months, 2 months ahead of his corrected age (difference = +2). Between the 6 months and 1 year assessments he was catching up towards his chronological age. In fact by 1 year (corrected age) he was performing at a level just 3 weeks behind his chronological age of 15 months. In terms of motor development, his AE at the 6 months (corrected age) assessment was 6 months (difference = 0), but at 1 year (corrected age) he was performing 3 months ahead of his corrected age (difference = +3). He had caught up to his chronological age level of 15 months, and had overcome the lag in development due to his preterm birth.

In contrast, Baby 34 was falling behind developmentally by the 1 year assessment. She achieved a mental AE of 5.5 months at the 6 month (corrected age) assessement (difference = -0.5). By 1 year her mental AE was 10 months (difference = -2). At the first assessment she was performing at her corrected age level although this was 2.5 months behind her chronological age. By the second assessment her mental AE was 2 months behind her corrected age and 4.5 months behind her chronological age. Her motor development shows a similar pattern. At 6 months she was performing at her corrected age level and by 1 year she was falling behind. Her motor AE of 8 months was 4 months behind her corrected age and 6.5 months behind her chronological age. The reason for this lag in development was the increasing effect of the symptoms of spastic diplegia.

The Impact of Disability

The impact of emerging disability was evident in the index group as a whole. Of the 30 babies who were at risk for the development of motor problems, 23 (77%) were falling behind whilst only 3 (10%) were catching up when the motor AEs were compared. In the control group, 13 (37%) were catching up and 13 (37%) were falling behind (Fisher's exact $p=0.002$).

The at risk group were also falling behind in mental development. Whereas 26 of the 35 control infants had mental AEs that were catching up to their chronological age, only 8 of the at risk group were doing so. Indeed 17 of the at risk group were falling behind compared to only 3 of the control group (Fisher's exact p=0.00001).

In summary, the babies in the at risk group were characterised by lower developmental levels, both mental and motor, than the control group. The levels for the two groups were also diverging. The control group was catching up to chronological age; the at risk group was falling further and further behind, particularly in motor development. This effect is most evident for the severely disabled children.

Temperament

Most mothers have no difficulty in describing their babies' temperaments, whether their babies are difficult or easy going. An intuitive awareness of temperament exists, that usually encompasses moods, emotional responses and activity. Temperament has been characterised as the "how" of behaviour, as opposed to the "what" (the content), or the "why" (the motivation), or to the capabilities and skills of the individual child (Rutter, 1989a; Thomas and Chess, 1977, 1989; Buss and Plomin, 1975).

The abstract quality of temperament makes it difficult to measure directly. Consequently, among the researchers who have attempted to study temperament much disagreement has developed, not only over measurement but also over basic definitions of what temperament actually is (Goldsmith, Buss, Plomin, Rothbart, Thomas, Chess, Hinde and McCall, 1987; Streslau, 1986; Bates, 1980). In recent years there have been several attempts to synthesise the major elements from the various schools of thought (McCall, 1987; Rutter, 1989a, Bates, 1989). Bates (1989, p 4) has suggested that a general definition that applies to all the work would be that temperament encompasses "biologically rooted individual differences in behaviour tendencies that are present early in life and are relatively stable across various kinds of situation and over the course of time".

There are six main areas of young infants' behaviour that can be assessed in order to describe temperament. These are:- negative emotionality (eg distress, fear, anger); both adaptability and reactivity to novel stimuli or situations; levels and intensity of activity; attention regulation; positive emotionality, including sociability (Bates, 1989).

Different perspectives on these behavioural aspects of temperament have led to very different ways of measurement. Some researchers have concentrated on laboratory based assessment (eg. Kagan, Reznick and Snidman, 1986; Streslau, 1986; Rothbart, 1986). Others have used trained observers to rate infant behaviours associated with temperament (eg.

Daniels, Plomin & Greenhalgh, 1984; Riese, 1983; 1987a; Matheny and Wilson, 1981; Matheny, Riese and Wilson, 1985; St. James-Roberts and Wolke, 1988). By far the most commonly used method of assessment is the questionaire reporting maternal ratings of temperament (Hubert, Wachs, Peters-Martin and Gandour, 1982).

All of these methods are subject to methodological bias (Bates, 1989; Rothbart and Goldsmith, 1985). Indeed, as Rutter (1989a) has pointed out, no single instrument can possibly provide an unbiased measure. In the present study the decision was made to use a maternal report of temperament. The babies were already being assessed for two research projects as well as being followed up by pediatricians on the SCBU. In addition they were receiving well baby care, including developmental assessments, from their local health centres. It was felt that bringing the babies in to the laboratory for yet further temperament assessments would be unacceptable.

A large number of temperament instruments have been developed. (Hubert, Wachs, Peters-Martin and Gandour, 1982 report on 26 of these!) The most commonly used is the Revised Infant Temperament Questionaire (RITQ) (Carey and McDevitt, 1978), which is based on the New York Longitudinal Study work of Thomas and Chess. It is a very long (95 item) questionaire using American terminology. Furthermore, it is standardised on white, middle class, American women, living in the northeastern US (for a detailed critique see Gibbs, 1984).

A much shorter maternal report questionaire than the RITQ, the Infant Characteristic Questionaire (ICQ), was developed by Bates, Freeland & Lounsbury (1979). It has 24 items, ranked on a 7 point scale, with 4 being the behaviour of the average baby. Although the ICQ was developed for use with babies 4 months old and older, the nature of the items makes it easily adaptable to lower age ranges as well. The pilot study for the this study (see Chapter 2) had indicated that British mothers had few difficulties in completing the ratings. Bates has specifically used the ICQ to develop a measure of infant "difficultness", a concept first operationalised by Thomas, Chess and Birch (1968). Difficult temperament is closely related to negative emotionality, and Bates defines it as primarily involving frequent and intense expressions of negative affect, with possible connotations of both sensitivity to stress and social demandingness (Bates, 1987).

In other words, a baby with a difficult temperament is a fussy, demanding child. There is some evidence that difficult temperament in infancy leads to behaviour problems in later childhood (Thomas and Chess, 1982; Bates, Maslin and Frankel, 1985; Bates, 1986), and this was of interest for the larger project with its longitudinal aspects.

Assessment of Temperament by ICQ

The ICQ consists of 24 items, but for the youngest babies

(6 weeks corrected age) several of these were inappropriate and therefore were omitted at the time of the first assessment. Examples were the questions about feeding. The mothers did rate items such as "How much does your baby fuss and cry in general" or "How does your baby typically respond to being in a new place?"

The mothers were given the questionaire during the course of the interview and were asked to ring the most appropriate rating for their own children on a 7 point scale. It was pointed out to them that a rating of 4, "about average", meant how they thought the typical baby would be scored. For example "How easily does your infant get upset?" could be rated:

1	2	3	4	5	6	7
Very hard to upset-even by things that upset most babies			About average			Very easily upset by things that wouldn't bother most babies

Using the data from the completed questionaires, separate factor analyses were performed on each of the three sets (6 weeks, 6 months and 1 year), collected from the 65 mothers. For each of the 3 factor analyses a principle factors solution was obtained using varimax orthogonal rotations and 4 factors emerged in each case.

At 6 weeks, variables loading on Factor I concerned crying, fussiness and soothability, a factor very similar to Bates' Factor I. However the variable concerning care by the average mother did not load on Factor I. The mothers might have interpreted this rating differently to mothers of healthy fullterms. A young preterm baby may be difficult to care for but this has a physical rather than a temperament cause. For the most part, at 6 weeks Factor I could be considered synonomous with Bates' Fussy/Difficult factor.

By 6 months, Factor I loadings for the 65 preterm babies were almost exactly the same as those variables loading on Bates' Fussy/Difficult Factor I, including the difficulty for the average mother. The mothers at this age were rating their preterm infants in a way that was very similar to the fullterm babies used in Bates' original work (Bates et al., 1979).

Factor I loadings from the analysis of the 1 year data showed a similar pattern to the 6 week results. In particular, difficulty for the average mother no longer loaded on Factor I. Perhaps this was because mothers of children with disability perceived caretaking in physical terms. An "average" mother would find the physical care of a disabled child difficult. Hence this measure of difficulty was one of physical care rather than of temperament. This is reflected in the loading of this item. The variables that did load on Factor I again dealt with fussiness, crying, mood and demandingness.

After each assessment the main temperament factor emerging was one that could be labelled Fussy/Demanding. To most mothers a fussy, demanding infant would be interpreted as a difficult baby to deal with.

The concept of difficult temperament is a controversial one that has engendered much debate in the literature (for example Bates, 1980; Rothbart, 1982; Thomas and Chess, 1982; Kagan, 1982; Hubert and Wachs, 1985; Goldsmith et al., 1987; Bates, 1989). For the present sample it seemed a very useful concept in the study of the impact of disablity. The pilot work had shown that the idea had meaning for mothers of preterm infants, a finding supporting the work of Hubert and Wachs (1985), though they arrived at a more wide ranging set of difficulty variables. Consequently each baby in this study was assigned a difficulty score.

The difficulty scores were derived from the ratings given by each mother. At 6 weeks 7 variables loaded on Factor I. The rating score for each of these 7 variables was summed for each baby. A rating of 4 would be representative of the "average" baby. Babies scoring 1, 2, or 3 are therefore easier than the average baby. The least extreme possible score for an easier than average baby would be 7 X 3 or 21 in total. Babies scoring 5, 6, or 7 are more difficult than average. The least extreme possible score for a more difficult then average baby would score 7 X 5 or 35. Thus at 6 weeks a baby scoring 21 or less would be classified as an easy baby. Babies scoring between 22 and 34 would be neither particularly easy nor difficult in temperament.

Those babies who score 35 or more are difficult babies in their mothers' estimation.

A similar process was carried out for 6 month temperament ratings, where the scores on the 8 variables loading on Factor I were summed. Similarly at 1 year, when there were 10 variables loading on Factor I, the scores were also summed. The range of scores for easy, average and difficult babies is given in Table 4.7.

Table 4.7 Scores on Factor I: Babies with Easy, Average and Difficult Temperament.

	6 weeks[a]	6 months[b]	1 year[c]
Easy	21 or less	24 or less	30 or less
Average	22 - 34	23 - 39	31 - 49
Difficult	35 and up	40 and up	50 and up

[a] Sum of 7 variables loading on Factor I
[b] Sum of 8 variables loading on Factor I
[c] Sum of 10 variables loading on Factor I

The median Factor I score for the 65 babies increases from 6 weeks (27) to 6 months (31) to 1 year (36). The increase observed is due to the increasing number of appropriate variables rated by the mothers at each time. Table 4.8 shows the number of babies rated as difficult or easy at each assessment.

Over the year those babies who were rated as neither difficult nor easy increased from 51% to 74% of the whole group of 65. The number of babies exhibiting difficult temperament decreased markedly by 6 months, and then remained constant at about 15% of the total group. The number of babies who were perceived as having an easy temperament remained constant over the first six months, but then fell by half over the second six months. Then only 12% of the 65 babies were rated as easy in temperament.

Table 4.8 Frequency of occurence of Easy and Difficult temperaments over the first year for 65 babies

	6 weeks N (%)	6 months N (%)	1 year N (%)
Difficult babies	15 (23)	10 (15)	9 (14)
Average difficulty	33 (51)	38 (59)	48 (74)
Easy babies	17 (26)	17 (26)	8 (12)

It would appear that the mother ratings of the babies as a whole were becoming less extreme with the passage of time. In order to assess how much continuity there was in temperament scores, regression analysis was performed of Factor I scores at 6 months on Factor I scores at 6 weeks, for all 65 babies ($B_1 = 13.32 + 0.65B_0$ where B_0 represents Bates Factor I score at 6 weeks and B_1 represents Bates Factor I score at 6 months with a standard error of 8.42). Only 30% of the variation in difficulty scores at 6 months could be explained by Factor I scores at 6 weeks (adjusted $r^2 = 0.299$). A further regression was carried out of Factor I scores at 1 year on Factor I scores at 6 months ($B_1 = 22.62 + 0.51B_2$ where B_1 represents Bates Factor I score at

6 months and B_2 represents Bates Factor I score at 1 year with a standard error of 7.00). Again only 35% of the variation in difficulty scores at 1 year could be explained (adjusted $r^2 = 0.35$).

These low levels of explanation are not indicative of continuity. The reasons for this are twofold. As has already been mentioned, there is a decrease from 6 weeks to 6 months in the number of those babies who were rated as difficult, and a further decrease from 6 months to 1 year in numbers of babies who were rated as easy. Secondly, the overall figures for all 65 babies mask what is actually happening. Figure 4.3 is a schematic representation of how individual babies were rated over the year. About 60% of the sample, were rated the same way at each assessment; 6 as difficult, 6 as easy, and 26 at neither extreme. The remaining 27 babies were rated differently over the three assessments.

In summary, analysis of the ratings of the babies' temperaments produced a "Difficulty" factor very similar in content to that reported in Bates' original findings.

Median scores for the 65 babies on their degree of difficultness did not increase over the year of study - the babies did not become more difficult. At 6 weeks the mothers were more prone to rate their babies as difficult or easy. Over the year there was a retreat to the average, and the ratings of the babies became less extreme.

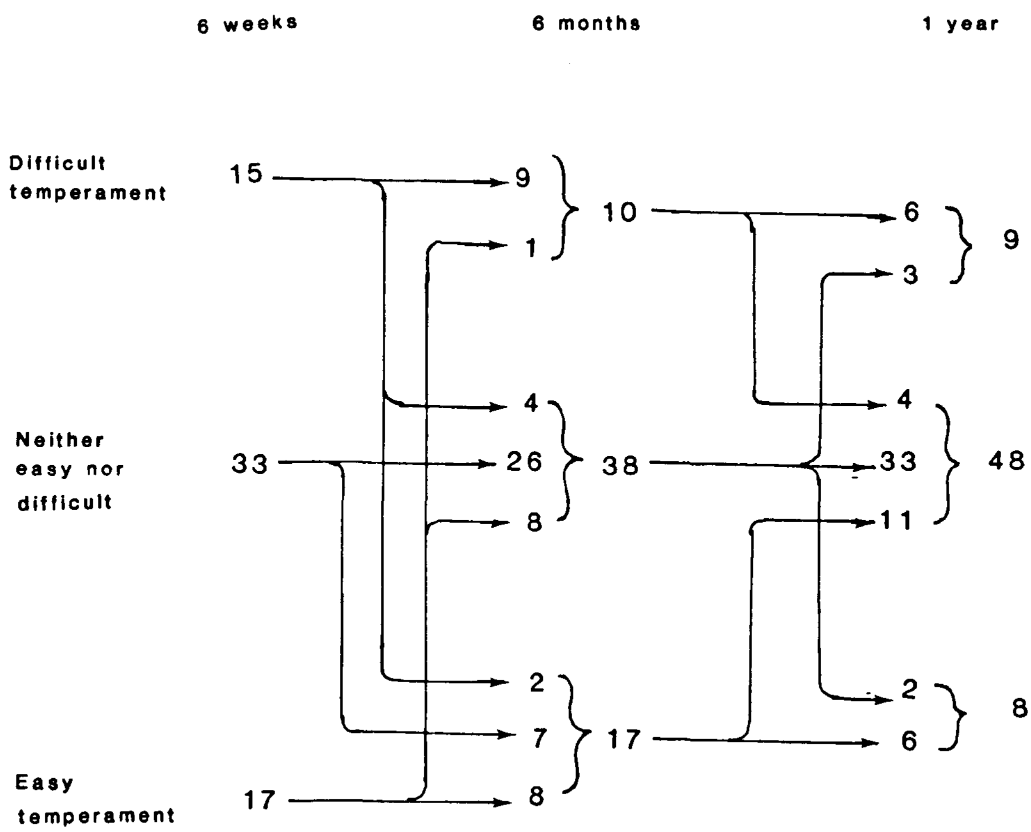


Figure 4.3 Distribution of babies' Bates Factor I ratings over the first year of life

Continuity in classification of individual babies was seen in 38 of the 65 in the sample. The remaining infants fluctuated in their temperament ratings, though usually by only one class.

Interaction amongst infant variables

The characteristics of the infants have been identified and described in terms of cognitive and motor development, and temperament. It has already been demonstrated that motor and cognitive development are closely linked. On the basis of the previous literature it could be hypothesised that these characteristics might also be related to temperament. For instance, delayed motor development, especially if this is associated with emerging disability, might lead to the development of a difficult temperament. Some of the variables taken into account in Chapter 2 that were associated with prematurity and neonatal illness, might also be expected to influence both cognitive and motor development and temperament.

First the impact of neonatal illness on subsequent motor and cognitive development will be examined. This will be followed by a discussion of the relationships of temperament with the developmental variables and with disability. Finally some of the context variables described in Chapter 2, those linked to prematurity and the sex of the child, will be related to development and temperament. The aim is to establish how such relationships develop and change over the first year of the baby's life, and to what extent they are independent of each other. In so doing, the infant context for interaction will have been described, to complement that outlined for the mother in Chapter 3.

Developmental level and the impact of neonatal illness

The level of development could have been governed by events in the neonatal period, in particular the presence of respiratory distress syndrome (RDS) and intraventricular haemorrhage (IVH). Previous work had shown that RDS delayed development (Field, Dempsey and Shuman, 1981). In the present study such delay was not observed. All 65 babies had suffered with RDS severe enough for them to have been ventilated. The 35 control babies subsequently developed cognitive and motor milestones that were age equivalent when they were assessed at 6 months and 1 year. The presence of neonatal RDS did not depress their development.

RDS is often accompanied by IVH (Levene, Tudehope and Thearle, 1987). IVH has been shown to have a negative impact on development, particularly in combination with respiratory problems (Sostek, Quinn and Davitt, 1979; Gaiter, 1982; Landry et al., 1984). The 30 babies in this study who had suffered from Grade III or IV haemorrhage (the group diagnosed to be at risk for the development of disability) showed a different development track from the 35 babies who had not (the control group). At 1 year, 25 of the at risk group had developed some form of disability, 13 severe, 12 mild (from Table 4.1). Even those 5 who had no overt functional disability showed lags in mental development (Table 4.9). The level of development attained by the infants was contingent upon the degree of disability that emerged over the year that they were investigated (Table 4.9).

Table 4.9 Mean (SD) age equivalents in months for the 2 groups of infants with varying degrees of IVH, at 6 months and 1 year assessments.

		6 months		1 year	
	N	Mental AE[1]	Motor AE[2]	Mental AE[1]	Motor AE[2]
Controls	35	6(1.0)	6(0.8)	13(1.6)	12(2.2)
At risk group[a]					
Severe[b]	13	3(1.6)	3(1.3)	6(3.9)	5(2.5)
Mild[b]	12	5(1.6)	5(1.7)	10(3.1)	10(1.4)
No disability evident[b]	5	5(1.0)	6(0.6)	11(2.1)	12(2.3)

[1] Mental age equivalent derived from Bayley MDIR
[2] Motor age equivalent derived from Bayley PDIR

[a] At risk status was diagnosed during SCBU stay.
[b] Subgroup status refers to outcome at 1 year. (See Table 4.1)

Table 4.9 demonstrates how closely mental and motor development were linked, once allowances were made for disability. There is never more than one month's difference between the mental and motor age equivalents, no matter what the level of disability.

Cognitive development and temperament

Results from previous work on the relationship between temperament and cognitive development have not been conclusive. It has been shown that temperament and cognitive development overlap (Matheny, 1989), and also that there has been no association between the two (Bates, Olson, Pettit and Bayles, 1982; Vaughn, Taraldson, Crichton and Egeland, 1981; Daniels et al., 1984). With the present group of preterm babies, cognitive development (Bayley MDIR) was not associated with difficult temperament (ITQ Factor I scores). Table 4.10 shows the low level of correlation found.

Table 4.10 Results of correlation analysis to show the correlation between cognitive development (MDIR) and temperament (ITQ Factor I) and between motor development (PDIR) and temperament (ITQ Factor I)for 65 infants at 1 year.

MDIR	PDIR
r = 0.033	r = 0.0028
r^2 = 0.001	r^2 = 0.000008
p ns.	p ns.

Since these overall correlations could have masked an underlying association between extremes of difficulty and cognitive development, the two extreme groups (easy and difficult) were examined separately. However, Fisher's exact p tests comparing the cognitive development of difficult and easy babies showed no significant differences between the two groups at either assessment (Fisher's exact $p = 0.36$ at 6 months and 0.29 at 1 year).

Figures 4.4 and 4.5 demonstrate this lack of association graphically. Babies scoring high on the MDIR have the same range of temperament scores as babies who score very low.

Figure 4. 4 Relationship between MDIR and Bates Factor I at 6 months

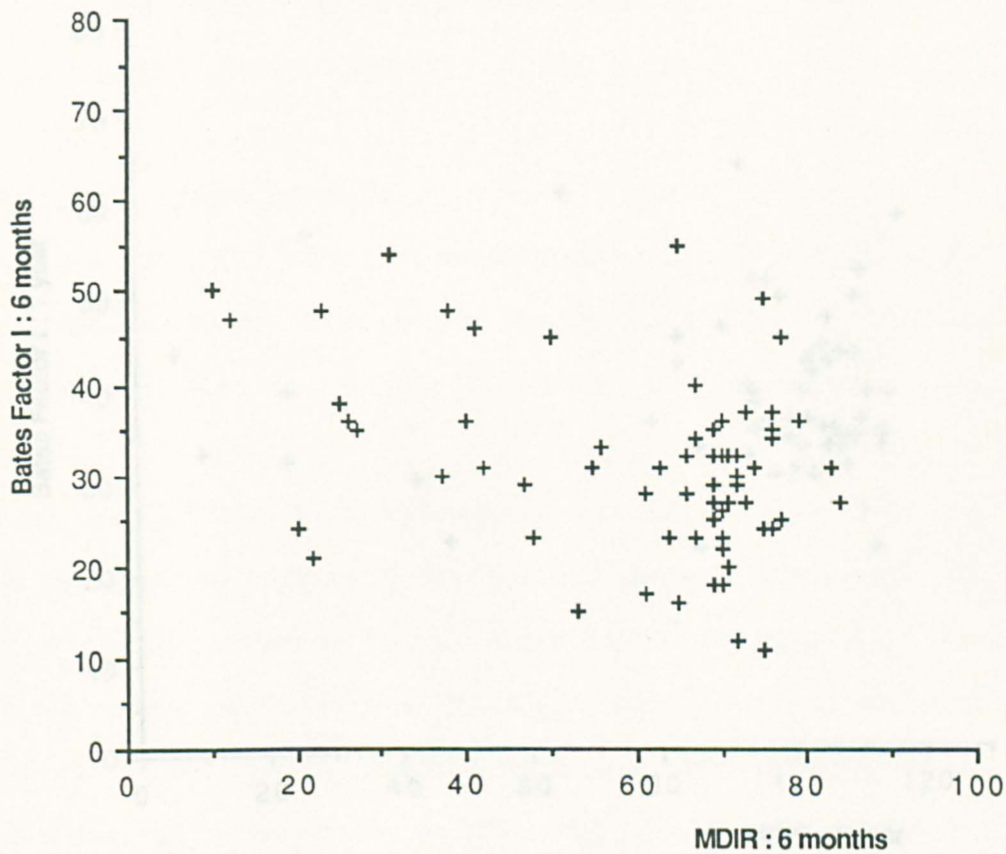
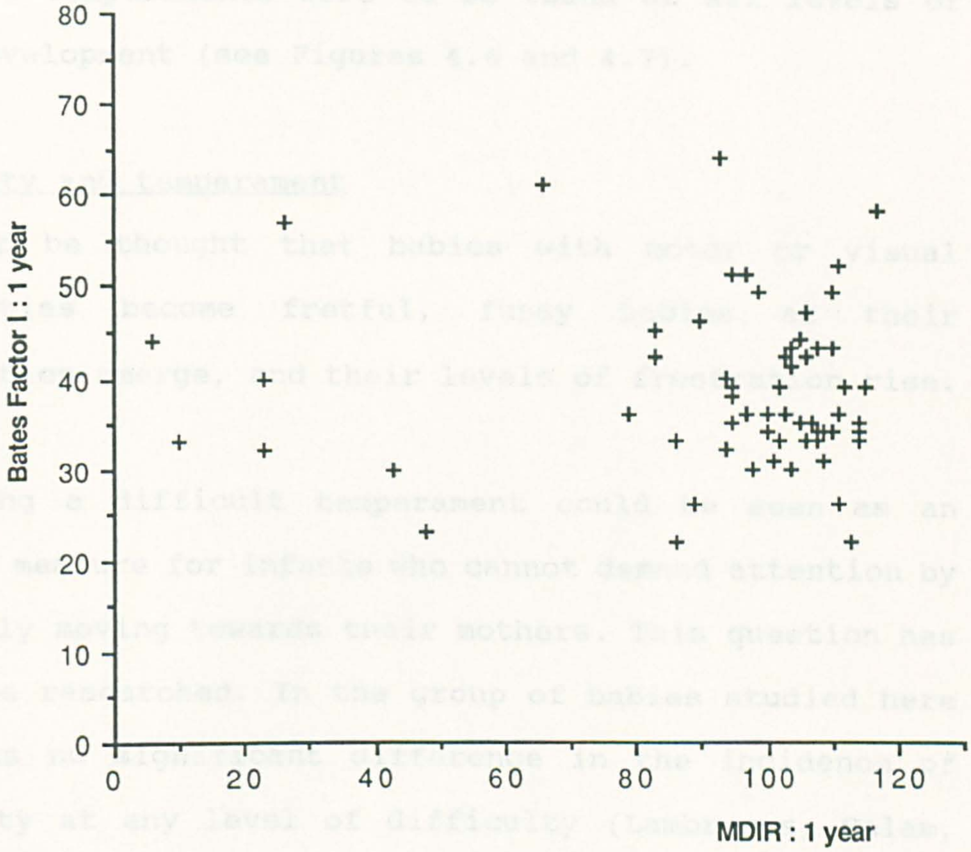


Figure 4.5 Relationship between MDIR and Bates Factor I at 1 year



Motor development and temperament

A very similar pattern was observed when the relationship between motor development and temperament was examined (Table 4.10). There was no relationship between motor development and temperament. Furthermore, babies with difficult temperaments were to be found at all levels of motor development (see Figures 4.6 and 4.7).

Disability and temperament

It might be thought that babies with motor or visual disabilities become fretful, fussy babies as their disabilities emerge, and their levels of frustration rise.

Developing a difficult temperament could be seen as an adaptive measure for infants who cannot demand attention by physically moving towards their mothers. This question has yet to be researched. In the group of babies studied here there was no significant difference in the incidence of disability at any level of difficulty (Lambrenos, Calam, Weindling, Cox, Klenker and Gregg, 1990). At 6 weeks there was no evidence of disability, just a diagnosis of risk. Of the 15 babies with a difficult temperament at this age, 7 had been so diagnosed. Of the 17 babies who had an easy temperament, 9 were from the at risk group. There is no significant difference between the two groups ($X^2 = 0.12$, nonsignificant).

Figure 4.6 Relationship between PDIR and Bates Factor I at 6 months

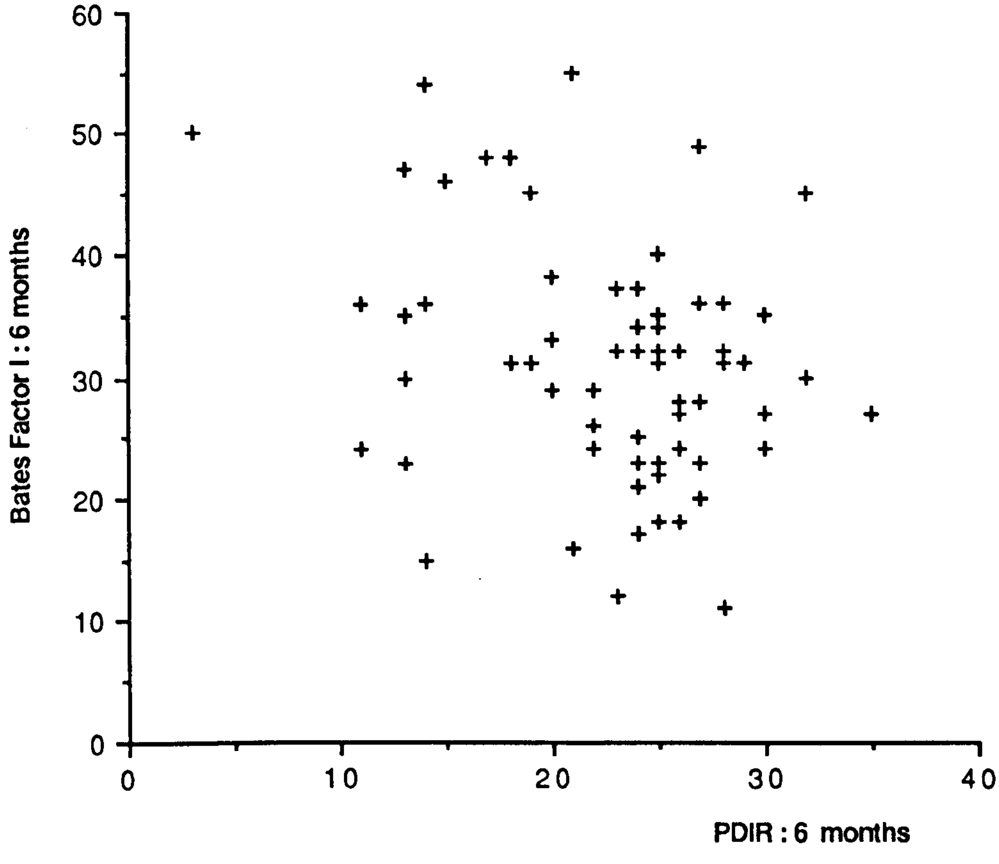
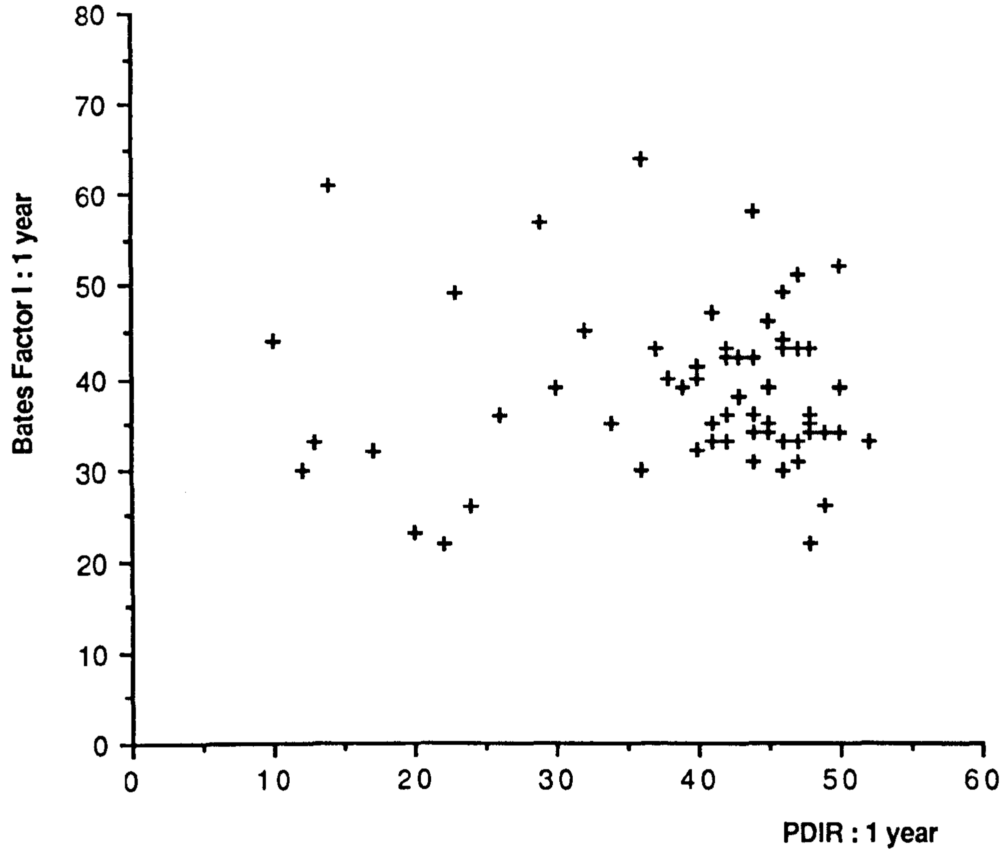


Figure 4.7 Relationship between PDIR and Bates Factor I at 1 year



At 6 months, of the 10 infants classified as difficult, 5 were in the at risk group. All 5 had developed motor disabilities by this age. In the group of 17 easy infants, were 9 babies who were diagnosed as being at risk, of whom 2 were functionally disabled. However, there is still no significant difference between easy and difficult babies on the basis of diagnosed risk status ($X^2 = 0$, nonsignificant).

At 1 year when both mild and severe disabilities were evident, the co-occurrence of disability and either difficult or easy temperament can be examined. Nine babies were classified as difficult and 4 of these were severly disabled; the other 5 were from the control group. Easy babies were 8 in number, of whom 4 were severely disabled. The remaining 4 were control babies not at risk for disability. All the mildly disabled infants were in the intermediate group (that is neither difficult nor easy), together with the 5 remaining severely disabled babies. The conclusion is that babies with severe disability were no more likely to be difficult than they were to be easy (Fisher's exact $p = 0.36$).

The 4 babies who had difficult temperaments can be followed in detail (Table 4.11).

Baby 32 had been difficult from birth. Over the year his motor problems had worsened into quadriplegia. His blindness was diagnosed just after his first birthday (chronological age), just before the 1 year (corrected age) assessment.

Table 4.11 History of temperament classification of 4 disabled babies with difficult temperament at 1 year based on maternal ratings.

Baby Number	6 weeks	6 months	1 year
32	Difficult	Difficult	Difficult
25	Difficult	Difficult	Difficult
45	Difficult	Difficult	Difficult
71	Difficult	Average	Difficult

Baby 25 displayed no signs of disability at 6 weeks, and at 6 months she could not sit independently. Supine, she could play with appropriate toys. By 1 year spastic diplegia had been diagnosed.

Baby 45 had also been difficult from birth. At 6 weeks there was no evidence of disability. By 6 months he was making no effort to sit and had poor head control. Propped up, he made little effort to move his arms. His motor abilities had improved a little by 1 year, but he still had no trunk control and limited use of his arms.

Baby 71 had a difficult, demanding temperament at 6 weeks, though she could move freely. At 6 months she was classified as average, not difficult nor easy. Blindness had been diagnosed by the time of this assessment. The mother was sedating the baby heavily to prevent her fussing and crying. This unmarried mother had been driven to this length by the complaints of her neighbours in the thin-walled social services hostel where she lived. Without the sedation the baby might well have been as demanding as ever. By 1 year with an improvement in housing the baby was not sedated, and classified as difficult. She could sit by then, but made no effort to crawl or stand. It would appear that the pattern of emerging disability had little effect on these babies' temperament classification.

The disabilities in the group of 4 babies with easy temperament were of a similar severity level (Table 4.12).

Baby 74 was hospitalised at the time of the 6 weeks interview with severe respiratory problems. However, there was no overt motor disability. By 6 months he had spent lengthy spells in and out of hospital, and his motor problems were becoming evident. By 1 year, with his respiratory problems stabilised, he had head control but no trunk control and his legs were beginning to stiffen and "scissor".

Table 4.12 History of temperament classification of 4 disabled babies with easy temperament at 1 year based on maternal ratings.

Baby Number	6 weeks	6 months	1 year
74	Average	Easy	Easy
17	Easy	Easy	Easy
80	Average	Average	Easy
55	Average	Average	Easy

Baby 17 moved freely at 6 weeks, but he had not begun to develop any head control. At 6 months, although he could not sit, he kicked his legs and moved his arms. By one year, still with poor trunk control that prevented independent sitting, his right leg and arm were stiffening rapidly as his hemiplegia became evident.

Babies 80 and 55 were not characterised as easy until the 1 year assessment. Baby 80's spastic diplegia had been diagnosed after the 6 month assessment. Baby 55's cerebral palsy was more severe, and her disability was diagnosed between the 6 weeks and 6 months interviews. Again with these four babies the emergence of disability was not reflected in their temperament classification.

Given these results, it should be pointed out that the temperament assessment used was standardised on nondisabled children. It is possible that measurement of a difficult temperament in a disabled child would need to tap a different set of behaviours. For example in a child with disability, it may be the lack of intensity or responsive mood that is the problem behaviour (Goldberg and Marcovitch, 1989). Greenberg and Field (1982) studied temperament in children with a variety of disabilities including cerebral palsy. They found that important characteristics including passivity, flat affect and neutral responses, were not captured by the standardised temperament instruments.

The lack of relationship found in this study may also reflect the fact that difficult temperament behaviours are not measured by the temperament assessment used. There is no questionaire available that is standardised for disabled children or babies.

The impact of neonatal variables

Previous work with preterm babies has suggested a number of characteristics which could influence temperament and the development of cognitive and motor functioning. Three characteristics were addressed in this study: prematurity, expressed by either birthweight or gestational age; chronicity of neonatal illness, expressed by days spent by the infant on the SCBU; and the sex of the child.

37% of the infants in the sample weighed below 1000 gms at birth, in other words they were of extremely low birthweight. When this group of low birthweight babies was compared to babies weighing over 1001 grams at birth, there was no significant difference in their difficulty scores at 6 weeks ($X^2 = 0.48$, nonsignificant), at 6 months (Fisher's exact $p = 0.33$), or at 1 year (Fisher's exact $p = 0.31$). Low birthweight alone had no impact on how difficult the baby's temperament was.

Gestational age can also be used as a measure of prematurity. When the mothers rated their babies at 6 weeks there was a high proportion of difficult temperaments perceived (Lambrenos, Weindling, Cox and Calam, 1990). Results reported for other studies of preterms who had not suffered from intracranial haemorrhage support this

(Anderson et al., 1989). However by 1 year no association was found between gestational age and mothers' perception of temperament. How difficult the baby was perceived to be and gestational age were not significantly correlated.

The length of time the baby spent on the SCBU reflected the chronicity of neonatal illness. Wolke (1991) has suggested that chronicity is a better predictor of later behaviour than are measures of prematurity per se. In this sample there was no correlation, either at the 6 months or 1 year assessments, between the level of difficultness (Bates Factor I scores) and the length of time the babies had spent on the SCBU ($r = 0.21$, $p = 0.09$ at 6 months; $r = 0.12$, $p = 0.35$ at 1 year).

Studies of older children have suggested that boys have more difficult temperaments than girls (for example Gordon, 1983), whilst studies of children in their first year have found the opposite (Sameroff, Seifer and Elias, 1982; Campbell, 1979). In this sample of preterms there was no difference at all in the level of difficultness between boys and girls at any time over the first year. This is in accordance with the results of Oberklaid, Prior, Nolan, Smith and Flavell (1985).

Turning next to cognitive and motor development as measured by the Bayley scales, little impact of prematurity emerges. The Bayley assessments were performed when the babies were 6 months and 1 year corrected age. The infants were of varying chronological ages depending on how many weeks preterm they were (measured by their gestational age). All the correlation coefficients between gestational age and Bayley MDIR or PDIR scores, at 6 months and at 1 year, were low (<0.1) and nonsignificant. Piper, Darrah and Byrne (1989) also found that motor development evolved according to conceptual age and biological maturity rather than chronological age.

The chronicity of the babies' neonatal illnesses was found to have no effect either. At 1 year there were no significant correlations between cognitive nor motor development and length of stay on the SCBU ($r = 0.04$, $p = 0.71$ for motor development, Bayley PDIR: $r = 0.07$, $p = 0.69$ for cognitive development, Bayley MDIR).

Finally the effect of the infant's sex on cognitive development was examined. Portnoy et al., (1988) found that girls outperformed boys in cognitive assessments, especially for children who had weighed less than 1000 gms at birth. In this study there was no significant difference between boys' and girls' cognitive nor motor scores, either at 6 months or at 1 year.

Conclusions

The general hypotheses proposed at the beginning of the previous section have been partially born out by an examination of the relationships between the groups of variables describing the characteristics of the infants.

Temperament was not found to be related to either motor development or cognitive development. Furthermore, difficult temperament was not linked to emerging disability. There was a strong relationship found between motor and cognitive development, but this was at least in part an artefact of measurement, and also partly a reflection that both areas of development are maturational in nature. Disability had its main impact on developmental measures. Very little was found by way of correlation between any of the other variables examined. With the exception of motor and cognitive development, infant characteristics seem to be independent of each other; this is especially true of temperament.

The infants in this study can be characterised therefore in terms of degree of disability, cognitive development, motor development and temperament. The individual variation in the children, their degree of prematurity and disability made it difficult to establish what their true capabilities were, since age norms were often not applicable.

This chapter has attempted to characterise how "old" the infants really were, for this is what the mothers were coping with on a daily basis. The babies' particular needs and capabilities in turn governed their ability to contribute to interactions with their mothers. This will be pursued further in Chapter 6.

CHAPTER 5

INTERACTION BETWEEN MOTHER AND INFANT CHARACTERISTICS

Interaction between mother and child is dependent upon the characteristics each brings to the relationship (Bell 1968; Sameroff and Chandler, 1975). It has been established that by the end of the first year the infant can respond contingently to the mother's emotional state and general mental health. The infant's social interactions and tendencies to explore are regulated by the mother's expressions and mood (Harris, 1989). It is the interaction between mother and child that appears to shape the quantity and quality of care given and received (Belsky, 1984).

In Chapters 3 and 4 the characteristics of the mothers and babies in the sample were discussed in detail. Chapter 4 demonstrated the independence of the infant variables: temperament and disability were not closely associated; nor was there a link between temperament and developmental level. Chapter 3 on the other hand showed how complex were the linkages between the mother variables. The mothers' mental health was linked with some aspects of personality but not with others. Marital discord and other psychosocial variables also were associated with mothers' mental health.

The purpose of this chapter is twofold. First, it is important to establish the degree to which mother and infant variables are independent of one another, before interactive behaviours are analysed in Chapter 6. If there should be a high degree of correlation between particular mother and child characteristics then this will influence the way that behaviours can be analysed and interpreted. Secondly, the way in which mothers' ratings of their own personalities and mental health interacted with their ratings of their infants' temperaments must be examined, as must the interaction of these more subjective variables with the objective assessments of infant development. The interaction of mother and child with their social environment must also be investigated. The description of these interactions provides the setting for the analyses of play behaviours explored in Chapters 6 and 7.

The relationships between the mother and infant variables

Previous work on the relationships between similar mother and infant variables to those used here, has produced indeterminate results. The details where relevant, will be discussed below, with the results of this study, but previous work would suggest several broad trends. The mother variables used here essentially fall into three groups relating to personality, mental health and psychosocial adversity; and the infant variables into two groups, temperament and developmental (Table 5.1).

In most cases the direction of the relationship might be expected to run from the mother to the child, but in a few cases the reverse might be true.

Table 5.1 Mother and baby variables used in Pearson correlation computations.

Variable name	Description	Assessment Timing
Gestational age	Age of baby at birth calculated from mother's last menstruation	6w
Days on SCBU	Total number of days spent on SCBU	6w
Bates Factor I score	Score for difficult temperament	6w,6m,1y
MDIR	Raw score on Bayley for mental development	6m,1y
PDIR	Raw score on Bayley for motor development	6m,1y
EPI-N	Neuroticism scale score on Eysenck EPI	6w, 1y
EPI-E	Extraversion scale score on Eysenck EPI	6w, 1y
Malaise score	Malaise Inventory measuring mother's mental health	6w,6m,1y
DAS score	Total score on Dyadic Adjustment Scale	6w,6m,1y
Adversity score	Total score on composite of 12 psychosocial variables	6w,6m,1y

Adversity might be expected to have an influence on the developmental variables and temperament, either through prematurity or directly. The mothers' mental health and personality traits might influence, and be influenced by, both temperament and development. There is controversy within the published literature on this theme (see Rutter, 1985; 1989b for a review).

In this study, bivariate associations between each of the main mother characteristics and each of the main baby characteristics (Table 5.1) were examined. Pearson correlations were computed first for the concurrent associations between variables at 6 weeks, at 6 months and at 1 year. Then, in order to explore the relationships further, lagged and multiple correlations and regressions were developed (see Appendix VII).

<u>Concurrent relationships</u>

Examination of the concurrent correlations revealed independence of some variables, but significant associations among others. Contrary to the findings of Bates et al. (1979), the extraversion/introversion dimension of the mothers' personalities was independent of the degree of difficultness found in the infants. Both the 6 weeks and the 1 year correlation coefficients between EPI-E and Bates Factor I were very low (0.07 and -0.14 respectively); neither was significant. Extraversion at 1 year was not significantly related to the developmental levels of the infants (correlation coefficient with MDIR: 0.07, and with PDIR: 0.06). Furthermore, difficult and easy babies were to be found in families with either high or low levels of psychosocial adversity - there was no correlation between Bates Factor I scores and the composite adversity scores ($r = 0.13$ at 6 weeks, and 0.11 at 1 year).

When just the state of the parental relationship (DAS) was correlated with the baby variables, no association was found. The level of discord between the parents (total DAS scores) was independent of difficult temperament (Bates Factor I scores) and of motor (PDIR) and of cognitive (MDIR) development. Though this would appear to run counter to other work of a similar nature, it must be remembered that levels of satisfaction in this sample were high (Satisfaction subscale of the DAS). Only 5 of the mothers were in what they considered to be poor relationships. Thus as 60 of the babies were not experiencing parental discord, any effect of the remaining 5 dyads would not be detectable. Other researchers, looking at individual items of the adversity scale used in this study, have also found no association with infant temperament. For example Matheny, Wilson and Thoben (1987) found no relationship between socioeconomic status and toddler temperament at 12 months.

Significant correlations were found between mothers' neuroticism and babies' temperaments at both 6 weeks and 1 year ($r = 0.37$, 0.40 respectively, in both cases $p = 0.001$). Similarly, there are significant but inverse correlations between mothers' neuroticism and the developmental level of the babies at 1 year ($r = -0.21$, $p = 0.05$ for MDIR; $r = -0.23$, $p = 0.03$ for PDIR).

Although there is no significant correlation at 6 weeks between the mothers' Malaise scores and babies' temperament ($r = 0.13$), there are significant correlations at 6 months (r = 0.29, p = 0.01) and at 1 year (r = 0.26, p = 0.019). A nonsignificant correlation at 6 months between Malaise scores and motor development scores (r = -0.20, p=0.06) becomes significant by 1 year (r = -0.23, p = 0.04). However at neither time is the relationship with cognitive development significant (r = -0.17 at 6 months and at 1 year).

Adversity levels correlate inversely with both motor and cognitive development in the babies at 6 months and at 1 year (for PDIR at 6 months r = -0.31, p = 0.006; at 1 year r = -0.24, p = 0.03: for MDIR at 6 months r = -0.32, p = 0.004; at 1 year r = -0.28, p = 0.01).

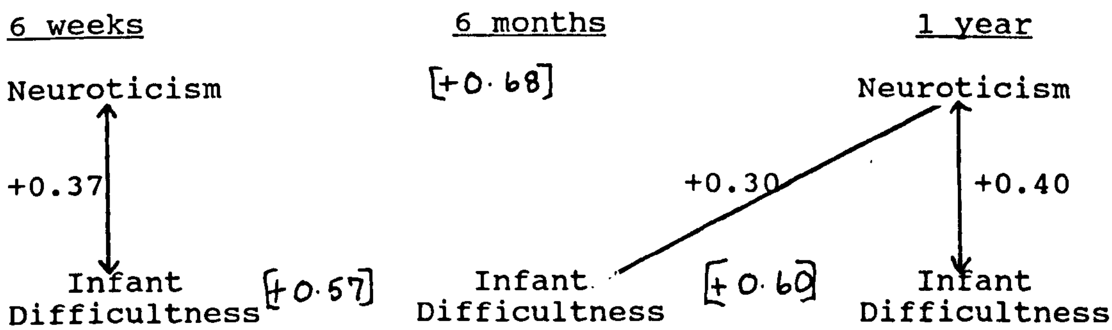
The significant, concurrent associations were examined in more detail by considering lagged and multiple correlations, in order to conjecture something of the processes at work.

<u>Lagged and multiple relationships</u>

<u>Mother neuroticism and infant temperament</u>

The associations between mother neuroticism and baby temperament are shown in Figure 5.1. High levels of neuroticism in the mother tend to be associated with higher baby difficultness as measured by scores on Bates Factor I. This association holds at both 6 weeks and 1 year. Whilst this result supports the work of Matheny et al. (1987), and Vaughn et al. (1981), it is in conflict with the findings of others (Thomas and Chess, 1977; Daniels et al., 1984), that show no association between maternal personality and infant temperament.

Figure 5.1 Schematic representation of the association between mother Neuroticism and infant Difficultness over time. Only those correlations where $p<0.05$ are shown. N=65, $p=0.01$ for a correlation coefficient of 0.30.



(bracketed numbers show sequential correlations, see chs. 3 & 4)

Interpretation of these correlations is difficult. The underlying causal direction for the relationships could be either from the mother to the child or vice versa. By considering lagged and multiple correlations it may be possible to suggest which causal direction is the stronger. From Figure 5.1 a causal direction from child to mother is suggested by the lagged correlation between infant difficultness at 6 months (BAT1) and mother's neuroticism at 1 year (EN2). This however could be a spurious correlation, resulting simply from the 6 month to 1 year sequential correlation for difficultness, together with the concurrent correlation between the two variables at 1 year, difficultness (BAT2) and neuroticism (EN2). Using multiple regression (see Appendix VII), marginally the best predictive equation for EN2 is based on neuroticism at 6 weeks (ENO) and BAT1 (r=0.704) rather than on ENO and BAT2 (r=0.700). The best predictive equation for BAT2 is based on BAT1 and EN2 (r=0.620) rather than a lagged relationship with neuroticism at 6 weeks (ENO) (r=0.616). These results both suggest a greater likelihood of influence from the baby to the mother variable, and that difficultness may have a situational effect on the mother's neuroticism.

<u>Mothers' neuroticism and infant motor development</u>

A similar situational effect was seen in the relationship between neuroticism scores and PDIR scores (Figure 5.2). There was a low but significant correlation between neuroticism and PDIR scores at 1 year (Figure 5.2). There is no reason to predict motor development, which is essentially maturational, from a personality trait in the mother.

Figure 5.2 Schematic representation of the association between mothers' neuroticism and infant motor development. Significance levels as for Figure 5.1

<u>6 weeks</u>	<u>6 months</u>		<u>1 year</u>
Neuroticism	[+0.68]		Neuroticism
		−0.23	−0.23
	Motor development	[+0.7[illegible]]	Motor development

(bracketed numbers show sequential correlations, see chs. 3 & 4)

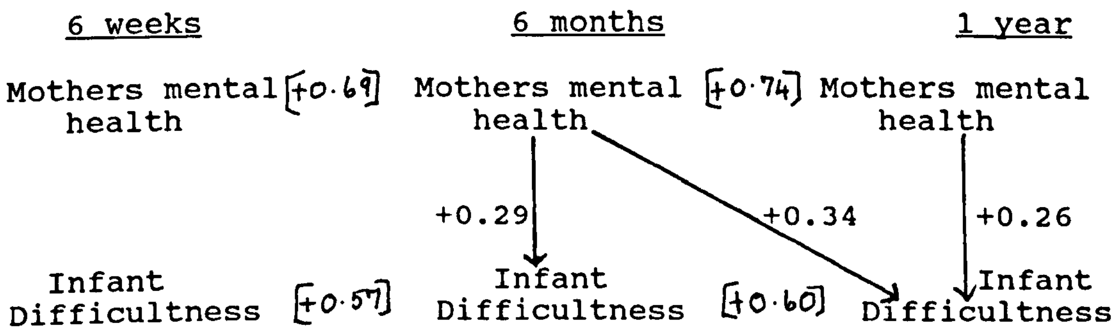
From the multiple regression analysis (Appendix VII), marginally the best predictive equation of EN2 is based on EN0 and PDIR at 6 months (r=0.691) rather than EN0 and PDIR at 1 year (r=0.688). Interestingly, EN0 does not add to the explanation of PDIR at 1 year from PDIR at 6 months.

It was shown in Chapter 3 that the sample of mothers as a whole became more neurotic over the study period. This might be partly explained by the impact of difficult babies and by the impact of those infants who were behind in motor development.

Mother's mental health and infant temperament

There was no relationship between Malaise scores and infant difficultness scores, a finding similar to that of Whiffen and Gotlib (1989). There were though concurrent relationships between these two variables both at 6 months and at 1 year. When lagged correlations from infant difficultness to mother mental health were examined, no association was found. However, when lagged correlations from mother's mental health to infant temperament were examined there was no association from 6 weeks to 6 months, but there was from 6 months to 1 year (Figure 5.3). The multiple regressions (see Appendix VII) also support a directional relationship from the mother to the child rather than vice versa. The best predictive equations for infant difficultness at 1 year are based on difficultness at 6 months and Malaise scores, though there is no difference in explanation using concurrent or lagged values (adjusted r^2 = 36.3 in both cases). The explanation of mother's mental health at 1 year by mental health at 6 months is not improved when infant difficultness (either at 6 months or at 1 year) is taken into account. These results are further supported when individual mothers and babies are examined.

Figure 5.3 Schematic representation of the association between mothers' mental health and infant Difficultness. Significance levels as for Figure 5.1



(bracketed numbers show sequential correlations, see chs. 3 & 4)

Of the 19 mothers who were depressed at 6 months, 7 (39%) had infants who were rated as difficult whilst only 3 (16%) had easy babies. In contrast, of the 46 mothers who were not depressed at 6 months, only 4 (9%) had difficult babies, and 11 (24%) easy ones. This suggests that being depressed is associated with having a difficult infant (Fisher's exact p = 0.037).

The same pattern is observed at 1 year for the depressed mothers. 6 (35%) of the 17 depressed mothers had difficult babies, and only 1 of the 17 had an easy child. However, the association between easy babies and non-depressed mothers seen at 6 months, is not as evident. Only 6 (13%) of these mothers had easy babies at 1 year, whilst 4 (9%) had difficult children (Fisher's exact p = 0.075).

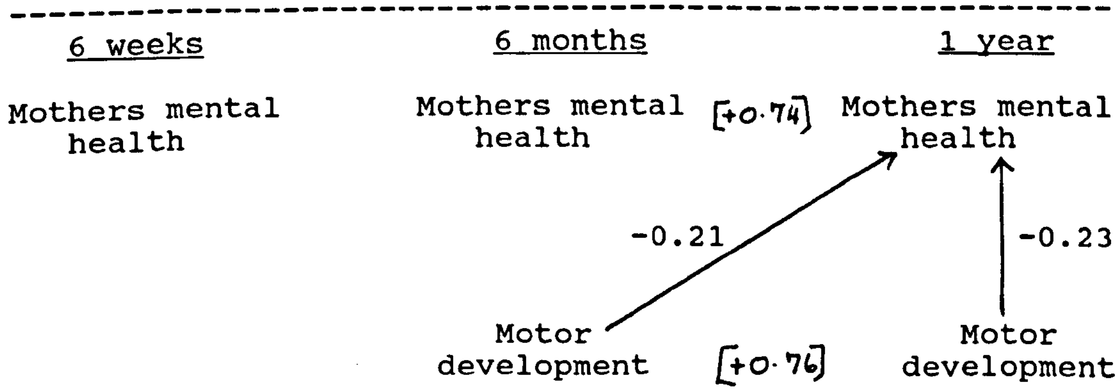
As was shown in Chapter 3, the mothers who were depressed varied from one assessment to the next. However, the 6 infants who had difficult temperaments at 1 year and whose mothers were depressed, also had had depressed mothers and difficult temperaments at 6 months. Mothers who became newly depressed at 1 year did not have difficult babies.

Putting the individual mother/baby results together with the group correlations, there is evidence that it is the mother's depression that is influencing the presence of difficult temperament. The reason for this could lie in the way that the temperament data were collected. Mother ratings could have been coloured by the mother's current emotional state, with negative depressive mood facilitating the recall of negatively toned information, leading to difficulty ratings (Gotlib, 1983; Whiffen and Gotlib, 1989). However, it could also be that in the presence of depression, infants show difficult behaviour as an adaptive measure. The amount of crying and fussing a child must do to gain the mother's attention and moreover induce her to act, may be higher in depressed mother/child dyads. Alternatively a baby of a depressed mother who is not sensitive to his/her cues may devlop a fussy/difficult temperament as a result of constant delays in gaining attention. The stability of the association of difficult temperament with depression over time lends weight to these arguments.

Mothers' mental health and infant development

The direction of association of depressive scores and difficult temperament would appear to be from mother to baby. When developmental levels were correlated with mothers' depression a different outcome was found. Cognitive development showed no association with mothers' mental health, neither at 6 months nor at 1 year. Thus lags in cognitive development, the fact that very few children were performing at their chronological age, did not affect the mothers' mental health. The depressed mothers were not necessarily those with the more cognitively delayed children.

Figure 5.4 Schematic representation of the association between mothers' mental health and infant motor development. Significance levels as for Figure 5.1



(bracketed numbers show sequential correlations, see chs. 3 & 4)

Motor development has different associations with mothers' mental health. It will be remembered that mothers expressed concern, when their infants were slow to achieve motor milestones, and there are low but significant correlations that reflect the effect this has on maternal mental health (Figure. 5.4).

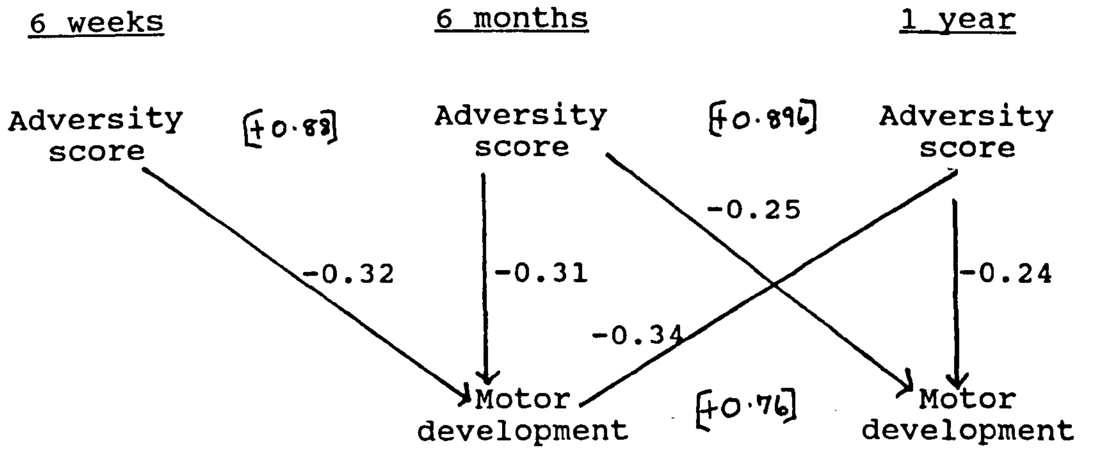
There were no lagged correlations from mother's mental health to motor development, either from 6 weeks to 6 months or from 6 months to 1 year. There was a low but significant correlation between motor development at 6 months (PDIR1) and mother's mental health at 1 year (MAL2), but this could be due to the sequential correlation of motor development (Figure 5.4). Multiple regression analysis (Appendix VII) tends to confirm this. It does suggest that PDIR may have an influence on the sequential Malaise regression, but Malaise has no influence on the PDIR regression. This trend is substantiated by the mothers of babies developmentally delayed at 1 year (ie. scoring <70 on the PDI) having more depressive symptoms than the remaining mothers (student's $t = 3.633$; $df = 63$; $p<0.01$).

Mothers' adversity and infant development

The final associations that remain to be examined are the correlations between developmental levels and the degree of psychosocial adversity the mother was experiencing.

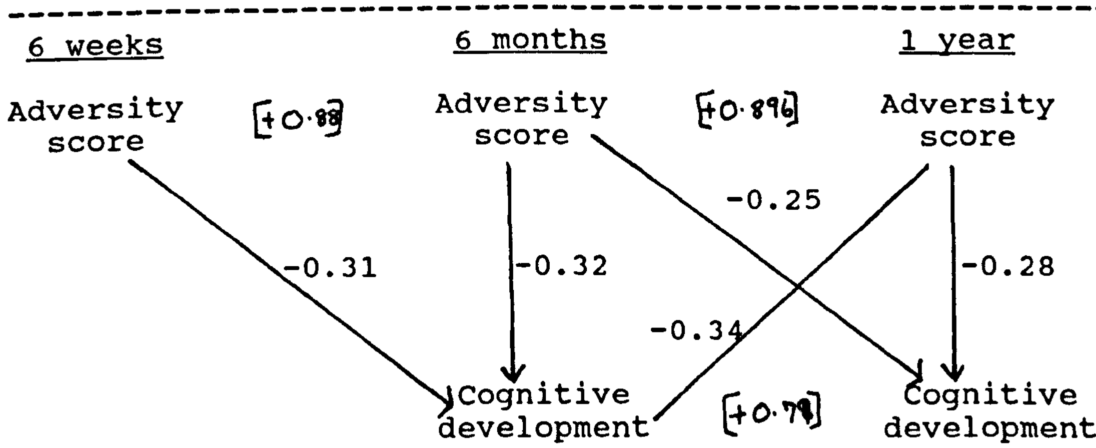
Both cognitive development (Bayley MDIR) and motor development (Bayley PDIR) were significantly correlated with the degree of adversity (Figures 5.5 and 5.6), and this is true whether the correlations were looked at concurrently or over time.

Figure 5.5 Schematic representation of the association between mothers' adversity score and infant motor development. Significance levels as for Figure 5.1



(bracketed numbers show sequential correlations, see chs. 3 & 4)

Figure 5.6 Schematic representation of the association between mothers' adversity score and infant cognitive development. Significance levels as for Figure 5.1



(bracketed numbers show sequential correlations, see chs. 3 & 4)

It is highly unlikely that the infant's development level (either motor or cognitive) could have any influence on the adversity scores. The correlations between adversity and development therefore might reflect the simple influence of adversity on development or be related to a third variable. One possible explanation is that adversity could be correlated with preterm birth which in turn, as has already been shown, is associated with the haemorrhaeging that leads to the development of motor problems (Chapter 3). To examine this further a correlation matrix was established between gestational age and PDIR and MDIR scores (Table 5.2).

Table 5.2 Correlations between gestational age and infant development at 6 weeks and 1 year.

		6 weeks		1 year	
		PDIR	MDIR	PDIR	MDIR
Gestational age	r	-0.09	-0.07	-0.08	-0.09
	p	0.22	0.28	0.27	0.23

There was no relationship between developmental level and gestational age. The correlations found between psychosocial adversity and development therefore do not appear to be associated simply with preterm birth. Because of very strong sequential correlations, multiple regression (Appendix VII) neither adds explanation to the simple relationships, nor clarifies any lagged effects. Adversity seems to have a simple detrimental influence on child development.

The impact of disability

Thus far, there has been no discussion of the impact of the babies' disabilities on the mothers. Using t tests or X^2 tests as appropriate, no significant differences were found, for any of the mother variables, between the mothers of babies who were vulnerable for the development of motor problems and the mothers of babies who were not at risk. This is true for all three time periods.

Mothers of at risk infants were neither more neurotic nor more extravert. Depression occurred in mothers of at risk babies just as often as in mothers of control babies. Children who were vulnerable for the development of a disability were no more likely to have mothers with high adversity scores than to have mothers with low adversity scores.

At 1 year, 25 of the at risk babies were in fact displaying signs of disability. If just these babies and their mothers are compared to the remaining dyads where no disability is in evidence, then again no significant differences are found between the two groups of mothers.

It has been shown that the neuroticism trait (EPI-N) in the mothers was influenced by both baby temperament and motor development. Disability per se had no affect on this trait. It is the overall lag in motor development, throughout the infants in this sample, which affects the mothers adversely. Other work with young disabled children has found high levels of mental ill health in their mothers (Butler, Gill, Pomeroy and Fartrell, 1978; Burden, 1980). Those authors suggest that the mothers are reacting to the presence of disability. In this sample high levels of maternal mental ill health were also found, but throughout the sample. The levels were not higher for the mothers of disabled infants than for those whose children were unaffected (Lambrenos et al., 1990). It may be that mental ill health becomes associated with disability in the child only after a longer period of time has passed. Previous studies have dealt only with older children, and have not included control groups. This study suggests that maternal mental ill health is more widespread than is generally acknowledged, and comes to light only when a group such as mothers of children with disability is studied. Mothers in the control group in this study revealed equally high levels of maternal mental ill health as did those mothers with disabled children.

It could be that the mothers of disabled children in this study received different levels of support. 16 of the 30 mothers with babies diagnosed as vulnerable for the development of motor disability received weekly professional support from the time that their babies left the SCBU. Possibly this timely and appropriate physiotherapy intervention ameliorated the impact of emerging disability. Burden (1980) has found that providing support for mothers reduced levels of maternal mental ill health. This was not found to be the case in this study. The mothers of the infants receiving early physiotherapy were not significantly more likely to be mentally healthy (12 out of 16 : 75%) than were the mothers of infants receiving standard care (9 out of 14 : 65%) (Fisher's p =

0.255 at 6 months and 0.311 at 1 year). The year of intervention had had no significant impact on the mothers' mental health.

Summary

In summary the 65 mothers in the study showed increasing levels of neuroticism over the year of assessment. This was affected by levels of infant difficultness, and by lagging motor development in the babies. Mothers' level of depressive symptoms was also associated with motor development. The infants were affected by the mothers only in the area of temperament. Difficult infants were more likely to have depressed mothers.

The one variable that runs as a common thread through both mother and baby characteristics is the adversity score. High levels of psychosocial adversity were linked to both the personality traits of introversion and neuroticism and to mental ill health in the mothers, and to lower levels of motor and cognitive development in the children. The pervasive nature of psychosocial background variables has been pointed out in numerous studies (for example Sameroff, 1987). The implications for the development of later psychological problems in mother and child have also been documented (for example see Fergusson et al., 1990; Rutter et al., 1970; Rutter, 1979; 1981; Werner and Smith, 1980). Suffice it to say that babies with disabilities growing up in deprived psychosocial environments are likely to lag far behind in development. As Sameroff and Chandler (1975) also point out, such deprived environments have neither the educational, emotional nor economic resources to deal with disability.

CHAPTER 6

MOTHER-INFANT INTERACTION : THE ANALYSIS

Introduction

The mothers in this study were the major caregivers for their children. The characteristics of the mothers were described in Chapter 4. The children as they matured from tiny preterm infants developed their own characteristics too, as was seen in Chapter 3. The main thrust of this thesis was to examine how these mothers and infants interacted with each other when the children were one year old, and how these interactions were affected by disabling conditions.

Early work on interactions concentrated on maternal behaviour towards infants (see the review by Lytton, 1971). Recent work has recognised the importance of the infants' contribution. These numerous studies of mother-infant interactions have failed to arrive at a consensus on the major dimensions of behaviour. The researchers are in agreement though, that early mother-infant interaction is important for the future development of the child (for example see Cohen and Beckwith, 1979; Bakeman and Brown, 1980; Beckwith and Cohen, 1980; Olson, Bates and Bayles, 1984; Crnic and Greenberg, 1987; Murray, 1988; Schaefer, 1989).

Behavioural observations of mothers and their children interacting have been carried out from very early in the relationship (Murray, 1988, with babies as young as 6 weeks) through to kindergarten age (Kogan et al., 1974). Healthy fullterm infants and their mothers have provided some baseline data (Cohen and Beckwith, 1979; Murray, 1988, Pettit and Bates, 1984: O'Brien, Johnson and Anderson-Goetz, 1989; Lyons-Ruth, Connell and Grunebaum, 1990; Schaefer, 1989; Belsky, Taylor and Rovine, 1984; Clarke-Stewart, 1973). Though the infants were healthy, these groups were often being studied because there were problems in the environment (for example Lyons-Ruth et al., 1990) or with the mother (Murray, 1988; Mills, Puckering, Pound and Cox, 1985).

In the last decade with the advent of modern intensive care units, preterm babies have become the focus of much of this behavioural research. Firstly, attempts have been made to assess the impact of the presence of an at risk preterm on mother-infant interaction, particularly in the first year of life (Malatesta, Grigoryev, Lamb, Albin and Culver, 1986; Brachfield, et al., 1980; Field, 1980b; Crnic et al., 1983b; Crnic and Greenberg, 1987). Secondly, some longitudinal studies have also reported the development of the mother-infant relationship through the second and third years of the baby's life (Barnard et al., 1984; Greenberg and Crnic, 1988; Landry, Chapieski, Richardson, Palmer and Hall, 1990).

A third line of research has focussed on the impact a disabled child can have on mother-infant interactions. Some of the changes that have been found appear to be specific to the type of disability (for example Brooks-Gunn and Lewis, 1984). Five studies, which are of particular interest for this study, have been carried out with children with physical disabilities. Since diagnoses of physical problems are rarely made during the first year, the mother-infant interactions were assessed when the children were somewhere between 15 and 18 months old (Kogan et al., 1974; Kogan, 1980; Brooks-Gunn and Lewis, 1982, 1984; Wasserman, Allen and Solomon, 1985a, b,; Barrerra and Vella, 1987; Palmer, Shapiro, Allen, Mosher, Bilker, Harryman, Meinert, and Capute, 1990).

No matter which group of mothers and children have been observed, the same types of behaviours have been of interest: affect; infant communication; infant play; mothering behaviours; and interactions per se (see Table 6.1).

There is little agreement on the criteria to be used for recording the occurrence of behaviours, and several of the studies are methodologically flawed, for example in the use of groups with heterogenous disabilities, the lack of statistical analyses and very small sample sizes. Moreover since numbers are often small, generalizations from samples are difficult to justify.

Table 6.1 Behaviours coded from mother-infant interaction observations in previous research.

Behaviours	Authors
1. <u>Maternal Affect</u> (positive, negative)	Kogan et al., 1974; Cohen & Beckwith, 1979; Brachfield et al., 1980; Kogan, 1980; Brooks-Gunn & Lewis, 1982; Dowdney et al., 1984; Pettit & Bates, 1984; Wasserman et al., 1985; Malatesta, et al., 1986; Barrera & Vella, 1987; Cox et al. 1987; Murray, 1988; O'Brien et al., 1989; Schaefer, 1898; Lyons-Ruth et al., 1989; Landrey et al., 1990.
2. <u>Infant communication</u> Gaze, visual regard, social initiation, vocalisation	Kogan et al., 1974; Cohen & Beckwith, 1979; Kogan, 1980; Brooks-Gunn & Lewis, 1982; Dowdney et al. 1984, Pettit & Bates, 1984; Wasserman et al., 1985; Malatesta et al., 1986; Barrera & Vella, 1987; Murray, 1988; Schaefer, 1989.
3. <u>Infant play</u> Plays with toy, focuses on toy, complies, refuses/ignores	Kogan et al., 1974; Kogan, 1980; Brachfield et al., 1980, Dowdney et al., 1984; Pettit & Bates, 1984; Wasserman et al, 1985; Barrera & Vella, 1987; Schaefer, 1989; Landrey et al., 1990.
4. <u>Mothering style (positive)</u>	Kogan et al., 1974; Brachfield et al., 1980; Pettit & Bates, 1984; Dowdney et al., 1984; Wasserman et al., 1985; Malatesta et al., 1986; Barrera & Vella, 1987; Cox et al., 1987; O'Brien et al., 1989; Lyons-Ruth et al., 1989; Schaefer, 1989; Landrey et al., 1990.
5. <u>Mothering style (negative)</u>	Kogan et al., 1974; Cohen & Beckwith, 1979; Kogan, 1980; Brachfield et al., 1980; Pettit & Bates, 1984; Dowdney et al., 1984; Wasserman et al., 1985; Malatesta et al., 1986; Barrera & Vella, 1987; Cox et al., 1987; Lyons-Ruth et al., 1989; Landrey et al., 1990.
6. <u>Interaction</u> Interactive play, quality of interaction sensitivity of mothering	Kogan, 1980; Brooks-Gunn & Lewis, 1982; Dowdney et al., 1984; Cox et al., 1987; Barrera & Vella, 1987; O'Brien et al., 1989; Lyons-Ruth et al., 1989; Schaefer, 1989;

When contrasting groups have been studied, very few differences have been found, though there are some. Preterm infants show more gaze aversion (Field, 1977; Malatesta et al., 1986) and exhibit fewer affective expressions (Wasserman et al., 1985a; Malatesta et al., 1986). Preterms who were sick neonatally play less (Brachfield et al., 1980 Wasserman et al., 1985a), and exhibit more noncompliance (Landrey et al., 1990). Mothers of preterms are more active, displaying more initiating behaviours (Wasserman et al., 1985a), more demonstrating of toys and touching their infants (Brachfield et al., 1980). They can also be more directive (Landry et al., 1990). However, the mothers provide fewer choices for their children (Landry et al., 1990), and do not respond appropriately to infants' expressed emotions (Malatesta et al., 1986).

Though such differences have been found for the infant's first year of life, they begin to disappear after the first 8 months (Brachfield et al., 1980). Crnic's group have followed a group of preterms from birth, and they report that differences that were evident at earlier times disappeared completely by 24 months. They suggest that preterms have different developmental routes up to the age of two years, with mothers showing more positive attitudes and caretaking which compensates for the infants' vulnerability over the first year. By 24 months their group of preterms was displaying the same levels of behaviour as a group of fullterm infants of the same age (Greenberg and Crnic, 1988).

In contrast, dyads that contain a disabled infant show persisting and increasing differences in behaviour as the child grows. The infants are more distractable (Wasserman et al., 1985b) and less compliant (Kogan, 1980; Wasserman et al., 1985b). They smile less (Brooks-Gunn and Lewis, 1982) and display less positive and less negative affect (Kogan et al., 1974; Kogan, 1980). In response the mothers also show less positive and negative affect (Kogan et al., 1974; Kogan, 1980; Brooks-Gunn and Lewis, 1982).

Wasserman and Allen (1985) report that by year two of the child's life mothers are withdrawing from disabled infants, ignoring them in play. Where mothers do interact they are more directive (Barrera and Vella, 1987) and initiate more play behaviours (Wasserman et al., 1985a). The disabled children then become more passive, showing less affect, and their mothers tend to withdraw both in play and in displays of positive affect. It must be remembered that these children and their mothers had been assessed in their second year of life. With the exception of Barrera and Vella's (1987) work, little is known about interaction between mothers and their disabled children at 12 months of age.

Aims

This study was concerned with the development of two groups of preterm infants. By 1 year, 25 of them were displaying functional motor disability and the other 40 had motor development that was approaching full term norms. Thus an opportunity existed to examine mother/infant interaction at 1 year, and to assess the impact of physical disability.

The aims of this chapter are to describe the interaction of mother and infant through play behaviours recorded on videotape; to analyse the relationships between behaviours; to examine the extent to which play behaviours are dependent on the mother and infant characteristics already described in Chapters 3 and 4; and specifically to assess the impact of disability on interaction as expressed through play behaviour.

Methodology and Procedures

Several methods for assessing mother/infant interaction can be found in recent research. Self report questionaires have been used, from which for example mothers' caretaking strategies can be categorised (Palmer et al., 1990). Real time observations have been made of mothers and children. There are two ways of documenting these, either by time sample recordings (Brachfield et al., 1980; Cohen and Beckwith, 1979; Pettit and Bates, 1984), or by ratings of the sessions immediately on completion of the observations (Schaefer,1989). Prior to the advent of video recording, real time observed behaviours were described and dictated onto audio tapes, which were later transcribed and the behaviours either rated (Kogan et al., 1974), or counted and coded (Brooks-Gunn and Lewis, 1984).

The most commonly used documentation now is vidoetape. The tape can later be assessed in any of three ways. Ratings of both individual and interactive behaviours can be made (O'Brien et al., 1989; Lyons-Ruth et al., 1990; Wolke, 1986; Crnic and Greenberg, 1987). Alternatively, frequency counts and sequences can be coded on a continuous or time sampled basis (Cox et al., 1987; Kogan, 1980; Barrera and Vella, 1987; Wasserman et al., 1985; Landry et al., 1990; Murray, 1988; Malatesta et al., 1986).

For this study it was decided that a video recording made in the home was the most appropriate method. The mothers and babies were in familiar surroundings, where it was more likely for usual patterns of interaction to take place (Bronfenbrenner, 1977). In particular, it was felt that the children with disabilities would not be at ease in unfamiliar laboratory settings. Some of the children with motor disabilities had for example specialised seats at home that facilitated interaction. These were often too cumbersome for the mothers to transport.

The mothers and children had been videoed previously. The mothers were therefore used to being videoed, and since they received a copy of the tape they were co-operative and not inhibited. Since this was the third visit made to the family the mothers were at ease with the situation.

The assessment was performed when the baby was neither hungry nor sleepy, after the Bayley assessments had been completed. If the child was tired, hungry or fractious an appointment was made for the following day. The mothers were told that the reseacher was interested to see how babies played with new toys with their mothers.

There were three sections to the play situation. For two of these standardised toys were provided. The two toys used were the Fisher-Price Stack-a-Ring and the Fisher-Price Shape-Sorter. These brightly coloured toys, whilst having a recognisable task built in, also lent themselves to creative play. For children with immature play, they could be sucked and bitten without fear of harm. Both toys could be used in imaginative ways depending on the mothers' inclinations. For example a ring could become a "crown" or a vehicle for playing peek-a-boo. The blocks could be built up in towers for demolition, made into a "train" or rolled around. The shape container could be a large rattle, a drum or a stool. As well as providing a standardised stimulus for play, taking toys into the home was essential for assessment in some cases where there were no toys for the child to play with.

The third play session was devoted to unstructured free play. The choice of toy was left to the mother. In situations where there were no toys as such, mothers chose a variety of objects for the children to play with. These ranged from a wooden spoon through a cigarette packet to the remote control for the television! Data based only on the standardised play sessions, and not the free play, will be presented here.

Note. The decision to base the majority of variables on frequency counts, rather than timed behaviours or mini sequences was made on several grounds. Most of the behaviours involved discrete events, amenable to simple counting (Dowdney et al., 1984; Altmann, 1974). The durations of the recorded sessions were all of exactly the same length, so comparisons of total frequencies would be valid. There had been few previous studies dealing with individual play behaviours, therefore frequency counts would provide basic descriptive data. Data based on frequencies could be used with equal ease in the analysis of behaviours, or in the classification of the dyads (see this Chapter and Chapter 7). Given the sample size (65 dyads) and the time required for coding each play session, frequency counts provided the most realistic method for the derivation of a wide range of behaviour variables. For behaviours not amenable to simple frequency counts, ratings were used.

In all three sessions the mothers were asked to play with their babies in any way they liked that would be fun. They were not asked to teach the child any particular task or way of playing with the toy.

The positioning of the child was also left to the mother. If she asked for directions, she was told that whatever she thought was best for the infant was fine, and that the interviewer would move to accomodate the arrangement. This was possible since taping was accomplished using a handheld Panasonic camcorder. This had a built in microphone and could be operated in low light conditions.

Coding the videotapes

For the analysis of the videotapes, each two and a half minute standardised play session was subsequently viewed from start to finish. It was then replayed, so that the required codings could be completed. The videotapes were coded using a series of frequency counts and ratings.* The frequency counts were partly adapted from the previous work of Puckering and Mills, The Newpin Coding Scheme (Puckering, personal communication), itself based on Dowdney, Mrazek, Quinton and Rutter (1984). One rating came from Ainsworth, Bell and Stayton (1974); the others were developed specifically for this study.*

For the frequency counts a prepared record sheet was marked in the appropriate column each time a codeable behaviour occured. The ratings were assigned after the counts were

* see note opposite

completed. The number of times a tape was replayed depended on the frequency and pacing of the behaviours observed.

A total of 20 primary behaviour variables were used, 11 relating to the mother, 7 to the child and 2 to interaction (Table 6.2). The scores for each variable were summed for the two standardised play sessions across the five minute time period. A further 4 composite variables were derived from the primary variables, one relating to child behaviour and 3 to interactive behaviour (Table 6.3), again for the five minute time period.

Table 6.2 Primary behaviour variables coded from the videotapes of standardised play

Variable	Type	Source
<u>Mother</u>		
Mother positive	Count	Puckering and Mills
Mother negative	Count	Puckering and Mills
Monitor	Count	Puckering and Mills
Check	Count	Puckering and Mills
Enable	Count	Puckering and Mills
Instruct	Count	Puckering and Mills
Mother links	Count	Puckering and Mills
Mother follows	Count	Puckering and Mills
Stop	Count	Puckering and Mills
Poor timing	Count	Puckering and Mills
Sensitivity	Rating	Ainsworth et al.
<u>Child</u>		
Child positive	Count	Puckering and Mills
Child protest	Count	Puckering and Mills
Child initiates	Count	Puckering and Mills
Child follows	Count	Puckering and Mills
Social referencing	Count	Puckering and Mills
Activity	Rating	This study
Sophistication of play	Rating	This study
<u>Interaction</u>		
Mutual affect	Count	Puckering and Mills
Harmony	Rating	This study

Ten of the variables used to express aspects of mother behaviours, derived from the Puckering and Mills system, were based on frequency counts. Two were concerned with affective behaviour - one positive, the other negative. The other codes relate to the play setting: monitoring and enabling behaviours; instructing, both verbal and nonverbal; linking behaviours, which expand the child's play; and following behaviours, where the mother responds to the child's initiations. Checking behaviour was coded that related to the mother's attempts to determine what it is that the child needs or wants. Sometimes in play the mother's behaviours are poorly timed and cut across the child's activity (Poor Timing). The number of times the child's behaviour is actually curtailed altogether (Stops) was also recorded (See Appendix V).

Five codes for infant behaviour, based on frequency counts, were taken from the Puckering and Mills system: positive affective behaviour; child protests (either verbally or nonverbally); two play behaviours, child following a mother link, and child initiation of play; and social referencing by the child of the mother (See Appendix V).

One interaction variable was based on frequency counts, Mutual Affect. This was coded when mother and child expressions of affect were congruent. For instance if one partner displayed positive affect which was responded to by positive affect from the other this was recorded as mutual affect. Alternatively, if the mother praised the child and he smiled in response this would also be coded as mutual affect. If mother and child laughed together when a tower of blocks toppled for example, this was mutual affect.(See Appendix V).

Rating scales were employed to augment the frequency counts. One mother rating that gives a global assessment for the whole period of interaction is the Sensitivity to Infant Communication, originated by Ainsworth et al. (1974). This is a 9 point rating scale ranging from highly sensitive through a midpoint of inconsistently sensitive to highly insensitive (See Appendix V).

None of the existing scales adequately covered some aspects of infant behaviour, so three further rating scales were developed for this study, two relating to infant activities per se and one to interactive behaviour. Infant activity level rated the pacing and amount of physical activity engaged in by the child. For each toy period, the infant was also given a rating on the "Sophistication of Play" engaged in. This rating ranged from no play, through mouthing and fingering to varying degrees of more complicated play, such as actually placing a ring in position on the stack. Finally a rating was made of the Harmony of the interaction existing between mother and child during each play session. This ranged from complete discord through blandness to harmonious accord (Appendix V).

The 4 composite variables, derived from primary variables, are given in Table 6.3.

Table 6.3 Derived variables calculated from scores on primary behaviour variables

Derived variable	Primary variables
<u>Child</u>	
Child Happiness	Child Positive, Child Protest
<u>Interaction</u>	
Diversity of Play	Mother Follows, Child Follows
Mother Response Index (MRI)	Mother Follows, Child Initiates
Child Response Index (CRI)	Child Follows, Mother Initiates

Child Happiness was calculated by subtracting the number of Child Protest behaviours from the number of Child Positive affective behaviours to give an overall score that was representative of the child's mood during the session. This summary variable could be positive (an overall score where positive affect behaviours outnumbered protest behaviours), neutral (score zero, positive and negative scores cancelling each other, or where no affect was shown), or negative (an overall score where protest behaviour predominated over positive affect).

Diversity of Play was calculated from the two variables Mother Follows and Child Follows. Since each of these is only coded after a new play initiation by the other partner, they are a measure of responding behaviour as well as of diversity. The derived variable was calculated as the sum of the total number of Child Follows and Mother Follows over the 5 minute play period.

Diversity of Play gives a measure of shared play. Though there may be a high degree of reciprocity, it may be entirely mother led. In this case the frequency of Diversity of Play depends on the child picking up on mother's initiation of new play. It was felt that variables concerned with direction of initiation and following should also be calculated.

If the direction of the interaction is predominantly from the child to the mother, then the number of Mother Follows is important. More than this, it is the <u>proportion</u> of child initiates that the mother follows that is crucial. However, this proportion is affected by the total number of follows that the mother makes. A Mother Response Index was calculated by the following formula.

$$\text{MRI} = (\text{Mother Follows}) \times \frac{(\text{Mother Follows})}{(\text{Child Initiates})}$$

For example if the number of Child Initiates is 11 and the number of Mother Follows is 6 then

$$\text{MRI} = 6 \times (6/11) = 3.27.$$

In contrast where the child initiates twice and the mother follows both times then

$$\text{MRI} = 2 \times (2/2) = 2.0$$

In the first case where MRI = 3.27, the mother is responding to new play about half the time but there is potential for much interaction, as the child initiates so many times. In the second case where MRI = 2.0, the mother identifies all the child's initiations and responds to them, but the number of interactions is low. Therefore a high value for the MRI means that there are numerous child initiations to which the mother responds on most occasions. A low value means that either there are few initiations or the mother responds to only a small proportion of the child's initiations. In both the latter cases the level of interaction is low.

The Child Response Index (CRI) is calculated in an identical manner where

$$\text{CRI} = (\text{Child Follows}) \times \frac{(\text{Child Follows})}{(\text{Mother Initiates})}$$

giving a similar range of values to the MRI with the same general implications.

This set of variables was then used to describe and analyse the behaviours of the mothers the children and the interactions between them.

Reliability

The frequency counts used in the analysis of videos are based on criteria derived from the Newpin Project carried out at the Institute of Psychiatry, London (Cox et al., 1991). The reliability of these criteria were established by Ellwood. She found that both mother and child behaviours could be reliably observed. However, whilst mother behaviours showed increasing consistency over time, child behaviours proved inconsistent when retested 4 months later (Cox and Ellwood, 1985). As a result of this work, Puckering and Mills deleted all codes from their scheme that did not reach an 85% inter-rater reliability. All the frequency counts used in this thesis are thus based on an 85% reliability level. The author was trained by Puckering in the use of the Newpin coding scheme, achieving an inter-rater reliability of 0.90.

A naive rater was also trained in the use of the coding scheme, and in the ratings devised specifically for this study. To establish inter-rater reliability with the author, this rater coded a randomly chosen 10% of the videotaped play sessions. The inter-rater correlation across both ratings and frequencies was 0.86.

To show that the coding of the author was reliable over time, a random 10% of the original sessions were recoded after one year. Across both counts and ratings a correlation of 0.96 was achieved.

Analysis of the data

The first step in the analysis was to examine the frequency distribution of each of the behaviour variables discussed above, for the whole sample. Then a Pearson correlation coefficient matrix was set up, in order that bivariate correlations between the variables could be examined to identify the nature of the relationships between the behaviour variables. The sample then was split by degree of disability into two groups, so that comparisons of behaviours could be made on this basis. This whole procedure was carried out first for the 11 mother variables then for the 8 child variables. Before a similar analysis of the 5 interaction variables, the correlation relationships between the mother and child behaviour variables were examined.

The relationships between the mother, child and interaction behaviour variables were summarised by 4 correlation networks. The influence of the descriptive variables (Chapters 3 and 4) on the 24 behaviours in play and on the structure of the 4 correlation networks is then examined. Finally the full impact of disability on the correlation networks is considered.

Mother behaviours

The median and modal scores and the ranges on the 11 mother variables for all 65 mothers are shown on Table 6.4. Large discrepancies between modal and median values are indicative of the skewed nature of the distributions of 5 of the variables: mother negative, enable, mother follows, checks and stops; where the most commonly observed occurence was zero. Two other variables, mother links and sensitivity, showed bimodal peaks close to and on either side of the medians, the remaining four showed unimodal, near normal distributions.

Table 6.4 Frequency distributions of scores on the 11 mother behaviour variables for all 65 mothers, coded from video recordings of standardised 5 minute play sessions.

Variable *	Median	Mode	Range
Mother Positive	8	10	1-27
Mother Negative	1	0	0-14
Monitor	6	6	0-18
Check	3	0	0-30
Enable	3	0	0-13
Instruct	26	35	0-73
Mother Links	5	3,4 & 6,7	0-13
Mother Follows	1	0	0-12
Stop	1	0	0-11
Poor Timing	13	10	0-44
Sensitivity +	10	9 & 12	2-17

* For variable definitions see Appendix V
\+ All other variables are counts; this variable is a rating, minimum possible score = 2, maximum possible score = 18.

The ranges (Table 6.4) illustrate how wide was the variability on some of the behaviours, particularly for: mother positive (1-27), instructs (0-73), checks (0-30) and poor timing (0-44).

Examination of the correlation matrix between the mother behaviour variables (Table 6.5) reveals a number of moderate but significant correlations.

On the basis of these correlations, it would appear that there are two clusters of variables, one focussing around Sensitivity, the other around Instructs. Mothers with high ratings for Sensitivity tend to display more positive affect with their children. Those displaying more positive affect tend also to be aware of the needs of their infants (Checks).

In play they interact more with their children, both showing them new activities and following their initiations. In keeping with their higher levels of awareness they also display more enabling behaviours (see Figure 6.1). They do not commonly show high levels of Poor Timing (see Table 6.5 and Figure 6.2).

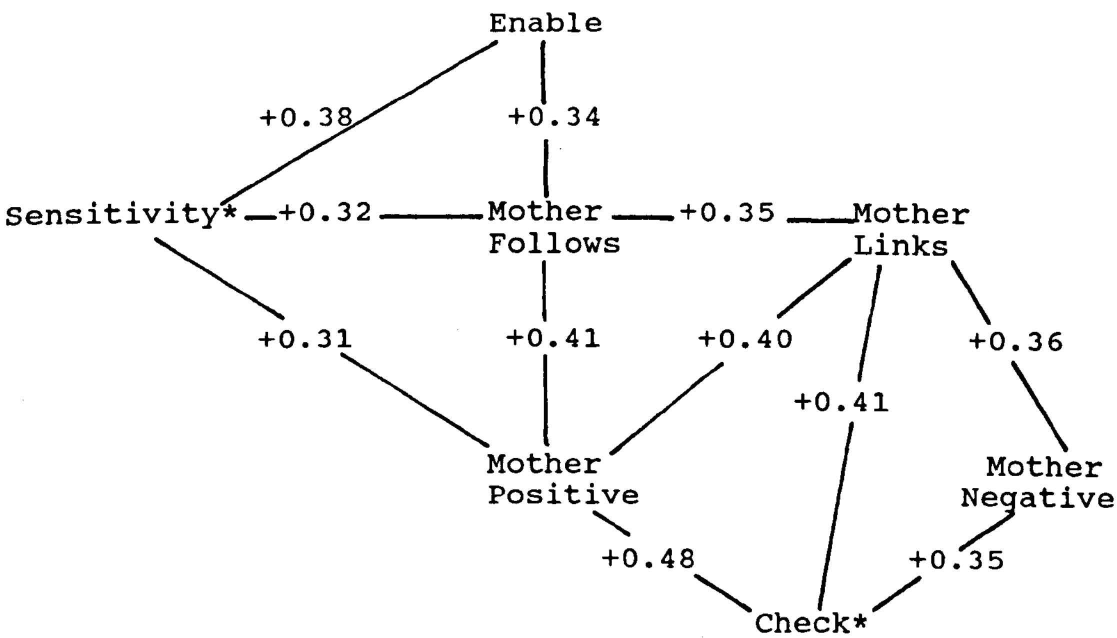
An alternative explanation is that mothers with lower sensitivity scores, show little or no positive affect nor interactive behaviour.

Table 6.5 Pearson correlation matrix showing 11 mother behaviour variables that are significantly correlated with each other to at least the 0.01 level.

	Ss	MP	MN	Mo	Ch	En	In	ML	MF	St	PT
Sensitivity (Ss)	.	+0.31				+0.38			+0.32		-0.43
Mother +ve (MP)		.			+0.48			+0.40	+0.41		
Mother -ve (MN)			.		+0.35			+0.36			
Monitor (Mo)				.			-0.47				-0.34
Checks (Ch)					.		+0.39	+0.41			
Enable (En)						.			+0.34		
Instructs (In)							.				+0.48
Mother Links								.	+0.35		
Mother Follows									.		
Stops										.	
Poor Timing											.

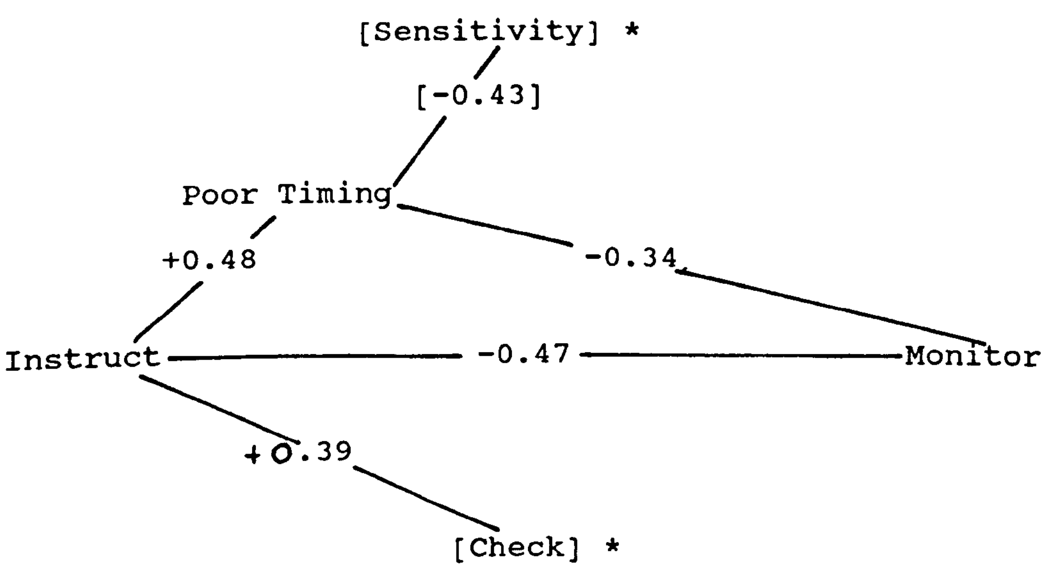
High levels of instruction are associated with a different constellation of variables (see Figure 6.2). Amount of activity seems to be the link between these variables. Mothers who are very verbal, speaking for most of the play session, score highly on both Instructs and Checks. Because the mother is talking or "doing" for much of the session, she does not take time to sit back and monitor the child's activity, nor to wait for a response to her Check. If levels of Instruct (which includes both verbal and physical behaviour) are high, then there is a high level of opportunity for poorly timed behaviour on the mother's part. There are links between the two networks through Checks and Sensitivity. Mothers who are rated as insensitive tend to have high levels of poor timing.

The mothers' behaviours during the videotaped play sessions can be largely understood in terms of Sensitivity ratings and Instructs scores, the latter apparently reflecting busyness. The only variable not included in the networks is Stops, which appears to be largely independent of all 10 others.



* Note that Sensitivity and Check also correlate with the other network (see Fig. 6.2).

Figure 6.1 Correlation network between mother behaviour variables: Sensitivity focus.



* Note that Check and Sensitivity also correlate with the other network (see Fig 6.1)

Figure 6.2 Correlation network between mother behaviour variables: Instructs focus.

Impact of infant disability on mother behaviour

It was hypothesised that having a child with an emerging disability would alter the ways in which the mother behaved in play with the one-year old child. Because of the small sample size (only 25 children in the disabled group) and therefore limited statistical power, it was decided to analyse the impact of disability by using categorical data. The categories were derived from tercile values from the frequency distributions of each mother behaviour variable. In using terciles, high, middle and low levels of behaviour in relation to the sample as a whole could be identified, whether the data existed as frequency counts or as ratings, and independently of the spread of the data range, largely overcoming the problems induced by data skewness.

Assignment to tercile groups was done in a conservative way. The tercile values were determined from the frequency distributions, and the upper tercile group identified as those with scores higher than the upper tercile value itself, and the lower tercile group as those with scores lower than the lower tercile itself. Subjects with scores equal to and between the upper and lower tercile values were assigned to the central group. This means that the central, middle tercile group normally contained the largest number of subjects, and that numbers in the high and low tercile groups varied from variable to variable. The most common cases where a high or a low tercile group contained a higher number of subjects was when the lower tercile value was zero, in which case all those scoring zero obviously had to be assigned to the lower tercile group. This conservative approach ensured that the upper and lower tercile groups were restricted to the extreme ends of the distributions (Table 6.6).

Table 6.6 Lower and upper tercile ranges for scores on the 11 mother behaviour variables (total sample of 65 cases)

Variable	Lower tercile range (N)	Upper tercile range (N)
Mother positive	0-5 (17)	11-27 (14)
Mother negative	0-0 (30)	3-14 (17)
Monitor	0-4 (19)	9-16 (20)
Check	0-0 (16)	7-30 (15)
Enable	0-1 (24)	6-13 (10)
Instructs	0-17 (21)	36-73 (19)
Mother Links	0-3 (17)	7-13 (21)
Mother Follows	0-0 (26)	3-12 (13)
Stops	0-0 (27)	4-11 (17)
Poor Timing	0-9 (21)	18-44 (21)
Sensitivity	2-7 (18)	13-17 (14)

The categories for comparing the disabled group with the nondisabled group then became the upper and lower terciles, in other words mothers who had a high level of a particular behaviour compared to those with a low level. As an example the frequency distribution for the scores on the Check variable is illustrated on Figure 6.3.

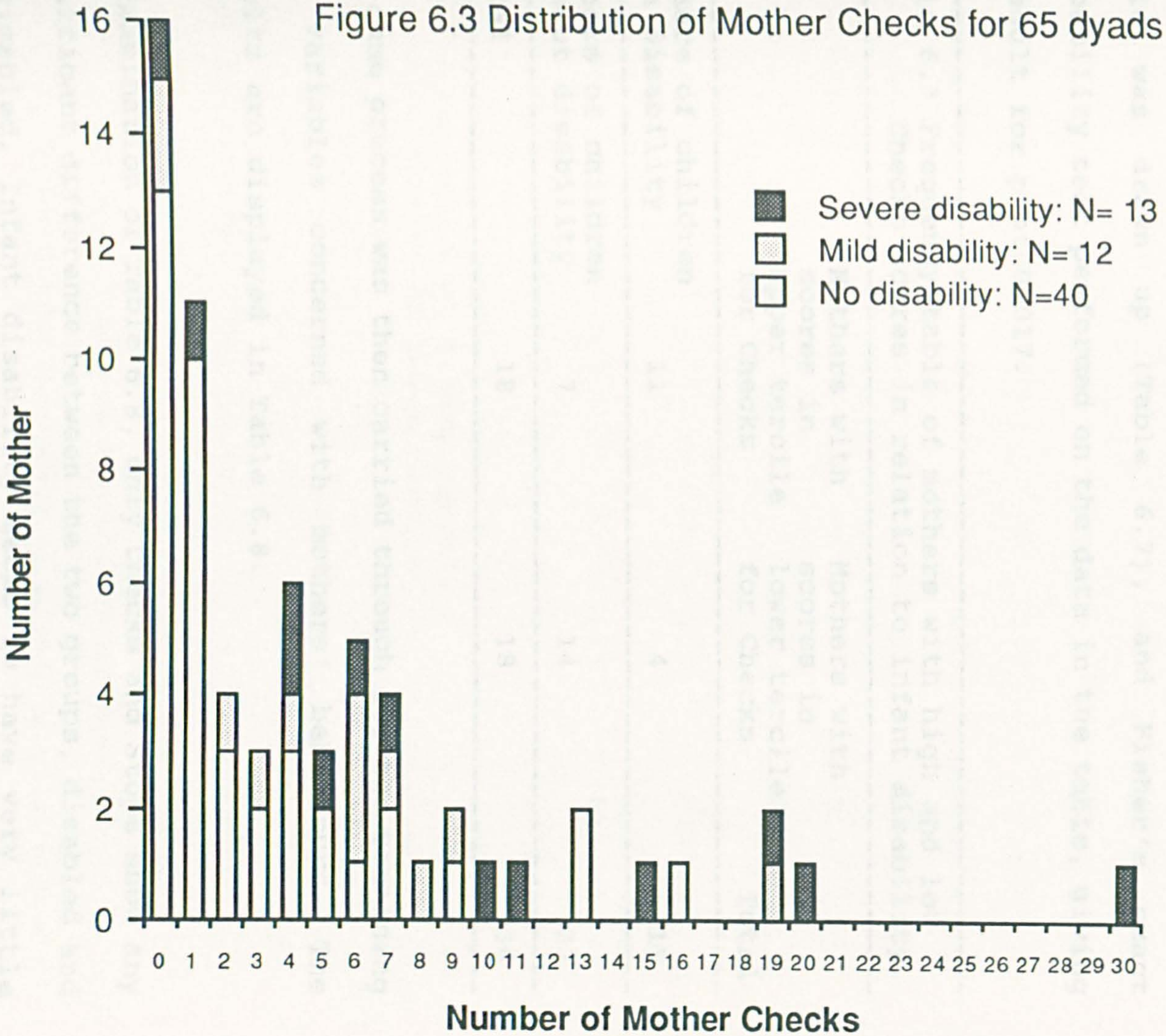


Figure 6.3 Distribution of Mother Checks for 65 dyads

Eighteen of the mothers' scores on the Check variable lay within the upper tercile. Of these, 11 were mothers of disabled children, 7 were mothers of children showing no disability. Eighteen of the mothers' scores lay within the lower tercile, only 4 were mothers of disabled children, the remaining 14 had children with no disability. A 2 x 2 table was drawn up (Table 6.7), and Fisher's exact probability test performed on the data in the table, giving a result for p of 0.017.

Table 6.7 Frequency table of mothers with high and low Checks scores in relation to infant disability.

	Mothers with scores in upper tercile for Checks	Mothers with scores in lower tercile for Checks	Total
Mothers of children with disability	11	4	15
Mothers of children without disability	7	14	21
Total	18	18	36

The same process was then carried through for the remaining ten variables concerned with mothers' behaviours. The results are displayed in Table 6.8.

On examination of Table 6.8, only Checks and Stops show any significant difference between the two groups, disabled and nondisabled. Infant disability seems to have very little impact on mothers' behaviour at play.

Table 6.8 Mother behaviour variables against disability

Variable	Mothers of children with disability		Mothers of children without disability		Statistics
	High	Low	High	Low	1
Mother +ve	5	6	9	11	X^2 = 0.0006
Mother -ve	10	10	7	20	X^2 = 2.96
Monitor	7	11	13	8	X^2 = 2.06
Enable	6	8	4	16	X^2 = 2.11
Mother Links	11	5	10	12	X^2 = 2.36
Mother Follows	5	6	8	18	X^2 = 0.26
Instructs	10	5	9	16	X^2 = 3.54
Checks	11	4	7	14	Fisher's p = 0.017*
Stops	3	13	13	15	Fisher's p = 0.05*
Poor timing	8	9	13	12	X^2 = 0.10
Sensitivity	5	8	9	10	X^2 = 0.25

High means number in higher tercile
Low means number in lower tercile
1 No significant differences were found except where indicated by *

Infant Behaviours

The median and modal scores for the 65 babies are shown in Table 6.9. Each of the variables displays a wide range of values, but with the exception of Child Positive and Child Protest, the distribution of the scores is near normal.

Table 6.9 Frequency distribution of scores on the 8 child behaviour variables for all 65 infants, coded from the video recordings of standardised 5 minute play sessions.

Variable	Median	Mode	Range
Child positive[1]	2	0	0-11
Child protest[1]	2	0	0-17
Child happiness[3]	-1	+2	-13 to + 10
Child initiates[1]	4	4	0-14
Child follows[1]	2	2	0- 8
Social referencing[1]	5	5	0-14
Infant activity[2]	11	11	2-16
Sophisication of play[2]	9	8or9	2-17

1 = Frequency count
2 = Rating
3 = Derived variable

Both of the affect variables have skewed distributions with a modal value of zero (Figures 6.4 and 6.5). To test whether the infants who displayed no positive affect were also those who showed no protesting behaviour, a further distribution was calculated. The number of affective behaviours expressed by each child, were summed, disregarding whether they were negative or positive. Then each child's total was plotted on Figure 6.6. This showed that only 7 infants displayed neither positive nor protest behaviours. There were however, 18 infants with no positive affect (Figure 6.4), so 11 of these must have shown protesting behaviour only. Furthermore 10 of the 17 children displaying no protest (Figure 6.5) must have shown positive affective behaviour only.

Figure 6.4 Distribution of Child Positive behaviours

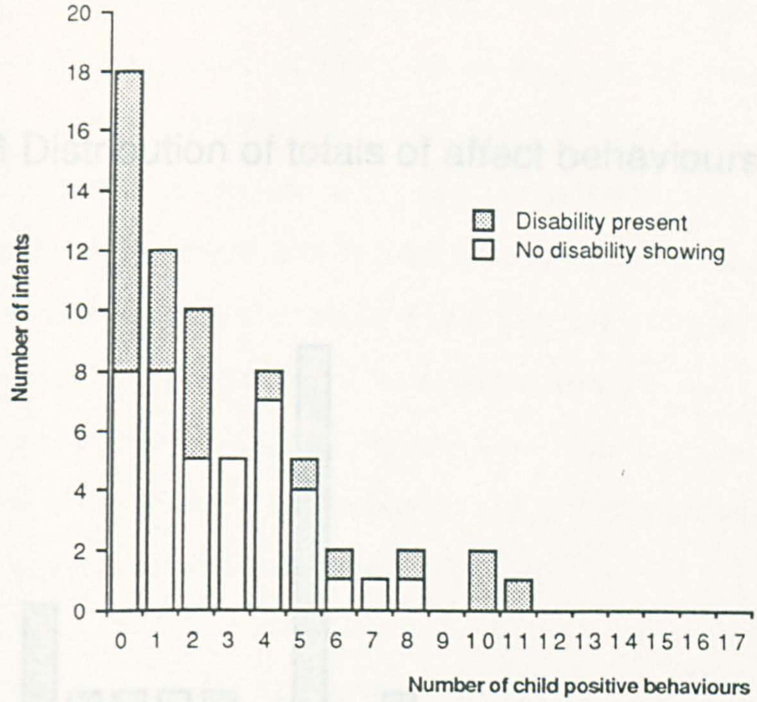


Figure 6.5 Distribution of Child Protest behaviours

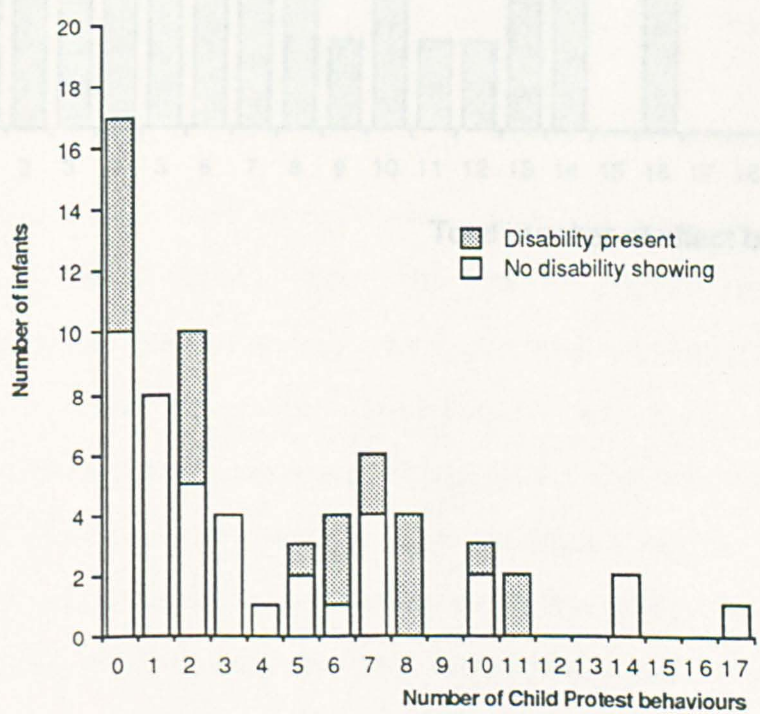


Figure 6.6 Distribution of totals of affect behaviours for 65 infants

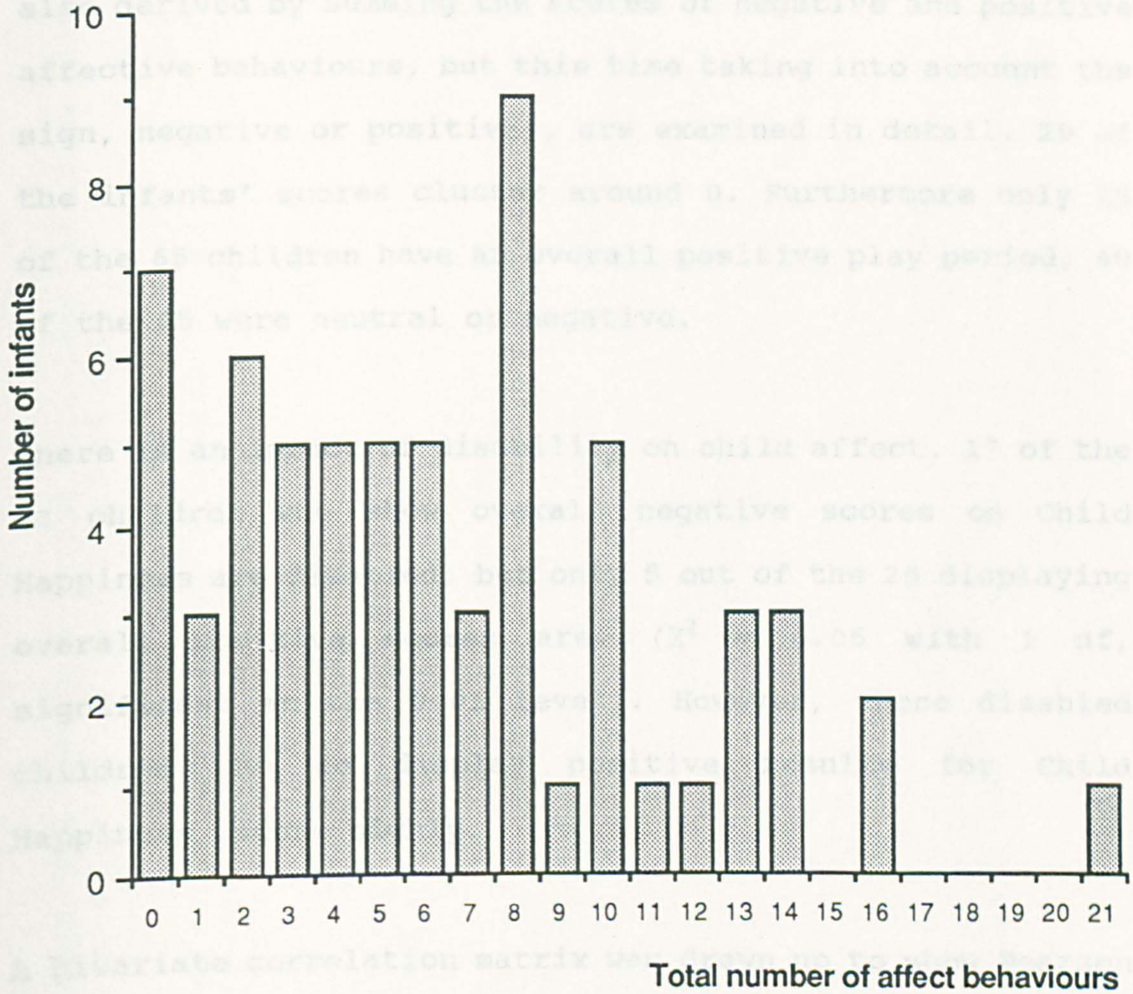


Figure 6.6 points up the overall paucity of infant affective behaviour. There are more children than might be expected with very few affective behaviours. Overall this sample was nondemonstrative. This fact is reinforced if the distribution of scores on the Happiness variable (which is also derived by summing the scores of negative and positive affective behaviours, but this time taking into account the sign, negative or positive), are examined in detail. 29 of the infants' scores cluster around 0. Furthermore only 25 of the 65 children have an overall positive play period, 40 of the 65 were neutral or negative.

There is an impact of disability on child affect. 17 of the 33 children who show overall negative scores on Child Happiness are disabled, but only 5 out of the 25 displaying overall positive scores are. (X^2 = 6.05 with 1 df, significant at the 0.01 level). However, those disabled children who do display positive results for Child Happiness, score highly.

A bivariate correlation matrix was drawn up to show Pearson correlation coefficients for the 65 children on the 8 infant variables (Table 6.10). As with the mothers this was restricted to correlations significant at the 1% level, that is correlations greater than 0.3. On the basis of these correlations a network can be constructed to show how the infant variables link together (Figure 6.7). Since the variable Child Happiness was derived from the two affect variables it was omitted from the network.

Table 6.10 Pearson correlation matrix showing 8 infant behaviour variables that are significantly correlated with each other to at least the 0.01 level.

	Child Positive	Child Protest	Child Happiness	Child Follows	Child Initiates	Social Referencing	Sophistication of Play	Child Activity
Child Positive	.		+0.57		+0.37	+0.59		
Child Protest		.	-0.86					
Child Happiness			.			+0.40		
Child Follows				.	+0.30	+0.39		
Child Initiates					.			+0.37
Social Referencing						.	+0.38	
Sophistication of Play							.	+0.75
Child Activity								.

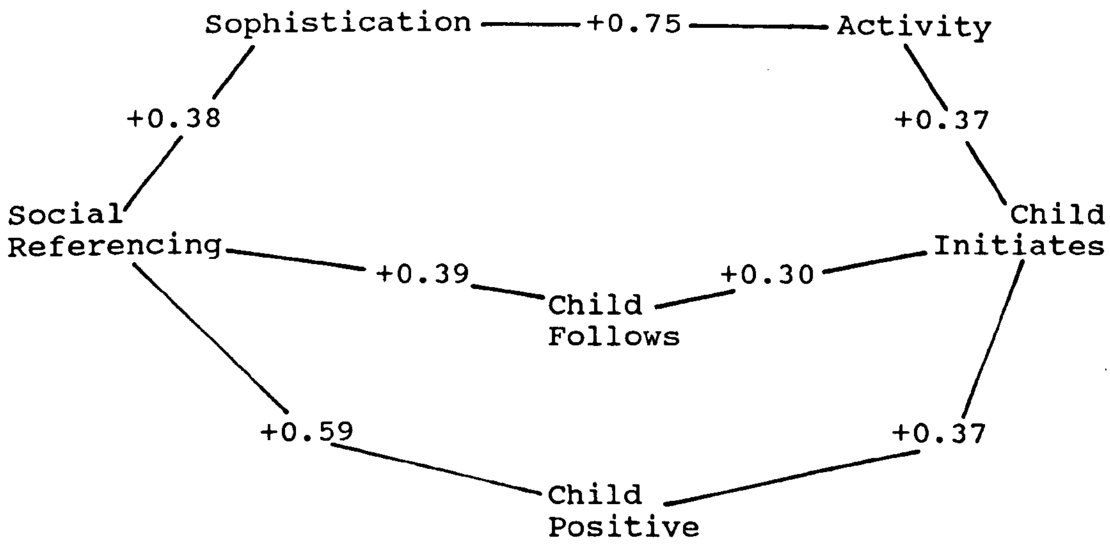


Figure 6.7 Correlation network of child behaviour variables

A child who is very active is likely to be a child who has a sophisticated level of play. Conversely a child who is not very active is likely to play at an immature level. The more sophisticated the child's play the more likely it is that (s)he checks the mother's status (Social Referencing). In so doing (s)he is more likely to detect and therefore follow any mother links (Child Follows). An active child is one who, by being active, initiates more new play behaviours. A setting condition both for child play (Child Initiates) and for Social Referencing seems to be the child showing positive affect. Perhaps a positive child has energy to expend on play and interaction with mother.

The one primary variable that does not correlate with any of the other primary variables is Child Protest. Its only correlation is, not suprisingly, with the composite variable Child Happiness (-0.86) which was derived from Child Positive and Child Protest. Child Happiness correlates less highly with Child Positive (0.57). It also correlates with Social Referencing (0.40) (See Table 6.10).

Impact of disability on infant behaviour

Terciles were calculated for infant variables in exactly the same way as had been done for the mother variables (See Table 6.11). This was done in order to test whether emerging disability influenced infant behaviours in play. When disabled and nondisabled children were compared on the basis of numbers in highest and lowest terciles (see Table 6.12) no significant differences emerged on either Child Positive or Child Protest. Neither was there a significant difference on Child Happiness, despite the significant difference on Happiness scores between disabled and nondisabled groups within the sample as a whole (see above). This can be explained by the presence of several happy disabled children in the upper tercile and several unhappy nondisabled children in the lower tercile cancelling each other out (see Figure 6.8).

Figure 6.8 Distribution of Child Happiness scores for disabled and nondisabled children

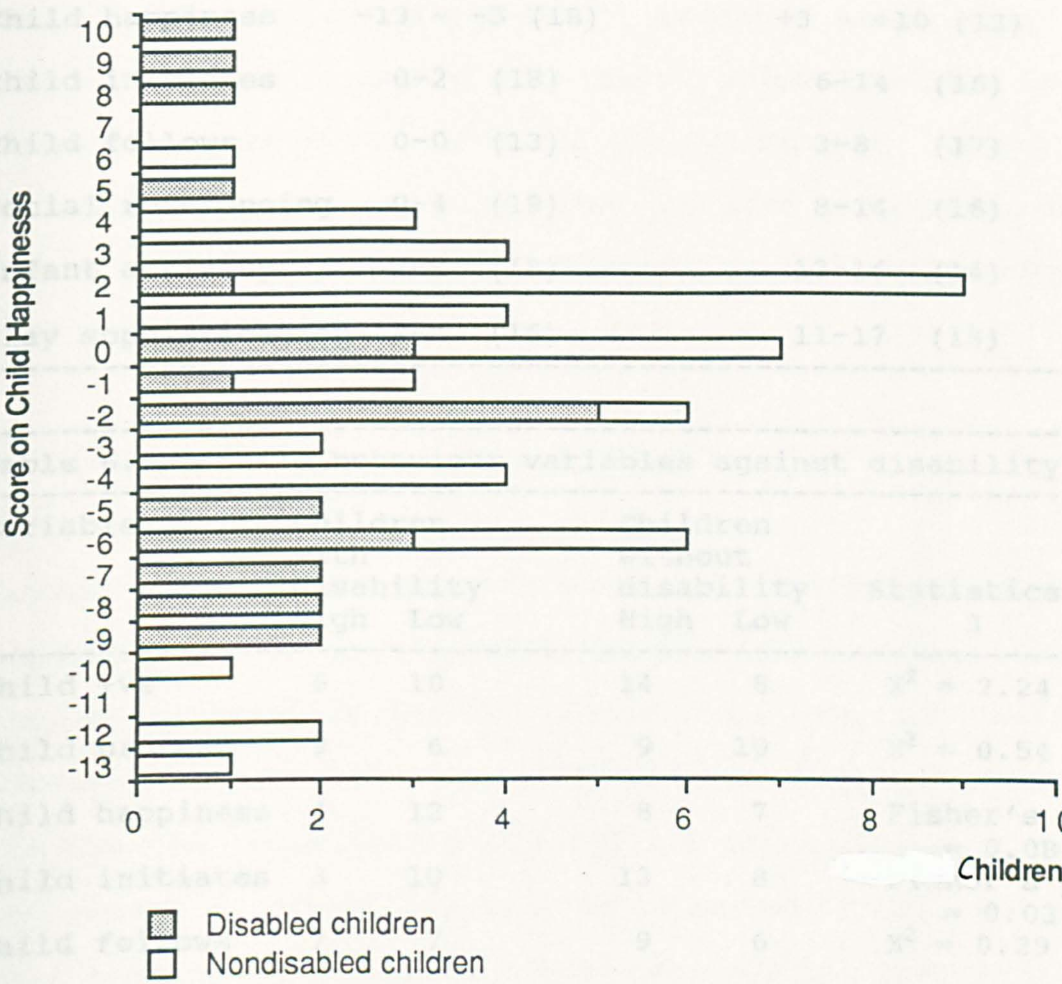


Table 6.11 Lower and upper tercile ranges for scores on the 8 child behaviour variables (total sample of 65 cases)

Variable	Lower tercile range (N)	Upper tercile range (N)
Child positive	0-0 (18)	4-11 (19)
Child protest	0-0 (16)	7-17 (18)
Child happiness	-13 - -5 (18)	+3 - +10 (12)
Child initiates	0-2 (18)	6-14 (16)
Child follows	0-0 (13)	3-8 (17)
Social referencing	0-4 (19)	8-14 (16)
Infant activity	2-8 (18)	13-16 (14)
Play sophistication	2-7 (16)	11-17 (13)

Table 6.12 Child behaviour variables against disability

Variable	Children with disability		Children without disability		Statistics [3]
	High	Low	High	Low	
Child +ve	6	10	14	8	$X^2 = 2.24$
Child protest	9	6	9	10	$X^2 = 0.54$
Child happiness	4	12	8	7	Fisher's p = 0.08
Child initiates	3	10	13	8	Fisher's p = 0.03*
Child follows	7	7	9	6	$X^2 = 0.29$
Social referencing	4	12	12	7	$X^2 = 5.08$*
Activity	2	11	12	7	Fisher's p = 0.008*
Play sophistication	1	12	11	4	Fisher's p = 0.0006*

High means number in higher tercile
Low means number in lower tercile
3 No significant differences observed, except as indicated by * : significant to at least the 0.05 level.

Significant differences were observed on four variables. Disabled children are less active in play and usually display only less sophisticated play behaviours. They have lower levels of social referencing but this may be partly caused by some mothers' positioning of their children. Mothers of disabled children frequently placed their children with their backs propped against the mother's body. Many of these children, unable to move independently, were therefore unable to look at their mothers. Disabled children initiated new play behaviour less frequently, but there was no significant difference in following mother linking activities (see Table 6.12).

Interaction between mother and child in play

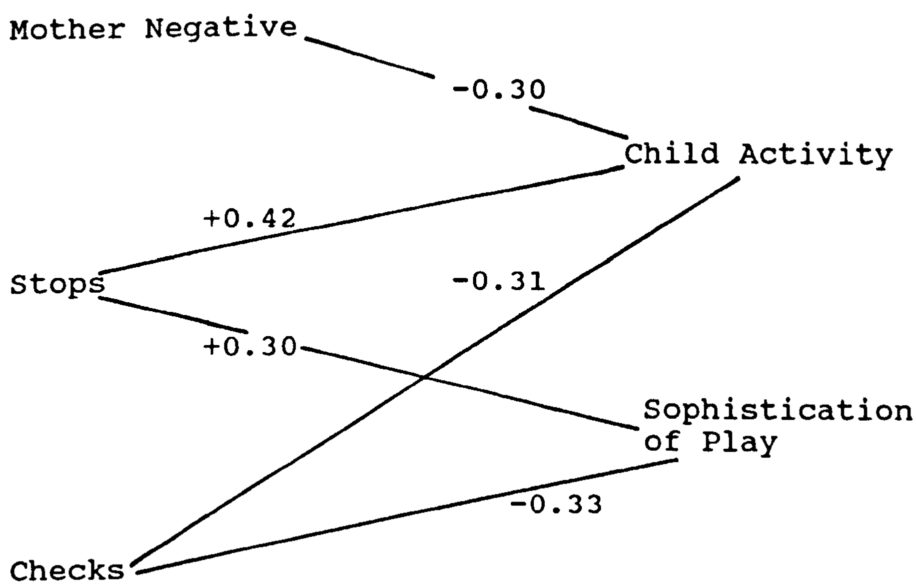
Having considered the mother and child behaviours separately, this section will examine interactions: first through interaction between mother and baby behaviours; secondly through coded interactive behaviours; and thirdly through the relationship between all three. In each case the impact of disability will be considered. This section will lead to a final section that examines the influence of mother and child characteristics described in Chapters 3 and 4 on observed behaviours, and the overall impact of disability.

Relationships between mother and child behaviours

Pearson correlation between the 11 mother behaviour and 8 child behaviour variables are displayed in Table 6.13.

Examination of the matrix reveals moderate to good levels of correlation which are significant at the 1% level of probability. Interaction between variables can be explained by three different networks. The first is concerned with the child's level of development and the mother's contingent responses (Figure 6.9).

Figure 6.9 Correlation network focussed on development level and mother's responses



A child who is very active is likely to have a mother who does not display negative affect. Children who are not active however have mothers who do show disaproval or negative affect. Active children are also more likely to be prevented from continuing their behaviour by their mothers (Stops). Children with low levels of activity are not stopped very often, but they are checked by their mothers more frequently. It will be remembered that the child's level of play sophistication is closely linked to

Table 6.13 Pearson correlation matrix between 11 mother and 8 child behaviour variables.

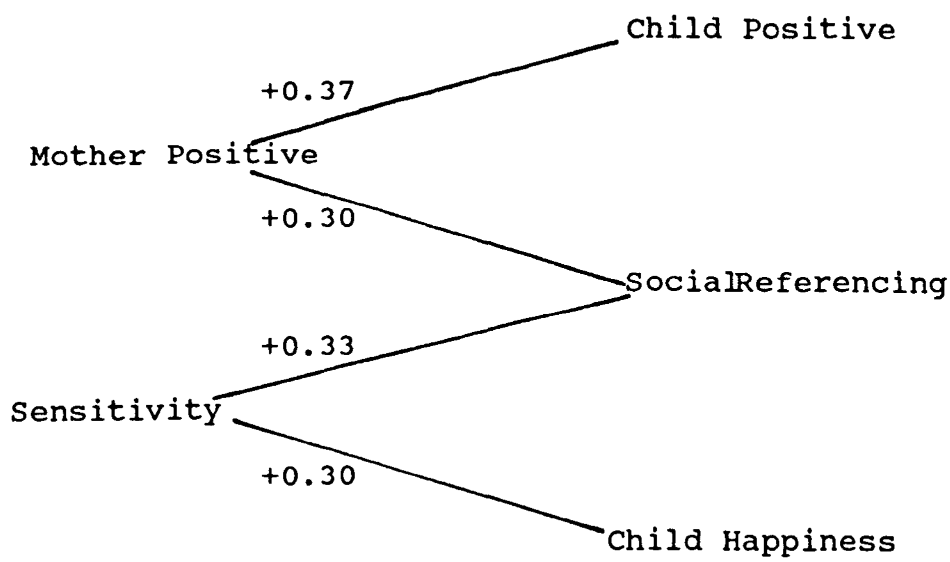
	Child +ve	Child Protests	Child Happiness	Child Follows	Child Initiates	Social Referencing	Sophistication of Play	Child Activity
Sensitivity			+0.30	+0.30	+0.34	+0.33		
Mother +ve	+0.37					+0.30		
Mother -ve								-0.30
Monitor								
Checks							-0.33	-0.31
Enable				+0.55				
Instructs								
Mother Links				+0.43				
Mother Follows				+0.52	+0.57			
Stops							+0.30	+0.42
Poor Timing								

NB. All correlations are significant to at least the 0.01 level.

activity level (r = +0.75). This is reflected in the tableassociation with mother behaviours. Children with more sophisticated play, who are also likely to be more active, are stopped more often by their mothers. Children with immature play, who are likely to be less active, are checked more often.

The second network of variables deals with social/affective interactions (Figure 6.10).

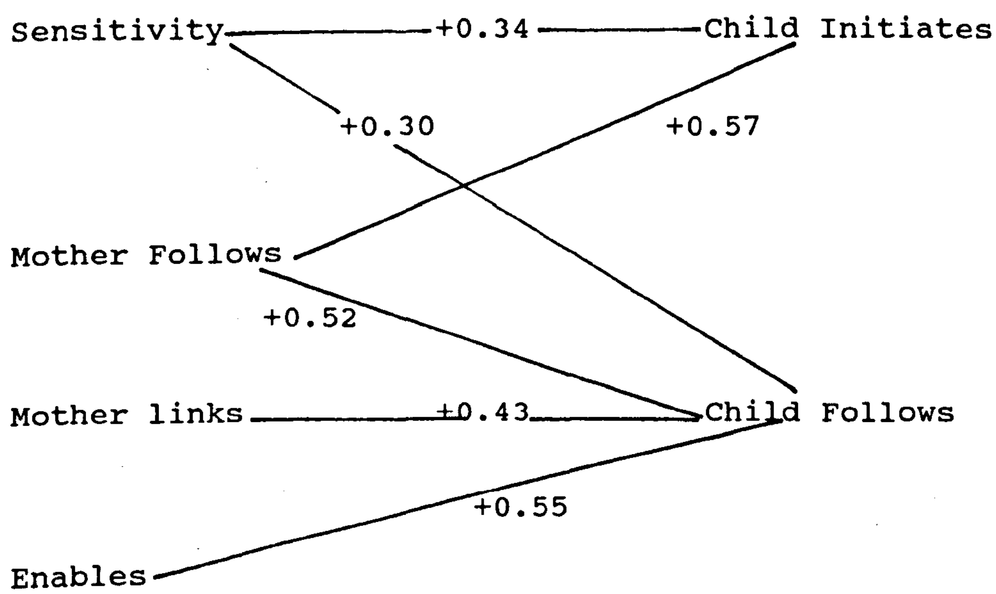
Figure 6.10 Correlation network focussed on social/affective interactions



A positive, sensitive mother is associated with a positive sensitive child. This may be due to the child mirroring mother behaviour. A sensitive mother is more likely to have a happy child who monitors the mother's state and behaviour. If the mother displays positive affective behaviour, the child sees this and would tend to display positive behaviours as well.

Finally Sensitivity is also linked with a network of play actions (Figure 6.11). As has been described above (See Figure 6.1), a sensitive mother tends to have higher levels of initiating, following and enabling behaviours. Figure 6.11 shows that the child of such a mother tends to mirror her behaviour, and also to have higher levels of child initiating and following behaviours.

Figure 6.11 Correlation network of variables focussed on play



To summarise, a sensitive positive mother is associated with a happy, aware child, and this is manifest in both their play behaviours.

It should be noted that one child variable and three mother variables remain in isolation. Suprisingly, protest is not linked with bad timing, nor high levels of instructing, nor with prohibiting behaviour. These variables act in more subtle ways in interaction, and will be discussed further in the next chapter.

Coded interactive play behaviours

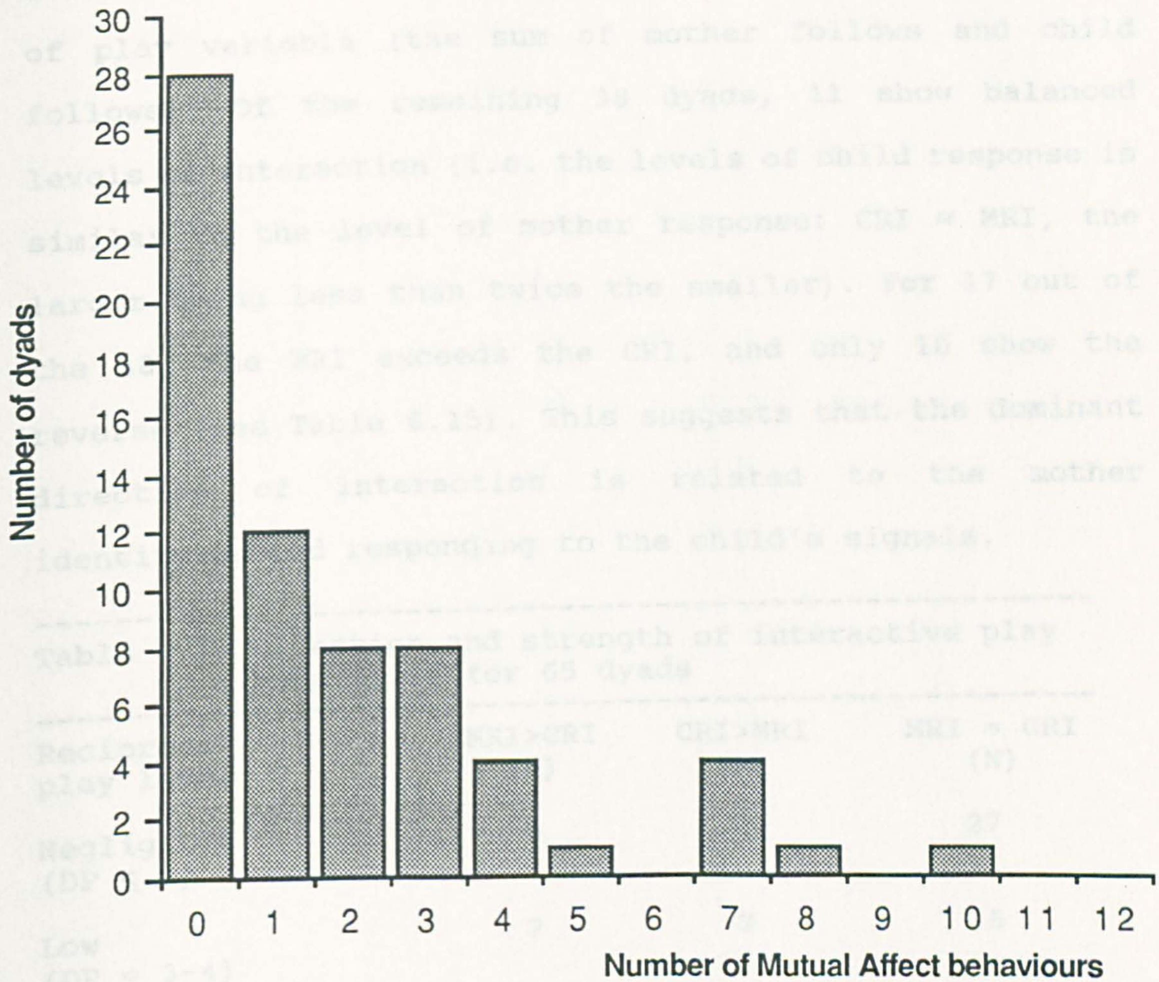
The ranges for each of the 5 interactive variables are displayed in Table 6.14, together with median and modal scores where these are applicable.

Table 6.14 Medians, modes and ranges of interactive behaviours for 65 dyads

Variable	Median	Mode	Range
Mutual Affect	1	0	0 -10
Diversity of Play (DP)	3	3	0 -18
Mother Response Index (MRI)	NA	NA	0 -10
Child Response Index (CRI)	NA	NA	0 - 7
Harmony (Hy)	9	8 & 11	3 -14

What is striking is the low level of affective interaction. 28 of the 65 dyads (43%) displayed no mutual affect at all during the whole of the coded play period. The skewed nature of the scores for this variable is illustrated in Figure 6.12. Furthermore the levels of innovative play amongst the mothers and infants is also low. The pairs do not seek to engage their partner in new play moves very often. 62% of the dyads engaged in 3 or less new play moves together over the 5 minutes of coded play. Overall it can be said that the whole sample displayed low levels of affect and did not engage in new reciprocal play very often.

Figure 6.12 Disribution of Mutual Affect behaviours displayed by 65 dyads during play



The dominant direction of interaction may be expressed by scores on the MRI and the CRI. A high proportion of the dyads show little or no play interaction. 11 out the 65 (17%) do not enter into any following behaviour at all, and a further 16 out of the 65 score 2 or less on the diversity of play variable (the sum of mother follows and child follows). Of the remaining 38 dyads, 11 show balanced levels of interaction (i.e. the levels of child response is similar to the level of mother response: CRI ≈ MRI, the larger being less than twice the smaller). For 17 out of the 38, the MRI exceeds the CRI, and only 10 show the reverse (see Table 6.15). This suggests that the dominant direction of interaction is related to the mother identifying and responding to the child's signals.

Table 6.15 Direction and strength of interactive play behaviours for 65 dyads

Reciprocal play level	MRI>CRI (N)	CRI>MRI (N)	MRI = CRI (N)
Negligible (DP ≤ 2)	0	0	27
Low (DP = 3-4)	7	7	5
High (DP ≥ 5)	10	3	6

This is reinforced when only the cases exhibiting high levels of diversity of play are examined (Table 6.15). 10 of these 13 relate to high levels of mother rather than child response rates. However, this is not a significant difference (Fisher's exact p = 0.12).

Table 6.16 Pearson correlations among 5 interactive variables for 65 dyads.

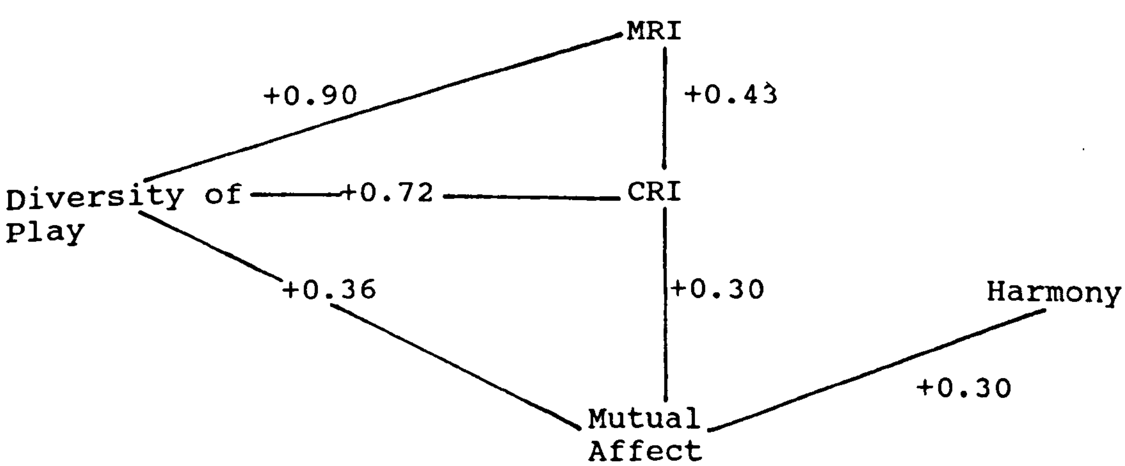
	MA	DP	MRI	CRI	Hy
Mutual Affect MA	.	+0.36		+0.30	+0.30
Diversity of Play DP		.	+0.90	+0.72	
MRI			.	+0.43	
CRI				.	
Harmony Hy					.

NB All correlations shown are significant to at least 0.01 level

In order to examine the relationships among the interactive variables, a bivariate Pearson correlation matrix was constructed (Table 6.16).

Examination of the matrix reveals moderate but significant positive correlations between Affect and Harmony, and between Affect and play behaviours. Not suprisingly, correlation of the MRI and CRI with Diversity of Play produces high coefficients. What is notable is the discrepancy between MRI and CRI correlations with Diversity of Play. The higher levels for the MRI (r = +0.90) than for the CRI (r = +0.72) again suggest that reciprocal play interactions depend more on mother than on child following behaviours (Figure 6.13).

Figure 6.13 Correlation network of interaction variables



It is noteworthy that the level of reciprocal play is not related directly to the harmony of the interaction. Those dyads where there is no reciprocal play (42% of the total) are not characterised by discord, which suggests that these mothers and infants are content not to interact.

Impact of disability on interactive behaviours

The interactive behaviour variables were treated in the same way as mother and infant variables to calculate high, middle and low terciles (Table 6.17). Then dyads with a disabled child were compared to dyads with no disabled child, on the basis of numbers in highest and lowest terciles. The only variable where there was any difference was Mutual Affect. 20% of the dyads with a disabled child were in the upper tercile compared to 30% of the control dyads. Whilst 52% of the pairs with a disabled child were in the lower tercile for Mutual Affect compared to only 35% of the pairs with no disabled child, this was not a significant difference (Fisher's exact p = 0.12). None of the other four variables (Harmony, Diversity of Play, CRI, MRI) approached significance (Table 6.18).

Table 6.17 Lower and upper tercile ranges for scores on the 5 interactive behaviour variables (total sample of 65 cases)

Variable	Lower tercile range (N)	Upper tercile range (N)
Mutual Affect	0-0 (26)	3-10 (17)
Diversity of play	0-1 (19)	5-18 (19)
MRI	0-0 (26)	1.33-10.3 (17)
CRI	0-0.2 (22)	1.1-7.1 (17)
Harmony	0-7 (17)	12-14 (13)

Table 6.18 Interactive Behaviour Variables against Disability

Variable	Children with disability High	Children with disability Low	Children without disability High	Children without disability Low	Statistics [1]
Mutual Affect	5	13	12	14	$X^2 = 1.58$
Diversity of play	9	8	10	11	$X^2 = 0.10$
MRI	6	8	11	18	$X^2 = 0.10$
CRI	7	12	10	10	$X^2 = 0.42$
Harmony	7	7	6	10	$X^2 = 0.55$

High means number in higher tercile
Low means number in lower tercile
1 No significant differences observed.

Relations between mother, child, and interactive variables

From the previous section it has been shown that there are essentially 3 areas of interaction, Harmony, Mutual Affect, and the initiation and following of play behaviours (DP). Mutual Affect has links with both Harmony and play behaviours, but the latter two are independent of each other. Figure 6.14 shows the relationships between mother and child behaviour variables and these three areas of interaction. The relationships, based on Pearson correlations, can be examined in three groups.

One network of behaviours centres on play (Figure 6.14). Mother and child play initiation and following behaviours are components of the MRI, CRI, and Diversity of Play interactive variables. Feeding into this network are

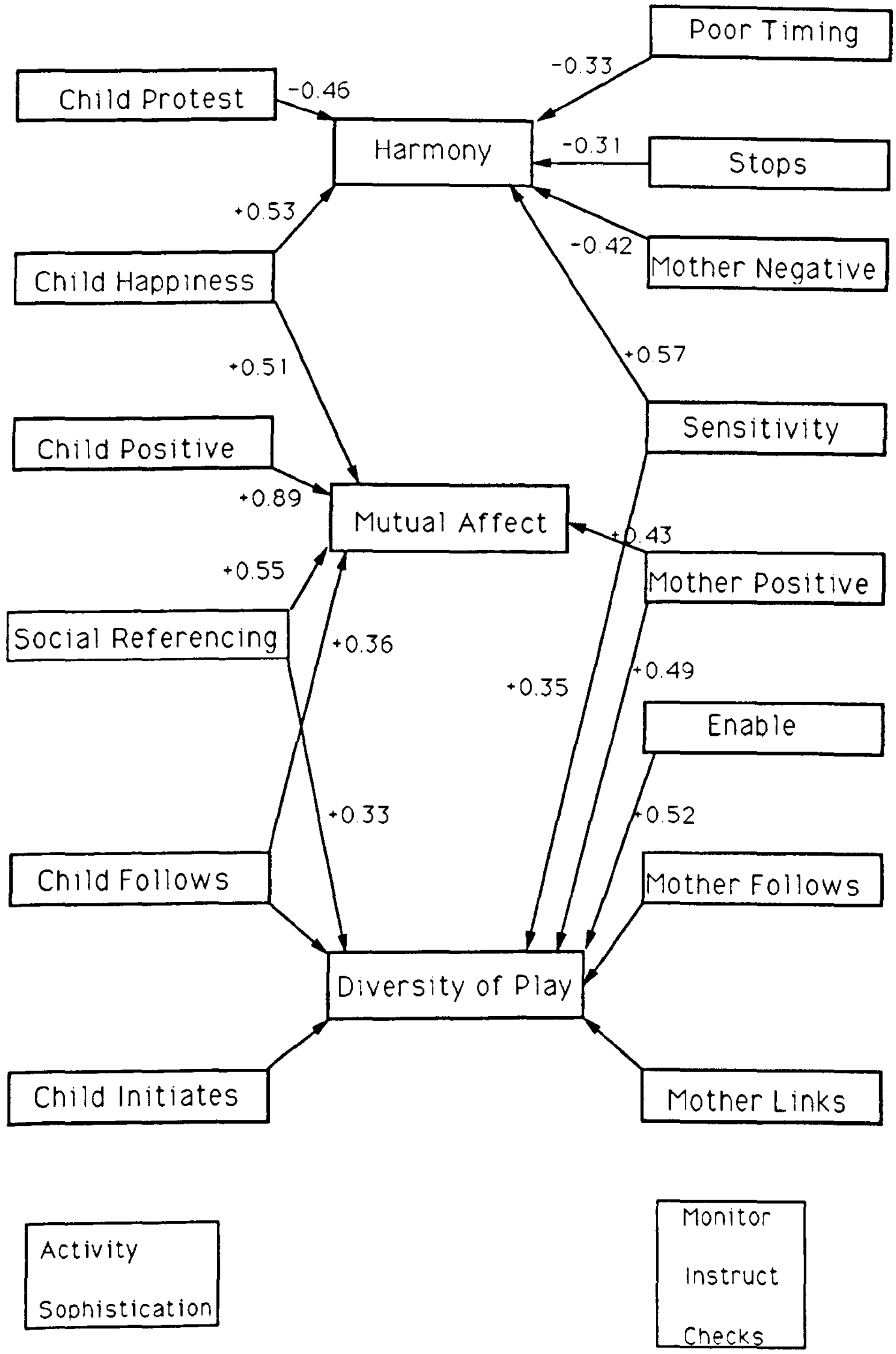


Figure 6.14 Relationship between Individual mother and child variables and the interactions of Harmony, Mutual Affect and Diversity of Play

setting behaviours that provide the environment for play to take place. A sensitive, positive mother who facilitates the child's actions, and a child who is aware of the mother's state and behaviour enable play interactions to proceed.

Mutual affect behaviours are a subset of Mother and Child Positive behaviours (Figure 6.14). Not suprisingly the three are linked. Mutual Affect is more dependent on the child's behaviours (r = +0.89) than on mother's (r = +0.43). Nearly all the child's expressions of positive affect result in mutual affect. The setting condition for Mutual Affect seems to be a child who is aware of the mother, whether this is in social referencing (r = +0.55) or child picking up on mother play initiations (r = +0.36). There is no direct link between Mutual Affect and Sensitivity, nor any of the other mother behaviours. Mutual Affect and mother's activities are not linked.

The final group of variables centres on the harmony of the play period (Figure 6.14). Harmony depends on the balance between positive and negative setting variables. A sensitive mother and a happy child contribute towards harmonious interactions. A child who protests contributes towards a discordant interaction, as does a mother displaying negative affect. However, how positive the mother and child are does not link directly with harmony. The mother's stopping the child's behaviours and the number of times she cuts across his ongoing play behaviours with her own activity also promote discord.

It is interesting to note that some mother and some baby behaviours do not link at all with any of the three networks described. On the child side, Sophistication of Play and Activity, both measures of developmental level, show no relationship at all with interactive variables. Three measures of mother's activity level, Monitor, Instructs and Checks, also do not correlate with any interactive variable. These 5 distinctive infant and mother variables do interact directly with one another (See section on Mother/Infant Variables Interaction above).

To summarise, it would appear that two of the interactive variable groups, mutual affect and the network of play interactions, duplicate and complement the direct interactions between mother and baby behaviours discussed in an earlier section of this chapter. The group of variables centered on harmony acts in a different way. In addition to these three groups, a further interaction is formed by direct links between variables describing developmental level (Activity and Sophistication) and variables measuring mothers' reactions to developmental levels (Checks, Monitors and Instructs). There are thus four interaction networks: one based on affect; one based on harmony; one based on play behaviours; and one based on child developmental level.

Influence of descriptive characteristics of mother and child on behaviour in play

A number of characteristics were examined for the mother and the child in Chapters 3 and 4. There were four mother descriptors - the mother's mental health as measured by the Malaise Inventory; the mother's personality as measured by the Eysenck Neuroticism and Extroversion/Introversion Scales; and the Psychosocial Adversity score of the mother. For the child there were three objective descriptors - level of difficultness measured by the score on the first factor extracted from the Bates' temperament data; the level of cognitive development as measured by the raw scores on the Bailey MDI (MDIR); and the level of motor development as measured by the raw scores on the Bailey PDI (PDIR).

This section examines first the relationships between these 7 variables and the 24 play behaviour variables derived from the video analysis. Secondly, the relationships between the 7 descriptive variables and the 3 primary networks of interactions, described in the previous section, are presented. In both cases the impact of disability is considered.

Table 6.19 shows the correlation matrix of the 7 predictor variables and the 24 play behaviour variables. Each correlation is given relating to the total sample (N = 65), then to the nondisabled and disabled groups (N = 40 and 25 respectively). Examination of the correlation matrix shows that there are low to moderate correlations between the 7 descriptor variables and a number of the behaviour variables. Because the correlations are moderate, a conservative level of significance, 0.01, was used initially. For the smallest group (N = 25) the lowest significant correlation coefficient was 0.3. For the other two groups 0.3 was then taken as the cut-off ($r^2 = 0.09$), thus eliminating very low but significant correlations for the largest group (N = 65), with explanation levels well below 10%.

Overall, the Mother descriptors (Malaise, Eysenck N, Eysenck E, and Psychosocial Adversity scores), as might be expected, have a closer relationship with Mother behaviour variables than with Infant behaviours. Similarly, the Infant descriptors (Bates Factor I scores, Bailey MDIR scores, and Bailey PDIR scores) are more closely related to Infant behaviour variables. However, it is evident that the predictor variables have varying degrees of influence, both on individual behaviour variables, and within the same play variable, depending upon which group is under consideration.

The mother's mental health, as measured by the Malaise Inventory, appears to have little impact. Where it does have an impact is almost exclusively with the disabled group. Mothers with high scores on the Malaise display low levels of positive affect, whilst mothers with low Malaise scores display higher levels of positive affect, but only if there is a disabled child present. Similarly where there is a depressed mother of a disabled child there are higher levels of discord in play, whereas mothers who are healthy have more harmonious interactions with their disabled children. The mother's mental health does not affect such interactions at all if her child is not disabled. In the infants there seems to be a differential response to the mother's mental health. In disabled children social referencing decreases with a depressed mother, whereas in nondisabled children, levels of activity are decreased.

Two aspects of the mother's personality were measured by the Eysenck Personality Inventory (EPI), extraversion/introversion and neuroticism. The former had less impact than the latter, but again what influences there were can be seen only on mothers of children with a disability, and on the children themselves. Mothers with high extraversion scores and their disabled children all show more affect, both positive and negative, and these infants overall are happier. The response to this seems to be more mother initiation of play and more child following. The reverse also is true. Introverted mothers and their children display low levels of affect and play together less. There is no relationship between extraversion/introversion and dyads with a nondisabled child.

Neuroticism, as measured by EPI-N, again has more impact on the group where disability is present. With a mother with a high neuroticism score, there are low levels of displayed affect, particularly in the mother, but also in the child. There is less mutuality in the positive affect that is shown. These mothers do not initiate play very often, which in turn leads to reduced levels of reciprocal play (Diversity of Play). When the infants do play, they do so in an immature way. Perhaps the mothers' worrying causes them to withdraw from their disabled children. The infants then mirror the mother's low level of play and happiness. Since this is correlational data, the reverse may also be true. Mothers with low N scores cope with the disability, initiating more play and displaying more affect. This then results in higher levels of reciprocal play and happier children who play at a more sophisticated level.

It may be that mothers with high neuroticism scores respond to level of disability more. Low values on the sophistication of play variable are often recorded for infants with the more severe disabilities. Thus mothers of the more disabled children may become more neurotic, which sets in motion the other behavioural reactions.

Children who do not have a disability react in a different way to mothers who are neurotic. Mother's higher level of neuroticism is related to low levels of child initiated play. There appears to be no impact of neuroticism on the affect level of either participant, if the child is not disabled.

The remaining variable, which measures the mother's level of psychosocial adversity, correlates well with almost all behaviour variables measured. Sometimes this is just with the group with a disabled child, sometimes with the group where no disability is present, and sometimes with both groups in the same way. For the whole group high levels of psychosocial adversity are associated with low levels of play activity behaviours on the part of both mother and infant. The mother instructs less and makes fewer initiations of new play. The child displays low levels of activity and follows the mother's initiations less often. Mothers with high scores on the adversity scale also display lower levels of positive affect. However, these overall lowered levels of behaviour are differentiated by the presence of a disabled child. Levels of correlation are higher with the group with a disabled child, than with the group where disability is absent.

Higher levels of adversity are associated with more immature play in disabled children. These infants also interact less with their mothers primarily because neither mother nor child initiates much play. The mothers overall seem to have withdrawn from play since they also do not instruct the children nor stop their activities. Such play interactions are less harmonious too. However, levels of sensitivity show no relationship to adversity in the presence of a disabled child.

Table 6.19 Pearson correlation matrix of 7 mother and child characteristics and 24 play behaviour variables for dyads with a disabled child, for dyads with no disabled child, and for the total sample.

		Ac	Sp	SR	CI	CF	CP	Pr	CH	Ss	M+	M-	ML	Mo	En	Ch	MF	In	St	PT	Hy	MA	CRI	MRI	DP
Mother	1	-.40																							
Malaise	2			-.36							-.46										-.36				
Inventory	3																								
Mother	1	-.39				-.32				-.36			-.36		-.30			-.39					-.32		-.30
Adversity	2	-.35	-.54		-.39	-.60					-.54		-.38				-.53	-.35	-.40		-.33		-.44	-.50	-.70
Score	3	-.37	-.34			-.44				-.32	-.38		-.36					-.35					-.36	-.31	-.43
	1				-.32												-.31								
EPI-N	2	-.37					-.39		-.45		-.44	-.41	-.50					-.44				-.39			-.35
	3				-.31								-.33												
	1													+.40											
EPI-E	2					+.41	-.35	-.35	+.47			+.37	+.57									+.43			
	3												+.30												
Child	1			+.34								+.33						+.36							
	2			-.38													-.39								
Temperament	3																	-.35							
	1	+.38	+.49				+.35		+.38												+.35	+.34			
MDIR	2	+.72	+.82	+.44	+.47	+.38	+.36									-.35			+.34	+.54					+.36
	3	+.68	+.73	+.38	+.36		+.30									-.47									
	1	+.44	+.44						+.36			-.33													
PDIR	2	+.66	+.71	+.35				+.34							-.37	-.39			+.40	+.41					
	3	+.67	+.69	+.32	+.32										-.35	-.49			+.34						

1 Dyads without a disabled child: 2 Dyads with a disabled child 3 Total sample of 65 dyads

Ac Activity, Sp Sophistication, SR Social Referencing, CI child Initiates, CF Child Follows, CP Child Positive, Pr Child Protest, CH Child Happiness, Ss Mother Sensitivity, M+ Mother Positive, M- Mother Negative, ML Mother Links, Mo Monitor, En Enable, Ch Checks, MF Mother Follows, In Instructs, St Stops, PT Poor Timing, Hy Harmony, MA Mutual Affect, CRI Child Response Index, MRI Mother Response Index, DP Diversity of Play.

This is not the case where the child has no disability. Here there is a similar pattern of lower levels of play if adversity scores are high but the mothers are also less sensitive to their infants (Table 6.19). They enable less and follow less too.

Perhaps these interactions are illustrating the position of play in situations of high psychosocial adversity. A child with disability in such a situation is particularly at risk, although the mothers do appear to have made some compensations in becoming more sensitive.

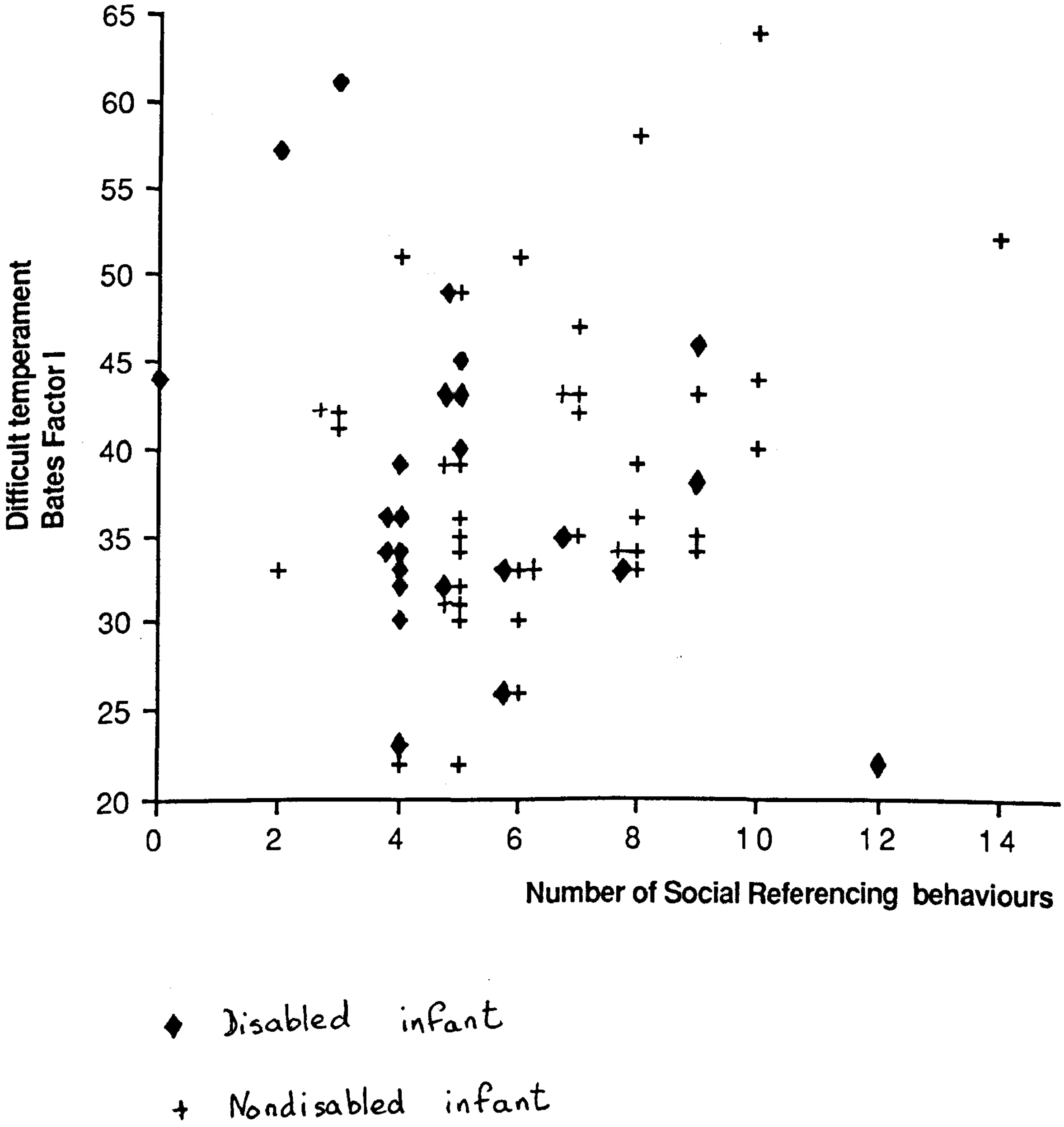
Turning to the infant predictor variables, it can be seen from Table 6.19 that these have very little relationship to interaction or infant play variables and are most important in the context of the behaviour of mothers with a disabled child. How difficult the child is temperamentally (Bates Factor I scores), has little impact on any of the behaviours observed in play. If a nondisabled child is difficult, then the mother reacts with higher levels of instructing behaviour and displays more negative affect. With a disabled child, the mother does not react in this way. If the infant is difficult the mother does not pick up on the child's initiations of play. Without disability, mothers of difficult children heighten their input into interactions; with disability present they tend to withdraw.

One apparently anomalous set of correlations must be examined, the relationship between difficultness and infant social referencing. Examination of the plot of these scores (Figure 6.15) shows that a small subset of individual children with very extreme scores, have an important influence, turning the correlations positively for nondisabled children, and negatively for disabled children. The remaining 55 children are clustered together with no apparent correlational trend (Figure 6.15).

The two remaining infant variables are both measures of developmental level, one physical (Bayley PDIR scores) the other cognitive (Bayley MDIR scores). They both act the same way in relation with the behaviour variables, though the relationships are strongest where there is disability present. Not suprisingly, the level of infant activity and sophistication of play are strongly related to developmental level, particularly so for disabled children; for example see Figure 6.16 which plots MDIR with Sophistication of Play. The cognitive developmental level is also directly related to levels of positive affect for all the children (Table 6.19).

The other relationships found pertain to disabled children and their mothers only. This suggests that it is lower levels of development that are of particular importance. Children who have low levels of both cognitive and physical development (ie. not only physically disabled but also cognitively delayed) do not show high levels of social referencing of the mother. Those who are just physically delayed are also the ones who do not protest much.

Figure 6.15 Relationship between infants' Social Referencing behaviour and difficult temperament (N=65)



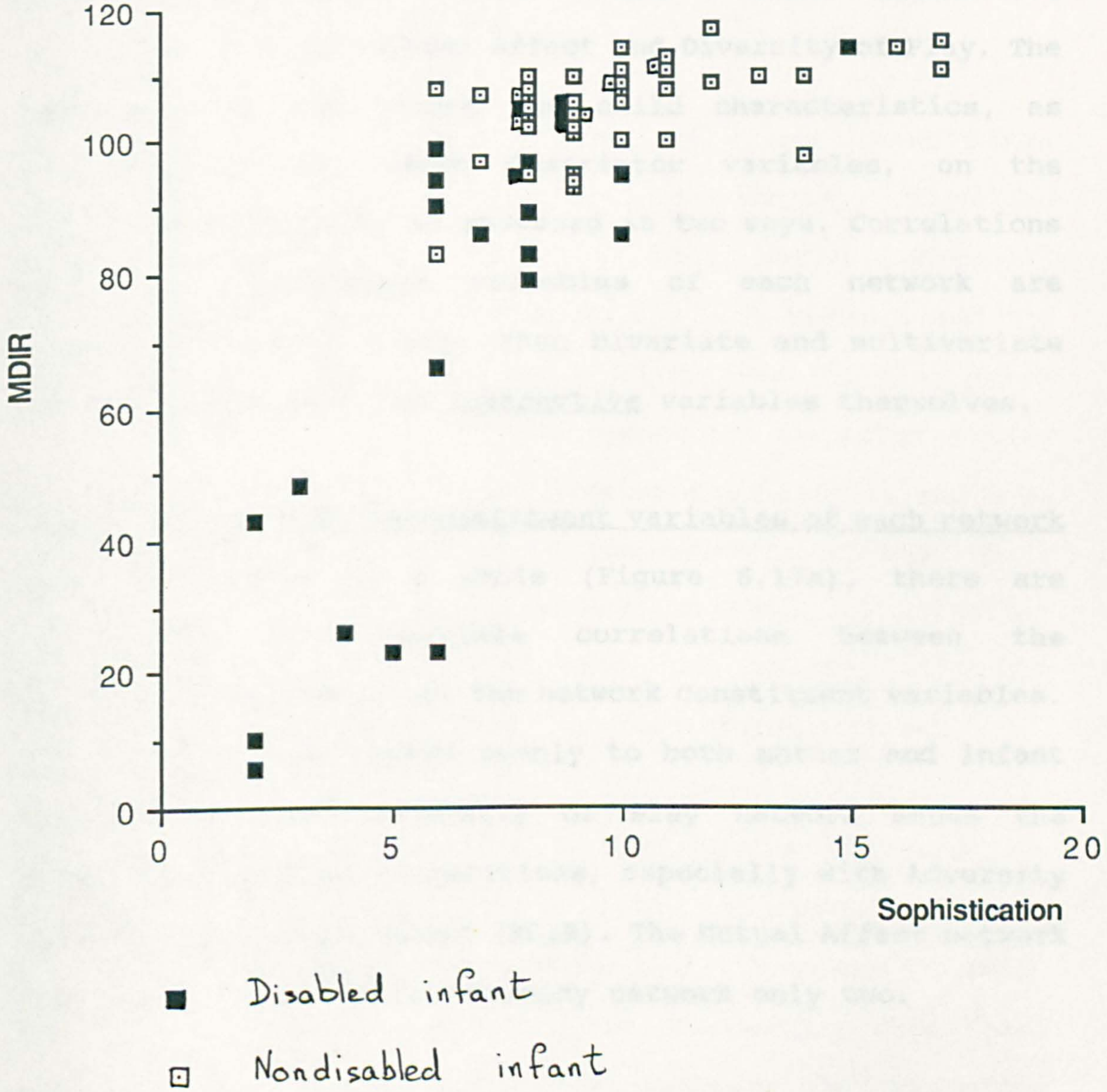
Lower levels of cognitive ability impede the children's play if they are disabled too. They initiate play less and follow the mothers' lead less.

The mothers of disabled children adjust their play behaviours to accomodate them. Low levels of physical development mean that the mothers enable the children to play more. If the child is both cognitively and physically delayed, the mothers check on their needs more. They are also more in tune with the children's play, not cutting across the children's behaviour inappropriately nor stopping the children's actions.

Mothers of nondisabled children respond differently. If the children score high on physical and cognitive scales, then the mothers are more likely to be sensitive in their interactions. However, mothers of children who are physically less able, but not disabled, are likely to exhibit higher levels of negative affect.

When the play interactions were observed directly, then only cognitive development was important. Mothers with nondisabled children who had higher cognitive scores had more harmonious interactions and displayed higher levels of mutual affect. For disabled children and their mothers, affect and harmony were not influenced by developmental level. Those who were cognitively delayed had lower levels of diversity of play though (Table 6.19).

Figure 6.16 Relationship between cognitive development and infants' Sophistication of Play (N=65)



Relationships between mother and child chartacteristics and the interaction networks

Six of the child and eight of the mother behaviours in play can be grouped into the three primary networks of interaction described earlier (Figure 6.14). Each interaction network centres around a coded interactive variable, Harmony, Mutual Affect and Diversity of Play. The influence of the mother and child characteristics, as measured by the seven descriptor variables, on the interaction networks is assessed in two ways. Correlations with the constituent variables of each network are considered (Table 6.19), then bivariate and multivariate relationships with the interactive variables themselves.

Correlations with the constituent variables of each network

For the sample as a whole (Figure 6.17a), there are relatively few bivariate correlations between the descriptor variables and the network constituent variables. The networks are linked evenly to both mother and infant descriptors. The Diversity of Play network shows the greatest number of correlations, especially with Adversity and cognitive development (MDIR). The Mutual Affect network has fewer links and the Harmony network only two.

The seemingly simple pattern that is displayed for the whole sample (Figure 6.17a) masks a more complex set of relationships that emerges when disabled and nondisabled groups are examined separately. For the nondisabled group (Figures 6.17b), the Diversity of Play network remains strongly linked to Adversity, but there is no relationship to developmental level (PDIR, MDIR). The Harmony network

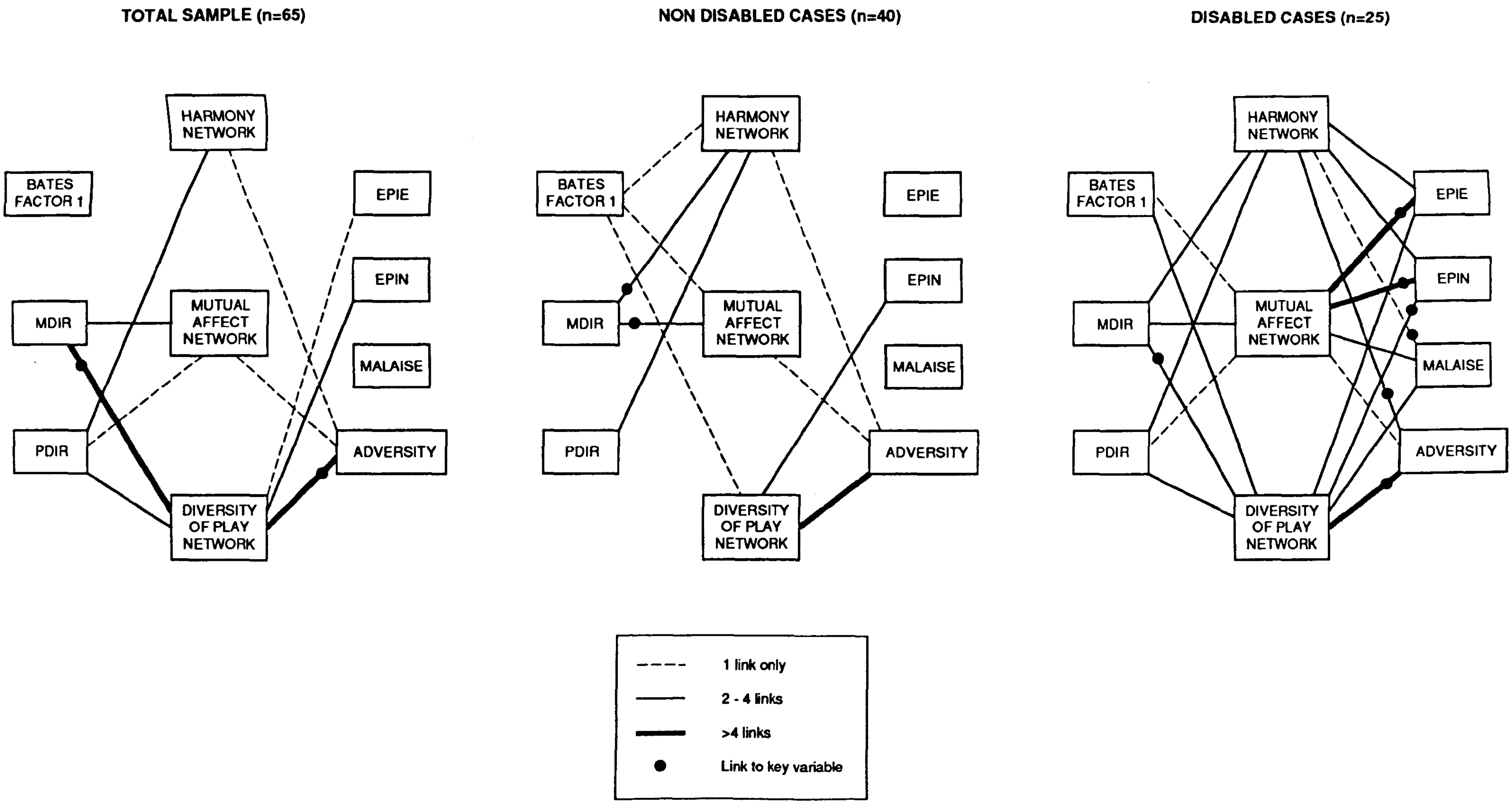


Figure 6.17 Relationships between 7 mother and child descriptor variables and the 3 interactive networks:

a) for total sample, b) for nondisabled cases, c) for dyads with a disabled child.

emerges as a focus of interaction, linking with all child descriptor variables, but there is only one link to the mother descriptors.

When relationships are examined for the disabled group alone, a completely different pattern is revealed (Figure 6.17c). All three networks are closely linked to both mother and child descriptors. Infant descriptors, especially the developmental variables, are correlated not only with the Diversity of Play network as might be expected, but also with the Harmony and Mutual Affect networks. However, the three networks are dominated by the mother descriptor variables. Though Adversity is again important, links with personality variables emerge, particularly with the Harmony and Mutual Affect networks. It is also noteworthy that it is only in the group with a disabled child that the mother's mental health (Malaise) is correlated with the interaction networks. This descriptor is linked to all three networks.

It is clear that in some cases the correlations are working in different directions between nondisabled and disabled groups (see above and Table 6.19). The main contrast that emerges is the mother's contribution to the interaction in the disabled group.

Relationships with the interactive variables

The relative contribution of the descriptor variables to interaction was examined through multiple regression. The lead variable (Harmony, Mutual Affect and Diversity of Play) from each of the three interaction networks was used in turn as the dependent variable (Table 6.20).

For Mutual Affect there were no significant correlations for the sample as a whole. For the disabled group the best prediction comes from mother's extraversion (EPIE), but for the nondisabled group comes from cognitive development (MDIR) with mother's neuroticism (EPIN) (Table 6.20).

Similarly, for Harmony there were no significant correlations for the sample as a whole. Once more the best predictive relationship for the disabled group differs from that for the nondisabled group. For the disabled group mother's mental health (MALS) provides the best equation. No other variables add to the explanation. For the nondisabled group the best explanation again comes from cognitive development (MDIR) and mother's neuroticism (EPIN) (Table 6.20).

For all three groups, the relationships with Diversity of Play are dominated by adversity (ADV). Only in the nondisabled group is the explanation improved by taking into account other variables, mother's neuroticism (EPIN) and mother's mental health (MALS) (Table 20). To assess the impact of variables other than Adversity on Diversity of Play, a separate set of regressions was run (Table 6.20). For the total sample and for the nondisabled group the best single predictor, in the absence of the Adversity variable, was mother's neuroticism (EPIN). In neither case did the level of explanation improve by the addition of other variables. For the disabled group the best single predictor was cognitive development (MDIR), but the explanation level

Table 6.20 Multiple Regression Analysis of Mother and Child characteristics and interactive play behaviours.

Mutual Affect (MA)
Total sample (n = 65)
Bivariate Relationship: No significant correlations
Multiple relationship: No significant correlations

Disabled cases (n = 25)
Bivariate Relationship: MA = -4.06 + 0.375 EPIE
$R = 0.43$; adj $R^2 = 15.3$; $s = 2.569$
Multiple relationship: No significant improvement

Nondisabled cases (n = 40)
Bivariate relationship: MA = -6.92 + 0.0803 MDIR
$R = 0.34$; adj $R^2 = 9.1$; $s = 1.600$
Multiple Relationship: MA = - 7.71 + 0.0791 MDIR + 0.818 EPIN
$R = 0.42$; adj $R^2 = 13.1$; $s = 1.565$

Harmony (Hy)
Total sample (n = 65)
Bivariate relationship: No significant correlations
Multiple relationship: No significant correlations

Disabled cases (n = 25)
Bivariate relationship: Hy = 10.0 - 0.213 MALS
$R = 0.35$; adj $R^2 = 8.8$; $s = 3.106$
Multiple relationship: No significant improvement

Nondisabled cases (n = 40)
Bivariate relationship: Hy = -3.85 + 0.124 MDIR
$R = 0.35$; adj $R^2 = 9.8$; $s = 2.387$
Multiple relationship: Hy = - 4.98 + 0.122 MDIR + 0.108 EPIN
$R = 0.41$; adj $R^2 = 16.9$; $s = 2.352$

Diversity of Play (DP)
Total sample (n = 65)
Bivariate relationship: DP = 5.85 - 0.591 ADV
$R = 0.44$; adj $R^2 = 17.8$; $s = 3.091$
Bivariate relationship (excluding ADV):
DP = 5.67 - 0.185 EPIN
$R = 0.28$; adj $R^2 = 6.4$; $s = 3.299$
Multiple relationship: No significant improvement
Multiple relationship (excluding ADV):
No significant improvement

Disabled cases (n = 25)
Bivariate relationship: DP = 6.45 - 0.764 ADV
$R = 0.67$; adj $R^2 = 42.2$; $s = 2.183$
Bivariate relationship (excluding ADV):
DP = 0.84 + 0.0337 MDIR
$R = 0.40$; adj $R^2 = 12.0$; $s = 2.693$
Multiple relationship: No significant improvement
Multiple relationship (excluding ADV):
DP = 1.83 + 0.0279 MDIR - 0.112 MALS
$R = 0.44$; adj $R^2 = 12.4$; $s = 2.687$ ($p=0.09$)

Nondisabled cases (n = 40)
Bivariate relationship: DP = 5.51 - 0.487 ADV
$R = 0.33$; adj $R^2 = 8.8$; $s = 3.571$
Bivariate relationship (excluding ADV):
DP = 5.88 - 0.200 EPIN
$R = 0.27$; adj $R^2 = 5.0$; $s = 3.644$ ($p=0.089$)
Multiple Relationship: DP = 15.4 -0.618ADV -0.268EPIN +0.339MALS
$R = 0.46$; adj $R^2 = 21.1$; $s = 3.504$
Multiple relationship (excluding ADV):
No significant improvement

Best equations shown, non significant correlations ($p>0.05$) omitted.

Variable list (see Table 6.19): ADV, Adversity: EPIE, Extraversion: EPIN, Neuroticism: MALS, Malaise: MDIR, Cognitive development.

was improved by also taking into account mother's mental health (MALS) (Table 6.20).

When the disabled and nondisabled groups are treated separately, the levels of explanation resulting from the multiple regression analyses ranged from 8.8% to 42.2% (Highest for the disabled group: predicting diversity of play from adversity). What is very clear from both analyses, the correlation analysis of the constituent network variables and the multiple regression analysis of the interactive variables, is the contrast between disabled and nondisabled groups. For the nondisabled group, infant descriptors are more prominent. For the disabled group the characteristics of the mother are more telling, particularly her level of adversity. The differences are most pronounced in Diversity of Play. These results fit very well with Sameroff and Chandler's model of the continuum of caretaking casualty (1975).

However, mothers and infants vary enormously, bringing a wide range of characteristics to interactions. Preterm birth or emerging disability in the child have been shown to modify interactions with mothers, but how this happens is not clear (see for example Greenberg and Crnic, 1988; Wasserman et al., 1985b). The results reported here suggest that the characteristics of mother and child are important but in different ways, depending on whether disability is present or not. Sameroff, Seifer and Elias (1982) have pointed out that the way that particular mothers come together with particular children is crucial to outcome. The next chapter will pursue this theme in depth.

CHAPTER 7

MOTHER-INFANT INTERACTION : THE SYNTHESIS

Introduction

The behaviours of the 65 dyads have been examined in Chapter 6. This was done first through considering mother and baby behaviours independently and then through an examination of interactive behaviours. Four correlation networks were identified that related the observed behaviours to one another. The influence of the independently measured characteristics of mothers and babies and of mother and baby behaviours, on interactive behaviours was also assessed. Some differences in the networks of relationships could be observed between disabled and nondisabled groups.

Numerous correlations, significant at the 0.01 level, were identified. However, these were of a moderate order with few exceeding 0.5. In other words, rarely was more than 25% of the variance explained by correlations within the networks. Although this may be satisfactory for identifying the structure of the networks (the relationships between behaviours), it would be inadequate to form the basis for prediction of mother/infant interactions.

To do this a more sensitive approach might be to characterise the types of mother and the types of baby, and then go on to identify the types of interaction that result from particular combinations. Rather than being based on the relationships between variables, through correlation and regression analyses, this approach requires the identification of characteristic styles of behaviour, through the classification of individual mothers and babies through their observed play behaviours.

There has been relatively little previous work on classification of mother and baby behaviours in play. Some (eg Cox et al. 1991, Murray, 1988), has been at the microanalytic level, with little synthesis of the results into a classification. One attempt at classification is that by the Harvard Preschool Project (White and Watts, 1973). Mothers were classified into three groups on the basis of the performance levels of their first child. The behaviours of the mothers in groups A and C were then studied in detail in relation to their second babies. This classification was therefore very simple, and aimed primarily at identifying optimal childrearing practices. Though David and Appell (1969) explored mother-child relationships through interaction studies, they identified 5 prototypical case studies, rather than establish empirical categories.

In order to identify characteristic styles of behaviour, this chapter therefore opens with a consideration of possible classification procedures. The advantages and shortcomings of a simple categorisation based on the observed interaction behaviours themselves, and of bivariate and multivariate classifications of mother and infant behaviours, are discussed. A choice is made to use a nonparametric tercile-based multivariate system. Using this system, five mother types and five baby types are identified and characteristic interactions between these are presented. Two conclusions emerge: first that most interactions are mother led, although some are baby led, and second that the match or mismatch between mother and baby is fundamental to the interaction. Only in this context can the impact of disability be fully understood.

Methodology

The focus of this chapter is interaction, expressed by the three directly observed play interaction behaviours; Mutual Affect, Diversity of Play, and Harmony. For this reason a classification procedure had to be devised that provides an explanatory framework for the observed interactive behaviours. This section on methodology starts with a simple classification of the interactions on the basis of the three interaction variables alone. It then considers the use of bivariate classifications of mothers and infants in the identification of interaction styles. It finally considers multivariate procedures, before identifying and describing the classification technique finally chosen, a nonparametric tercile-based multivariate system.

particular type of mother combines with any particular type of child to produce a specific kind of interaction needs a different approach.

Table 7.1 Classification of play interactions by combined tercile scores on Harmony, Mutual Affect, and Diversity of Play behaviours.

Harmony	Mutual Affect	Diversity of play	N	Dyad number
H	H	H	3	17,66,86
H	H	M	2	34,93
H	M	H	2	09,35
M	H	H	3	27,31,39
H	H	L	0	
H	L	H	0	
L	H	H	0	
H	M	M	1	59
M	H	M	6	21,48,49,52,69,73
M	M	H	6	14,16,19,22,23,51
H	M	L	1	18
H	L	M	2	44,74
M	H	L	2	41,43
M	L	H	2	45,89
L	H	M	1	54
L	M	H	2	10,11
M	M	M	4	56,60,78,92
H	L	L	1	81
L	H	L	0	
L	L	H	1	12
M	M	L	4	28,62,64,79
M	L	M	5	04,25,68,84,87
L	M	M	2	80,83
M	L	L	5	55,58,76,82,85
L	M	L	1	30
L	L	M	4	05,29,40,53
L	L	L	5	32,38,71,75,77

L = Low Tercile, M = Middle Tercile, H = High Tercile

Bivariate classification

There were 11 mother and 8 child behaviours observed individually. It ought to be possible to characterise mother/infant interaction on the basis of some or all of these.

The networks of behaviours that were described in Chapter 6 could be used. For the mothers two networks of behaviour variables were found, one centered on Sensitivity, the other on frequency of Instructs. These two variables tap very different aspects of maternal behaviour and were therefore appropriate to use as the basis for a bivariate classification of the mothers (Figure 7.1).

For the children there was only one network of behaviours. Within this, Sophistication and Activity have a high degree of covariance, and both reflect developmental level. It was decided to use one of these, Sophistication of Play, in the bivariate classification. Sophistication was not directly linked to the Positive Affect variable, nor to Child Protest, which was the only variable not linked to the network at all. In order to maximise the degree of independence, Child Happiness (the variable derived from Child Positive and Child Protest) was used as the other classification variable (Figure 7.2).

In both bivariate plots (Figures 7.1 and 7.2), there is a disparate peripheral distribution with a concentrated cluster of points at the core. Superimposed on the plots are lines representing upper and lower tercile values.

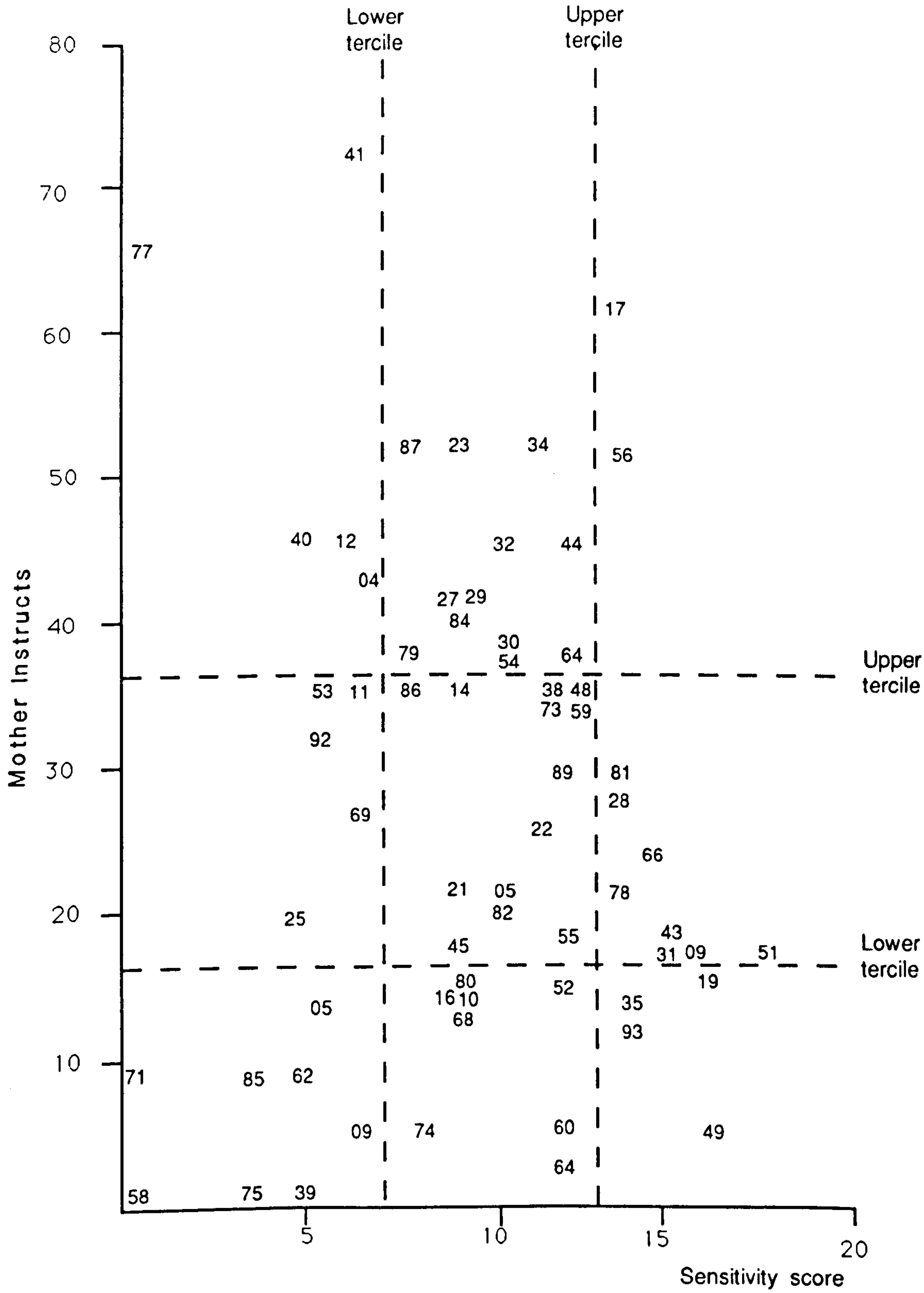


Figure 7.1 Nine cell classification of mothers using tercile categories

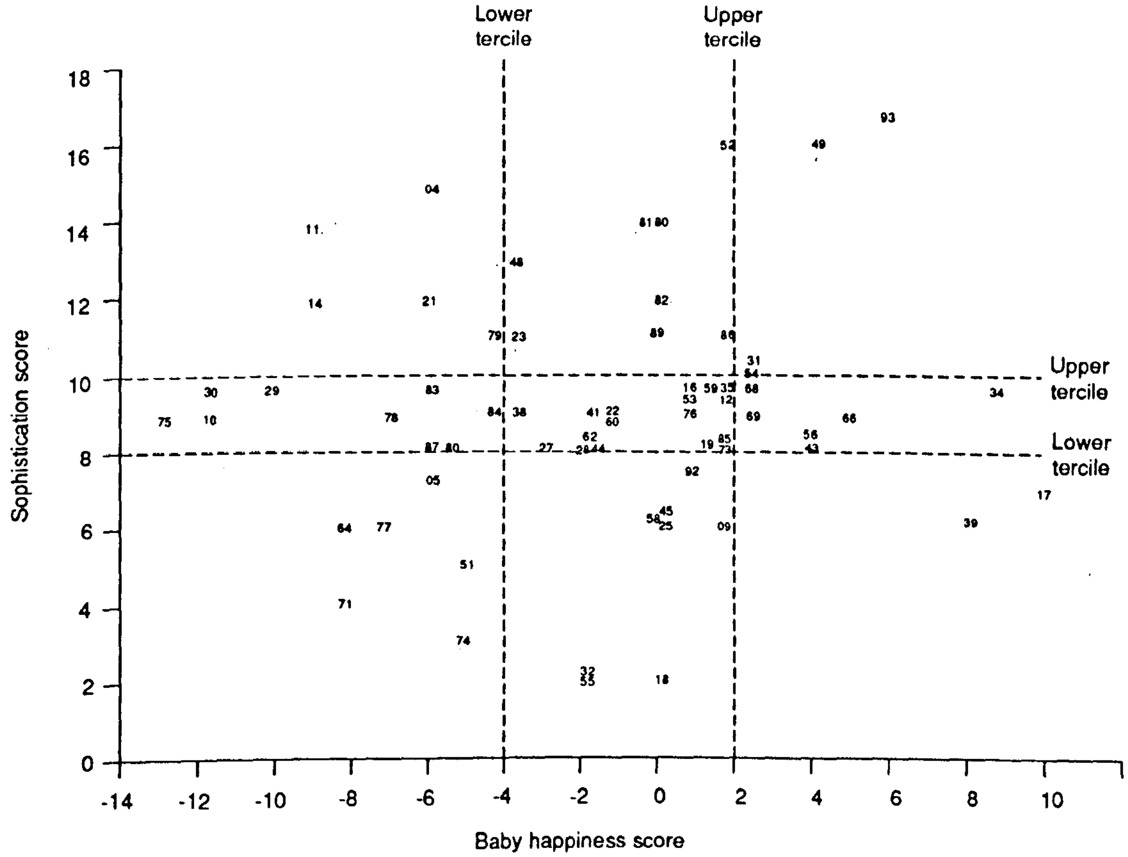


Figure 7.2 Nine cell classification of babies using tercile categories

Using tercile values as cut-off points, categorisation of mothers into nine types is possible (see Figure 7.1). This process separates mothers into groups on the basis of Sensitivity and activity (as reflected by Instructs). However, there are problems of interpretation. The numbers in the peripheral cells are small, for example only two mothers are categorised as Active/Sensitive and only four as Inactive/Sensitive. These low frequencies at the extremes, coupled with a bunching in the centre, make any possible comparison of types of mother very difficult.

Secondly, whilst the use of terciles gives an objective edge to each class of mothering behaviour, there are often problems at the class boundaries. Like can be split from like, whilst cells can link like with unlike. The impact of the class boundary problem is magnified by the system being based on only two variables.

For example Mothers 68 and 16 each score exactly the same for Sensitivity and exactly the same for Instructs. Therefore they would be classed the same as Moderately Sensitive/Inactive. These two mothers have very little else in common in their observed behaviours as Table 7.2 shows.

For only 5 out of the 11 variables do these two mothers share the same tercile. If the individual scores on each behaviour variable are examined, then striking differences are found. Mother 16 is more labile and enables her daughter to complete play behaviours herself. She also, by monitoring the child's behaviour, follows her initiations of play.

Table 7.2 Scores and tercile position for Mothers 68 and 16 on 11 mother behaviour variables

Variable	Mother 68		Mother 16	
	1	2	1	2
Sensitivity	9	Medium	9	Medium
Mother positive	5	Low	15	High
Mother links	4	Medium	4	Medium
Mother Follows	2	Medium	5	High
Enables	0	Low	4	Medium
Checks	0	Low	7	High
Monitors	0	Low	5	Medium
Stops	5	High	1	Medium
Instructs	14	Low	14	Low
Poor Timing	17	Medium	10	Medium
Mother Negative	0	Low	5	High

1 Score 2 Tercile

Mother 68 in contrast, displays little affect. She does not monitor nor check her son. She follows his initiations only twice and does not Enable his actions at all. Neither mother is particularly sensitive or insensitive to their baby, and they both issue the same number of instructions. By using only this bivariate classification, both these mothers are categorised as Moderately Sensitive/Inactive. Despite the very real differences in their mothering behaviour they are lumped together in the same class.

Finally to illustrate how groups of mothers with very similar bivariate scores are split by the use of tercile boundaries, two groups of mothers can be considered. Mothers 43, 09, 31, 19, and 51 have very similar scores on the two classification variables (see Figure 7.1), and would appear to have much in common. However, the location of the tercile boundary puts Mother 19 into a separate class. In other cases mothers whose scores are located at or very near tercile boundaries may well have more in common with the more or less extreme group. Mothers 53, 11 and 92 may have more in common with the Active/Insensitive mothers than with Mother 25, who in turn may be more similar to the group of Insensitive/Inactive mothers (see Figure 7.1).

Similar problems arise when the 9 cell categorisation of the infants is attempted (Figure 7.2). Using tercile scores as boundaries, it is possible to identify 9 groups of babies. Since the infants' behaviour scores cluster more towards the centre, the problems of using a bivariate classification are accentuated. Baby 52 has more in common with Babies 49 and 93 than with Baby 23 (see Figure 7.2). Babies 86, 31, 54 and 68 are much closer to the central core of babies than to the more peripheral members of their groups (see Figure 7.2).

It would appear that simple bivariate classifications of mothers and infants do not produce easily interpretable categories. A multivariate approach might be more sensitive.

Multivariate procedures

Using the 11 mother variables and 8 infant variables, it ought to be possible to define clusters of mothers and children based on how similar individuals are to each other.

The standard technique of cluster analysis is designed to deal with many variables simultaneously (Everitt, 1980). From an initial correlation matrix of all possible pairs, intercorrelated groups are extracted such that the correlation between all possible pairs which are members of the group is greater than, or equal to some arbitrarily selected level of correlation. There are a number of weaknesses with this method of clustering. Firstly, the degree of congruence required to accept or reject a member to or from a cluster is subjective. Secondly, the clusters arrived at all depend on the choice of the first "basic pair". The clustering depends very much on which two are chosen. If a different pair is used, then different clusters result. With a set of data, the solution ie. numbers of clusters, depends on the starting point. Furthermore, the method assumes normality and equal weightings for the data ranges.

The particular mother and child variables in this study were not in a form that was readily usable in cluster analysis. A number had somewhat skewed distributions; data ranges differed, and the combination of ratings and scores would have been difficult, if not impossible to standardise for use in multivariate parametric statistics.

Instead of using cluster analysis, a procedure for the derivation of a non-parametric similarity index was devised. The purpose of a similarity index is to compare each individual with every other individual, to give a similarity score for each pair. High scores indicate pairs with high degrees of similarity; low scores indicate pairs with little in common. Examination of the matrix of scores, built up in this way, allows individuals to be grouped together at pre-selected levels of similarity.

Similarity indices, based on the 11 mother behaviour variables and the 8 infant behaviour variables, have therefore been used in the classification of the mothers and babies respectively. At this stage disabled babies and their mothers were treated in exactly the same way as the nondisabled. The impact of disability is considered later.

The first step in constructing the mother similarity indices was to list the 65 mothers, and their tercile placings (high, medium or low) on each of the 11 mother behaviour variables. Individual mothers were then paired with every other mother. For each pair of mothers, the tercile placings on the 11 variables were compared. For each variable, a score of +1, 0 or -1 was recorded. If the mothers were in the same tercile, either high medium or low, they were allocated +1 for similarity. If they were in different terciles they scored zero for similarity, unless they were in opposite terciles, in which case they were allocated a score of -1. For each pair of mothers, the 11 variable scores were summed to give a total score for the similarity index. Perhaps this is best illustrated by an example. Table 7.3 shows the degree of similarity between Mothers 23 and 31.

Table 7.3 Similarity index score for Mothers 23 & 31, derived from terciles.

Variable	Mother 23	Mother 31	Similarity score
Sensitivity	Medium	Medium	1
Mother Positive	High	High	1
Mother Links	High	High	1
Enables	Medium	Medium	1
Mother Follows	High	High	1
Checks	High	High	1
Monitors	Low	Low	1
Stops	Low	Low	1
Instructs	High	High	1
Poor Timing	High	High	1
Mother Negative	Low	Low	1
		Total =	11

These two mothers with a similarity score of 11 are very similar to each other in the way that they were observed playing with their infants.

In contrast Mothers 17 and 43 scored -6 on the similarity index (Table 7.4). These two mothers have very little in common when playing with their children.

By considering all possible pairings a matrix of scores was built up, from which the groupings of mothers were derived. The maximum possible score would be +11, the two mothers would be in the same terciles as each other for all 11 behaviours. The minimum possible score would be -11, the two mothers would be in opposite terciles for all 11

Table 7.4 Similarity index score for Mothers 43 & 17, derived from terciles.

Variable	Mother 43	Mother 17	Similarity score
Sensitivity	High	High	1
Mother Positive	Low	High	-1
Mother Links	Medium	High	0
Enables	Low	High	-1
Mother Follows	Low	High	-1
Checks	Low	High	-1
Monitors	High	Low	-1
Stops	Low	Medium	0
Instructs	Low	High	-1
Poor Timing	Medium	High	0
Mother Negative	Low	High	-1
			Total = -6

variables. A score of zero would indicate a balance between similar and opposite terciles, the remaining behaviours registering differences no more than one tercile away from each other. A positive score would indicate more similar than opposite behaviours, a negative score the reverse (see Tables 7.3, 7.4).

From this matrix, pairs of mothers with the greatest similarity could be identified, starting with a threshold of pairs scoring +11, followed by +10, then +9 and so on. At each stage the web of similarity links grows more complex, and groupings of individuals begin to emerge. Eventually, the optimal threshold level is reached where any further reduction in threshold would result in a decrease in within-group coherence. For the mother similarity indices identified here, this occurs at a threshold score of +7, which results in the specification of five main groups of mothers. This procedure is illustrated diagrammatically on Figure 7.3.

Grouping mothers in this way worked well for all but 6 subjects. In these 6 cases, each individual mother scored no more than +6 in pairings with any other mother. For the purpose of categorisation, these mothers were linked to the mothers with whom they scored the highest.

The 65 infants can be categorised using a child similarity index derived in much the same way as the similarity index for mothers described above. Each infant was listed alongside his/her score and tercile on each of the 8 infant behaviour variables. A total similarity score was derived for each pairing of infants, based on comparison of tercile scores between pairs. In this way, just as for the mothers, a matrix of similarity scores was constructed. Because there were only 8 infant variables, the range of possible scores was from +8 (for infant pairs in the same terciles for all 8 behaviours), to -8 (for infant pairs in opposite terciles for all 8 behaviours).

The matrix was examined, and the threshold score of +6 identified. This process however left 10 children unconnected to any other infant, and 8 more infants linked only in pairs. For these 18 children their next order links (at a score of +5), were assessed and the children allocated accordingly. The procedure resulted in the specification of five groups of infants (Figure 7.4). The full tercile groupings on which the mother and infant similarity indices are based are given in Appendix V.

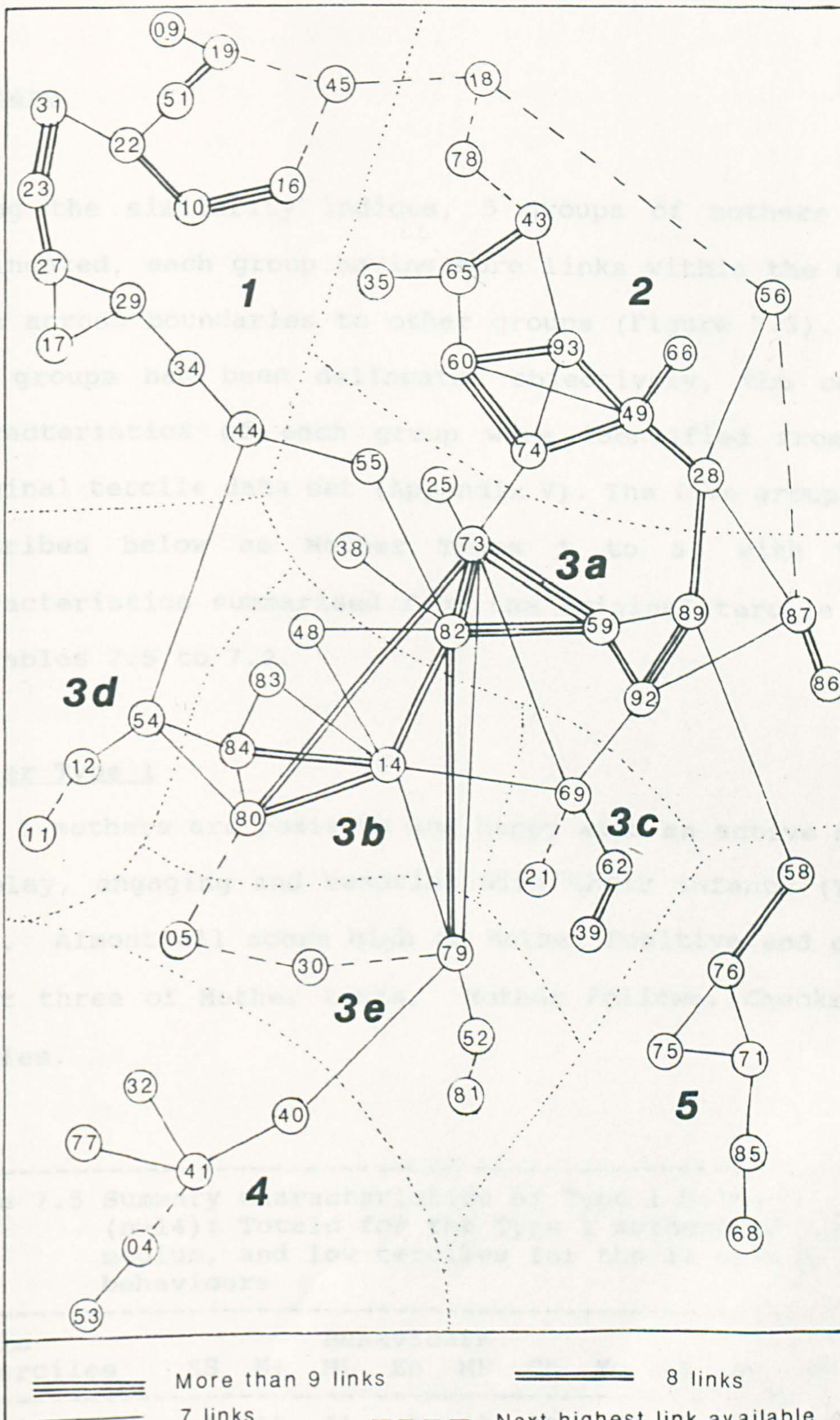


Figure 7.3 5 groups of mothers based on similarity index links.

Results : Classification of Mothers and Babies

Mothers

Using the similarity indices, 5 groups of mothers were delineated, each group having more links within the group than across boundaries to other groups (Figure 7.3). Once the groups had been delineated objectively, the common characteristics of each group were identified from the original tercile data set (Appendix V). The five groups are described below as **Mother Types 1 to 5**, with their characteristics summarised from the original tercile data on Tables 7.5 to 7.9.

Mother Type 1

Type 1 mothers are positive and happy with an active style of play, engaging and reacting with their infants (Table 7.5). Almost all score high on Mother Positive and on at least three of Mother Links, Mother Follows, Checks and Enables.

Table 7.5 Summary characteristics of Type 1 Mothers (n=14): Totals for the Type 1 mothers in high, medium, and low terciles for the 11 mother behaviours

Totals in terciles	Behaviours SS	M+	ML	En	MF	Ch	Mo	St	In	PT	M-
High	5	12	11	7	10	12	3	3	7	5	5
Medium	9	2	3	7	4	2	4	5	4	5	4
Low	0	0	0	0	0	0	7	6	3	4	5

SS= Sensitivity: M+= Mother Positive: ML= Mother Links: En= Enables: MF= Mother Follows: Ch= Checks: Mo= Monitor: St= Stops: In= Instructs: PT= Poor Timing: M-= Mother Negative. For definitions see Chapter 6 and Appendix IV.

At the core of Group 1 is Mother 22. Her behaviour is typical, down on the floor playing with her daughter. She is smiling and positive, praising her child's efforts. She rarely stops the infant's play, relying instead on different ways to play with the toys to distract her daughter and prevent her becoming bored. Sometimes her timing is poor and the odd negative comment creeps in, but overall play activity never lags and she appears to enjoy interacting with her daughter.

Away from the core group of Type 1 mothers, level of mother play activity, in particular Instructs, is very high. Because these mothers are so active, they also have more opportunities for poor timing. However, they are still very positive and warm. Right at the periphery are Mothers 44 and 45, who are less active than most of the Type 1 mothers, but who have more in common with group 1 than with any other group.

<u>Mother Type 2</u>

Type 2 mothers (Table 7.6) are quite distinct from Type 1. They tend to sit back and watch their infants (high Monitor), intervening as and when they think it is needed (low Stops). They are very attuned to their children's behaviours, but interact only in a very low key fashion. Emotionally, they are not demonstrative. They are very sensitive in their approaches to the child's play.

Table 7.6 Summary characteristics of Type 2 Mothers (n=12): Totals for the Type 2 mothers in high, medium, and low terciles for the 11 mother behaviours.

Totals in terciles	SS	M+	ML	En	MF	Ch	Mo	St	In	PT	M-
High	9	1	3	1	0	1	6	0	2	0	1
Medium	3	8	7	5	6	6	5	2	3	4	1
Low	0	3	2	6	6	5	1	10	7	8	10

(Behaviours)

For definitions of behaviours see Table 7.5

Typical of Type 2 mothers is Mother 49 who scores in the medium to low range for affect (medium Mother Positive; low Mother Negative) and low on initiating behaviours (Mother Links; Enables; Stops and Instructs). She watches her child's play and follows his leads when he initiates play (high Monitors; medium Mother Follows). Overall she scores very high on Sensitivity.

Again towards the periphery of the group there are mothers who have less in common with the core group. Two in particular merit discussion. Mother 18 does not link strongly with this group, in fact she links hardly at all with any mother in the whole sample. It is impossible to examine her style without reference to her infant, who is severely physically and mentally disabled. This makes it impossible for the mother to react to any infant behaviours since there are none (no score assignable on Enables; Mother Follows; Stops; Poor Timing). Her behaviours that can be scored are highly tuned to her child's capabilities. Soft voiced and gentle in her movements, she is a very sensitive mother. The closest group of mothers in style was group 2, who were also quiet, sensitive mothers.

Mother 28, though sensitive, is more active than core Group 2 mothers. She sits squarely on the boundary between Groups 2 and 3. It was decided to place her in Group 2 because her extreme scores were more similar to those of Group 2 mothers (high Sensitivity; low Poor Timing; low Mother Negative).

<u>Mother Type 3</u>

Type 3 mothers as a whole are characterised by scores on many different variables that lie in the middle ranges (Table 7.7). To borrow a phrase from Winnicott (1965), they are "good enough" mothers. Because this is such a large group (41% of the mothers), encompassing such a wide range of behaviours, several subgroups can be identified (Table 7.7).

Type 3a mothers are mid-tercile mothers for most behaviours, except for Mother Links and Stops where the majority were in the lower tercile. These are the moderate mothers. Mother 73 is typical. 10 of her 11 behaviours lie within the mid-tercile. Only Stops lies within the lower tercile. This is a mother who displays no extremes of behaviour.

Table 7.7 Summary characteristics of Type 3 Mothers (n=27): Totals for the Type 3 mothers (subdivided into Types 3a, 3b-d, 3e) in high, medium, and low terciles for the 11 mother behaviours.

Totals in terciles	SS	M+	ML	En	MF	Ch	Mo	St	In	PT	M-
Type 3, Total (n=27)											
High	1	2	6	3	3	4	6	7	6	14	5
Medium	18	22	15	16	14	18	13	9	16	11	10
Low	8	3	6	8	10	5	8	11	5	2	12
Type 3a (n=10)											
High	0	1	1	1	2	1	1	0	1	1	0
Medium	8	8	3	4	5	9	7	3	9	7	5
Low	2	1	6	5	3	0	2	7	0	2	5
Types 3b-d (n=12)											
High	0	1	3	2	1	3	1	3	3	11	4
Medium	7	9	9	9	8	5	5	5	6	1	2
Low	5	2	0	1	3	4	6	4	3	0	6
Type 3e (n=5)											
High	1	0	2	0	0	0	4	4	2	2	1
Medium	3	5	3	3	1	4	1	1	1	3	3
Low	1	0	0	2	4	1	0	0	2	0	1

For definitions of behaviours see Table 7.5

Groups 3b, 3c and 3d are also characterised by mid-tercile levels of behaviour, but almost all mothers in these sub-groups also display high levels of Poor Timing. A high proportion of their play with their children is not well attuned to the children's behaviour. Group 3c is distinctive in also being of low sensitivity. These mothers show low levels of monitoring the children's behaviour and checking on their needs. With group 3d mothers, of whom there are only three, behaviours start to exhibit more negative aspects, with high levels of intrusive behaviour (Stops, Instructs, Poor Timing). Two of the three also display high levels of negative affect. None are particularly warm. For example Mother 12, a 3d mother, has her own agenda for play, and this leads to her frequently stopping and cutting across her son's play. She does not wait to see what he will do (low Monitor), but she does frequently ask what he wants (high Checks). Sometimes she does manage to follow his initiations of play (medium Mother Follows). Overall, she tries very hard to play with her son but somehow never quite gets it right.

Group 3e mothers also have mid-tercile characteristics, in particular they do not show extremes of affect, neither positive nor negative. They are the most intrusive of the Group 3 mothers, with high levels of Stops, and medium to high levels of Poor Timing and Instructs. Though they do monitor their children, much of the time this does not lead to reciprocal play. Perhaps this is because these mothers are less sensitive to their children's cues. Perhaps they have different play agendas, which is indicated by their high to medium levels of poorly timed behaviours. Mother 79 is typical. She tended to alternate between bursts of instructions, showing the infant what to do and then sitting back watching. When she did play, sometimes the child picked up on her cues, but often she cut across the child's play already in motion. She rarely tuned in to the child's initiations of interaction.

Mother Type 4

Insensitivity is the distinguishing characteristic of Type 4 mothers (Table 7.8). They are critical (high Mother Negative, low to medium Mother Positive), bossy (low Mother Follows; medium Mother Links; low Monitor; high Instructs), and intrusive (low Monitor; high Instructs; high Poor Timing). Much of the interaction with their children consists of instructions and demonstrations, and when the children fail to comply with expectations, high levels of criticism.

Table 7.8 Summary characteristics of Type 4 Mothers (n=6): Totals for the Type 4 mothers in high, medium, and low terciles for the 11 mother behaviours.

Totals in terciles	Behaviours Ss	M+	ML	En	MF	Ch	Mo	St	In	PT	M-
High	0	0	1	0	0	2	2	1	5	4	5
Medium	1	3	3	3	2	2	0	4	1	1	1
Low	5	3	2	3	4	2	4	1	0	1	0

For definitions of behaviours see Table 7.5

Mother 41 lies at the centre of this group. She decided that her daughter would learn to use the toys in specific ways. She began by lining up the rings in size order, cutting across several attempts by the child to examine them. She then spent the time in demonstrating the toy and instructing the child in its use. Any attempt by the little girl to play with the rings was stopped. When the infant failed to accomplish the mother-set task, she was roundly critisised.

Mother Type 5

Type 5 mothers can best be described as noninteractive. They display low levels of all kinds of behaviour, both play and affect (Table 7.9). They do not initiate nor follow play. They do not show their children how things might work. Since they do so little they do not display poor timing. However, there is a great difference between these mothers and Type 2 mothers, who are also relatively inactive. Type 5 mothers "remove" themselves from the play situation. They may watch, but they are not part of an interaction. They are insensitive to the children's behaviours. A typical Type 5 mother was Mother 76. She sat her son on the carpet and placed the toy in front of him with the instruction for him to play with it. She then retreated to the sofa where she sat watching him. However, she was not watching in order to intervene as and when he needed help. Her role was rather that of a spectator. When he whimpered with frustration she sometimes commented to him to be a good boy or to entreat him again to play with the toy. At no point did she actually get down and play with him with the toy.

Table 7.9 Summary characteristics of Type 5 Mothers (n=6): Totals for the Type 5 mothers in high, medium, and low terciles for the 11 mother behaviours.

Totals in terciles	Behaviours										
	SS	M+	ML	En	MF	Ch	Mo	St	In	PT	M-
High	0	0	0	0	0	0	2	2	0	1	0
Medium	1	1	1	0	1	2	3	2	0	2	2
Low	5	5	5	6	5	4	1	2	6	3	4

For definitions of behaviours see Table 7.5

The two mothers who differ slightly are Mothers 85 and 68. They are essentially noninteractive in play, but they frequently stop their son's actions. Their own initiating of actions is usually poorly timed, and not geared to play with the toys.

To summarise, 5 types of mother were identified: 1) happy, active, playful mothers; 2) sensitive, low key mothers; 3) "good enough" mothers who do an adequate job; 4) negative, intrusive, bossy mothers who are generally insensitive; 5) noninteractive mothers who do little and show little affect.

Babies

Classification of the infants was carried out in the same way as for that of the mothers, again using the similarity index constructed for this study (Figure 7.4). 5 groups of infants were identified, each group member having more internal links in common than with infants in other groups. The infants were not as distinct in their behaviour patterns as were their mothers, and there are more links across boundaries. However, these are often at the weakest level. Once delineated, groups could be characterised by an examination of the original tercile behaviour data. The five groups are described below as Baby Types 1 to 5, with their characteristics summarised from the original tercile data on Tables 7.10 to 7.14.

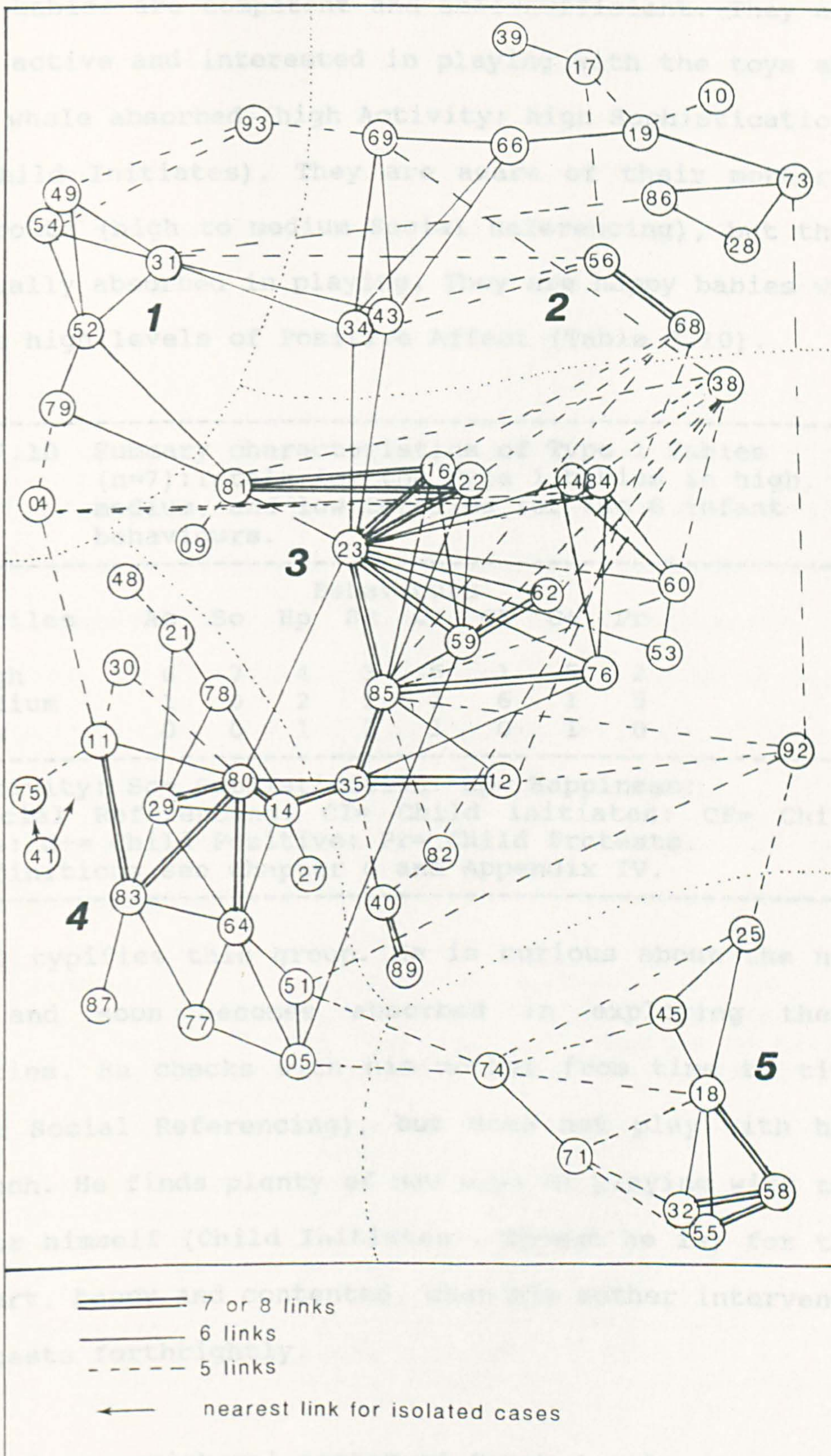


Figure 7.4 5 Groups of Babies, based on similarity index links

Baby Type 1

Type 1 babies are competent and self-sufficient. They are quiet, active and interested in playing with the toys and on the whole absorbed (high Activity; high Sophistication; high Child Initiates). They are aware of their mothers' whereabouts (high to medium Social Referencing), but they are usually absorbed in playing. They are happy babies who express high levels of Positive Affect (Table 7.10).

Table 7.10 Summary characteristics of Type 1 Babies (n=7): Totals for the Type 1 babies in high, medium, and low terciles for the 8 infant behaviours.

Totals in terciles	Behaviours Ac	So	Hp	SR	CI	CF	C+	Pr
High	6	7	4	3	5	1	5	2
Medium	1	0	2	2	1	6	1	5
Low	0	0	1	2	1	0	1	0

Ac= Activity: So= Sophistication: Hp= Happiness: SR= Social Referencing: CI= Child initiates: CF= Child Follows: C+= Child Positive: Pr= Child Protests.
For definitions see Chapter 6 and Appendix IV.

Baby 52 typifies this group. He is curious about the new toys, and soon becomes absorbed in exploring their properties. He checks with his mother from time to time (medium Social Referencing), but does not play with her very much. He finds plenty of new ways of playing with the toys for himself (Child Initiates). Though he is, for the most part, happy and contented, when his mother intervenes he protests forthrightly.

Baby 04 is a peripheral member of Group 1, placed here on the basis of a link only with Baby 79. However, he is a very competent, self-sufficient little boy who has much in common with the play style of Group 1. He differs greatly in that he is a sombre child, rarely expressing positive affect. He also does not check on his mother very much; in fact he ignores her at one point, turning his back on her so that he can continue playing at his own sophisticated level.

Baby Type 2

The babies of Type 2 are a happy, sunny-natured crowd (high to medium Happiness; high Child Positive; low to medium Child Protest). They are also sociable (high to medium Social Referencing; high to medium Child Follows). The capabilities of the babies vary, and the group as a whole is not particularly active, nor do the children play at a very sophisticated level (low to medium Activity; low to medium Sophistication)(Table 7.11). 5 of the 13 are physically disabled.

Table 7.11 Summary characteristics of Type 2 Babies (n=13): Totals for the Type 2 babies in high, medium, and low terciles for the 8 infant behaviours.

Totals in terciles	Behaviours Ac	So	Hp	SR	CI	CF	C+	Pr
High	1	1	9	9	5	6	11	1
Medium	6	10	4	4	7	6	3	4
Low	6	2	0	0	1	1	0	4

For definitions of behaviours see Table 7.10

Baby 66 is a typical member of this group. Not particularly skilled at fine motor control, he nevertheless is content to play at his level with the toys and to follow his mother's suggestions. He is a happy little boy, often with a big smile on his face, and he rarely protests vigourously. However, if things get too stressful he is quite capable of pushing his mother's hand away from the toy, or whimpering in protest.

Baby 10 has only a weak affiliation to Group 2, but the only links he does have are with Baby 19. He was placed in this group on the basis of this weak pairing and because his style of play (low Activity; medium Sophistication; high Child Initiates; high Child Follows) is similar to that of many members of Group 2. Baby 10 though is an unhappy, fraught little boy (low Happiness; high Protest). The combination of competent play style and unhappiness can only be explained by reference to his mother. Though she is active and initiating, she is also unpredictable. The coding scheme did not include ways to rate teasing behaviour, which this mother used. For example, she would offer the blocks to the child, then snatch them away saying "No, they're mine, and you shan't have them". When the boy was about to cry, she would invite him to play, with a big smile. This behaviour was mixed with high levels of initiating and following behaviour from her. The ambivalent style adopted by the mother was probably the source of the baby's unhappiness. He is unlike any other baby in the sample in this combination of play and affect behaviours.

Baby Type 3

The core group of babies of Type 3 is the most strongly linked of the five groups. Babies 38, 92, 82 40, and 89 have numerous links within the group and only two links across boundaries to other groups (Figure 7.4). All the babies have much in common in the way they play, and much of this behaviour is in the middle range (medium Activity, Sophistication, Child Initiates, Child Follows)(Table 7.12). Toward the peripheries particular behaviours deviate towards the extreme range, for example Babies 22, 16, 09, and 81 have a more sophisticated level of play. Socially Group 3 babies are also in the middle range. In mood they present a somewhat stoic front (medium to low Child Positive; medium to low Child Protest; medium to low Child Happiness).

Table 7.12 Summary characteristics of Type 3 Babies (n=20): Totals for the Type 3 babies in high, medium, and low terciles for the 8 infant behaviours.

Totals in terciles	Behaviours Ac	So	Hp	SR	CI	CF	C+	Pr
High	4	4	0	2	4	5	0	0
Medium	13	14	20	14	12	12	14	11
Low	3	2	0	4	4	3	6	9

For definitions of behaviours see Table 7.10

Typical of this group is Baby 23, who has all 8 of her behaviours scored within the mid-tercile. She shows no extremes of behaviour at all.

Baby Type 4

The infants of Type 4 are similar to those of Type 3, but their play behaviours are more mixed, with some children scoring in the high terciles and others in the low terciles. What distinguishes Group 4 is the level of unhappiness - all but three score in the low tercile for Happiness (Table 7.13). What is more, these are babies who protest - all but two are in the high tercile for Child Protest. The children are frustrated by the intervention of their mothers, and this is what provokes their protest behaviour. If left alone, they do not protest nor demand attention. Their capabilities vary from a child who is blind but quite sociable (Baby 51) through various levels of motor disability (Babies 14, 80, 64, 78, 11, 77 and 87) to very competent children (Babies 05, 83, 29, 27, 30, 48 and 75).

Table 7.13 Summary characteristics of Type 4 Babies (n=17): Totals for the Type 4 babies in high, medium, and low terciles for the 8 infant behaviours.

Totals in terciles	Ac	So	Hp	SR	CI	CF	C+	Pr
High	3	2	0	2	2	4	3	15
Medium	13	11	3	9	10	9	12	2
Low	1	4	14	6	5	4	2	0

For definitions of behaviours see Table 7.10

Group 4 is a well linked group on the whole, but mention must be made of Baby 41. This child had the fewest links to any other, and was only associated with Babies 75 and 11 at a similarity score of +4. Baby 41's contradictory behaviour pattern can be explained by reference to her environment. Her father is unemployed and the family live with the paternal grandmother in a small two bedroomed council flat. The three generations (and a large alsation!) spend most of their time in the living room which measures 12 feet by 12 feet. Observing the parents playing with Baby 41 on other occasions, it was obvious that she is their main interest and diversion in life. They spend their time together in this confined space and the result is a competition for the infant's attention. The child tends to ignore their overtures, alternating between smiles and whimpers of protest as she tries to play.

Baby Type 5

Type 5 babies form a distinct cluster with only three weak links outside. They cannot or do not do very much, and cannot or do not express emotion either. With a few exceptions they score in the lowest terciles for all types of behaviour (Table 7.14). All, except Baby 58, are severely motor disabled, and Babies 55, 32, 71, and 74 are also severely visually disabled. Five of the babies are very restricted in their range of movement, and cannot play independently with the toys.

Baby 71, who is blind, is actually quite mobile, but seemed not to know what to do with the toys, and ignored what was placed in her grasp, preferring to sit and rock herself to and fro as she sat. Baby 58 is not disabled, and has fairly good gross and fine muscle control. Again he seemed not to know what to do with the toys. He sat where his mother placed him, alternatively sucking on the rings or blocks or banging them together. Since his mother initiated no play, he could not follow her leads. The whole group showed little emotion, neither smiling nor protesting. The one exception was Baby 71 who wailed loudly when her mother interupted her self-rocking.

Table 7.14 Summary characteristics of Type 5 Babies (n=8): Totals for the Type 5 babies in high, medium, and low terciles for the 8 infant behaviours.

Totals in terciles	Ac	So	Hp	SR	CI	CF	C+	Pr
High	0	0	0	0	0	1	0	1
Medium	0	0	6	1	0	2	3	3
Low	8	8	2	7	8	5	5	4

For definitions of behaviours see Table 7.10

Thus 5 clusters of babies can be derived from the similarity matrix: 1) competent, self-sufficient babies; 2) happy, sociable babies; 3) stoic babies, of medium ability; 4) fraught, unhappy babies; 5) babies with low ability levels, and low levels of expressed affect.

Summary

To summarise, the 65 mothers can be categorised into 5 main types and the 65 babies can also be categorised into 5 types on the basis of their observed behaviours in play. Each member of each group is more similar to other members of that group than to a member of a different group. Thus the problems arising from the bivariate classification discussed earlier have been largely dealt with.

Discussion of classification

The classifications of mothers and babies delineated here are empirical, based on close observations of behaviours in play situations. Very clear differences in mother and in baby styles could be identified.

How far do the empirical categories reflect the attributes of the mothers and babies described in Chapters 3 and 4? The means for each of the mother descriptor variables, broken down by mother type, are shown in Table 7.15.

Table 7.15 Mean scores (SD) on 4 mother descriptor variables for the 5 Types of Mothers.

Mother Type	Eysenck E	Eysenck N	Malaise Inventory	Adversity Scale
1	15.1(4.6)	9.1(5.3)	3.3(3.7)	2.2(2.0)
2	15.8(3.1)	11.1(4.8)	4.4(5.3)	4.3(2.9)
3	15.9(3.7)	12.6(5.2)	4.9(4.3)	4.1(2.0)
4	16.5(3.4)	11.3(5.1)	6.2(5.9)	3.5(1.9)
5	13.2(4.4)	13.7(4.8)	4.7(2.7)	7.0(3.0)

There is a trend for Type 1 Mothers to be less neurotic and for Type 5 Mothers to be more introverted. Overall, though there are no significant differences between the types of mother on the basis of personality, as measured by the Eysnck Personality Inventory. Nor are there any significant difference between mother types according to how depressed the mothers were. Mothers with the less interactive styles, Types 2 and 5, were not more depressed than other types of mothers.

On the other hand, Mother types are distinguished by their levels of psychosocial adversity. Only 2 out of the 14 Type 1 mothers have high levels of adversity. This was a significantly different level to Type 2 ($t= 2.4$, $p= 0.05$), Type 3 ($t= 2.87$, $p= 0.01$), and Type 5 ($t= 3.60$, $p= 0.01$). They were not distinguishable from Type 4 mothers on the basis of their levels of adversity though.

Type 5 mothers were in disadvantaged psychosocial circumstances, 5 of the 6 had high levels of adversity. They were significantly different from Type 1 mothers ($t= 3.60$, $p= 0.01$), from Type 3 mothers ($t= 2.28$, $p= 0.05$) and from Type 4 mothers ($t= 2.45$, $p= 0.05$).

Baby types also reflect to some extent the baby characteristics that were described in Chapter 4 (Table 7.16).

The competent behaviour styles of the Type 1 babies are reflected in their cognitive developmental levels as measured by Bayley MDIR. These are significantly higher than Type 2 ($t= 3.15$,$p= 0.01$), Type 3 ($t= 3.05$, $p= 0.01$), Type 4 ($t= 2.44$, $p= 0.05$) and Type 5 ($t= 5.24$, $p= 0.001$).

The low level of physical development achieved by Type 5 babies (PDIR) is a reflection of their disabilities. However, the very large standard deviations found for both MDIR and PDIR show that the babies of Type 5 are by no means all severely disabled.

Table 7.16 Mean scores (SD) on 3 baby descriptor variables and Mother Psychosocial Adversity Scale for 5 Types of Baby.

Baby Type	Mental Development MDIR	Motor Development PDIR	Difficult Temperament Bates (FI)	Adversity Scale
1	111(5.3)	48(2.9)	36.7(9.3)	2.6(1.3)
2	100(8.5)	41(7.3)	38.9(10.2)	3.7(2.4)
3	102(9.7)	43(5.8)	37.2(6.7)	3.6(2.8)
4	94(27.5)	41(9.0)	38.8(7.5)	3.9(2.3)
5	48(33.5)	20(10.8)	42.4(13.2)	6.4(2.0)

In terms of the level of difficulty perceived by their mothers (Bates Factor I), the babies showed no significant differences from one type to another.

Since the mothers' levels of adversity were in many ways a reflection of the environment in which the babies were living, the impact of this variable on baby types was also examined. Type 1 babies come from homes with the lowest levels of psychosocial adversity, but they are only significantly different from Type 5 babies ($t= 4.36$, $p= 0.001$). In contrast Type 5 babies have significantly higher levels of adversity than Type 2 ($t= 2.76$, $p= 0.02$), Type 3 ($t= 2.94$, $p= 0.01$) and Type 4 ($t= 2.78$, $p= 0.02$).

Simple data derived from questionaires are not sufficiently sensitive to predict the distinct styles of mother and baby behaviour, defined by this classification. Only the adversity scale, a derived measure, and the objective

Bayley developmental assessments are reflected in the categorisation, and then only in a rather basic way. The clinical implications of this classification scheme will be discussed in Chapter 8, but first the interactions between mother and baby behaviours must be examined.

Results : Interactions

Now that the mothers have been satisfactorily classified into five main types and the babies also into five types, it is possible to consider which types of mother and baby commonly occur together, and what styles of interactions are characteristic of particular combinations of mother and baby types.

Table 7.17 shows that some combinations occur quite frequently, even dominating a particular mother or baby type. Others occur singly or in small numbers in an apparently random pattern. Some potential combinations just do not occur. The common occurrences and non-occurences may give some indication of the interaction processes at work.

For instance, Types 1 and 2 mothers occur with all baby types, but most commonly with Type 2 babies. Perhaps the happy sociable mien of these babies is itself partly a response to the positive mothering styles of these two mother types. Type 3a ("good enough") mothers are normally associated with ("average") Type 3 babies, whereas Type 3b mothers ("poor timers") are most commonly associated with "fraught" Type 4 babies (Table 7.17).

Equally important are the low or non-occurences. Competent, self-sufficient Type 1 babies are not associated with noninteractive, nonstimulating Type 5 mothers, nor do they have Type 3a, 3b or 3c mothers, who range from average to somewhat intrusive in style. Type 2 babies are not found with Types 3b, 3d, 3e and 4 mothers. In other words happy, sociable babies do not occur with intrusive, controlling or insensitive mothers (Table 7.17).

The style of interaction is characterised by the tercile classes on the three observed interactive behaviours, Mutual Affect, Diversity of Play, and Harmony. An assessment can now be made of the relative influence of mother and baby types on these three interaction variables. The contribution of each of the mother and baby types to the interaction will be considered in turn.

Table 7.17 Frequency of co-occurence of mother and baby types

	Baby Type 1	Baby Type 2	Baby Type 3	Baby Type 4	Baby Type 5	Totals Mother Types
Mother Type 1	1	4	5	3	1	14
Mother Type 2	2	4	2	2	2	12
Mother Type 3a	0	2	5	1	2	10
Type 3b	0	0	1	4	0	5
Type 3c	0	2	1	1	0	4
Type 3d	1	0	1	1	0	3
Type 3e	2	0	1	2	0	5
Mother Type 4	1	0	2	2	1	6
Mother Type 5	0	1	2	1	2	6
Totals Baby Types	7	13	20	17	8	65

The mother's influence on interaction

The influence of mother types on the interactive behaviours is shown on Table 7.18 and Figure 7.5.

Interactions involving **Type 1 mothers** are characterised by high levels of Diversity of Play (Table 7.18). These mothers find novel ways to explore and play with the toys. The ability level of the baby does not seem to be important, for these mothers can stimulate play even with severely disabled babies. For example, Mother ~~18~~ 17 has a son with hemiplegia and no trunk control. She propped him with pillows in a high chair, and placed the toys between them on the chair's tray. In this way she was able to facilitate his limited range of movements, and to develop with him several games with the toys. For Type 1 mothers levels of Harmony are medium to high across the range of baby types.

There are exceptions to these general observations of interactions with Type 1 mothers. The dyad involving Baby 10 has already been mentioned. Though there is a medium level of Mutual Affect between him and his mother, the interaction is fraught (low Harmony). The ambivalent teasing style adopted by the mother was probably the source of the fraught interaction.

Table 7.18 Influence of mother types on interactive behaviours

	Numbers in terciles		
	High	Medium	Low
Mother Type 1 (Happy, Active)			
Mutual Affect	4	7	3
Diversity of Play	11	3	0
Harmony	4	8	2
Mother Type 2 (Sensitive, Low key)			
Mutual Affect	4	7	1
Diversity of Play	2	6	4
Harmony	5	7	0
Mother Type 3 (Moderate)			
Mother Type 3a			
Mutual Affect	2	2	6
Diversity of Play	2	5	3
Harmony	2	7	1
Mother Type 3b			
Mutual Affect	1	3	1
Diversity of Play	1	4	0
Harmony	0	3	2
Mother Type 3c			
Mutual Affect	3	1	0
Diversity of Play	1	2	1
Harmony	0	4	0
Mother Type 3d			
Mutual Affect	1	1	1
Diversity of Play	2	1	0
Harmony	0	0	3
Mother Type 3e			
Mutual Affect	0	3	2
Diversity of Play	0	2	3
Harmony	2	1	2
Mother Type 4 (Insensitive, Bossy)			
Mutual Affect	0	1	5
Diversity of Play	0	3	3
Harmony	1	1	4
Mother Type 5 (Noninteractive)			
Mutual Affect	0	0	6
Diversity of Play	0	1	5
Harmony	0	4	2

Only three of the Type 1 mothers are in interactions which are characterised by low levels of Mutual Affect. In these cases the baby was diplegic with some upper limb involvement too. Because the infants lacked trunk control, the mothers propped them against their own bodies, between their knees. This meant that they could support the children in a sitting position, and have their hands free to play. Unfortunately this arrangement precludes any display of mutual affect, since the infant cannot see the mother's face, and lacks the ability to adjust position.

The interactions of **Type 2 mothers**, the quiet sensitive mothers, are characterised by Harmony. None have low levels, no matter what kind of baby they have. The more competent the infant the higher the level of Mutual Affect. The only example of low level of Mutual Affect is with a disabled child whose mother props him against her body. The diversity of the interaction tends to vary directly with the competence of the child. Half of the babies of Type 2 mothers are disabled, four of these severely. Where there are low levels of diversity, this is related to disability in the child. Perhaps a low key mothering style provides insufficient stimulation to overcome the child's difficulties. In the case of Baby 18, the baby is so disabled that she is incapable of responding. Play interaction possibilities with a child like this are severely limited.

It was found that while **Type 3 mothers** have some behaviours in common, the different characteristics of the subgroups did affect interactions. Type 3a mothers had broadly similar interactions with their babies, to Type 2 mothers, though Mutual Affect is lower. It is interesting to note that the most common type of baby of a 3a mother is a Type 3, the "average" mother with the "average" baby.

In terms of their play styles, Type 3b mothers differ very little from Type 3a mothers, and this is reflected in the similar levels of Diversity of Play that occur in the two groups. However, all Type 3b mothers but one, had Type 4 (fraught, unhappy) babies. These babies had more impact on the interaction than did Type 3 babies, resulting in lower levels of Harmony. The babies' state modifies the mothers' behaviour creating the distinctive subclass of Type 3b mothers.

Type 3c mothers are distinctive for their higher levels of Poor Timing and low levels of Checks and Monitors, however this lack of sensitivity to the baby did not appear to affect interactions. Mutual Affect on the whole is high, Harmony levels are moderate, and only in one case was the Diversity of Play low.

Thus the interactions involving Types 3a, 3b and 3c mothers are are quite similar.

There are only three Type 3d mothers, but they all have interactions with their children that are characterised by low levels of Harmony. Even with a Type 1, competent baby the intrusive mothering style produces fraught interaction (Dyad 54). In all three cases, Diversity of Play is high to medium, but there is no pattern to Mutual Affect. In many respects, Type 3d mothers are like Type 4 mothers, but not as extreme.

Type 3e mothers mark the transition between Types 3 and 4, and this is born out by the style of the interaction. With more competent babies (52 and 79) interactions are more affective and harmonious. With Type 3 and 4 babies the interactions are characterised by low Harmony, low to medium Diversity of Play and low or medium Mutual Affect. Dyad 81 (Type 3e mother: Type 3 baby) at first appears discordant, but the observed interaction was affected by the environment. The little boy had only just learned to walk, but had not mastered speed nor direction control. Along one side of the room was a rough, fieldstone, decorative wall about 18 inches high, topped with sharp edged slate slabs. This was a distinct hazard. There was also an unguarded fire alight. It is hardly surprising that the mother was worried about these, and did not display much positive affect as her son careened around the room. The child had great fun! This is an example of a sensitive mother who displays high stopping behaviour.

Though totally different mothering styles have been described for **Type 4 and 5 mothers** (above), the resulting interactions are very similar. No matter what the type of baby, low levels of interaction are characteristic in all three domains. With the least competent babies (Types 4 and 5), the lowest levels of overall interaction are observed, and even a happy Type 2 baby (Baby 68) can only improve interactions to the medium level. Thus, whether the mother is insensitive or merely noninteractive, levels of Affect, Diversity of Play and Harmony are low.

The baby's influence on interaction

If interactions are examined on the basis of baby types, different patterns emerge (Table 7.19, Figure 7.5). With **Type 1 babies**, the competent self-sufficient ones, Mutual Affect, Diversity of Play and Harmony are medium to high. This is especially true with Types 1 and 2 mothers. As the level of mother competence falls away, the levels of interaction also decrease. Dyad 04 (Type 1 baby: Type 4 mother) is characterised by medium levels of Diversity of Play and Harmony, but low levels of Mutual Affect.

Sociable, happy **Type 2 babies** have interactions characterised by high or at worst medium levels of Mutual Affect and Harmony. Diversity of Play varies depending upon the abilities of each child, but tends to reach medium to high levels.

Table 7.19 Influence of baby types on interactive behaviours

	Numbers in terciles		
	High	Medium	Low
Baby Type 1 (Competent, self sufficient)			
Mutual Affect	4	2	1
Diversity of Play	1	5	1
Harmony	2	4	1
Baby Type 2 (Happy, sociable)			
Mutual Affect	8	4	1
Diversity of Play	6	5	2
Harmony	4	8	1
Baby Type 3 (Medium, stoic)			
Mutual Affect	0	9	11
Diversity of Play	7	7	6
Harmony	5	11	4
Baby Type 4 (Unhappy, fraught)			
Mutual Affect	3	9	5
Diversity of Play	4	8	5
Harmony	1	8	8
Baby Type 5 (Low performers)			
Mutual Affect	0	1	7
Diversity of Play	1	2	5
Harmony	2	4	2

Two dyads with Type 2 babies have rather different patterns of interaction. The low Harmony in Dyad 10 has already been described. Baby 68's environment must be explained in order to understand the interactions observed. He is part of a three generation extended family in which he is the only male. His mother, a gruff voiced rather brusque lady, is the only member of the family who works outside the home, and Baby 68 is routinely cared for by his grandmother, aunt or older sister. His mother (a Type 5 mother) does not often play with him, but he is used to this and to her noninteractive style. Thus he remains positive and does not protest even though she does not play with him. They are not used however to interacting on an affective level. Hence the low level of Mutual Affect.

Type 3 babies have medium levels of competence. Types 1 and 2 mothers who stimulate this type of baby, produce high levels of Diversity of Play. However Diversity of Play was clearly mother led, since with less skilful mothers, Types 3, 4 and 5, only low levels of Diversity of Play were observed. With stoic Type 3 babies the level of Mutual Affect observed during play tends to be low (Table 7.17). The low levels of Mutual Affect can not be explained by disability as only 1 of the 20 babies was disabled. Overall, levels of Harmony tend to be in the medium range, no matter what type of mother is involved. The exceptions are where Type 3 babies have intrusive, bossy mothers, Types 3d and 4, where Harmony levels are low. Perhaps this is a reflection of relatively competent babies being thwarted in their play.

Interactions with **Type 4 babies** are striking for the relative absence of Harmony. With the more capable mothers (Types 1, 2 and 3a) Harmony reaches the medium level. With the poorest mothers (Types 3d, 3e, 4 and 5) it almost always in the low tercile. The only exception out of the 17 interactions is that with Baby 41 described above. Even with a Type 1 mother, these interactions can be characterised by low Harmony. For example, Baby 29 is particularly strong-willed, and negative behaviours are observed whenever she is invited to do anything she had not thought of for herself. Even with her sunny natured, active mother, Harmony is low.

Mutual Affect is moderate where Type 4 babies are paired with Type 1, 2 and 3 mothers. With insensitive mothers (Types 3e, 4 and 5) Mutual Affect levels are low. Diversity of Play interactions vary considerably from high to low, reflecting in part the mothering styles of Types 1, 4 and 5 mothers.

9 of the 17 Type 4 babies are disabled. It may well be that these babies are frustrated in their efforts to play, which in turn is responsible for the fraught nature of their interactions. However, the 8 babies who are not disabled also show high levels of obstreperous behaviour. The behaviour of both disabled and nondisabled Type 4 babies is similar, and the interactions are fraught in one way or another.

Finally **Type 5 babies**, who because of their disabilities could contribute very little, are in dyads characterised by low levels of interaction. Levels of Mutual Affect are very low, mainly because the mothers do not position their babies in such a way that mutual affect behaviours can take place. The one exception, Baby 18, sat sideways on her mother's lap and then medium levels of Mutual Affect were observed. With Type 1, 2 and 3a mothers who have adapted to their babies' disabilities, levels of Harmony are medium to high. With insensitive mothers (Types 4 and 5), Harmony is low. The levels of Diversity of Play, which are low, reflect the limiting nature of the babies' disabilities. Mention should be made of Baby 58, who is the only Type 5 baby displaying no functional motor disability. This family is very poor, and there are few age-appropriate toys in evidence in the house. His mother was severely depressed throughout his first year of his life. During the video assessment she literally did nothing except stare at the floor. The baby sat on the floor beside her and did not move, not even to wriggle about. He "played" with the rings and blocks, in that he mouthed and sucked on them and banged them together. At no time during the play session was there any real interactive contact made between mother and infant. Harmony was scored as medium in this case, since there was no disharmony observed. The mother appeared indifferent to her son, and he appeared to have learned not to "bother" her.

Summary

Having looked at the 5 mother and the 5 baby types, it is clear that they have a differential impact on interaction. The three areas of interaction can be examined separately. The primary influence on the level of **Diversity of Play** is the type of mother (Table 7.20). If there is a Type 1 mother present then levels of Diversity of Play are high. Interactions involving Types 3e, 4 and 5 mothers produce only low levels of Diversity of Play. Baby type appears to have little effect, except that most dyads with a child with severe disability (baby Type 5) are part of interactions that are low in Diversity of Play.

Table 7.20 Diversity of Play: mother and baby types, numbers in terciles.

	High	Medium	Low		High	Medium	Low
Mother				Baby			
Type 1	11	3	0	Type 1	1	5	1
Type 2	2	6	4	Type 2	6	5	2
Type 3a	2	5	3	Type 3	7	7	6
Type 3b	1	4	0	Type 4	4	8	5
Type 3c	1	2	1	Type 5	1	2	5
Type 3d	2	1	0				
Type 3e	0	2	3				
Type 4	0	3	3				
Type 5	0	1	5				

In contrast, **Mutual Affect** is much more strongly influenced by baby style (Table 7.21). Low levels of Mutual Affect are observed in the interactions of only 2 of the 20 Type 1 and 2 babies. In contrast, only 3 of the 45 Type 3, 4 and 5 babies are in interactions with high levels of Mutual Affect. The mothers do still influence the level of Mutual Affect in that Type 4 mothers (controlling, intrusive) and Type 5 mothers (noninteractive) are in interactions characterised by low levels of Mutual Affect, whilst the more skilful mothers, Types 1 and 2, are in interactions where Mutual Affect is at a medium to high level.

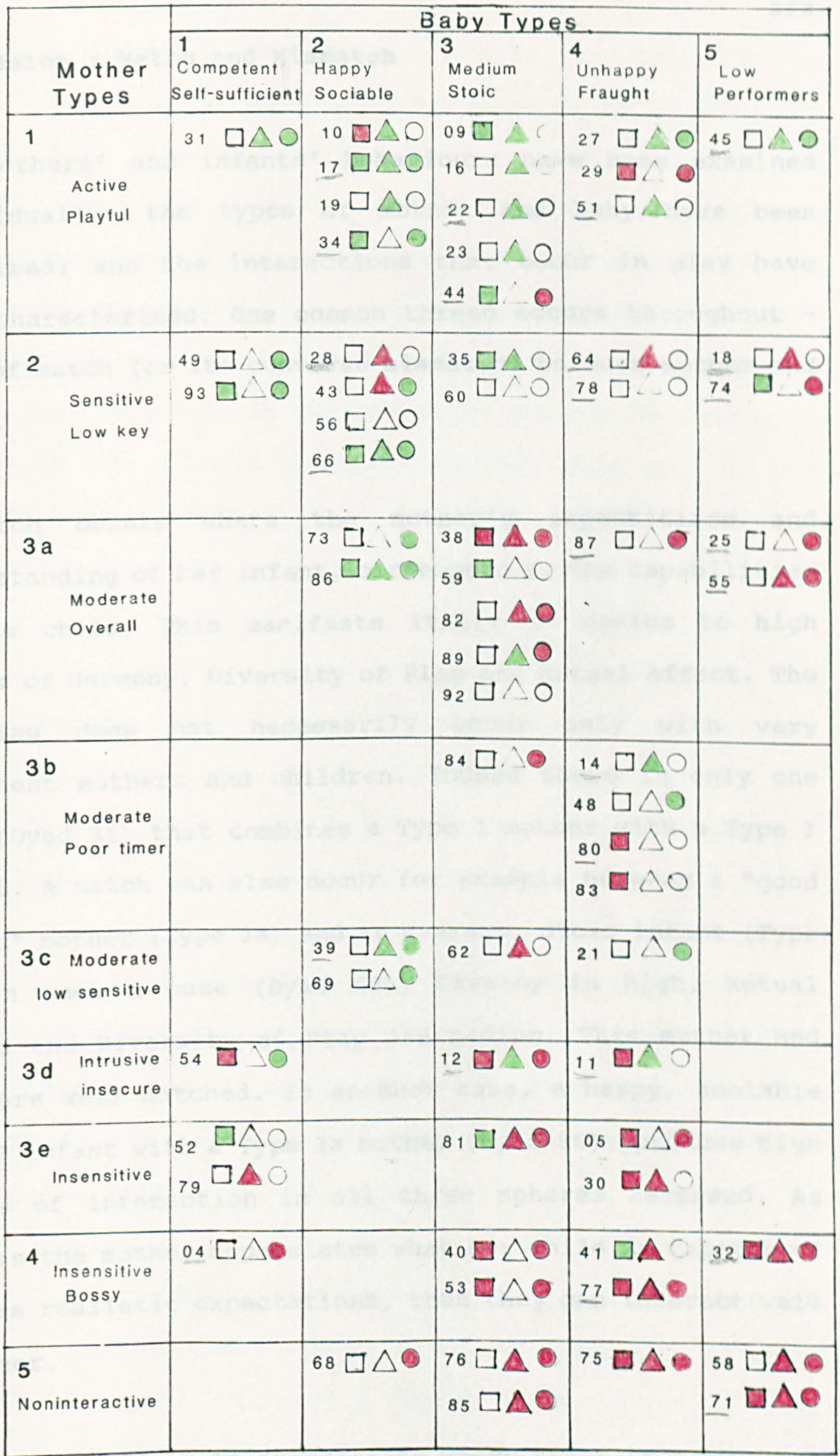
Table 7.21 Mutual Affect: mother and baby types, numbers in terciles

Mother	High	Medium	Low	Baby	High	Medium	Low
Type 1	4	7	3	Type 1	4	2	1
Type 2	4	7	1	Type 2	8	4	1
Type 3a	2	2	6	Type 3	0	9	11
Type 3b	1	3	1	Type 4	3	9	5
Type 3c	3	1	0	Type 5	0	1	7
Type 3d	1	1	1				
Type 3e	0	3	2				
Type 4	0	1	5				
Type 5	0	0	6				

The **Harmony** of the play interaction again shows the importance of the mothering style (Table 7.22). Very few of the Type 1, 2 or 3a mothers are in discordant interactions (low Harmony), whilst only one of the Type 4 and 5 mothers is found in a harmonious interaction. The impact of the baby style is less important for Harmony. Not suprisingly Type 4 babies, the unhappy, fraught children, are most often found in discordant interactions, though this is not necessarily causal. It may well be that the discordant relationships in play are the trigger for the babies' unhappiness.

Table 7.22 Harmony: mother and baby types, numbers in terciles.

	High	Medium	Low		High	Medium	Low
Mother				Baby			
Type 1	4	8	2	Type 1	2	4	1
Type 2	5	7	0	Type 2	4	8	1
Type 3a	2	7	1	Type 3	5	11	4
Type 3b	0	3	2	Type 4	1	8	8
Type 3c	0	4	0	Type 5	2	4	2
Type 3d	0	0	3				
Type 3e	2	1	2				
Type 4	1	1	4				
Type 5	0	4	2				



□ Harmony △ Diversity of Play ○ Mutual Affect

Green indicates upper tercile, open symbols middle tercile, red lower tercile.

Figure 7.5 Occurence of Mother and Baby Types, by dyad, showing terciles for interaction variables.

Discussion : Match and Mismatch

The mothers' and infants' behaviours have been examined individually; the types of mother and baby have been described; and the interactions that occur in play have been characterised. One common thread occurs throughout - that of match (or its converse mismatch) between mother and child.

A match occurs where the mother's expectations and understanding of her infant, correspond to the capabilities of the child. This manifests itself in medium to high levels of Harmony, Diversity of Play and Mutual Affect. The matching does not necessarily occur only with very competent mothers and children. Indeed there is only one dyad (Dyad 31) that combines a Type 1 mother with a Type 1 infant. A match can also occur for example between a "good enough" mother (Type 3a) and an average, stoic infant (Type 3). In such a case (Dyad 59), Harmony is high, Mutual Affect and Diversity of Play are medium. This mother and baby are well matched. In another case, a happy, sociable Type 2 infant with a Type 3a mother (Dyad 86), produce high levels of interaction in all three spheres assessed. As long as the mother appreciates what her child is capable of and has realistic expectations, then they can interact well together.

Interactions begin to deteriorate where there is a mismatch between mother and infant. This is observed in heightened levels of discord (Low Harmony), and in lowered levels of Mutual Affect and Diversity of Play. In cases of mismatch either the needs of the baby are not met or the expectations of the mother are unfulfilled. Understimulation in one form or another is usually the reason for the baby's needs not being met. This can result when the mother is suffering from depression, in which case she is so wrapped up in her own needs she has no energy to devote to her child's. The most extreme case of this has already been described (Dyad 58, Type 5 mother: Type 5 baby).

Secondly, the mother's style can be too restrained for the baby, leading to lack of stimulation. Not engaging the child leads to low levels of interactive play, low expressions of affect and heightened discord (for example in Dyad 38, Type 3a mother: Type 3 baby).

A third kind of mismatch can occur where the baby is smarter than the mother, and his/her need for stimulating play exchanges are not met. This can lead to discord as the baby tires of the low level of play the mother offers (Dyad 21, Type 3c mother: Type 4 baby).

Fourthly some mothers and babies appear unaccustomed to playing with each other. There is no evidence of a history of reciprocal play. The baby's need for play in these cases is often met by an older sibling (Babies 04, 53 and 68). One mother admitted not playing with her child, since in her opinion this made him more demanding. This child was just not played with (Baby 85, Type 5 mother: Type 3 baby).

Aside from the baby's needs not being met, mismatch also results from mother's expectations being unfulfilled. In such cases the mother appears to be ignorant of what pleasures such play experiences would bring to her child. The behavioural manifestations vary. Occasionally mothers have no concept of child development at all, or are unaware that young children need to be taught to play (Mother 71). Some interactions are characterised by the mother getting the child to perform "tricks" that have been learned. Noncompliance on the child's part leads to maternal withdrawal of attention (Mother 77). Some mothers demand levels of concentration and attention that are beyond the capabilities of their children, or indeed of most one year olds (Mothers 12 and 30). Other mothers have styles of play that are appropriate for much older children, for example using teasing behaviour and withdrawing attention when the child cannot comprehend the rules (Dyad 10).

In all these mismatches of mother and baby, levels of Harmony in particular, but also Diversity of Play, are depressed. Discord may escalate rapidly, and a fraught interaction with a protesting or avoidant baby is the result.

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Impact of disability

So far children with disabilities and their mothers have not been differentiated from control babies. This section examines the dyads with a child with a disability as a separate group, and compares mother and baby types and their interactions. Table 7.23 shows the number of babies in each Baby Type by disability.

Table 7.23 Numbers of babies in Types 1 - 5 by disability

	Disabled (N=25)	Nondisabled (N=40)	Total (N=65)
Baby Type 1	1	6	7
Baby Type 2	5	8	13
Baby Type 3	3	·17	20
Baby Type 4	9	8	17
Baby Type 5	7	1	8

The most obvious contrast is between Type 1 and 5 babies. With one exception, babies with disability are not found in the most competent group, Group 1. The exception is Baby 04, whose slight hemiplegia does not interfere with his play development. It should be noted that able-bodied children (e.g. Baby 58) can also appear in the least capable group (Type 5), which otherwise is dominated by children with disability.

Very few of the disabled children were classified as Type 3, the rather stoic babies with medium levels of ability. Only 3 out of the 25 disabled babies were Type 3's. This compares with 43% of the babies with no disability (17 out of 40). It is as if disability precludes medium levels of behaviour.

Five (20%) of the disabled babies were happy, sociable Type 2's. However, this proportion is the same as for the nondisabled group (8 out of 40 : 20%). Nine of the 25 babies with disability (36%) were fraught, unhappy Type 4's. This compares with 8 out of 40 nondisabled children (20%), a difference, but not statistically significant (X^2 = 2.11).

The distribution of the mothers of disabled and nondisabled children into the 5 mother types is shown in Table 7.24.

Table 7.24 Distribution of 65 mothers of disabled and nondisabled children by mother type.

	Disabled children (N=25)	Nondisabled children (N=40)	Totals (N=65)
Mother type 1	6	8	14
Mother type 2	6	6	12
Mother type 3a	3	7	10
Mother type 3b	2	3	5
Mother type 3c	1	3	4
Mother type 3d	2	1	3
Mother type 3e	0	5	5
Mother type 3 (total)	8	19	27
Mother type 4	4	2	6
Mother type 5	1	5	6

The most striking contrast between mothers of disabled and nondisabled children occurs within the less skilled Types 3e, 4 and 5. The noninteractive, withdrawn mothers, Type 5, are not associated with disabled children. This is also true of the intrusive Type 3e mothers. However, the more extreme, bossy, insensitive Type 4 mothers are found with disabled infants. There is a pattern but no simple explanation.

Almost 50% (12 out of 25) of the disabled babies have skilful mothers, Types 1 and 2, compared to only 35% (14 out of 40) for the nondisabled babies, though this is not statistically significant.

What these two trends suggest is that emerging disability in the infant inhibits "average" mothering. The mothers either adapt their styles and cope well (Types 1 and 2), or their skills prove inadequate (Type 4).

In fact the themes of match and mismatch between mother and child are equally valid where disability is present. A Type 1 mother with a severely disabled, but happy Type 2 baby, produces a play interaction high in levels of Mutual Affect, Diversity of Play and Harmony (Dyad 17). The reason for this is the mother's acceptance of the child's disability. She facilitates interaction by supporting her son in a chair, and by challenging him to interact. This is all done in a warm, positive way with much praise for his slightest achievement, and much enabling of his smallest initiative. Thus, a child with very limited movements is encouraged to be an active partner in play, from which he and his mother derive much enjoyment.

Mismatch, unfortunately, occurs frequently in dyads with a disabled child. There are mothers who have unrealistic expectations for their disabled child either in his ability to interact (for example Dyad 12, Mother Type 3d: Baby Type 3), or to accomplish physical achievements (for example

Dyad 78, Mother Type 2: Baby Type 4; and Dyad 87 Mother Type 3a: Baby Type 4). Inappropriate levels of stimulation for their child's level of development are provided by some mothers. This can take the form of bombarding the infant with things to do (Dyad 32, Mother Type 4: Baby Type 5), not playing at an advanced enough level (Dyad 04, Mother Type 4: Baby Type 1), or with a depressed mother not stimulating the child socially (Dyad 25, Mother Type 3a: Baby Type 5).

The impact of disability varies considerably. For the disabled infants, there are more fraught, unhappy, negative babies than happy, sociable ones. For the mothers of disabled babies the picture is more complex than previous research would predict. Withdrawal from disabled infants has been observed during the second year (Wasserman and Allen, 1985), but this has not been found in this study. Type 5 mothers, those who do not interact with their infants, are not found with disabled children. What is found are Type 2 mothers. They have a quiet style of mothering and are sensitively attuned to their babies' needs. They cannot be said to be withdrawn, for their interactions with their infants are always characterised by high or medium levels of affect and/or harmony.

The other finding from previous work is the increased level of controlling behaviour in mothers of disabled children (Barrera and Vella, 1987). The present study would support this, <u>but</u> increased activity on the mother's part is not necessarily maladaptive. Again it depends on the mothering style. The twelve mothers of disabled children who show high levels of activity are split evenly between Type 1 (N =6) and Type 3d and 4 mothers (N= 6). The amount of interactive activity is highest with Type 1 mothers. These mothers are very happy and interactions are very positive, high in harmony. They can be said to have adapted sensitively and positively to their children's disabilities and to have adapted their level of activity to compensate for the children's disabilities. Type 3d and 4 mothers' activity on the other hand takes place in a fraught atmosphere. Their interactions are characterised by lower levels of harmony and mutual affect. The mother's activity level in these cases is intrusive and negative.

The interactions between mothers and their disabled infants are very varied. They cannot adequately be characterised by simple variables such as frequency of smiling, or touching, or by number of approaches made by either partner. It must be remembered that there is no one good style of behaviour for mother or for infant or indeed for interaction. Mothers and babies evolve a style of interacting over the first year of life that attempts to accomodate the characteristics of both.

Conclusions

From the classifications of mothers and infants developed in this chapter, five types of mother can be identified and five types of baby.

The types of mother identified were :

Mother Type 1 Happy, active

Mother Type 2 Sensitive, low key

Mother Type 3 Moderate (3a to 3e, see above)

Mother Type 4 Insensitive, bossy

Mother Type 5 Noninteractive

The types of baby identified were :

Baby Type 1 Competent, self sufficient

Baby Type 2 Happy, sociable

Baby Type 3 Medium, stoic

Baby Type 4 Unhappy, fraught

Baby Type 5 Low performers.

From an examination of the occurrence of mother and baby types, what emerges is that some combinations occur singly or in pairs with no apparent pattern, but others are quite common, and some potential pairings do not occur at all. The extent to which the style of interaction can be predicted from combinations of mother and baby types has been explored in the preceding sections. To a large extent the strength of the interaction follows logically from the combination of mother and baby types (Figure 7.5).

The interaction between mother and child is often seen as a fundamental component in the development of the healthy child (see Ch 1). In a transactional model of development Sameroff and Chandler (1975), see the child's development as a result of continuing dynamic interactions with the mother and the environment. It has already been shown that interactions of mother and child are crucial to the development of for example cognitive skills (Murray, 1992).

Of the few previous attempts to classify mother-infant interactions only that by David and Appell (1969) is of relevence here. Several of their prototypes are mirrored by some of the combinations identified here. However, their study was intuitively based on case studies rather than on a systematic approach to classification.

So far, there has been little other work on the behavioural aspects of interactions, nor of the behavioural components of a transactional model. This chapter has been an attempt to rectify that deficiency.

As a whole what emerges is the importance of the mother matching her expectations to the child's ability, so in this way the style of interaction appears to be mother led. A skilled mother (Types 1, 2, and 3a) is able to adjust her behaviour to accomodate her baby's capabilities. Levels of interaction rarely fall into the lowest terciles, no matter what type of baby is involved. In contrast the least skilled mothers (Types 3e, 4, and 5) have behavioural styles that do not accomodate the babies' needs. With these types of mother, babies' development appears to lag, whether this is in the cognitve or emotional sphere. Interactions where there are Types 4 and 5 mothers rarely rise above the lowest terciles. Strikingly, with only two exceptions, there are no instances of competent happy babies (Types 1 and 2) being paired with mother Types 4 and 5. Good mothers facilitate high levels of interaction. Less skilled mothers impede interaction.

CHAPTER 8

DISCUSSION AND IMPLICATIONS

Summary of main results

At the outset the broad aims of the thesis were to assess the behaviour and interactions of mothers and their one year old infants at play. These behaviours were to be viewed within the context of mother and infant characteristics objectively measured over the infants' first year. With this group of preterms, one aim was to assess the impact of disability on the mother-infant relationship.

The core of the analysis, that presented in Chapters 6 and 7, was based on a series of behaviours captured on videotape. Each videotaped encounter between mother and child is embedded in a year long, ongoing set of experiences, and is set in a context that encompasses immediate and extended family and the community in which the pair live. Over the first year of the infant's life the two participants will have changed and will have adapted one to the other.

Nearly half of the mothers were vulnerable to psychosocial deprivation. This was reflected in high rates of maternal depression and neuroticism. Some of the mothers had the added stress of caring for a child with disability. This seemed to have no detectable impact on them. They were not, for example, more depressed. It may well be that the effect of their high levels of psychosocial adversity was so strong that it swamped the weaker effects that emerging disability in the child may have had. Protective factors which were associated with mentally healthy, happier mothers were a stable relationship with a partner, good social support from family, and the financial stability that employment brings.

The infants in the study had all been admitted to a special care baby unit, following preterm birth. Their developmental course over the first year was varied. Some developed motor and sensory disabilities, as had been predicted on the SCBU, others did not. The children's temperaments ranged from easy to difficult, in proportions similar to those found for fullterm infants. Disability was not associated with any particular range of temperament. Its effect was evident, though, in both cognitive and motor development. Where functional disability was severe, the infants were up to seven months delayed developmentally. Less severe disabilities delayed the infants by two months, whilst control infants were beginning to catch up to their chronological age markers. The infants, like the mothers, felt the effects of deprived environments. Both cognitive and motor development were delayed for all children where there was psychosocial adversity.

These then were the characteristics of the mothers, the infants and their environments. The main body of the analysis was concerned with the behavioural observations of the mothers and children in standardised play situations. Two networks of mothers' behaviours were identified through correlation analysis, one centred on Sensitivity and the other on the level of Instructs, itself reflecting activity level. Presence of a disabled child did not radically or consistently modify mother behaviours. Only one observed behaviour, Checking, was increased for dyads with disabled children. None, not even affective behaviours, were decreased.

One network of behaviours, which did not include negative affect, was identified for the children. It included both activity related and positive affect behaviours. The impact of disability was greatest on activity levels, but was not evident in mood related behaviours.

There was no observable modification of interactive behaviour in the presence of disability. The level of innovative play and the harmony of the interaction showed similar ranges for disabled children and controls. There was a lowered score for displays of mutual affect, but this was apparently due to the mothers' positioning of infants which precluded face to face interaction. In the en face position, mutual affect levels were not depressed.

From the behavioural analysis a typology of mother and infant styles of behaviour was derived. Combinations of particular styles of mothering with specific kinds of infant produced distinctive interactions. Disability was not a major factor in determining interactive style, though there was a tendency for the disabled children to occur in some groups rather than others. Of the context measures used, those relating to the developmental level of the infants, and psychosocial adversity had a significant impact on the observed behaviours.

Discussion

The broad hypotheses of the thesis, identified in Chapter 2, relate to three main areas - the bases of mother infant interaction in play, the effects of prematurity and the effects of disability. Two broad hypotheses were proposed.

1. The style of interaction was expected to reflect the characteristics of the mother and the baby. Within the context of the personality of the mother, poor psychosocial environment and poor maternal mental health were expected to lead to disrupted interactions. Similarly, developmental delay and difficult temperament in the infant were expected to contribute to disrupted interactions.

2. Within the general context of prematurity, the impact of disability was expected to be expressed by interactions involving lowered levels of positive affect, increased levels of maternal control and intrusiveness, coupled with overall maternal withdrawal.

In the context of the first set of general hypotheses, the measured mother and baby characteristics do have an influence on the observed interactive behaviours (see Chapter 6), however the relationships are neither complete nor absolute. The infant developmental level has an important effect on the individual play behaviours (Chapter 6), on the interaction (Chapter 6), and on the mother and infant typology (Chapter 7), but temperament seems to have little direct effect. The mothers' mental health and personality, as measured, have little effect on the interactions, though a selective influence of personality can be identified for interactions with disabled children when the linkages are examined seperately from those involving nondisabled children (Chapter 6). The most important of the context variables is psychosocial adversity. Its influence can be identified at all levels in the analyses of the observed behaviours in play; at the level of the individual behaviour variable, at the level of the networks of behaviours, and at the level of the mother and infant typology. The child most at risk is one that develops disability within a disadvantaged psychosocial environment.

The second general hypothesis deals with disability itself. It is expressed in both infant and mother play behaviours relating to activity rather than to affect. The influence of disability feeds through the correlation networks so that different correlation structures are identified for dyads with and without a disabled child (Chapter 6). There is also an effect of disabilty on the mother and infant typologies. The children who develop disability are not found as Type 1 (competent, self-sufficient), nor as Type 3 (average, stoic), with one exception. They do occur as Type 2 (happy, sociable), Type 4 (unhappy, fraught) and Type 5 (low performers). Their mothers typically respond in one of three ways. Some are found as negative, intrusive Type 4s, others as happy, active Type 1s, and others as sensitive, low key Type 2s. Mothers of disabled children were rarely characterised as Type 3 (moderate) or Type 5 (noninteractive).

Some of these results show marked differences from previously reported empirical work on mothers and their children with motor disabilities. For the infants studied here, decreased levels of smiling and general positive affect were not found (compare Brooks-Gunn and Lewis, 1982; Kogan et al, 1974; Kogan, 1980), nor were increased levels of negative affective behaviour. The children with disability did not differ in these ways from preterm controls. Nor was there any detectable impact of the child's disability on the mother's level of positive affect. The finding that mothers withdrew from disabled infants (Wasserman and Allen, 1985) was not replicated here, although a quiet, warm, low key style of mothering (Type 2 mothers) with disabled children was identified. However, this style was also displayed by some mothers of non-disabled children.

There is qualified support for the previous reports of increased levels of activity and controlling behaviour (Barrera and Vella, 1987; Wasserman et al., 1985a; 1985b). This could be either positive and adaptive to the infant's capabilities (Type 1 mothers), or maladaptive and unrealistic in expectations (Type 4 mothers).

The differences, noted above, between this and previous studies, could be attributable to different sample identifications, different age of assessment and, in this study, a more complex conceptualisation of the problem. This sample of infants was very tightly identified, whereas in some other studies a range of disabilities was included. All index babies in this study, had similar neonatal courses, including respiratory distress and cerebral haemorrhage. The disability of the 25 functionally impaired children could be traced to their neonatal experience. The size of the sample used in this study was also much larger than those used in the other studies. This study is therefore less prone to sampling problems.

All the children in this study were assessed within two weeks of their first birthday (corrected age). Previously reports relate to children of varying age ranges (both within and between studies), with an overall range from 9 months to 4 years. It could be that some of the differences reported in other studies had not yet emerged in the younger children and their mothers assessed here.

This work was conceptually different from most of the other studies, in that a whole array of mother and infant behaviours was assessed together, and in the context of the development of the child. In so doing it has been possible to identify two forms of increased maternal activity, one that is adaptive and one that is intrusive. It has also been possible to distinguish between warm, accepting, quiet mothers, and mothers who have withdrawn from their children. If we consider the applied aspects of these findings (see below), in the context of service support, these distinctions could become crucial. Simple, unifactor descriptors may not be particularly useful.

Implications

This study provides an empirical example of a transactional model of development at work (Clarke and Clarke, 1986; Sameroff and Chandler, 1975). Some light has been shed on the structural complexity of mother-infant interactions in general.

One of the conundrums raised by transactional models is why some children interact with their environment and thrive, whilst others in very similar circumstances, develop problems (Kopp, 1983; Garmezy and Tellegen, 1984; Rutter, 1985; Rutter and Garmezy, 1983). Perhaps some of the answers could be found through a better understanding of mother-infant interactions.

Within a clinical population, improving maladaptive mother-infant interactions could be crucial for the optimum development of the child. What is needed is a way of screening those mothers and children who are at risk. The typology of mothers and infants developed here goes some way to doing this.

In the case of child disability, the way that the child learns to interact with his mother, and her ability to cope with him, could well lead either to resilience or to the disabliity becoming a handicap. It is through interacting that the child can develop resilience. If the mother's skills are maladaptive then interactions are not always at an appropriate level. The typology presented here could be developed into a screening device for the identification of dyads who have not achieved a matching interactive style.

If problem dyads can be identified, then intervention could be targetted appropriately. For instance Type 1 and Type 2 mothers, can cope very well, in their different ways, with their child's disabilities, and would probably benefit relatively little from intervention. Although Type 3 mothers can cope well with nondisabled children, with disabled children their interactions become more fraught. Low key intervention could help these mothers adjust their styles to accomodate the disability. Type 4 mothers, with their intrusive, controlling, negative style do not interact well with disabled children. Withdrawn, noninteractive Type 5's do not provide good play interactions either. With both these types of mother more intensive intervention would be necessary to help change their maladaptive mothering behaviours.

The theoretical underpinnings of the interaction assessment developed here need to be understood more fully. Validation of the mother and infant types is needed, based on full term healthy one year olds. Replication of the results on another disabled group also needs to be carried out. It is also necessary to widen the sample assessed to include a lower proportion of psychosocially at risk families. Over the longer term it ought to be possible to follow up some of the children in order to assess the predictive validity of the typology. If the assessment could be validated and proved reliable in this way, then work could begin on simplifying the identification of the core behaviours, with a view to the development of an instrument for use in clinical screening.

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APPENDIX I THE USE OF ULTRASCAN SCREENING FOR THE DETECTION OF CEREBRAL HAEMORRHAGING IN NEONATES

The use of trans-fontanelle scanning with a real time ultrasound scan machine on neonates was first suggested by Cooke (1979). The technique is non-invasive, and does not disturb the baby. A small amount of jelly is applied to the fontanelle area of the skull. The scanning device is then touched gently to the fontanelle and moved into position. A series of scans is taken through the coronal, sagittal and axial planes of the ventricles, and the results printed out for later examination.

The scans detect haemorrhage from the subependial plate (the germinal matrix). The production of glial cells from the subependymal plate is most active between 24 to 34 weeks gestational age. During this period the plate is supplied with blood through a rich matrix of poorly supported, fragile capillaries. Irregular blood flow associated with irregular respiration leads to rupturing of these capillaries, periventricular haemorrhage (PVH). If the vessels rupture upwards into the body of the lateral ventricles then interventricular haemorrhage (IVH) is said to have occurred (Levene, Williams and Fawer, 1985). Papille, Burstein and Koffler (1978) suggested a grading system for IVH. Grade III haemorrhage is defined as a rupture of the blood vessels with bleeding into the ventricles with subsequent dilation.

For a Grade IV haemorrhage to occur there is extension of the bleeding into the parenchyma.

The natural history of PVH is unpredictable. In the majority of cases there is complete resolution of the ultrascan appearances. For those with IVH, the sequelae of haemorrhage can include porencephaly, cystic degeneration and hydrocephaly.

From 32 to 34 weeks changes in the pattern of the cerebral vasculature occur with the disappearance of the subependymal layer together with the rapid growth of the cortex and the white matter. With this growth there is an increase in the vascular requirements for these regions. Periventricular leukamalacia (PVL) results from ischemic lesions in the border regions between central and cortical arterial capillaries (see Figure I.1). The lesions are often bilateral and separated from the ventricles by a layer of glial tissue (Levene et.al., 1985).

The sequelae of IVH and PVL are varied. IVH with enlargement of the ventricles but no parenchymal bleeding has a good prognosis. Babies tend to normalise despite an initial developmental delay. If there is parenchymal bleeding and development of cysts adjacent to the ventricular wall, then as ventricles dilate the cysts are absorbed. Again the prognosis is good, and there may not even be a motor developmental delay. If the parenchymal bleeding becomes cystic there may be motor delay depending on the size of the lesion. However porencephalic cysts with ventricular dilation often lead to later motor developmental delay as does the presence of PVL.

If the haemorrhage is restricted to one side of the brain then contralateral hemiplegia may result. Depending on the exact location of the parenchymal damage, one, two or all four limbs may be involved in motor delay.

The size of the lesion will determine how much intellectual functioning is compromised. With small lesions, such as can occur with PVL, there may well be no resulting intellectual impairment (DeVries, Dubowitz, Dubowitz and Pennock, 1990).

APPENDIX II

EXCERPT FROM THE PHYSIOTHERAPY IMPACT PROJECT SEMI-STRUCTURED INTERVIEW SCHEDULE: QUESTIONS AND PROBES USED IN THE THESIS INVESTIGATION

Current Conditions (Taken from the 6 weeks interview)

I'd like to ask you some background questions. I use this information to group mothers together, so that each person remains anonymous.

How old are you?	___yrs
Are you married/living with someone?	Yes No
Marital status of mother	Married Single Widowed Separated Divorced
How old is he?	___yrs
How long have you been together?	___yrs
If no cohabitee, Do you have a steady boyfriend?	Yes No
How long have you been going together?	___yrs
Cohabitibg status of mother	No boyfriend Boyfriend, not cohabiting Living with partner Married, living with spouse

Note extent of contact with natural father by mother and child.

<u>Other persons in the household</u>

Can you tell me all the other people who live here with you?

Sex	Age	Relationship to mother

Anyone else?

<u>Housing</u>

Establish number of homes in the last year.

How long have you been living here? __yrs

Type of housing.

Detached
Semi
Terrace/Townhouse
Purpose built flat
Conversion flat

How many rooms do you have?

Living rooms __
Bedrooms __
Kitchen __
Bathroom __

Do you own the home / rent privately / rent from council/ / share with others eg. parents, friends, relatives?

How do you find living here?

Are there any problems?

House: None / Some / Major

Environment: None / Some / Major

If housing problems, ask for specific items

eg. poor repair, dampness

If environment, ask for specific examples

eg. burglaries, muggings, drug problems, vandalism

How do you feel about living here?

Happy, no wish to move
O.K.
Resigned, no option
Would really like to move
Plans to move already under way

Mother's employment

Are you working at the moment?

Yes
No
Maternity leave

What do you do? ______________________________

What arrangements do you have for minding the baby while you work?

Mother not working
Minded in own home by father or relative
Minded in own home by outside minder
Minded ouside home by relative
Minded outside home by minder, not a relative
Nursery or day care centre

If not working, do you receive government payments?
What kind?

How do you manage for money?

No problems
Some problems, but we manage
Problems paying bills
Major problems

Co-habitee's employment

Is your husband / partner working? Yes No

What does he do? ____________________

How long has he been in this job? __ yrs

Has he been unemployed in the last 3 years? Yes No

List employment history for last three years.

Source of income

Social Security payments only
Income from co-habitee's earnings only
Income from own employment only
Income from both partners

Extracts from 6 month and 1 year schedules.

Current conditions

When I last saw you you were living with ________________.

Is that still the same or has the situation changed?

Yes No

Probe : Are you living with someone ?
Have you married?
Do you have a steady boyfriend?
Have you split up?

Have there been any changes in the number of adults living in the household?

Or changes in number of children?

List these

No change
Adult(s) has left household
Adult(s) has joined household
New baby born to mother
Child(ren) has left household
Child(ren) has joined household

Housing changes

Have there been any changes in your housing situation?

Yes No

If there have been changes,

How long have you been living here? __mths

Type of housing.

Detached
Semi
Terrace/Townhouse
Purpose built flat
Conversion flat

How many rooms do you have?

Living rooms __
Bedrooms __
Kitchen __
Bathroom __

Do you own the home / rent privately / rent from council/ / share with others eg. parents, friends, relatives?

How do you find living here?

Are there any problems?

House: None / Some / Major

Environment: None / Some / Major

If housing problems, ask for specific items

eg. poor repair, dampness

If environment, ask for specific examples

eg. burglaries, muggings, drug problems, vandalism

How do you feel about living here?

Happy, no wish to move
O.K.
Resigned, no option
Would really like to move
Plans to move already under way

Employment changes

When I last saw you, you were ____________________________.

Have there been any changes? Yes No

Probe: Have you gone back to work?
Have you given up work?
Have you changed to part time work?

If working, what arrangements do you have for minding the baby while you work?

Mother not working
Minded in own home by father or relative
Minded in own home by outside minder
Minded ouside home by relative
Minded outside home by minder, not a relative
Nursery or day care centre

If not working, do you receive government payments?
What kind?

How do you manage for money?

No problems
Some problems, but we manage
Problems paying bills
Major problems

Have there been any changes in partner's work situation?
Yes No

Unemployment since last interview? Yes No

Partner currently working? Yes No

Source of income

Social Security payments only
Income from co-habitee's earnings
Income from own employment only
Income from both partners

Have there been any problems that you've had to deal with since I last saw you, things not to do with the baby?

Probes : Unemployment
Housing
Problems with other children
Problems with family of origin
Problems with in-laws
Problems with own health
Ill health in family

Support networks

How often do you see your parents? __________

How often do you see your partner's parents? __________

Are there other family members that you see on a regular basis?
Who are they? How often do you see them?

Relationship	When seen

How do you feel about the amount of contact you have with your family?

We've talked about your family, now I'd like to ask you about friends that you see.

Are there friends that you see on a regular basis?
Where do they live? How often do you see them?

Friend	Location	When seen

How do you feel about the amount of contact you have with your friends?

Emotional support

Do you ever feel lonely? Yes No

Who do you discuss day-to-day problems with?

Partner
Mother
Sister
Mother-in-law
Other relative
Friend
No-one

When you get upset or angry, who do you talk to?

Partner
Mother
Sister
Mother-in-law
Other relative
Friend
No-one

If answer to above is no-one, Do you wish there was someone you could talk to?

Yes No

Who do you think understands your present situation the best?

List the reply.

APPENDIX III ADVERSITY SCORES FOR MOTHERS AT 1 YEAR INTERVIEW

Subject Number	Adversity Score	Subject Number	Adversity Score
04	1	76	2
05	6	77	4
09	1	78	1
10	3	79	4
11	2	80	7
12	2	81	6
14	2	82	4
16	8	83	3
17	2	84	4
18	4	85	9
19	0	86	6
21	2	87	5
22	1	89	3
23	0	92	7
25	7	93	4
27	2		
28	6		
29	2		
30	4		
31	2		
32	6		
34	2		
35	3		
38	2		
39	4		
40	2		
41	5		
43	1		
44	1		
45	4		
48	4		
49	3		
51	3		
52	1		
53	3		
54	3		
55	7		
56	3		
58	10		
59	1		
60	9		
62	3		
64	10		
66	2		
68	8		
69	4		
71	8		
73	7		
74	5		
75	5		

APPENDIX IV DISABILITIES EVIDENT AT ONE YEAR

The 35 babies recruited to the control group had not developed observable functional disabilities by one year.

5 of the babies predicted to develop motor problems did not appear to have any problems at 1 year.

Subject number : 30, 40, 43, 58, 83.

25 babies were showing evidence of motor problems of varying types and degree.

Baby 04 : Weakness in left arm, favours right arm.
Baby 11 : Right leg weak, visual problems.
Baby 12 : Weakness in evidence on right side, squint in both eyes.
Baby 14 : Severe visual problems.
Baby 17 : Right hemiplegia, weak trunk control, good head control.
Baby 18 : Quadriplegia, no head nor trunk control.
Baby 22 : Motor weakness in both legs, good head control.
Baby 25 : Spastic diplegia, no trunk control, good head control.
Baby 28 : Problems involving stiffening of wrists only.
Baby 32 : Quadriplegia, no head nor trunk control.
Baby 34 : Weakness in both legs, spastic diplegia, good head and trunk control.
Baby 39 : Poor fine motor control, visual problems.
Baby 44 : Spastic diplegia, also some involvement of left arm, poor trunk control.
Baby 45 : Spastic diplegia, impaired use of arms, no trunk control, good head control.
Baby 51 : Spastic diplegia, no trunk control, good head control, blind.
Baby 55 : Quadriplegia, no head nor trunk control.
Baby 64 : Weakness in left leg.
Baby 66 : Poor fine motor control, clumsy.
Baby 71 : Severe visual problems.
Baby 74 : Spastic diplegia, both arms weak, no trunk control.
Baby 77 : Severe visual problems.
Baby 78 : Spastic diplegia, good trunk control, good head control.
Baby 80 : Spastic diplegia, poor trunk control, good head control.
Baby 87 : Weak motor control in legs, good trunk and head control.

APPENDIX V CODINGS USED IN ANALYSING THE VIDEORECORDINGS

Frequency Counts

Affective Behaviours

Mother Positive

Definition

Mother verbally or nonverbally displays positive affective behaviours directed towards the child.

Examples :

Smiles at the child
Caresses the child
Kisses child
Praises child with positive voice tone - Well done. Good boy.

Mother Negative

Definition

Mother verbally or nonverbally expresses negative affective behaviours towards the child.

Examples :

Negative gesture or facial expression - Raising eyes heavenwards
Mother smacks child
Negative comment coupled with negative tone - Stupid! That's naughty. Bad girl.
Teasing comment or behaviour - Holds toy just out of reach with comment It's mine, you can't have it.

Child Positive

Definition

Child expresses positive affective behaviour either verbally or nonverbally.

Examples :

Child smiles
Child makes contented, happy noises eg. babbling

Child Protests

Definition

Child expresses upset or dislike at what is occuring, may be verbal or physical.

Examples :

Child cries or whines
Child makes angry, protest noises
Child pushes mother away
Child wriggles to escape from mother
Child throws toys angrily
Temper tantrum

Mutual Affect

Definition

Mother and child display positive affect simultaneously, or mother responds to child's display of positive affect with an expression of positive affect, or child responds to mother's display of positive affect with expression of positive affect.

Examples :

Mother and child both smile together as child knocks over a tower of blocks
Child smiles at mother who responds with a kiss or caress
Mother praises child with a positive tone and child responds with a big grin

Play Behaviours

Mother Monitor

Definition

Mother watches child's activity, allowing the child to determine his own activity and timing. A 5 second time interval without verbal or physical intervention by mother is necessary to code monitor. Mother must be paying attention to child, and not engaged in an additional activity, for example talking to a sibling. Each monitor is coded only once, no matter how long it continues.

Examples :

Mother presents toy to child and then waits to see what the child does
Child plays with toy while mother sits back and watches tie child's activity

<u>Mother Enable</u>

<u>Definition</u>

Mother facilitates the initiation and/or completion of a child behaviour. A difficulty does not need to have occurred. Mother may have foreseen a difficulty or limitation and circumvented it.

<u>Guidelines</u>

Code each Enable that occurs. Take into account whether the <u>child</u> can play with the toy without the mother's help. If mother directs child physically to enable the child to play, in this cae it will be enabling.

Examples :

Child is trying to fit a shape into a hole, but has the wrong angle, so mother moves container slightly so that block is aligned.

<u>Instructs</u>

<u>Definition</u>

Mother instructs or directs child's behaviour. This may be a physical or verbal directive.

<u>Guidelines</u>

Code every separate instruction, even if child has no time to respond to the previous directive.
If a mother changes the disabled child's body position, when the child is incapable of making such a correction , do not code Instruct eg. if a child with no trunk control slips sideways and mother sits the child upright.

Examples :

Mother points to Stack-a-Ring and says "Put it on here."
Mother places her hand over child's to hold a block, and puts block through the hole in container <u>for</u> the child.

Mother Links

Definition

A mother's non-directive verbal or nonverbal action that is designed to initiate a new or expanded way of playing from the child.

Guidelines

This behaviour is coded only on the first occasion it is observed, even if the child does not follow (see Child Follows), and the mother repeats the action.

Examples :

Mother shakes the container of blocks to draw the child's attention to the blocks inside.
After the child has been playing with the blocks, mother builds several into a tower for the child to knock down.

Child Follows

Definition

Child responds either verbally or physically to mother's linking behaviour.

Guidelines

Code only after a Mother Link behaviour. A similar action when repeated is not a follow. Child Follows is not coded after Mother Instructs.

Example :

Mother shakes container of blocks and puts it down (Mother Link). Child bends over container and looks right inside.

Mother holds ring to her face and says "Peek-a-boo" (Mother Link). Child laughs.

Poor Timing

Definition

Mother behaviour is poorly timed. The mother, not being aware of the child's current activity, cuts across the child's flow of behaviours. The inappropriateness is in her timing not in her behaviour per se.

Guidelines

Every occurrence of Poor Timing is recorded even when repeated.

Examples :

Child is taking rings off stack and examining them.
Mother insists each one is given to her.

Child attempts to take lid off blocks container.
Mother either not aware of or ignoring the child's activity, gives the child a block to insert.

Child has a block in each hand.
Mother offers a third block.

Stops

Definition

Mother physically or verbally stops the child's behaviour.

Examples :

Child tries to wriggle away from mother and the toy. Mother physically restrains by holding child's arm.

Child is sucking on ring. Mother pulls ring from child's mouth.

Child starts to move ring towards mouth. Mother says "Ack-ack. Dirty. Mustn't".

Child Initiates

Definition

Child verbally or nonverbally initiates an interaction with the mother.

Guidelines

Code only the first occurrence of an initiation. If child repeats the behaviour at a later point in time, this does not count.

Examples :

Child says "Hiya".
Child looks into the blocks container.
Child bangs with the stack on the floor.

Mother Follows

Definition

Mother follows up the child's initiation by a contingent behaviour of her own. This may be verbal or nonverbal.

Guidelines

Follows is coded only the first time it occurs. To be coded as a Follow the mother's behaviour must occur immediately after the infant's initiate. The sequence cannot be interupted by other behaviours.

Examples :

Child says "Hiya".
Mother replies "Hiya".

Child looks into blocks container.
Mother says "What's in there?"

Child bangs with the stack on the floor.
Mother repeats the action.

Mother Checks

Definition

Mother verbally or nonverbally tries to determine what it is that the child wants or needs. Recognition by the mother that the child is a separate individual with different needs and wants from her own, must be implied.

Examples :

Child is reaching towards two blocks. Mother picks up both and says "Do you want this one or this one ?"

Child fusses while playing. Mother says "Are you tired?"

Child Social Referencing

Definition

Child looks towards mother to check on her state or her reactions.

Examples :

Child puts a ring on the stack. Looks at mother's face to see what she will do or say.

Child is absorbed in own play. Looks up to see where mother is.

Child crawls away from toy towards television, looking at mother the whole time.

Ratings

Child happiness

This rating relates to the overall demeanor of the child across the total time of the coded play session.

5 *Very happy*. Child frequently smiles, and makes positve vocalisations. Absence of crying, whining or protest. Also applies to a child who is quietly and happily absorbed in an activity such as playing with a new toy.

3 *Bland*. The child does not display signs of happiness nor unhappiness nor protest.

1 *Very unhappy*. Consistent prolonged crying spells, or temper tantrums. Alternatively the child keeps up a constant grizzle of discontent or unhappiness.

Child Sophistication of Play

9 In playing with the toy the child accomplishes the task inherent in the toy eg. rings on stack in order, blocks through correct holes. Child may then go on to mature creative play.

7 Shows initiative in exploring toy, may learn rudiments of task set by toy, but at a more immature level eg. some rings on stack but not in order.

5 Accomplishes low level appropriate play with toy eg. rings taken off but no attempt to replace them, blocks out but puts them back again without the lid in place.

4 Throwing toy with purpose, banging with purpose.

3 Low level of interaction with toy eg. purposeless banging, just looking at the toy.

2 Mouthing and sucking of toy.

1 Ignores the toy or disability precludes play with toy.

Activity level of child in play

9 Child in constant motion.

7 Child in motion 75% of the play session.

5 Child active 50% of the play session.

3 Child only active for 25% of the play session.

1 Child just lies or sits, moves very little.

Harmony of interactions between mother and infant during play session

7 Balanced, contented play session. No evidence of disagreement nor discord.

5 There may be some discord but this is short lived. Overall the session is characterised more by accord than by discord.

4 The session is characterised by indifference. There is no discord but neither can the interaction be said to be harmonious. It is characterised by blandness.

3 There may be some agreement but this lasts only a short while. Overall the play session is characterised more by discord than by accord.

1 This play session is characterised by discord, disagreement and 'battle'.

Sensitivity of Mother (Ainsworth et al., 1974)

9 *Highly sensitive* This mother is exquisitively attuned to baby's signals, and responds to them promptly and appropriately. She is able to see things from baby's point of view; her perceptions of his signals and communications are not distorted by her own needs and defences. She 'reads' baby's signals and communications skilfully, and knows what the meaning is of even his subtle, minimal and understated cues. She nearly always gives baby what he indicates he wants, although perhaps not invariably so. When she feels it is best not to comply with his demands - for example when he is too excited, over-imperious, or wants something he should not have - she is tactful in acknowledging his communication and in offering an acceptable alternative. She has 'well-rounded' interactions with baby, so that the transaction is smoothly completed and both she and baby feel satisfied. Finally, she makes her responses temporally contingent upon baby's signals and communications.

7 *Sensitive*. This mother also interprets baby's communications accurately, and responds to them promptly and appropriately - but with less sensitivity than mothers with higher ratings. She may be less attuned to baby's more subtle behaviours than the highly sensitive mother. Or, perhaps because she is less skilful in dividing her attention between baby and competing demands, she may sometimes 'miss her cues'. Baby's clear and deffinite signals are, however, neither missed nor misinterpreted. This mother empathises with baby and sees things from his point of view; her perceptions of his behaviour are not distoted. Perhaps because her perception is less sensitive than that of mothers with higher ratings, her responses are not as consistently prompt or as finely appropriate - but although there may be occasional little 'mismatches', mother's interventions and interactions are never seriously out of tune with baby's tempo, state and communications.

5 ***Inconsistently sensitive*.** Although this mother can be quite sensitive on occasion, there are some periods in which she is insensitive to baby's communications. Mother's inconsistent sensitivity may occur for any one of several reasons, but the outcome is that she seems to have lacunae in regard to her sensitive dealings with baby - being sensitive at some times or in respect to some aspects of his experience, but not in others. Her awareness of baby may be intermittent - often fairly keen, but sometimes impervious. Or her perception of baby's behaviour may be distorted in regard to one or two aspects although it is accurate in other important aspects. She may be prompt and appropriate in response to his communications at some times and in most respects, but either inappropriate or slow at other times and in other respects. On the whole, however, she is more frequently sensitive than insensitive. What is striking is that a mother who can be as sensitive as she is on many occasions can be so insensitive on other occasions.

3 *Insensitive*. This mother frequently fails to respond to baby's communications appropriately and/or promptly, although she may on some occasions show capacity in her responses to and interactions with baby. Her insensitivity seems linked to inability to see things from baby's point of view. She may be too frequently preoccupied with other things and therefore inaccessible to his signals and communications and interpret them inaccurately because of her own wishes or defences, or she may know well enough what baby is communicating, but be disinclined to give him what he wants - because it is inconvenient or she is not in the mood for it, or because she is determined not to 'spoil' him. She may delay an otherwise appropriate response to such an extent that it is no longer contingent upon his signal, and indeed perhaps is no longer appropriate to his state, mood or activity. Or she may respond with seeming appropriateness

to baby's communications but break off the transaction before baby is satisfied, so that their interactions seem fragmented and incomplete or her responses perfunctory, half-hearted or impatient. Despite such clear evidence of insensitivity, however, this mother is not as consistently or pervasively insensitive as mothers with lower ratings. Therefore, when the baby's wishes, moods and activity are not too deviant from the mother's wishes, moods and household responsibilities or when the baby is truely distressed or otherwise very forceful and compelling in his communication, this mother can modify her own behaviour and goals and, at this time, can show some sensitivity in her handling of the child.

1 *Highly insensitive.* The extremely insensitive mother seems geared almost exclusively to her own wishes, moods and activity. That is, mother's interventions and initiations of interaction are prompted or shaped largely by signals within herself; if they mesh with baby's signals, this is often no more than coincidence. This is not to say that mother never responds to baby's signals; for sometimes she does if the signals are intense enough, prolonged enough or often enough repeated. The delay in response is in itself insensitive. Furthermore, since there is usually a disparity between mother's own wishes and activity and baby's signals, mother, who is geared largely to her own signals, routinely ignores or distorts the meaning of baby's behaviour. Thus, when mother responds to baby's signals, her response is characteristically inappropriate in kind, or fragmented and incomplete.

APPENDIX VI TERCILES FOR CODED BEHAVIOURS IN PLAY

Dyad	Mother Behaviours										
	SS	M+	ML	En	MF	Ch	Mo	St	In	PT	M-
04	L	M	L	M	M	M	H	M	H	H	H
05	L	M	H	L	L	M	H	H	L	H	M
09	H	H	H	H	H	M	M	H	M	L	L
10	M	H	H	M	H	H	M	L	L	M	H
11	L	M	M	M	H	H	L	H	M	M	H
12	L	M	H	H	M	H	L	H	H	H	H
14	M	M	M	M	L	M	M	M	M	H	L
16	M	H	M	M	H	H	M	M	L	M	H
17	H	H	H	H	H	H	L	M	H	H	H
18	H	M	H	L	L	H	L	L	H	L	H
19	H	H	H	H	H	H	H	M	L	L	M
21	M	H	M	M	M	L	L	H	M	H	L
22	M	H	H	M	H	H	H	L	M	M	M
23	M	H	H	M	H	H	L	L	H	H	L
25	L	L	H	M	M	M	H	L	M	M	M
27	M	H	H	M	H	M	L	M	H	H	M
28	H	M	L	L	M	M	M	M	M	L	L
29	M	H	H	M	M	H	L	H	H	H	H
30	M	M	H	L	M	M	H	H	H	M	H
31	M	H	H	M	H	H	L	L	H	H	L
32	M	M	M	L	L	H	L	L	H	L	H
34	M	H	H	H	M	H	L	H	H	M	L
35	H	M	M	H	M	L	M	L	L	M	L
38	M	M	L	L	L	H	M	M	M	M	M
39	L	M	H	M	M	L	L	L	L	H	H
40	L	L	M	M	L	L	L	H	H	H	M
41	L	M	M	L	L	M	L	M	H	H	H
43	H	L	M	L	L	L	H	L	L	M	L
44	M	M	M	H	M	H	L	L	H	M	L
45	M	M	H	H	M	H	M	M	M	L	H
48	M	M	M	H	L	M	M	L	M	H	H
49	H	M	L	L	M	M	H	L	L	L	L
51	H	H	M	H	H	H	H	L	M	L	M
52	M	M	M	M	L	L	H	H	L	M	M
53	L	L	L	M	M	L	H	M	M	M	H
54	M	M	M	M	M	H	L	M	H	H	M
55	M	M	M	H	L	M	L	L	M	L	L
56	H	M	M	L	L	M	M	M	H	M	M
58	L	L	L	L	L	M	L	L	L	L	L
59	M	M	L	M	M	M	M	L	M	M	M
60	M	M	M	M	M	L	H	L	L	L	L
62	L	M	H	M	L	L	L	L	L	H	L
64	M	L	M	M	L	L	M	L	L	M	L
66	H	H	H	L	M	M	H	L	M	L	L
68	M	L	M	L	M	L	M	H	L	M	L
69	L	M	M	M	M	L	M	L	M	H	L
71	L	L	L	L	L	L	H	L	L	M	M
73	M	M	M	M	M	M	M	L	M	M	M
74	M	M	M	M	M	M	H	L	L	L	L
75	L	M	L	L	L	L	H	M	L	L	L

76	L	L	L	L	L	M	M	M	L	L	M
77	L	L	H	L	L	H	L	M	H	H	H
	SS	M+	ML	En	MF	Ch	Mo	St	In	PT	M-
78	H	L	H	M	M	M	M	L	M	L	L
79	M	M	M	M	L	M	M	M	H	H	M
80	M	M	M	M	M	M	M	M	L	H	M
81	H	M	M	M	L	M	H	H	M	M	L
82	M	M	M	M	L	M	M	L	M	M	M
83	M	L	M	L	M	M	H	M	M	H	L
84	M	L	M	M	M	M	M	M	H	H	L
85	L	L	L	L	L	L	M	H	L	H	L
86	M	M	L	L	H	M	L	M	M	H	L
87	M	M	L	L	H	M	M	M	H	M	L
89	M	H	L	L	M	M	M	L	M	L	L
92	L	M	L	L	M	M	M	L	M	M	L
93	H	M	L	M	L	L	H	L	L	L	L

Dyad	Infant behaviours								Interaction				
	Ac	So	Hp	SR	CI	CF	C+	CP	H	A	CRI	MRI	D
04	H	H	L	L	M	M	L	H	M	L	H	M	M
05	M	L	L	M	L	M	M	M	L	L	M	L	M
09	H	L	M	L	H	H	M	M	H	M	H	H	H
10	L	M	L	H	H	H	M	H	L	M	H	H	H
11	H	M	L	L	M	M	M	H	L	M	M	H	H
12	M	M	M	H	M	H	M	L	L	L	M	M	H
14	M	M	L	M	M	H	M	H	M	M	H	L	H
16	M	M	M	M	H	M	M	M	M	M	M	H	H
17	L	L	H	H	H	H	H	L	H	H	H	H	H
18	L	L	M	L	L	L	L	L	H	L	L	L	L
19	L	M	M	H	H	H	H	M	M	M	H	H	H
21	M	H	L	M	L	L	M	H	M	H	M	L	M
22	M	M	M	M	H	M	M	M	M	M	M	H	H
23	M	M	M	M	M	M	M	M	M	M	M	H	H
25	L	L	M	M	L	M	L	L	M	L	L	M	M
27	M	M	M	M	M	H	H	H	M	H	H	H	H
28	M	M	M	H	M	L	H	M	M	M	L	M	L
29	M	M	L	M	M	M	L	H	L	L	M	M	M
30	H	M	L	H	M	L	M	H	L	M	L	M	L
31	M	H	H	M	H	M	H	M	M	H	L	H	H
32	L	L	M	L	L	L	M	M	L	L	L	L	L
34	M	M	H	M	M	M	H	M	H	H	L	M	M
35	M	M	M	M	M	H	M	L	H	M	H	H	H
38	H	M	M	M	M	L	L	M	L	L	L	L	L
39	L	L	H	H	L	H	H	L	M	H	H	H	H
40	M	H	M	M	L	H	L	L	L	L	H	L	M
41	M	M	M	L	M	L	H	H	L	H	L	L	L
43	M	M	H	M	M	M	H	M	M	H	M	L	L
44	M	M	M	L	M	M	L	M	H	L	M	M	M
45	L	L	M	L	L	H	L	L	M	L	H	M	H
48	M	H	M	H	L	H	M	H	M	H	H	L	L
49	H	H	H	H	H	M	H	M	M	H	H	M	M
51	L	L	L	M	M	M	M	M	M	M	M	H	H
52	H	H	M	M	H	M	H	M	M	H	M	L	M
53	L	H	M	M	M	M	M	M	L	L	M	M	M

54	H	H	H	H	H	M	H	M	L	H	M	M	M
55	L	L	M	L	L	L	M	M	M	L	L	L	L
56	M	M	H	H	H	M	H	L	M	M	M	L	M
58	L	L	M	L	L	L	M	L	M	L	L	L	L

	Ac	So	Hp	SR	CI	CF	C+	CP	H	A	CRI	MRI	D
59	M	M	M	M	L	M	M	M	H	M	M	M	M
60	L	M	M	M	M	M	M	L	M	M	M	M	M
62	M	M	M	M	L	L	M	M	M	M	L	L	L
64	M	L	L	M	M	M	M	H	M	M	L	L	L
66	L	M	H	M	M	H	H	M	H	H	H	M	H
68	M	M	H	H	H	M	M	L	M	L	M	M	M
69	H	M	H	M	M	H	H	M	M	H	H	M	M
71	L	L	L	L	L	L	L	H	L	L	L	L	L
73	L	M	M	H	M	M	H	M	M	H	L	M	M
74	L	L	L	L	L	M	L	M	H	L	M	M	M
75	H	M	L	L	H	L	H	H	L	L	L	L	L
76	M	M	M	L	M	M	M	L	M	L	M	L	L
77	M	L	L	L	L	M	M	H	L	L	L	L	L
78	M	M	L	M	L	H	L	H	H	L	H	M	M
79	H	H	M	L	H	M	M	M	M	M	L	L	L
80	M	M	L	M	M	M	M	H	L	M	L	M	M
81	H	M	M	M	H	M	M	M	H	L	L	L	L
82	M	H	M	M	M	L	L	L	M	L	L	L	L
83	M	M	L	L	M	M	M	H	L	M	M	M	M
84	M	M	M	L	M	M	L	M	M	L	M	L	M
85	M	M	M	M	M	M	M	L	M	L	M	L	L
86	M	H	M	H	M	M	H	M	H	H	M	H	H
87	M	M	L	L	H	L	M	H	M	L	L	H	M
89	H	H	M	M	L	H	L	L	M	L	H	H	H
92	L	L	M	H	M	M	M	L	M	M	M	H	M
93	H	H	H	H	L	H	H	M	H	H	M	L	M

H M L: In high, middle and low terciles respectively

Variable codes:

Mother:
SS sensitivity, M+ Mother positive,
ML Mother links, En Enables, MF Mother Follows, Ch Check,
Mo Monitor, St Stop, In Instructs, PT Poor timing,
M- Mother negative,

Child:
Ac Infant activity, So Sophistication,
Hp Infant happiness, SR Social referencing, CI Child initiates, CF Child follows, C+ Child positive, CP Child Protests,

Interaction:
H Harmony, A Mutual affect, CRI Child response index, MRI Mother response index, D Diversity of play.

APPENDIX VII REGRESSION ANALYSIS OF CONCURRENT AND LAGGED MOTHER AND CHILD DESCRIPTOR VARIABLES

<u>Variables</u> EN Eysenck Neuroticism, MAL Mother's mental health, ADV Adversity score, BAT Infant difficultness, PDIR Motor development, MDIR Cognitive development;
at 6 weeks (0), at 6 months (1), at 1 year (2).

<u>Regression Equation</u>		<u>s</u>	<u>R</u>	<u>adj R²</u>
EN2 = 4.84 + 0.689 EN0		3.819	0.680	45.5
EN2 = 2.20 + 0.661 EN0 + 0.938 BAT1	*	3.732	0.704	47.9
EN2 = 1.35 + 0.649 EN0 + 0.101 BAT2		3.750	0.700	47.4
BAT2 = 22.3 + 0.525 BAT1		7.064	0.600	35.0
BAT2 = 20.3 + 0.484 BAT1 + 0.279 EN2	*	6.981	0.620	36.5
BAT2 = 20.5 + 0.505 BAT1 + 0.249 EN0		7.000	0.616	36.0
EN2 = 7.28 + 0.684 EN0 - 0.105 PDIR1	*	3.795	0.691	46.2
EN2 = 6.89 + 0.685 EN0 - 0.050 PDIR2		3.810	0.688	45.7
PDIR2 = 9.41 + 1.33 PDIR1	*	6.872	0.762	57.5
PDIR2 = 9.94 + 1.32 PDIR1 - 0.036 EN2		6.921	0.762	56.8
BAT2 = 22.0 + 0.482 BAT1 + 0.295 MAL1	*	6.993	0.619	36.3
BAT2 = 21.6 + 0.500 BAT1 + 0.307 MAL2		6.994	0.619	36.3
MAL2 = 0.98 + 0.685 MAL1	*	2.971	0.738	53.8
MAL2 = 1.57 + 0.699 MAL1 - 0.021 BAT1		2.987	0.740	53.4
MAL2 = 0.67 + 0.680 MAL1 - 0.0086 BAT2		2.983	0.741	53.9
MAL2 = 1.99 + 0.674 MAL1 - 0.042 PDIR1		2.984	0.740	53.4
MAL2 = 2.51 + 0.677 MAL1 - 0.038 PDIR2	*	2.967	0.744	53.9
PDIR2 = 8.07 + 1.35 PDIR1 + 0.151 MAL1		6.981	0.766	57.3
PDIR2 = 9.42 + 1.33 PDIR1 + 0.001 MAL2		6.927	0.763	56.8
ADV2 = -0.134 + 0.942 ADV1	*	1.128	0.896	79.9
ADV2 = 0.281 + 0.929 ADV1 -0.159 PDIR1		1.133	0.896	79.7
ADV2 = -0.351 + 0.947 ADV1 +0.005 PDIR2		1.136	0.896	79.6
PDIR2 = 8.78 + 1.34 PDIR1 + 0.089 ADV1		6.924	0.763	56.9
PDIR2 = 7.42 + 1.36 PDIR1 + 0.291 ADV2		6.891	0.766	57.3
ADV2 = 0.291 + 0.926 ADV1 +0.006 MDIR1		1.132	0.897	79.7
ADV2 = 0.195 + 0.932 ADV1 -0.003 MDIR2		1.134	0.896	79.7
MDIR2 = 28.4 + 1.09 MDIR1	*	16.27	0.786	61.2
MDIR2 = 30.1 + 1.08 MDIR1 - 0.262 ADV1		16.39	0.786	60.6
MDIR2 = 29.7 + 1.08 MDIR1 - 0.201 ADV2		16.40	0.786	60.6