A COMPARISON OF THE CHILDBEARING AND INITIAL CHILDREARING EXPERIENCES OF TEENAGE AND OLDER MOTHERS

By

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ABSTRACT

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The purpose of the study was to determine the possible causal mechanisms of the developmental deficits that longitudinal studies have attributed to the children of teenage mothers. Sixty-two primiparous mothers from 15-32 years old and their non-twin infants were the subjects of the study. The mothers were contacted and interviewed during the last trimester of their pregnancies and the mothers and infants were studied until the infants were three months old. Demographic data were gathered in home interviews, medical data for the birth were recorded, and the Brazelton Neonatal Behavioral Assessment Scales were administered shortly after birth. At one, two, and three months postpartum the mother and child were systematically observed while interacting in their home, the home environment was assessed, and the mothers completed scales rating maternal attitudes and infant temperament.

The results indicated that teenage mothers (n = 14) were more similar to older mothers than generally has been

reported. However, the teenage mothers had significantly lower SES levels, began prenatal care later in pregnancy, and lived in more crowded homes than the older mothers. The teenage mothers also spent significantly less time talking to their infants, less time talking to their infants during mutual gazing, and were significantly less responsive to their infants' distress signals than the older mothers. On the other hand, the teenage mothers had easier births than the older mothers. Only one of seven a priori Brazelton scales differentiated between the two groups of infants, with the infants of the older mothers scoring higher.

Systemic analysis of the data, using LISREL, a maximum likelihood method of estimating linear structural relations, indicated that SES was the most influential variable relating various predictors of a child's developmental status. Maternal age, with SES controlled for, was negatively related to the same predictors; i.e., given equal SES, young mothers of their infants did better than the older mothers or their infants on each of the predictors of developmental status. The results of the systemic analysis need to be treated cautiously since the model is not sufficiently precise in its present state of development, at least for the small sample that was studied. Refinement of the research model and its application to other data sets (especially longitudinal data sets) were recommendations for future research.

To Mr. & Mrs. Fred Rose

and

Mary Kaufman

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CHAPTER I

INTRODUCTION

Statement of the Problem

Each year in the United States, approximately one million women 15-19 years old, or about one-tenth of the women in this age group, become pregnant. An additional 30,000 girls younger than 15 become pregnant annually. These teenage pregnancies result in about 600,000 live births each year and over 90% of young mothers keep their babies, a reversal of the situation little more than a decade ago (Alan Guttmacher Institute, 1976; Center for Disease Control, 1980; National Center for Health Statistics, 1977).

The fertility rate for teenage women declined by almost 45% from 1960 to 1977. However, the fertility rate for older women dropped by about 50% during the same period. Since the fertility decline of teenagers did not equal that of older women, and since the overall size of the teenage population increased until 1977 due to the baby boom, teenagers accounted for an increasing percentage of all births during most of the period from 1960 to the present. The percentage of all births accounted for by teenagers rose from 14% in 1960 to a high of about 19% in 1974 and declined to about 17% in 1977 (Baldwin, 1976; Center for Disease Control, 1980).

Interest in teenage pregnancy, childbearing and childrearing grew as the percentage of all women giving birth who are teenagers increased. Some of the interest in teenage pregnancy has centered upon its causes (Gottschalk, Titchener, Piker & Stewart, 1965; Klein, 1978; Meyerowitz & Malev, 1973; Moore & Caldwell, 1977; Russ-Eft, Spreenger & Beever, 1979; Vincent, Haney & Cochrane, 1969). A far greater number of studies have been focused upon the consequences of teenage pregnancy for the pregnant woman (and occasionally the male involved) in terms of education, relative economic status, family size and marital stability (Alan Guttmacher, 1976; Bacon, 1974; Burchinal, 1965; Butman & Kamm, 1965; Cannon-Bonventre & Kahn, 1979; Card & Wise, 1978; Coombs, Freedman, Friedman & Pratt, 1970; David, 1972; Freedman & Thornton, 1979; Freedman & Coombs, 1966; Furstenberg, 1976, 1979; Moore, 1978; Moore, Hofferth, Caldwell & Waite, 1979; Moore, Hofferth & Wertheimer, 1979; Nye, 1976; Osofsky, 1968; Presser, 1980; Rolfe & Roosa, 1979; Roosa, 1977; Stickle & Ma, 1975; Trussel & Menken, 1978; Trussell, 1976; Waite & Moore, 1978). The medical aspects of adolescent pregnancy, including higher rates of maternal and infant mortality, prenatal and postnatal complications, and birth defects, also have received considerable attention (Alan Guttmacher Institute, 1976; Ballard & Gold, 1971;

Coates, 1970; Dott & Fort, 1976; Duenhoelter, Jimieniz & Baumann, 1975; Dwyer, 1974; Hollingsworth, Moser, Carlson & Thompson, 1976; Hulka & Schaaf, 1964; Jones & Placek, 1979; McCarthy, Abbott & Terry, 1979; Mednick, Baker & Sutton-Smith, 1979; Mellor & Wright, 1975; Menken, 1972; Nye, 1976; Osofsky, 1968; Ryan & Schneider, 1978; Stickle & Ma, 1975; Walters, 1975).

However, very few researchers have examined the impact of teenage childbearing upon the child. Several medical studies mentioned above did discuss the infant's physical status immediately after birth. Nevertheless, until recently, few studies have examined the long term consequences of teenage childbearing and childrearing for the children involved.

Two groups of researchers who did examine the long term social and psychological consequences for children of teenage parents found that by age 6 these children score lower on intelligence tests, are more likely to be dependent and distractable, to have behavioral problems, and to be deficient in reading-grade level than are children born to nonteenage parents (Oppel & Royston, 1971; Hardy, Welcher, Stanley & Dallas, 1978). In the first of these longitudinal studies, Oppel and Royston (1971) matched 86 mothers under 18 with mothers who were 18 or over at the delivery of their child. Matching was on the basis of socioeconomic status, birth weight of the child, maternal parity and maternal race. When the children were 6-8 years old and again when they were 8-10 years old, social and psychological data were collected. The children were individually administered the Stanford-Binet and Weschler IQ tests and the Wide-Range Reading Achievement Test. Psychological ratings of emotional adjustment and personality traits were obtained as were data concerning mother-child relationships and family socioeconomic status. Oppel and Royston (1971) found that the children of the younger mothers: (a) were more likely to be reared by persons other than their biological parents; (b) generally had more siblings and lived in larger households; (c) had a lower mean height; (d) scored lower on the Stanford-Binet IQ test but not on the Weschler; (e) scored lower in reading-grade level; and (f) were more often rated as dependent and distractable than children born to older mothers.

The Johns Hopkins Child Development Study (Hardy et al., 1978; Hardy, 1971) had a more extensive and complex data collection protocol and a larger sample (4,557 mothers, 706 of whom were 17 years of age or less at the time of delivery) than the Oppel and Royston study. The children in this study were born from 1959 to 1965 to predominantly black (77%) lower-middle or lower socioeconomic families from the geographic region near Johns Hopkins University in Baltimore. All children were followed for 8 years; a representative sample of 466 children (77 with mothers 17 years of age or less) were followed for 12 years. At the 8 and 12 year follow-ups, 88% of the sample were examined.

When children born to adolescents (17 years of age or less) were compared to children born to women 20-24 years of age, children born to adolescents: (a) scored lower on the Bayley mental test at 8 months; (b) scored lower on the Stanford-Binet IQ test at 4 years; and (c) scored lower on the Weschler Intelligence Scale for Children (verbal, performance and overall) and on the Wide-Range Achievement Test (spelling, reading, and arithmetic) at 7 years. The results at the 12-year examination were similar to those at 7 years (Hardy et al., 1978).

Though Hardy et al. did not take birth weight, parity, race, or socioeconomic status into account, the results of the study are quite similar to those reported by Oppel and Royston (1971). In neither study did the children born to teenagers do better than children born to older mothers on any of the developmental measures used. Vandenberg (1976, reported in Chilman, 1980) reports finding similar results in a retrospective study with a large, all white sample. Several correlational studies that link a child's IQ score with maternal age at delivery also support the results reported above (Illsley, 1967a, 1967b; Broman, Nichols & Kennedy, 1975; Record, McKeown & Edwards, 1969; Lobl, Welcher & Mellits, 1971; Dryfoos & Belmont, 1979).

Recently, Baldwin and Cain (1980) reviewed the results of several National Institute of Child Health and Human Development (NICHD) studies that looked at the long term impact of teenage parents upon their children's development. With few exceptions, the studies reviewed were, like the Oppel and Royston, Hardy *et al*. and Vandenberg studies, reanalyses of longitudinal data originally collected for other purposes. Though quite diverse in their design and methodology, the authors of the NICHD studies reached basically the same conclusions as the previous studies:

> While excellent prenatal care of the teenager may result in the birth of a healthy infant, the subsequent health of her child may be severely jeopardized by early parenthood. All analyses show deficits in the cognitive development of children (especially male children) born to teenagers; much, but not all, of the effect results from social and economic consequences of early childbearing. Less consistent effects are found for the children's social and emotional development and school adjustment (p. 37).

None of the studies cited above nor any of those reviewed by Baldwin and Cain (1980) offers an adequate explanation for the developmental deficits that were found. Though the educational and economic disadvantages associated with early parenthood and the greater likelihood of marital breakup or of social isolation are reported to be related to the various deficits, we are given no hint as to the mechanisms through which these rather massive status variables operate. Since about one of every six children born in the U.S. is born to a teenage mother, it is important to discover the etiology of the developmental differences that were cited above.

Objective of the Study

The objective of this study was to determine the possible causal mechanisms of the developmental differences cited by Oppel and Royston, Hardy *et al*., and Baldwin and Cain. To accomplish this objective, the researcher examined and compared the childbearing and early childrearing experiences of teenage mothers and older mothers. The following research questions were posed:

1. Are the background characteristics of teenage mothers different from those of older mothers? If differences are found, can they be related to the cited developmental differences?
2. Are the childbearing experiences of these two groups of mothers different and, if so, can this difference be related to later developmental differences?
3. Do the children of these two groups of mothers differ from one another at birth? Could such a difference be related to later developmental differences?
4. Do teenage mothers differ from older mothers in their attitudes toward their children and could such a difference be related to later differences in the children's behavior and abilities?
5. Do the home environments provided by teenage mothers differ from those provided by older

mothers and what would be the relationship of any differences to later development?

6. Are the children of teenage mothers temperamentally different from those of older mothers even in the first few months of life?
7. Are the childcare practices of teenage mothers different from those of older mothers? Are such differences related to differential patterns of development?

A short-term study such as the present one cannot possibly provide final answers to questions about the etiology of the developmental deficits cited above. Instead, by focusing upon the late pregnancy-early postpartum period, I hope to be able to describe the processes that may be the early precursors of developmental deficits. Therefore, the results of the present study should be useful in generating hypotheses about the developmental problems associated with teenage parenting. Only detailed longitudinal studies can begin to determine the value of hypotheses so generated.

CHAPTER II

REVIEW OF THE LITERATURE

There exists an extensive body of literature concerned with developmental risks associated with pregnancy and the immediate postpartum period and there is a growing body of literature concerned with postnatal effects upon development. Factors which appear to have a negative effect upon a child's development can be conceptualized as lying on two dimensions or continua: the continuum of reproductive casualty, incorporating the biological events from the time of conception to the end of the perinatal period, and the continuum of caretaking casualty, incorporating the social and environmental events that occur after the time of birth (Pasamanick & Knobloch, 1966; Sameroff, 1975; Sameroff & Chandler, 1975). In general, researchers involved with developmental risk have tended to focus upon one of these two continua to the exclusion of the other. Sameroff (1975; Sameroff & Chandler, 1975) was among the first to argue that the major weakness in risk research has been the assumption that the continua were mutually exclusive, when, in fact, the relationships among the factors along each continuum are transactional.

In the review that follows, the focus is upon factors located on each of these continua, especially as each is affected by the age of the mother. Evidence for the transactions between the factors on the continua will also be examined. Finally, a model will be developed, based upon the evidence presented in the literature review, for examining the effects of teenage childbearing and childrearing upon child development.

The Continuum of Reproductive Risk

There are several aspects of childbearing in which the medical literature reports differences according to maternal age. For purposes of this review these aspects of childbearing will be divided into obstetric and gynecologic factors (experiences of pregnancy, labor and delivery) and neonatal factors (the state of the neonate at birth).

Experiences of Pregnancy and Delivery

It has been widely reported that teenagers tend to experience complications of pregnancy and delivery more often than women in their twenties (Nye, 1976; Jones & Placek, 1979). Several researchers have reported that pregnant teenagers have higher rates of toxemia or hypertension, anemia, and prolonged labor than women who are in the normative childbearing age range of 20-30. Table 1 contains a summary of the research in this area.

Table 1

Complications of Pregnancy and Delivery that are Reported to be More Common for Teenagers than for Women in Their Twenties, and Supporting Studies

Complication	Supporting Studies
1. Toxemia or hypertension	Baldwin (1976); Fielding (1978); Hollingsworth et al. (1976); Alan Guttmacher Institute (1976); Stickle and Ma (1975); Dott & Fort (1976); McAnarney (1975); Menken (1972); Coates (1970)
2. Anemia	Fielding (1978); Alan Guttmacher Institute (1976); McAnarney (1975); Menken (1972); Baldwin (1976); Stickle and Ma (1975); Menken (1972)
3. Prolonged labor	Baldwin (1976); Stickle and Ma (1975); Menken (1972)

It is important to note that these researchers are not unanimous in indicating that teenagers experience each of these difficulties more than other mothers. In fact, the results of several studies with very young adolescent mothers ($\leq$ 15 years of age), for whom the incidence of these complications is generally reported to be high (Nortman, 1974; Dott & Fort, 1976), provide evidence which appears to contradict these generalizations or at least suggest that the differences may well be less than is generally reported. In three such studies the pregnancy experiences of large samples (N = 137 to 471) of 12-15 year old primigravidas (women who are pregnant for the first time) were compared with older primigravidas. No differences were found between the groups in terms of anemia and prolonged labor (Hulka & Schaaf, 1964; Coates, 1970; Duenhoelter et al., 1975). However, the young mothers were reported to experience a somewhat higher incidence of toxemia or hypertension in two of these three studies (Coates, 1970; Duenhoelter, 1975).

In a related study focusing upon early adolescents, Dwyer (1974) attempted to determine whether the provision of an adequate prenatal program would eliminate the difficulties that have been reported for teenage pregnancies. After providing such a program for 231 pregnant 12-16 year olds, Dwyer reported finding no significant differences between the pregnancy and delivery experiences of young mothers and those of older women (cf.: Berg, Taylor, Edward & Hakanson, 1979).

As Dwyer (1974) suggests, teenagers may be at risk during pregnancy because few of them get good prenatal care. Other researchers have reported that teenage mothers begin prenatal care later than older women and generally have fewer prenatal visits (Dott & Fort, 1976; Hulka & Schaaf, 1964; Coates, 1970). Furthermore, Ryan and Schneider (1978), in a study of 220 teenagers, reported finding a strong relationship between both the timing of the first prenatal care received and the pregnancy and delivery experiences of adolescents.

In taking a closer look at the relationship of prenatal care to the pregnancy experiences of teenagers, Mednick et al. (1979; see also Sutton-Smith, 1979) examined two large studies, one American and one Danish, which showed a linear relationship between maternal age and the number of complications during pregnancy; that is, teenagers experienced fewer complications than older mothers. There was no evidence of physiological immaturity of the teenage mothers. In both studies, all the participants were enrolled in free, high quality prenatal care programs early in their pregnancies. The authors attribute this factor alone with being responsible for a finding that is contrary to that usually reported.

Mednick et al. (1979) argue that teenage pregnancy occurs most frequently in low SES groups. Since social status has been shown to be related to the quality of obstetrical care available to a person, it seems reasonable to assume that teenage mothers generally would not have access to high quality programs of prenatal care. Moreover, since teenagers often hide the fact of pregnancy as long as possible, they are less likely to enroll in any type of prenatal care in the first trimester (Mednick _et al_., 1979). Dott and Fort (1976) offer evidence to support this line of reasoning while agreeing that, with adequate prenatal care, there should be few differences between the obstetric performance of teenage and older mothers.

In a major prospective study, the research team of the Collaborative Perinatal Project followed over 26,000 children from birth (Broman _et al_., 1975). The authors reported that the four-year IQ scores of this group were related to both the number of prenatal visits and the length of gestation at prenatal registration. However, both maternal education level and SES were more strongly related to the four-year IQ score.

Thus, the relationship between maternal age and the experiences of pregnancy and delivery may not be as direct as is commonly thought. The critical variable in teenage childbearing does not appear to be physiological immaturity. Instead, the critical variable for predicting pregnancy experiences appears to be the timing of onset, quality and quantity of the mother's prenatal care. In turn, a mother's pattern of prenatal care is influenced by socioeconomic factors and maternal age, which are probably covariates (Illsley, 1967b).

Complications of pregnancy, labor and delivery such as those discussed above are thought to have a negative impact upon fetal development and therefore on later development. For instance, Pasamanick and Knoblock (1966), in a review of several retrospective studies, reported that several developmental disorders, including mental deficiency, behavior disorders, and reading disabilities, were related to complications of pregnancy and delivery, especially toxemia and maternal bleeding. Similarly, Stott (1957) found a strong relationship between later development and the incidence of complications of labor and delivery using a sample of 200 mentally retarded children.

However, it should be noted that the relationship between obstetric and gynecologic factors and later development is probably not a strong one. Studies that have used more representative samples than that used by Stott (1957) have reported weaker relationships between pregnancy and delivery factors and the development of very young children (Goldstein _et al_., 1976; Kopp & Parmelee, 1979). In fact, the relationship between prenatal factors and postnatal development becomes even weaker with increasing age, while the influences of environmental factors become greater (Drillien, 1964; Harper & Weiner, 1965; Nortman, 1974; McDonald, 1964; Sameroff & Chandler, 1975; Sameroff, 1975). Thus, one would expect any direct relationship among maternal age, experiences of pregnancy and delivery, and the developmental status of school age children to be quite small.

Developmental Status at Birth

The two most commonly used indicators of neonatal well-being are Apgar scores and a general evaluation of intrauterine development based upon either gestational age or birth weight or both. A third indicator, the Brazelton Neonatal Behavioral Scale, has been used in several research studies but is not commonly used in hospital delivery rooms or nurseries. In this section, each of these indicators of neonatal viability will be reviewed for evidence of their relationship to maternal age and child development.

Apgar scores. Originally devised by an anesthesiologist to evaluate the deleterious effects of obstetrical medication upon the newborn (Apgar, 1953), Apgar scores taken at one and five minutes postpartum have become part of normal hospital routine. Five vital signs (heart rate, respiratory effort, muscle tone, reflex irritability, and color) are evaluated and each is scored on a scale of 0-2. The Apgar score is the sum of these five subscores. It should be stressed that these scores are limited to vital functions and that only depressed functions are measured (i.e., a low pulse rate results in a diminished score while both a normal or elevated heart rate receive an optimum score). It is also probable that the evaluation of color at birth (from blue or pale to completely pink) is of little value for nonwhite babies.

Despite its imperfections as a sound psychometric instrument, the Apgar scores at one and five minutes have become widely accepted as indicators of neonatal viability. In general, a score of 7-10 indicates a vigorous infant; 4-6, a depressed infant; 0-3, a markedly depressed infant in need of immediate attention (Apgar, 1953).

Only a few studies have compared the Apgar scores of infants born to teenagers and infants born to older women. Using 220 teenagers, Ryan and Schneider (1978) found a positive relationship between maternal age and infant Apgar scores. Jones and Placek (1979) reported national data which support such a conclusion. However, Sandler (1979; in Baldwin & Cain, 1980) failed to find any relationship between maternal age and Apgar scores.

How do Apgar scores relate to later development? In one study a randomly selected sample of over 200 newborns were rated by a trained observer who had no other delivery room responsibilities (Edwards, 1968). The one- and five-minute Apgar scores were significantly correlated with IQ scores on a concept formation task, and fine and gross motor skills at four years of age, with the highest correlations obtained for the motor skills. The five-minute Apgar score accounted for more of the variance in four year mental and motor development scores than either the one-minute Apgar score or the infant's birth weight.

Other researchers who have compared Apgar scores with later developmental status have reported much weaker relationships than those reported by Edwards. For instance, in a study of 233 infants, no significant relationships were found between newborn Apgar scores and infant developmental indexes (Gesell & Cattell) at 12 months of age (Caputo, Taub, Goldstein, Smith, Dalack, Pursner & Silberstein, 1974). The authors suggest that the failure to find significant correlations may be attributable to: (a) limited variability of the scores due to extreme negative skewness of the distribution; (b) biased ratings (the reason for the extreme skewness) due to the fact that the attending physician administered the examination; and (c) use of the one-minute Apgar score rather than the five-minute score, which, at least according to Edwards, is the stronger predictor.

In summary, it appears that the newborns of teenage mothers are likely to receive lower Apgar scores than are other newborns. Secondly, research reports indicate that Apgar scores may be related to later development and therefore might be useful predictors for the developmental differences reported for children of teenagers relative to other children.

However, it is too optimistic to assume that the predictive power of the Apgars will be as strong as Edwards' data suggest. First, as noted earlier, the predictive value of perinatal events diminishes with age (Drillien, 1964; Harper & Weiner, 1965; Kopp & Parmelee, 1979; McDonald, 1964; Sameroff & Chandler, 1975; Weiner et al., 1968). Secondly, Apgar scores are extremely biased when obtained from the attending physician (Caputo et al., 1974; Drage & Berendes, 1966). Finally, it is difficult to imagine how an instrument with both a skewed distribution (by design) and such a limited range (0-10) could prove to be a major predictor of later development over such a wide range of outcome variables.

Gestational age and birth weight. Two commonly used indicators of the newborn's status are gestational age and birth weight. Although gestational age technically refers to the time in utero from conception to birth, measuring true gestational age is difficult. Gestational age is routinely recorded in most hospitals and infants with a gestational age of less than 37 weeks are usually considered to be premature and at risk. Generally, gestational age is estimated based upon either the pregnant woman's knowledge of the date of conception, the date of her last menstrual cycle, or the date of quickening (Illsley, 1967b). A rarely used clinical method for assessing gestational age, the Dubowitz Scale (Dubowitz, Dubowitz & Goldberg, 1970), has been shown to provide highly accurate estimates.

At least partially due to the difficulty of accurately estimating gestational ages, birth weight generally is used alone, or in conjunction with gestational age as an indicator of neonatal status. In general, low birth weight infants (< 2,500 gms) are considered to be at risk relative to older infants: "the risk of death in the first year of life is 17 times the risk among infants weighing 2,501 gms or more" (Chase, quoted in Menken, 1972). A much higher degree of risk is associated with that subset of low birth weight infants who are classified as "very low birth weight" (< 1,500 gms).

It is widely reported that children of teenagers are more likely than children born to older mothers to be of short gestation, low birth weight, or both (see Table 2). In only two published studies did researchers fail to find any differences in the gestational ages or birth weights of the infants of teenagers and older mothers (Coates, 1970; Duenhoelter _et al_., 1975). However, the relationship of gestational age and/or birth weight to later development is not totally clear. For instance, Edwards (1968) failed to find any relationship between birth weight and any four-year developmental measures. On the other hand, in the Caputo _et al_. (1974) study, both gestational age and birth weight (which are highly intercorrelated) were significantly related to measures of infant development at one year of age. A relationship between gestational age and intellectual performance at age nine has also been reported (Muller, Campbell, Graham, Britain, Fitzgerald, Hogan, Muller & Ritterhouse, 1971).

Table 2

Studies Reporting Differences Between the Gestational Ages and/or Birth Weights of Infants Born to Teenagers and Older Mothers

Gestational age	Dott & Fort (1976); Illsley (1967b); Nye (1976); McAnarney (1975); Vandenberg (1976, reported in Chilman, 1980)
Birth weight	Alan Guttmacher Institute (1976); Baldwin (1976); Broman *et al*. (1975); Fielding (1978); Hulka & Schaaf (1964); Jones & Placek (1979); Mellor & Wright (1975); Menken (1972); Osofsky & Osofsky (1970); Ryan & Schneider (1978); Stickle & Ma (1975); Lobl *et al*. (1971); Zachau-Christiansen (1975)

In one of the few prospective studies dealing with prematurity, Hunt and Rhodes (1977) followed 56 infants, divided into four groups based upon gestational age: 27-31 weeks; 32-34 weeks; 35-37 weeks; and 38-44 weeks. Testing these children almost every month for the first year, Hunt and Rhodes found consistent differences between the groups on the Bayley mental scales. However, when the infants were compared at equal conceptional ages, no differences were found. Thus when compensation is made for unequal gestational ages, the results for all groups are quite similar. From these results, one would expect prematurity *per se* to have little effect upon development at school age.

Sigman (1976) compared the exploratory behavior of premature and full term infants, defining prematurity as a combination of gestational age (< 37 weeks) and birth weight (< 2,500 gms). When preterm and full term infants were compared at eight months conceptional age, the preterm infants explored a familiar object longer and showed less preference for a novel object. Citing other studies which found that exploratory behavior of novel objects at six months is significantly correlated with three-and-a-half year Stanford-Binet performance, Sigman concluded that prematurity may be related to lower performances on cognitive abilities tests in the preschool years.

When considering studies that use birth weight alone as the major independent variable, one again finds great confusion and disagreement in the literature regarding its relationship to later development (usually later IQ scores). However, there is a chronological pattern to the results as the following reports reveal. For instance, researchers studying children born prior to 1960 regularly report finding a relationship between birth weight and later IQ scores (Churchill, 1965; Harper & Weiner, 1964; McDonald, 1964; Weiner, Rider, Oppel & Harper, 1968; Willerman & Churchill, 1967). In studies of children born since 1960, researchers have not found a correlation between birth weight and later IQ, even when infants who were less than 1,500 gms at birth are included (Davies & Stewart, 1975; Francis-Williams & Davies, 1974; Hack, Fanaroff & Merkatz, 1979). However, even recent studies concur that small-for-date children (children whose birth weight is less than expected for their gestational age) perform significantly poorer on IQ tests than do average-size-for-date children (Als, Tronick, Adamson & Brazelton, 1976; Davies & Stewart, 1975; Francis-Williams & Davies, 1974; Kopp & Parmelee, 1979).

The explanation for the contradictory results cited above lies in changes that were made in the methods used in neonatal intensive care units, methods that were related to neurological and sensory handicaps experienced by very low birth weight infants (Davies & Stewart, 1975). Due to radical changes in medical procedures, data from earlier eras cannot be applied to the prognosis for today's low birth weight children. By the early 70s the 80-90% of surviving very low birth weight infants were free from serious mental or physical handicap (Hack, Samaroff & Merkatz, 1979). However, though school performance has not been completely analyzed for these later cohorts, there seems to be an increased incidence of learning, reading and behavioral disorders despite normal intellectual development (Davies & Stewart, 1975; Francis-Williams & Davies, 1974; Hack _et al._, 1979).

In summary, it appears that for at least some groups, there is a tendency for children of teenagers to be premature and/or of low birth weight (LBW). Though the developmental effects of prematurity alone may be negligible, low birth weight may be related to later learning difficulties. The developmental outcome for LBW children is also similar to that reported above for children born to teenagers. However, these relationships appear to be confounded by SES since early parenthood, prematurity, low birth weight and poor developmental outcome all covary with SES (Broman _et al._, 1975; Davies & Stewart, 1975; Dott & Fort, 1976; Francis-Williams & Davies, 1974; Hack _et al._, 1979; Illsley, 1967a, 1967b; Mednick _et al._, 1979; Sameroff & Chandler, 1975; Thompson, 1976).

Brazelton Neonatal Behavioral Scale indicators. The Brazelton Scale consists of 20 indicators of neurological development and 27 indicators of behavioral abilities (Brazelton, 1973). It is designed to be used on infants less than one month old and has been used primarily as a research tool with neonates. (A more detailed explanation of the Brazelton Scale is included in Chapter III.)

In two studies that have used the Brazelton Scale to compare the newborns of teenagers and older mothers, the results are somewhat different. In a Nashville study, in which "the quality of medical care was maintained," no differences were reported between the two groups of infants on day two, even though the teenage mothers experienced more stress during pregnancy than did the older women (Sandler, 1979, reported in Baldwin & Cain, 1980). A second study was conducted with samples from Florida and Puerto Rico (the quality of medical care is not mentioned). When these infants were tested at two days postpartum, in both samples the children of teenage mothers, though their scores fell within the normal range, were significantly more likely to be underaroused or overaroused than babies of older mothers (Lester, 1978, reported in Baldwin & Cain, 1980). Again, the difference in the results of these two studies may be related to the prenatal care received by the mothers.

The relationship between scores on the Brazelton Scale and later development is not well established and more studies in this area are needed. To date, only one long term follow-up study of the Brazelton Scale has been published. Low scores on the Brazelton exam were shown to be predictive of abnormal neurological development at age seven. In comparison with alternative newborn examinations, the Brazelton Scale correctly detected 80% of the abnormal children while achieving a much smaller false alarm rate, i.e., incorrectly labeling normal children as abnormal (Tronick & Brazelton, 1975).

Summary

The above review of factors on the continuum of reproductive risk has indicated several variables that apparently discriminate between the childbearing experiences of teenagers and older mothers. Unfortunately, the relationship between these factors and later development is not as clear as one would like. For instance, even though many teenagers apparently experience more difficult pregnancies and deliveries than older mothers, the relationship of pregnancy and delivery complications to later development of the child is small. Furthermore, both the experiences of pregnancy and delivery and the child's developmental status are strongly related to the mother's SES level and to the type of prenatal care she received.

Similarly, the relationship of perinatal factors to later development is unclear. Apgar scores, which may discriminate between the children of teenagers and older mothers, are reported to be related to later development, but only in a controlled setting. In a normal setting where the attending physician, who obviously has a vested interest in the results of the pregnancy, is the one who assigns the Apgar scores, the reliability, and therefore the usefulness of the scores, may be in doubt.

The relationships of maternal age to prematurity and of prematurity to later development also are unclear. In part, this lack of clarity probably is due to the difficulties inherent in any determination of gestational age. Thus, prematurity *per se* may not be an appropriate variable for use in predicting later outcome.

On the other hand, birth weight does seem to be related to developmental outcome and to maternal age, at least for some samples. The relationship between birth weight and later development is strongest for children of very low birth weight (< 1,500 gms). Small-for-date infants also are at risk. In addition, the developmental consequences of low birth weight are similar to those that have been described for the children of teenage mothers. Therefore, birth weight, probably in combination with gestational age, may be a useful perinatal indicator of the later development of children born to teenagers.

However, it is important to take into account the relationship between SES and maternal age, prenatal care, birth weight, and developmental outcome that continually reappears in the literature (Davies & Stewart, 1975; Francis-Williams & Davies, 1974; Hack et al., 1979; Illsley, 1967; Kopp & Parmelee, 1979). Low income mothers are more likely to become pregnant as teenagers, to receive little or poor prenatal care, to have low birth weight infants and to have children with developmental problems. When children of very low birth weight are divided into groups based on SES, higher scores are characteristic of the higher SES group (Francis-Williams & Davies, 1974). These relationships must be taken into account in any study of the impact of teenage childbearing on child development.

Finally, it is important to remember that studies reported above showed that the predictive ability of any pregnancy/delivery variable diminishes with time, at least when IQ is the dependent variable. Unfortunately, similar studies have not been done with the other developmental problems such as those associated with learning, reading, and behavior. Thus one would not expect that the experiences of pregnancy, delivery, and the immediate postpartum period, by themselves, to account for the developmental deficits that would have been reported for the children of teenagers.

The Continuum of Caretaking Casualty

In their review, Sameroff and Chandler (1975) indicate that parents influence their child's development through their behavior, their attitudes and the psychological and socioeconomic environments they provide their children. In this section, information relating to the quality of teenage parenting and its potential impact upon later development will be reviewed. The effects of parenting style, parental attitudes, and home environment upon child development also will be discussed.

Teenage Parenting

Several researchers have examined teenage parenting knowledge and practices. Reviewing the studies on this topic, one finds that a wide variety of approaches have been used. For instance, the samples studied have varied from 12 to 300 subjects, from all white to all black, from all rural to all urban, with some consisting of institutionalized subjects. The methodologies used have varied from the exclusive use of questionnaires to the exclusive use of unstructured interviews.

Nevertheless, the results of these diverse studies are relatively consistent (see Table 3). In general, researchers have concluded that teenage parents may lack

Table 3

Characteristics of Teenage Mothers Reported in the Literature

Characteristic	Citation
(a) Unaware of developmental milestones	deLissovoy (1973, 1975) Epstein (1979) Walters (1975)
(b) Prone to use physical punishment	deLissovoy (1973, 1975) Furstenberg (1976)
(c) Insensitive to infant's signals or needs	deLissovoy (1973, 1975) Mercer (1980) Williams (1974)
(d) Unaware of how to stimulate a child's development	Epstein (1979)
(e) Ambivalent toward motherhood	Crumidy (1966) Mercer (1980)
(f) Not inclined toward spontaneous play	deLissovoy (1973, 1975) contradicted by Williams, (1974)
(g) Likely to spend less time looking at and talking to their babies than older mothers	Sandler (1979, in Baldwin & Cain, 1980)

both the knowledge and abilities necessary for adequate parenting, especially when the teenager is the sole caregiver. Teenagers are reported to be insensitive to their children's needs and signals, inconsistent in their caregiving, and apparently more concerned with their own welfare than with that of their child.

Unfortunately, the studies from which these conclusions are drawn suffer from a number of weaknesses. Foremost among the weaknesses are small samples, samples of mixed age groups, samples of institutionalized subjects, a general lack of comparison groups, either a complete reliance upon survey methods or upon unstructured observations, and the rare use of any form of statistical analysis of the differences reported. Only the weight of repeated reports of inadequate parenting among adolescents from studies using varied methods and samples leaves one with any faith in the findings presented (see Nelson, 1973). To date, no study in which teenage parenting has been studied systematically, especially in comparison to the parenting practices of older mothers, has been published. Until that occurs, one must accept the results reported above.

Theories of development during the adolescent period provide support for the descriptions of teenage parenting reported above. During adolescence, children are making the transition from childhood to adulthood, establishing their identity or self-concept and establishing their independence from their parents (Chilman, 1980; Erikson, 1959).

At this time, the change to the formal operations stage in cognitive development usually occurs resulting in a period of strong egocentricism (Elkind, 1967). Thus psychologists have suggested that teenage mothers are more likely than older mothers to provide inconsistent care to their children, to experience shifts in mood and behavior, and to be ambivalent toward motherhood (Bemis, Diers & Sharpe, 1976; Chilman, 1980; Walters, 1975). Williams (1974) reports that the discussions among the participants of a national workshop for persons working with adolescent parents provide support for the conclusion reached by Bemis _et al_. (1976).

In a detailed study of the characteristics of mothers of colicky infants, one finds a description of mothers that is quite similar to that of teenage mothers given above (Lakin, 1957). Mothers of colicky infants are described as: (a) being ambivalent toward their role and role function; (b) having poor self concepts with respect to role function and feelings of inadequacy; (c) experiencing poor marital adjustments (see Roosa, 1977, for a review of the marital adjustment of teenage marriages); (d) being tentative and insecure; and (c) lacking facility in carrying out mothering activities. Lakin suggests that the feelings associated with these attributes greatly affect the quality of mother-infant interaction. Such feelings are reflected in less adequate responses to the infant, in less effective infant need reduction behavior, and, therefore, in greater mutual tension and discomfort.

Finally, descriptions of abusive parents indicate that there may be striking similarities between them and teenage parents. For instance, abusive mothers are described as: (a) having inappropriate expectations of the child's development; (b) being unaware of the child's needs (Bavolek, Kline, McLaughlin & Publicover, 1978; Delsordo, 1974; Johnson & Morse, 1974); and (c) having a strong belief in the value of physical punishment (Johnson & Morse, 1974). Abusive mothers usually have their first child before they are 20 years of age (Smith, Mumford, Goldfarb & Kaufman, 1975), are from low SES groups, and often are experiencing severe marital conflict (Johnson & Morse, 1974). In a recent review, Bolton (1980) also notes the numerous similarities between adolescent parents and abusive parents. He concludes that, while there is no empirical base to support a connection between adolescent parents and abusive parents, there are too many similarities in demographic and behavioral variables to ignore (cf.: David, 1972).

To summarize, all the available evidence indicates that teenagers may be less than adequate as parents. Only reports that teenagers' interest in playing with their children (Williams, 1974) and their energy, enthusiasm and willingness to learn parenting skills (Epstein, 1979; Mercer, 1980) provide an encouraging note to the review. However, the insufficient quality of the studies reviewed and the circumstantial nature of the other evidence presented do not generate much confidence that a true picture of teenage parenting in the U.S. has been presented.

Maternal Attitudes and Child Development

Though not much work has been done directly with maternal attitudes and child development, the studies that do exist suggest that this relationship could be an important one. In one of the recent studies in this area, Broussard and Hartner (1970, 1971) evaluated the attitudes of 120 mothers of full-term, normal, firstborn infants at both day 2 and at one month postpartum. Maternal attitudes were found to be quite unstable during the first month. However, the authors found that children who were rated as average or below by their mothers at one month were much more likely to need psychological intervention by four-and-a-half years of age than were children who were rated positively. This need for intervention was not related to SES or to changes in SES, to prenatal or postpartum complications, type of delivery, religious preference of the mother, or sex of the child. It is reported that disturbances in a mother's early attitudes toward her infant may lead to a chronic disturbance in the mother-child relationship (Bibring, 1961), a point made much earlier by Fries (1944). Also, a mother who is insensitive to her infant's cues, or who will not or cannot respond to these cues, can severely harm the developing relationship with her child

(Korner, 1974). Finally, self-confidence appears to be an important factor in the way a mother cares for her child (Benedek, 1949).

Summarizing the pre-1970 literature, Walters and Stinnett (1971) concluded that parental acceptance, warmth and support are positively related to favorable emotional, social and intellectual development of children. On the other hand, extreme restrictiveness, authoritarianism, and punitiveness, without acceptance, warmth and love were negatively related to a child's emotional and social development. Recent reviews support the conclusions advanced by Walters and Stinnett (e.g., see Osofsky & Connors, 1979).

Obviously maternal attitudes affect the mother-child relationship, although succinct demonstrations of these effects are not readily available in the literature. One would expect maternal attitudes to shape all aspects of a mother's relationship with, and behavior toward, her infant. Especially with the reports of negative or ambivalent attitudes toward parenting for teenage mothers, and their expressed lack of self-confidence as mothers, maternal attitudes may be a factor that distinguishes teenage mothers from older mothers.

Home Environment and Child Development

One of the more neglected, although potentially significant, influences on child development is the type of home environment in which the child is reared. There is little in the literature on teenage parents to suggest that they provide a qualitatively different environment for their children than do older mothers. However, since teenage pregnancy is associated with lower SES both before and after pregnancy, and since teenage childbearing is often associated with a rather rapid transition to "independent" living arrangements, one might hypothesize that the environments provided by teenage mothers are less optimal, in general, than those provided by older mothers.

An early study of the effects of home environment on child development examined language and intellectual development longitudinally. Seventy-six children born in London were followed from the time they were six months old until they were eight years old. At two-and-a-half years, the child's toys, books and experiences with these items, the parents' use of example and encouragement with the child, and the level of acceptance, warmth and sensitivity of the parents to the child were rated on five-point scales by observers. At two-and-a half, none of these variables showed a significant correlation with concurrently given developmental tests, but each was strongly correlated with IQ, vocabulary, comprehension, and reading quotient scores at age eight (most correlations were about .60). These correlations generally remained significant, but smaller, when social class was statistically controlled (Moore, 1968). Thus, it appears that at least global measures of the home environment during the early years are significant predictors of later development and language acquisition.

Using more detailed measurements of the environment, Elardo, Bradley and Caldwell (1975; Bradley & Caldwell, 1976) found similar results when assessing: (a) emotional and verbal responsivity of mother, (b) avoidance of restriction and punishment, (c) organization of physical and temporal environment, (d) provision of appropriate play materials, (3) maternal involvement with child, and (f) opportunities for variety in daily stimulation. Using multiple regression, the multiple correlation of these six variables measured at six months with three-year Binet scores was .54. Measured at twelve months, this correlation was .59; at twenty-four months, it was .72. The importance of the home environment appears to increase with the age of the child, probably in direct relationship with the increased use of language (cf.: Golden & Birns, 1976).

Research in this area suggests the mechanisms for some of the subtle influences of SES on child development. For instance, Wachs, Uzgiris and Hunt (1971), using a version of the Bradley and Caldwell Home Scale, documented differences between homes rated as "disadvantaged" and "average." Contrary to common belief, overstimulation of infants in disadvantaged homes accounted for the main difference between home environments. Tulkin and Kagan (1972) obtained similar results in their study comparing working class homes to middle class homes. Excessive noise, too many people providing stimulation, and, in general, levels of stimulation too high for the child's current level of functioning were negatively correlated with psychological development. It seems that environmental stimulation has a curvilinear relationship with development with both high and low levels detrimentally influencing child development (Wachs *et al.*, 1971; Tulkin & Kagan, 1972; Bradley & Caldwell, 1976; Elardo *et al.*, 1975; McCall, 1979).

The studies reported above clearly suggest that measurements of the home environment (including aspects of the parent-child relationship) can be useful as predictors of later developmental status. The unanimity of the findings is impressive considering the variety of variables measured, methods used, and samples tested. The relationship reported between the home environment variables and measures of development are also generally larger than the relationships between other variables and development.

Socioeconomic Status and Child Development

Socioeconomic status is an abstraction generally based upon education level, income and/or occupational prestige. The primary use of SES is to divide populations into groups whose members are assumed to share similar characteristics, behaviors, values and social histories. When SES is used as a variable in research, it is used to represent the qualities that the members of these groups share and not social class *per se* (cf.: Illsley, 1967b).

Throughout the previous sections of this review, references to the interaction of SES with various predictors of developmental status have been made. SES has been reported to be negatively related to the probability of becoming a teenage mother, and to the number of complications of pregnancy, labor and delivery. It is positively related to the status of the child at birth and the quality of the physical and psychosocial environment in which the child will develop. The influence of this rather gross variable appears to be pervasive. Therefore, it is easy to understand why the positive relationship between SES and development is one of the strongest and most widely reported relationships in developmental research (Ainsworth & Bell, 1973; Bayley, 1965; Broman et al., 1975; Carew, 1977; Golden & Birns, 1976; Illsley, 1967; Kopp & Parmelee, 1979; McCall, 1979; Moore, 1968; Ricciuti, 1977; Sameroff, 1975; Sameroff & Chandler, 1975; Wachs, Uzgiris & Hunt, 1971; Werner et al., 1968).

Exactly how does SES impact upon child development? The answer to this question is extremely complex. First, as mentioned above, at birth the children of low SES mothers are more likely than other children to be defined as "at risk." Such children are then reared in an environment which may not provide adequate nutrition or medical care, which may be unclean and unhealthy, which may be overcrowded and loud, and which, because of the parents' educational level and value system, may not be responsive to the child's needs and may not provide adequate stimulation to the child. As it was expressed by Lewis and Freedle (1977), the environment of the poor seems to be constructed in such a manner that the children of the poor seem predisposed to remain in the same social environment as their parents.

In this sense, children of the poor are born to parents who feel (are) powerless in their environment, an experience which shapes their attitudes and feelings toward life. In turn, the parents socialize their children in a way that prepares the children to feel powerless, a lesson that is constantly reinforced by the parents' lack of responsivity and by the environment in general (Tulkin, 1973). In such an environment, the lack of parental responsivity trains the child in "learned helplessness" (Lewis & Goldberg, 1969), thus helping to maintain the poverty cycle. It is the fact that so much of a child's environment is influenced by parental SES that makes SES such a potent influence on development.

Parenting Style and Child Development

Only one study has been found which compared the parenting styles of older mothers and teenagers (Sandler, 1979, in Baldwin & Cain, 1980). Sandler reported that the older mothers spent more time than the teenage mothers talking to and looking at their babies. Furthermore, these social interactions were associated with higher Bayley scores at nine months of age.

There is a growing body of knowledge regarding the relationship between parents' (usually the mother's) behavior and the children's later developmental status. A wide variety of methods have been used and numerous questions remain to be answered. Nevertheless, it is quite clear that parenting styles do influence child development.

For instance, Epstein and Evans' (1979) longitudinal study of children from age two to seven showed that the maternal-infant interactional style was more significantly related to later intelligence test performance than SES. Furthermore, interaction styles at age two were predictive of academic success at age seven, though not of interaction style at age seven. (This last result is probably due, at least in part, to a radical change in measures from age two to seven. Though the authors refer to their measures of interactional style, it is clear that their measures focused primarily upon maternal verbal behavior toward the child at age two. At seven, the focus appears to have changed from the mother to both the mother and child.) In this study, a positive interactional style was one in which the mother was verbally supportive, expanded upon what the child was saying, and asked questions as a teaching device. Negative interactional styles consisted of the use of positive and negative commands in response to the child's efforts.

Clarke-Stewart (1973) made repeated observations of 36 mothers and their nine-month-old firstborns over a nine month period. A complex maternal factor composed of the appropriateness of maternal behavior for the child's age and ability, expressions of affection, social stimulation, contingent responsiveness, acceptance of the child's behavior, and stimulation and effectiveness with materials was significantly correlated with measures of the child's competence. Maternal effectiveness and infant attachment to the mother, as well as maternal effectiveness and infant irritability, were significantly related. Maternal restrictiveness was related to the child's object orientation score on the Hunt-Uzgiris scale. In other words, mothers who provided more stimulation to their children (especially verbal stimulation) were positively influencing their child's development, especially intellectual development. Contingent responsiveness also was related to future intellectual development.

In another study, 24 infants who had been adopted within ten days of birth were observed and tested once when they were seven months old and again at eleven months. Though the infant's developmental test scores were found to be correlated with the natural mother's SES, parenting styles of the adoptive mothers were found to have a significant influence as well. Infants who were spoken to less, touched less or given less opportunity to explore their home scored lower on the developmental examinations (Beckwith, 1971).

Yarrow, Rubenstein, Pederson and Jankowski (1972) examined the relationship between various types of environmental stimulation (physical and social) and infant abilities among 41 black five-month-old infants from low SES families. Both level and variety of social stimulation were related to performance on the Bayley Mental Development Scale (MDI score). Furthermore, the caregiver's contingent response to infant distress was positively correlated with MDI scores. Yarrow et al. suggested that "relatively early intervention in distress states may have a general facilitating effect, either by freeing the infant to respond to external stimuli or by making him aware of a contingent relationship with the caretaker" (1972, p. 212).

Bradley and Caldwell (1976) observed 77 normal infants and their mothers in another study of multiple environmental influences. They reported that children whose performances increased significantly from six months to three years had mothers who were rated more sociable and affectionate toward the child than the other mothers in the study. At 12 months the correlation between this "maternal involvement" variable and the three year Stanford-Binet score was .47 and at 24 months, .55.

Tulkin and Kagan (1972) examined the differences in parenting style between middle class and working class white mothers and their firstborn daughters. At ten months, there were few social class differences in the areas of social contact, prohibitions, and nonverbal interactions. However, every verbal behavior observed was more frequent among the middle class mothers, though this difference may "be attributable to a subgroup of middle class mothers who were highly verbal with their infants" (Tulkin & Kagan, 1972, p. 38). There was a tendency for working class mothers to believe that their infants did not have the ability to express emotions and to communicate with others. Therefore, they saw little reason to interact with them. Tulkin and Kagan suggest that working class mothers care for their children as intensively as other mothers do, with the exception of verbal stimulation of cognitive development.

Several studies have shown the differential impact of various types of caregiving upon the developmental status of premature or low birthweight infants. For example, one group of researchers followed 51 premature infants for nine months (Beckwith, Cohen, Kopp, Parmelee & Marcy, 1976). After naturalistic observations at one, three and eight months, the Gesell developmental schedules and a sensorimotor scale were administered at nine months. Infants with high Gesell D.Q.s spent less of their awake time at one and three months receiving physical care, had experienced more postural stress when being held (i.e., they were made to provide some support for themselves), and were given more opportunities for floor freedom and exploration at eight months. Infants who received higher sensorimotor scores experienced more mutual gazing with the caregiver, more interchanges of smiling during mutual gazing, more contingent response to distress and greater levels of social interaction including more responsiveness to nondistress vocalizations. Beckwith *et al*. (1976) contend that the most significant aspects of enhanced development are the reciprocal social transactions, that is, transactions that occur contingently to the infant's signals, either simultaneously as in mutual gazing or successively as in contingency to distress or nondistress vocalizations. Even though these reciprocal social transactions occupy only a small part of the infant's daily activities, they appear to be the underlying factors in the development of competence.

Three other studies with premature infants illustrate the relative efficacy of even minimal amounts of infant-caretaker interaction. Each study provided extra stimulation to small groups of low birth weight infants during the newborn period. White and Labarba (1976) found an increase in weight gain, compared to six controls, in six infants who were given only 15 minutes additional daily stimulation for a ten day period. Solkoff and Matuszak (1975) found that 11 infants who received 7½ minutes of extra handling each hour for 16 hours a day over a 10 day period showed considerably more improvement on the Brazelton Scales than did controls. Powell (1974) also demonstrated the benefits of extra stimulation on the development of low birth weight infants, though this study was weakened by a 50% attrition rate that was especially pronounced in the control group.

These studies with premature infants seem to demonstrate that even minimal additional stimulation or interaction with caregivers can lead to enhanced development for biologically disadvantaged infants, even if the mechanisms for the improvements are not fully understood (cf.: Cornell & Gottfried, 1976). Additionally, certain patterns of caregiving are more likely than others to help infants overcome deficits that may be due to biological disadvantages at birth.

Researchers consistently have found a relationship between mothering styles and a child's developmental prognosis. Apparently, the critical variable is the amount of social stimulation, as contrasted to the amount of time spent providing physical care. Though social class differences have been reported for the amount of stimulation provided, parenting style has been reported to be more strongly related to development by school age than is SES, in contrast to all the previously reviewed influences on development. However, it is probably more logical to assume that parenting style is simply a mechanism through which SES influences are transmitted.

Possibly the most encouraging aspect of research in this area has been pointed out by Moore (1977).

> One suspects from these observations that the mothers of competent children do not have mothering skills that other mothers lack; none of the behaviors they display would appear to require a high degree of social skill or expertise. But they do require a "mind set" about mothering in which the mother is conscious of her part

> in nurturing her child's budding intellectual and social competences as well as in caring for her child's physical needs (Moore, 1977, p. 68).

Mother-Infant Interaction

Up to this point, mother-infant interaction has been seen as a relationship in which only the mother (or caregiver) has influence upon the child's development. The infant appears to be a passive acceptor of environmental stimulation. This is, in fact, the way that much of the literature views mothers and infants. However, there is considerable evidence that the infant plays a significant role in shaping his/her own environment and in determining, to some extent, how caretakers respond to his/her needs.

The infant's role in mother-infant interaction is readily apparent in extreme cases. For instance, Shaw (1977) found that mothers of babies labeled "chronic cryers" interacted less with their infants and were less responsive to the infant's cues than mothers of other babies. Similarly, abused children often have abnormal characteristics that appear to predispose the parents to be abusive. These children often are of low birth weight, may be mentally or physically ill, or may be temperamentally difficult or trying (Sameroff & Chandler, 1975).

Another extreme example is provided by work done in a village in which undernourishment is prevalent (Chavez, Martinez & Yaschine, 1975). One group of mothers were provided vitamin supplements early in their pregnancies and their children received food supplements from the twelfth to the sixteenth week of life. By the twenty-fourth week, the supplemented infants were more active and demanding than unsupplemented infants. As a consequence, the supplemented infants had higher levels of interaction with their mothers and even their fathers, though it was unusual for fathers in this village to be involved in child care for very young children. These supplemented children also were moved more and spent more time outside the home than unsupplemented children and thus were exposed to a greater variety of environmental stimuli.

However, the child's first influences upon his/her own development are more subtle and occur earlier than the examples given above. Bennett (1976) noted that caretakers, whether professionals or parents, tended to label various aspects of the baby's personality from the first moments. These labels, combined with the infant's particular active-sleep cycle, were related highly to the type and amount of mother-infant interaction by as early as the second week. Even before the infant is able to develop expressive mechanisms, he/she is exerting an influence on his/her social environment.

Mother-infant interaction is more complex than either of the unidirectional models presented thus far. It is best described as a fitting together of two complex organisms and personalities, a bidirectional organization of behavior. Each infant is born with a unique rhythm and organization of the arousal and inhibitory systems (Bennet, 1976; Brazelton, 1976; Lozoff, Brittenham, Trause, Kennell & Klaus, 1977; Schaffer, 1974) and a characteristic temperament (Bonem, 1978; Thomas, Chess & Birch, 1963). One of the first tasks of the mother is to adapt to the infant's basal characteristics, to learn his/her rhythms and to learn to identify and interpret his/her cues (Sander, 1976, 1977; Thoman, 1975). Her mode of adaptation to these characteristics alters them and thus alters the stimuli to which she must respond. It appears that the infant is in charge at this stage, with the mother adapting to the infant's needs and cues (Brazelton, 1976; Lozoff <u>et al</u>., 1977). However, the mother is simultaneously shaping the baby's behavior by altering its sleep-wake cycle (Sander, 1970, 1972) and by presenting her particular style of caretaking and handling to the infant (Call & Marshak, 1976; Thoman, 1974). In optimal situations, mother and infant learn each other's characteristics and styles and learn to identify the signals each uses. In this case, behavioral synchrony has been established and mother-infant interactions generally are characterized by sequences of give-and-take (Brazelton, 1976; Sander, 1970, 1976; Schaffer, 1974). Asychrony in these early interactions is usually related to neurological or severe physiological handicaps in the infant (Brazelton, 1976; Condon, 1975; Lozoff <u>et al</u>., 1977) or may be predictive of developmental traumas such as failure to thrive (Thomas, 1975). Since adults are more capable of conscious adaptation, it is extremely important for the infant to experience a sensitive and responsive mother or other caregiver during the first months of life (Dunn, 1976).

Mother-Infant Attachment

In order to understand the full significance of mother-infant interaction one must understand the concept of attachment. Attachment is one of the major adaptive processes for both mother and infant and, because of the developmental level and characteristics of teenage mothers, may be an extremely difficult process for teenage mothers and their infants. Unfortunately, theoretical perspectives of attachment vary greatly depending upon one's theoretical background. In this section, the varied theoretical perspectives of attachment will be reviewed and the relevance of attachment to adolescent parenting will be discussed.

Instinct theorists were the first to use the term attachment as they attempted to apply to humans the concept of imprinting that ethologists discovered in animals (Bowlby, 1958). Though the newborn infant did not actually follow its mother, it did behave in a manner that kept the mother close to it. According to this theory, the infant has an innate drive to maintain proximity to its mother (and only its mother) because she is the only source of food (the breast), comfort and safety. Likewise, the mother is innately attached to the infant, for the good of the species. The primary distinction between humans and animals in attachment behavior is that the infant, instead of remaining close to the adult, produces behavior such as crying or smiling that keep the parent close to it.

There are a number of problems with Bowlby's theory of attachment. First, Scrimshaw (1978) argues that infanticide has been the most widely used method of population control throughout human history. If attachment is well organized at, or very shortly after, birth, infanticide would interfere with the mother's desire to reproduce. The fact that cultures which practiced infanticide survived seems to preclude early, innate attachment (Freedman, 1974).

Second, researchers have shown that fathers are adequate caregivers and fathers and infants do form attachments, even when fathers are not involved in routine caretaking (Parke, 1979). In general, fathers and infants interact differently than do mothers and infants. However, these differences probably result from the socialization of the father and are not necessarily innate.

In contrast to Bowlby (1958), Gewirtz and Boyd (1977) and social learning theorists in general, view attachment as a process of mutual conditioning. As the caregiver's contingent responses condition her infant's behavior, the infant's contingent responses condition the caregiver's behavior. Attachment then is seen as a process of mutual learning and reciprocity. According to this viewpoint, facial features and expressions develop discrimination functions as the mother responds to the infant's needs (cf.: Cairns, 1972). Originally the mother is reinforced by the infant's signals that it's needs have been met and the infant is reinforced for crying by having it's needs met. Through mutual conditioning, eventually facial features, smells, body movements, and more specific sounds may replace the original reinforcers.

Others who speak of attachment tend to emphasize the role of psychological attitudes with the behavioral aspects receiving second priority (Klaus & Kennell, 1976; Kennel, Voos & Klaus, 1979; Leifer, 1977; Lozoff et al., 1977). Leifer (1977) found that emotional attachment begins as early as the second trimester of pregnancy, after fears of miscarriage have passed. After quickening, women tend to become increasingly emotionally invested in the fetus as the fetus becomes personified and preparations for the birth take place. Leifer considered this linear increase in affect toward the fetus during pregnancy as a significant developmental task of pregnancy and as an intricate part of the postpartum bonding process. Women who did not develop these affectional ties during pregnancy tended to have difficulty in the transition to parenthood and in establishing attachments with the infant.

Klaus, Kennell and their associates (1976, 1977, 1979) tend to focus on the immediate postpartum period for the development of mother-infant attachment. This formulation suggests that there is a sensitive period for the formation of parental bonds during the first hour or so after birth (see also Ainsworth, 1973; Brazelton, 1976). During this period Klaus and Kennel (1976) propose that there is a species-specific response to the human infant that lays the foundation for maternal-infant bonding. Stresses that occur during pregnancy, or even during previous pregnancies, which leave the mother feeling unsupported or ambivalent about the pregnancy or which precipitate concern for the health or survival of either the mother or infant, can delay preparation for the infant and retard bond formation (Cohen, 1966; Leifer, 1976).

Therefore, if the mother has positive psychological attitudes toward the child (i.e., the child is wanted and the mother is ready to love and care for the child), the mother will be much more accepting of the child and ready to adapt to the child's needs than if she had negative attitudes. Then, if the mother is psychologically attached to the infant at birth, the infant will become attached to the parent much more positively and rapidly than otherwise. However, complications of pregnancy, labor, and delivery, deformities or morbidity of the infant at birth, or intensive care for the infant, can delay or retard the development of mother-to-infant bonds and therefore, infant-to-mother bonds (Goldberg, 1979; Klaus & Kennell, 1976). In this approach, attachment is seen as a two phase unilateral process with the parent doing all the adapting before birth and during the first few days afterwards and the infant doing most of the adapting thereafter.

In a more holistic and systemic approach, attachment is seen as the constructed, cognitive-social relationship between a caregiver and an infant. It is a continuously negotiated and achieved adaptive fit between these two individuals as they adapt to one another and become a unit during the early months of infancy. This complex interaction between genetic and environmental elements is linked to further socio-emotional organization and development of the child (Ainsworth, 1969; Ainsworth & Bell, 1973; Ainsworth et al., 1974; Freedman, 1974; Sroufe, 1979).

One of the critical features of this view is the importance of behaviors or events that are consistent and contingent upon the infant's signals (Ainsworth, 1969, 1973; Ainsworth & Bell, 1973; Ainsworth, Bell & Stayton, 1974; Blehar, Lieberman & Ainsworth, 1977; Brazelton, 1976; Lewis & Goldberg, 1969; Lozoff et al., 1977; Robson, 1967; Sander, 1977; Sroufe, 1979). When a caretaker responds, or fails to recognize or respond, to the infant's cries or movements, the caretaker is providing feedback to the infant about the efficiency or usefulness of the infant's signaling. In turn, the infant's responses to the caregiver's ministrations indicate to the caregiver the acceptability or utility of those efforts. Through this process of signaling and feeding back, the caregiver and infant shape each other's behavior (Ainsworth, 1969). The resulting behavior may not be as either would have desired, but it will evolve from this mutual adaptation and reciprocity.

However, this process of shaping behavior is fundamentally different from the mutual conditioning process of Gewirtz and Boyd (1977). As Gewirtz suggests, shaping of another's behavior requires responses that are contingent upon that behavior. The term "contingency of reinforcement" implies that both the mother and infant are passive receptors of stimulation. The term feedback, on the other hand, suggests that each of these individuals is actively involved in their interactions, that each learns from the information received from the other's response, that each uses this information to reorganize behavior in a trial-and-error fashion, and that each response, rather than being the end of a stimulus-response chain of behavior, is a link in a complex chain of behavior (Ainsworth, 1969). In this view, infant development, rather than being a passive process, is seen as one in which there is a continuous trend on the infant's part toward more active participation in producing effective stimuli (Sroufe, 1969).

Attachment is not solely based upon contingencies and responsivity. The mother's ability to provide adequate caregiving and to set an affective mood, her acceptance of the infant, and her sensitivity to the child's affective signals are an important part of the process as well (Ainsworth _et al_., 1974; Sroufe, 1979). Sensitive caregivers provide the proper affective climate, help the infant achieve and maintain an optimal level of tension, and help their infants organize the behavior to which she will respond contingently. However, with sufficient interactions, attachments can develop even in harsh, punishing environments (Ainsworth, 1973).

This early interaction is the infant's first attempt at the negotiation of an interpersonal relationship and the progress of this relationship is thought to affect future interpersonal relationships (Ainsworth, 1969, 1973; Sroufe, 1979). After all, this is where the child begins to learn the rules that govern such relationships. Furthermore, the infant's ability to control or shape the caregiver's behavior provides the infant's first experiences in controlling aspects of its environment. The relative success or failure of these early efforts is thought to affect future cognitive development (Ainsworth, 1969, 1973; Ainsworth & Bell, 1973; Lewis & Goldberg, 1969; Schaffer, 1971; Sroufe, 1979; Sugarman, 1977).

In general, infants who are relatively successful at environmental control learn from their experiences, refine their signaling behaviors, and apply their efforts to other parts of the environment. Such securely attached infants are also much more likely to feel free to leave the mother, when they become mobile, and use her as a base from which to explore their environment, a behavior that has been linked to cognitive development (Ainsworth, 1969; Kennell & Klaus, 1976; Sroufe, 1979). On the other hand, infants whose efforts continually meet with failure and frustration, experience learned helplessness (Lewis & Goldberg, 1969). Over time, such infants can be expected to become passive and listless and may even experience traumas such as the failure-to-thrive syndrome (Thoman, 1974). Thus, experiences gained by the infant during the first few months of life are seen as critical to much of the child's later development.

Unlike the behaviorists, psychobiologists do not see attachment as purely learned behavior. Because the human newborn is so helpless at birth and therefore completely dependent upon adult caretakers for sustenance and protection, the mutual attachment of adults and infants is obviously a necessity for species survival. Therefore, one would expect inherited thresholds or pathways of learning to exist to facilitate the attachment process (Ainsworth, 1969; Freedman, 1974; Klaus & Kennell, 1976). The acceptance of genetic support for the attachment process is one of the major differences between the psychobiological view of attachment and the social learning view.

For instance, most theorists agree that social smiling plays an important part in the attachment process. However, social smiling does not occur until the infant is two to three months old (McFarlane, 1974). During the period before social smiling begins, involuntary or non-elicited smiling does occur occasionally. During this time the infant begins making mutual eye contact with the caregiver. Soon, smiling occurs during mutual eye contact and the infant takes on "human" qualities for the parents. Mutual eye contact and social smiling are the infant's first adult-like positive reinforcers. This developmental process, probably genetically influenced, is hypothesized to have the evolutionary utility of allowing mothers eventually to accept early neonatal death without threatening further reproduction. Secondly, it allows another caretaker to rear the child, and form attachments with the child, in the event of maternal death during birth (Freedman, 1974).

Another apparently innate developmental factor is the infant's ability to adapt to the communication rhythm of those around him/her (Condon & Sander, 1974a, 1974b; Kennell et al., 1979). Speech communication is a uniquely human characteristic. In one child development laboratory, microanalysis of videotapes has supposedly shown that hours old neonates who are moving begin to coordinate their movements with the rhythm of the human speech around them (Condon & Sander, 1974a, 1974b). Such an ability no doubt would help the infant in its initial primitive communications with its caregivers. Furthermore, reciprocal, contingent behavioral patterns which mothers and infants develop would be similar in form to human speech; that is, they intercollate their behaviors whereas later they will intercollate their speaking turns. The infant's ability to adapt to the rhythm of adult speech would be helpful both in the development of reciprocal, contingent patterns as well as the development of speech. If other researchers can replicate Condon and Sander's findings, this ability will be another example of the interaction of what is probably a genetic pathway and social learning processes that is crucial to overall human development.

Thus, in the psychobiological approach, attachment is a critical element in human evolutionary adaptation and as such has meaning only as a long term ongoing process. It is an intimate relationship that is constantly negotiated and changing between a caregiver and an infant and which is shaped by the infant's biological status and the mother's developmental history. It is not a singular, easily defined or recognized process but it is the process through which mother-infant interaction style is developed and expressed.

Furthermore, because attachment is a process, one can only infer its presence when one sees attachment behaviors (Schaffer, 1971; Ainsworth, 1969, 1973; Klaus & Kennell, 1976; Sroufe, 1979). These behaviors are generally described as proximity-maintaining behaviors, baby's reacting differently toward parents and strangers, harsh reactions from infants separated from their mothers for long periods of time, exploratory behaviors, and reciprocal, contingent behaviors between caregiver and infant.

As the above description has shown, attachment is thought to have a significant effect upon a child's socio-emotional and cognitive development. Because of its complexity and its role in all of a mother and infant's interactions, it is a central concept in child development. The significance of attachment for a study of adolescent parenting behavior lies in the question, "Do adolescent parents and their children generally have more difficulty in the attachment process than do other parents and children?"

Since teenagers are known to have more unplanned pregnancies, to be ambivalent toward pregnancy, to experience more stresses during pregnancy, to have more complications during pregnancy, and to have more low birth weight and/or premature infants than older women, there is reason to believe that teenage mothers would be less prepared to form attachments with their children. Add the fact that teenagers are more likely than older mothers to be single parents or, when married, to have distressed marital relations, and the likelihood of experiencing difficulties during the attachment process appears to increase. For these reasons, attachment is seen as potentially the most important element that differentiates teenage mothers and their children from older mothers and their infants.

Summary

Though the quality of research on teenage parenting practices and attitudes is less than desirable, the results of these studies have been consistent. In all cases, the quality of teenage parenting has been found wanting. Teenagers have been reported to lack self confidence in their parenting abilities, to be ambivalent toward the parenting role, and to be unaware of, and/or unresponsive to, their infant's signals. It has even been suggested that teenage parents are more likely to be child abusers than other parents (Bolton, 1980). The characteristics of persons in the developmental stage in which most teenage parents find themselves also were shown to be in conflict with the demands of being a parent.

The elements on the continuum of caretaking casualty have consistently been shown to be related to child development. The mothers' attitudes toward parenting in general or her child in particular have been shown to be related to the way the mother interacts with the child and the child's later developmental status. The quality of the home environment and the quantity and type of stimuli that are available to the child have also been shown to be related to later development. Parental social class has been shown to have a strong effect upon many aspects of a child's development and to be strongly related to later developmental status. Finally, the mother-child interactional unit, which actually cannot be separated from the other elements discussed above, appears to have a strong role as a mediator of other influences on child development. Because of the contrast between what is known or suspected about teenage parenting behavior and what is necessary for normal or enhanced development for children, the elements of the continuum of caretaking casualty may help explain the developmental deficits reported for children of teenage mothers.

A Systems Approach to Child Development

The review of attachment above illustrates the need for approaching complex phenomena with methods more complex than the bivariate or multivariate unidirectional models (also known as mechanistic or medical models) that have characterized much of the child development research to date. For instance, throughout the review it has been noted that SES interacts with many of the independent-dependent variable relationships described. There is a need for multivariate transactional models that take several variables and their interactions into account to explain complex phenomena.

The use of transactional models is referred to as the systems approach. A system is a group of interacting, interdependent elements. The interaction and interdependence of the elements create a unique functioning whole. Any change in the parts produces systemic changes in the whole. The whole can be understood only by considering all the parts and their interactions simultaneously (Buckley, 1967; Kantor & Lehr, 1975).

Complex systems can themselves be constructed of interdependent, interacting systems. Thus when the systems approach is applied to an organism the focus is upon organism (a complex system)-environment systems (several complex systems which may include organisms). In such a complex system, one studies the transactions among the elements; i.e., one looks at the ways that the organism alters the environment and is, in turn, altered by that environment. No longer should one be content with simple stimulus-response networks. One must consider an organism that learns from its interactions with the environment and makes conscious efforts to alter that environment. This approach assumes constant change throughout the system in response to the feedback received from the changes occurring elsewhere in the system. Thus, behavior loses the essence of its meaning outside the context (environment) in which it occurs (Overton & Reese, 1977; Willems, 1977; Hook & Paolucci, 1970; Paolucci, Hall & Axinn, 1977; McGurk, 1977).

Willems (1977) outlines the basic assumptions of applying such a transactional approach to the study of humans. These assumptions are:

> (a) that human behavior must be viewed at levels of complexity that are quite atypical in behavioral science; (b) that the complexity lies in systems of relationships linking person, behavior, social environment, and physical environment; (c) that such systems cannot be understood piecemeal; (d) that such behavior-environment systems have properties that change and unfold over long periods of time; (e) that tampering with any part of such a system will probably affect the other parts and alter the whole, which in turn means we must develop an ecological awareness of the many ways in which simple intrusions can produce unintended effects and the many ways in which long-term harm may follow from short-term good; and (f) that the focal challenge is to achieve enough understanding of such systems so that the effects of interventions

> and planned changes can be anticipated in a comprehensive fashion (Willems, 1977, p. 22).

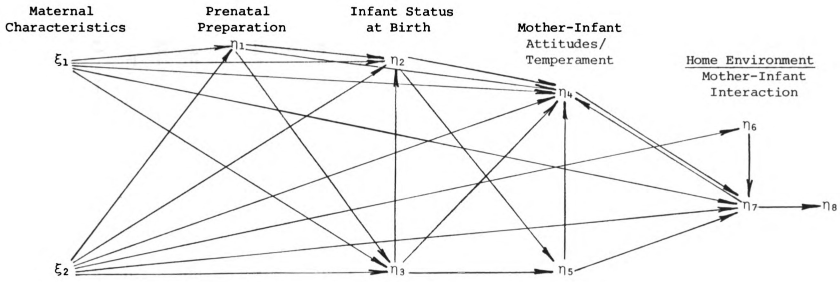
The need for such holistic and complex models in the study of the effects of teenage parents on their children's development should be apparent by now. The review of the literature above has shown continually that univariate or multivariate predictors of development are generally only weakly related to most measures of developmental outcome. Furthermore, most of these relationships are confounded by other relationships (often unmeasured) with the independent and/or dependent variables, e.g., confounding often occurs with SES, race, marital status, or age of mother (cf: Blank, 1976; Sameroff, 1975; Sameroff & Chandler, 1975; Social Research Group, 1977).

Thus it has been shown that early disorders in development, by themselves, have very little relationship to later developmental status. It is only when the continuum of reproductive casualty and of caretaking casualty are examined together that complex transactions are found which reduce or amplify early problems in behavior. Developmental outcomes are, therefore, the products of a child's characteristics and environments, and the transactions between the two (Sameroff, 1975). Inborn deficits cannot be regarded as a static characteristic if the child is thought of as actively and constantly engaged in attempts to organize and structure his/her world. According to this approach, the constants of development are not some set of traits but rather the processes by which these traits are maintained in the transactions between the organism and environment (Lester, 1979; Lewis & Starr, 1979; Sameroff & Chandler, 1975).

Furthermore, the child's perpetual state of active reorganization is thought of as a "self-righting ability," a means of correcting inborn deficits. One explanation for failure of this self-righting mechanism could be an insult to the organism's integrative mechanism which prevents the self-righting ability from functioning. This implies a major insult such as severe neurological damage. It is also possible that environmental forces present throughout development could prevent the normal integrations that would occur in a more modal environment (Sameroff & Chandler, 1975).

Model for Examining the Effects of Maternal Age on Child Development

By combining this type of holistic, integrative and systemic thinking with the above review of the literature, the model in Figure 1 emerges. This model includes all the causal variables mentioned in the literature. However, the pathways indicate the mechanisms through which each variable's influence is transmitted, rather than linking each variable directly to the final outcome variable. By doing so, the emphasis is upon the processes of the influences, thus reducing the proposed importance of any



ξ_1 = maternal age

ξ_2 = SES

η_1 = prenatal preparation

η_2 = neurological and behavioral status at birth

η_3 = physical indicators of neonatal status

η_4 = maternal attitudes

η_5 = infant temperament

η_6 = home environment stimulation

η_7 = quality of mother-infant interaction

η_8 = child's developmental status at school age

Figure 1.--Model for Examining the Effect of Maternal Age upon Child Development.

single variable. This conforms with suggestions that there is a need to shift the emphasis from assessing changes in outcome measures to identifying the processes underlying the changes (Social Research Group, 1977; Sameroff & Chandler, 1975).

As an example of this type of emphasis, look at the position of prenatal preparation in the model. The literature suggests that both maternal age and SES are related to the month in which prenatal care begins and the number of prenatal visits. In turn, prenatal care is related to the state of the infant at birth which should be evident both in the medical indicators of birth status and in the results of the Brazelton examination. Both the status of the infant at birth and the mother's degree of preparation for the birth are related to the mother's attitudes toward her child. These same variables are related to the child's temperament. The mother's attitudes will affect her behavior with her child. It is only through this complex network that prenatal care is seen to have an effect on child development. It is hard to imagine prenatal care having a direct effect upon child development as the results of correlational studies imply.

Unlike prenatal care, both maternal age (ξ_1) and SES (ξ_2) are expected to have a broader range of effects upon child development. Whether the effects of these variables in the model are both direct and indirect as shown is an empirical question.

It is hypothesized that all the relations noted should contribute to the child's developmental status six to twelve years later. Obviously, there would be numerous environmental and even physiological influences on development in the intervening years. For this reason, the model is limited in the amount of variance in intellectual development that it could account for. However, because the model focuses upon the critical mechanisms of development that will be operating during these intervening years (i.e., the mother-child interactional system), it is reasonable to expect a stronger relationship than is usually found in research that predicts later developmental status (Lewis & Starr, 1979).

Notice also that the model does not include any contemporary measures of developmental status at the one to three month level. Because of the widely recognized difficulty of using developmental status prior to about three years of age (when language development becomes very important) to predict developmental status beyond age three, it would not be advantageous to include such a measure in the model. The effects of SES and caretaking environment would be expected to be much more potent shapers of development in the intervening years than would developmental status at three months, a primarily biological phenomenon (Honzik, 1976; Kagan, 1979; Korner, 1976; Lewis, 1976; McCall, 1973, 1979; Sameroff, 1975).

Summary

In this chapter, research related to the childbearing and childrearing experiences of teenagers relative to older mothers and research related to child development has been reviewed. The factors on the continua of reproductive casualty and caretaking casualty have been examined with regard to their ability to differentiate between teenage mothers and older mothers and their association with the later developmental status of the child. Experiences of the prenatal and perinatal period as well as the physiological and neurological status of the newborn were shown to be related weakly, if at all, to later developmental status, except in extreme cases. On the other hand, factors on the continuum of caretaking casualty, including parental attitudes, SES, parenting style, and parent-infant interaction were shown to be related to a child's developmental status. Caretaking factors were shown to be capable of diminishing or amplifying the effects of genetic or congenitally acquired deficits.

Finally, it was argued that the continua of reproductive and caretaking casualty were not mutually exclusive. In fact, in order to gain a better understanding of the complexity of human development, one must examine both continua and the transactions that occur among their elements. Furthermore, rather than focus upon any set of elements, one should examine the processes that maintain or enhance child development if one is interested in predicting later developmental status. A multivariate model was developed which attempted to define the causal pathways and mechanisms of those "independent" variables in the child development literature which also appear capable of differentiating between teenage mothers and older mothers.

CHAPTER III

DESIGN

The research design for this study was a naturalistic observation, causal-comparative design which uses two groups of mother-infant pairs. Data were collected by interviewing mothers prenatally, by using medical records of the pregnancy and delivery, by examining newborn children, by observing mother-infant interactions in the home, by evaluating home environments, by measuring maternal attitudes toward the infant, and by assessing behavioral capabilities of infants at 12 months conceptional age. The remainder of this chapter describes the sample, the consent procedures, the details of the methodology, the instruments used, the measurements of variables, and the method of analysis.

Subject Recruitment and Selection

The subjects for this study were English speaking, primiparous mothers and their well, non-twin infants who were without any known defects. Subjects were excluded if their infants could not be maintained in an open crib after birth, or if the child was given up for adoption. One group of mothers was less than 20 years of age at the time of their delivery. The second group met the same criteria as the first except that they were at least 20, and not more than 35 years of age at the time of the birth.

All subjects were self-referred. A letter describing the project (Appendix A) was distributed by organizations teaching prenatal classes. Copies of the letter were left in the offices of cooperating physicians, prenatal clinics, family planning agencies, and school counselors which prospective subjects could be expected to frequent. The letter:

1. Explained the nature of the study,
2. Explained the type of subjects needed,
3. Explained the confidential nature of the data collected,
4. Explained the time obligations of volunteers,
5. Explained the remuneration available to participants (12 boxes of disposable diapers),
6. Contained a telephone number that mothers could call if they had additional questions or wanted to volunteer, and
7. Had a business reply postcard attached which mothers could complete and send if they wished to volunteer.

Using the letter and postcard, subjects were recruited from Eaton, Clinton, and Ingham counties in Michigan. In Gratiot County, cooperating physicians helped recruit subjects by urging their participation and indicating that the information gathered would become a part of their medical records. The letter to subjects specifically mentioned this arrangement (Appendix A). The distribution of live births for these counties for 1978 is shown in Table 4.

Table 4

Age-Specific Live First Births for Clinton, Eaton, Gratiot, and Ingham Counties, Michigan Residents, 1978[a]

County	Age of Mother		
	15-19	20-29	All Ages
Clinton	68	200	292
Eaton	85	273	392
Gratiot	88	171	268
Ingham	380	1,185	1,707
Totals	621	1,829	2,659

[a]Michigan Department of Public Health, Office of Vital and Health Statistics, 1979.

Seventy-eight mothers and their infants took part in all or part of the study. The present study is limited to 62 mothers and infants who met all the criteria for participation and for whom complete data are available. Table 5 shows the disposition of all 81 subjects. Table 6 shows the age distribution of the sample.

Table 5

Response Description

Subject Category	Reason for Losses	Number
Completed initial interview		78
Healthy child born	1 teenager's child died shortly after birth 1 older mother delivered in Midland; child could not maintain body temperature and therefore could not be tested 2 teenagers did not inform us of a birth	74
Hospital and Brazelton data gathered	1 teenage mother decided to drop out after the inter-view 1 teenage mother did not contact researcher when child was born; child was two months old when researcher reestablished contact 1 older mother moved out of state between inter-view and birth	71
First home visit completed	1 older mother left area to care for a sick relative; was gone over two months 1 older mother's child was placed in a foster home 1 older mother moved out of state after delivery 1 teenage mother was evicted at the time of the first visit; did participate in the second and third visits	67
Second visit completed		68

Table 5 (continued)

Subject Category	Reason for Losses	Number
Third visit completed	5 mothers (3 teens) gave birth beyond the end of the March 31 deadline. As much data as were possible were gathered for future analysis.	63
Cases for final analysis	1 teenage mother participated in only two of three home visits	62

Table 6

Age Distribution of Subjects

Age	Frequency (n = 62)
15	4
16	1
17	0
18	5
19	4
20	2
21	0
22	3
23	6
24	5
25	3
26	9
27	6
28	3
29	5
30	4
31	1
32	1

Informed Consent Procedures

Because of the sensitive nature of studies of teen-age pregnancy, a great deal of effort was taken to be sure that free, informed and legal consent was obtained before any data were collected. For this purpose, the population was divided into three groups with a consent procedure for each group. These groups and procedures were:

1. Women 20 years old or older and women 16-19 years old who were self-sufficient and who were not wards of the Probate Court (emancipated minors): For these groups only the signature of the woman was required. However, the signatures of the husband, significant male, relatives or relevant others were obtained where applicable, to gain their support for the study and to eliminate a possible source of tension as the study progressed.

2. Women 16-19 years of age who were self-sufficient and who were wards of the Probate Court: For this group, after the consent of the woman was obtained, the signature of the Probate Court judge would be obtained <u>before</u> collecting any data. Again the signatures of any relevant others with whom the woman may have been living would have been obtained also. (No women fitting this description volunteered to be in the study.)

3. Women 16-19 years of age who were not self-sufficient and women 15 years old: For these groups, the signatures of the woman and at least one parent were

obtained before data were collected. Whenever the woman was married, her husband's signature was sought also.

Immediately upon receipt of a postcard or telephone call from a pregnant woman, a researcher made an appointment with the woman and her husband (or others as appropriate). During this meeting, the researcher explained the nature of the study in somewhat greater detail than was available in the letter and answered questions that the woman (or others) may have had.

The researcher explained that the study concerned the many ways that different groups of people have of caring for children. The researcher was concerned with anything that may affect a family's method of childrearing, including the family's background, the medical records of the pregnancy, delivery and birth, the abilities of the infant at birth, and the mother's style of caring for the infant. The researcher gave the family a copy of the Schedule of Activities (Appendix B) which outlined the study simply and graphically. The researcher also explained that, if for any reason the infant could not be maintained in an open crib by the end of two weeks after birth, the family would be dropped from the study. Furthermore, the time requirements of the study were outlined as: first interview, 15-30 minutes; newborn examination, 30 minutes; home visits, about 2½ hours each. The informed consent forms (Appendix B) were explained in detail.

If the woman were interested in participating in the study after the explanation and after her questions were answered, the relevant signatures, as outlined above, were sought. Any of the signees could terminate the subject's participation.

The letters to expectant mothers (Appendix A) and the consent form (Appendix B) used in Gratiot County mentioned specifically that the data collected would become part of the woman's and baby's medical records. However, women from Gratiot County who wanted to participate in the study without this stipulation could sign the consent form that was used in the other counties. No one took this option.

Research Staff

The staff for the present study consisted of seven graduate students: six female, one male. Each was trained in the use of all of the instruments used in the study except the Brazelton Scale, which requires special training and certification. (Two staff members who received certification administered all of the Brazelton examinations.) After the end of the initial training sessions, staff meetings were held approximately every two weeks for the remainder of the project. Additional training took place at these meetings and unusual data gathering or recording situations were discussed.

The assignment of subjects to staff members was more or less random with two exceptions. As subjects enrolled in the project they were assigned to the staff on a rotating basis, depending upon work loads. A single researcher was assigned to each family for the duration of their participation, including accompanying the Brazelton examiner during his/her visit with the family. However, subjects assigned to the male staff member who indicated during the initial interview that they would be breast feeding their baby and would be uncomfortable doing so with the male observer present were reassigned to another member of the staff for the duration of the study. Furthermore, all subjects from the Alma area were assigned to the author due to the time commitments required.

Method

Initial Interview

When informed consent was granted, the Initial Interview Form was completed (Appendix C). The purpose of this interview was to obtain background economic and demographic information on the subject and, where relevant, her husband (or other significant male) and parents. At this time the subject was asked to contact the research staff at the time of the birth. The expected date of birth was also obtained. Using this information, the subject was called a few weeks prior to the delivery date to remind her of the study's interest in her delivery.

During the initial interview, each mother was engaged in open conversation about the pregnancy and impending birth. Throughout the conversation the researcher indicated his/her genuine interest in the mother's experiences and in children in general. Establishing good rapport with the mother at this time reduced her anxiety about participating in the study and began to desensitize the mother for future visits.

Obstetric Data

While the mother and baby were in the hospital, the medical charts of the mother and infant were examined. The Obstetric Information Form (Appendix C) was completed at this time. Information about the mother's weight gain during pregnancy, medications given during pregnancy, labor and delivery, any complications that occurred and information about the neonate at birth were recorded on this form. In hospitals in which the research staff were not allowed access to the subjects' medical records, the obstetric information was obtained from the mother after she got it from the nursing staff. This indirect system worked well with only a few exceptions.

Neonatal Behavioral Assessment

Approximately ten days *post partum*, a member of the research team who was certified to do so administered the Brazelton Neonatal Behavioral Assessment Scale (Brazelton, 1973; Appendix C). The Brazelton exam assessed the infant's neurological intactness and behavioral capabilities. During this visit, attempts were made to involve the mother in a discussion of the delivery and the general results of the assessment. This interaction also helped to desensitize the mother to the presence of the observer during later visits.

Home Observations

All infants were observed at equivalent conceptional ages, based upon the gestational age of the infant at birth, since cognitive development is related to biological age and not extrauterine age (Amiel-Tison, 1968; Hunt & Rhodes, 1977). Observations took place at 1, 2, and 3 months from the expected dates of birth, or at 44, 48, and 52 weeks conceptional age. At those times, naturalistic observations were made in each of the subjects' homes as the family members proceeded with their usual everyday activities. During each of these visits, the babies were observed through a cycle that consisted of waking from sleep, being fed, and all other activities that occurred until they fell asleep again (or for a maximum of two hours after waking from sleep, whichever came first).

The behaviors of the infant and the mother were recorded every 15 seconds using a checklist (Appendix C). The observers used an automatic timer which emitted a click every 15 seconds through an earphone.

Maternal Attitudes

During the three home visits the Know Your Baby Scale (Appendix C), a 13 item scale based upon the Neonatal Perception Inventory (Broussard & Hartner, 1971), was administered. During one of the asleep periods before or after the observation, each item was read to the mother and her responses were recorded.

Home Environment

The home environment was evaluated during visits one and three by using the Home Environment Assessment Instrument (Appendix C), an instrument that was developed from the Purdue Home Stimulation Inventory (Wachs, Francis & McQuiston, 1978). Information for the home environment evaluation was obtained by interviewing the mother, by observations made during the visit, and by inspecting the child's toys and room. This evaluation took place during one of the infant's sleep periods.

Infant Temperament

The Michigan Infant Temperament Scale (Bonem, 1978; Appendix C) was given to the mother to complete during a sleep episode in visits one and three. This scale consists of 164 true-false items and took 15-20 minutes to complete. The researcher, at the mother's discretion, cared for the infant's needs during this period, should the infant wake up, to facilitate the mother's uninterrupted completion of the instrument.

Developmental Assessment

During the third home visit, or within five days of the third home visit, the Bayley Scales of Infant Development were administered (Bayley, 1969). Each member of the research team was trained to administer and score the Bayley Instrument.

The complete research protocol is described in Figure 2.

Instruments

Initial Interview Form. The Initial Interview Form was designed to gather background data on the mothers in the study, the significant males in their lives (husbands, boyfriends, fathers of the infants who are neither husbands nor boyfriends), and one of their parents. This instrument also included some exploratory attitudinal items which allowed the mother and researcher to begin a dialogue about her pregnancy and the impending birth. Like all of the instruments, this form was designed to be self-coding to facilitate data handling and keypunching.

Obstetric Information Form. The Obstetric Information Form was designed to gather those medical data about the mother's pregnancy, labor and delivery, and about the neonate which are suspected of being most relevant to the infant's later development. After showing copies of the hospital permission forms (Appendix B) to the appropriate

First Contact*	Birth of Infant	Observations		
Prenatal Period	Within Ten Days	Month 1**	Month 2	Month 3
Explain project, confidentiality, responsibilities and remuneration. Obtain informed consent signatures of all relevant persons. Interview mother to gather socio-economic and demographic data.	Neonatal Neurological and Behavioral Measurement using Brazelton's Assessment Scale. Medical records examined for pre- and perinatal stresses.	Mother-Infant Interaction scored using the Home Observation Form. Maternal attitudes toward the infant measured with the Know Your Baby Scale. Home Environment Assessment Instrument administered. Evaluation of infant temperament using the Michigan Infant Temperament Scale.	Mother-Infant Interaction scored using the Home Observation Form. Maternal attitudes toward the infant measured with the Know Your Baby Scale.	Mother-Infant Interaction scored using the Home Observation Form. Maternal attitudes toward the infant measured with the Know Your Baby Scale. Home Environment Assessment Instrument administered. Evaluation of infant temperament using the Michigan Infant Temperament Scale. Developmental Assessment using the Bayley Scales of Infant Development.

*First contacts with mothers began July, 1979 and continued through April, 1980.

**Month 1 will be the tenth month after conception and will not depend upon the birthdate of the child.

Figure 2.--Research Protocol for Comparing Teenage Mothers and Their Infants with Older Mothers and Their Infants.

person and filing a copy in the charts of the mother and infant, information about the medications given the mother during pregnancy, labor and delivery (using a list compiled by Brackbill, 1979), the length of labor, and the number and types of complications that might have occurred were recorded. Data also were recorded regarding the time of delivery and the weight, length and head circumference of the infant.

Brazelton Neonatal Behavioral Assessment Scale. The Brazelton Scale was designed to measure the behavioral capabilities of the infant before the extrauterine environment has had much of an opportunity to begin to shape the infant's behavior (Brazelton, 1973). It measures those behaviors and responses that the infant uses to negotiate with its physical and social environments. The Brazelton Scale measures the infant's ability to control its state; its reactions to various stimuli; its ability to shut out aversive, interfering stimuli; its ability to attend to the signals of the caregiver; and the muscular development of the infant. As part of this evaluation, the examiner also performed a neurological examination to determine the adequacy of the infant's developing neurological functions at birth (Prechtl & Beintema, 1964; Prechtl, 1977). This part of the examination included testing various basic reflexes and motor responses.

The Brazelton Scale consists of 46 items: 26 behavioral responses which are scored on nine-point scales and 20 elicited responses (neurological items) scored on a three-point scale. For the elicited responses, 80% of all infants will score two; scores of one and three indicate abnormal responses and each is typical of only 10% of all infants. Each of the behavioral items is scored on a unique scale that is defined in the Summary of Brazelton Scale Scoring Definitions (Brazelton, 1973).

The Brazelton examination was administered by trained and certified examiners. Training consisted of observing training films, observing others giving the examination and performing the examination on 30-40 infants. Certification required traveling to Boston where the examination was performed and scored with a minimum level of 90% agreement with a trainer at the Children's Hospital Medical Center. Agreement was defined as scoring each behavior item within ±1 of the score assigned by the trainer and disagreeing with the trainer on no more than 1 of the elicited response items. Two members of the research team were trained and certified in this manner.

Previous research with the Brazelton has shown that testers trained to a .90 criterion of reliability will remain at that level of reliability for a year or more (Brazelton & Tryphonopoulii, 1972). Test-retest stability over a period of four weeks is .592 at the ±1 criterion level and .783 at the ±2 criterion level (Horowitz et al., 1971). These stability data were gathered before the present form of the scale was developed and the least reliable items had been deleted (Brazelton, 1973).

In the only long-term follow-up study to date with the Brazelton exam, the predictive validity of the earlier version of the instrument is compared to that of the standard neurological exam developed by the nationwide Collaborative Study sponsored by the National Institute for Nervous Disease and Stroke (Tronick & Brazelton, 1975).

The Brazelton exam was comparable to the neurological exam in detecting children who later were judged abnormal. However, the Brazelton achieved this level of prediction without including as many normal newborns in the abnormal category as did the other exam. The relative efficiency of the Brazelton was probably because it elicited higher order functioning of the CNS to predict a recovery process (Als, Tronick, Lester & Brazelton, 1977). The Brazelton Scale also has been shown to be correlated with measures of infant temperament intensity at ten weeks (Sostek & Anders, 1977; Brazelton _et al._, 1979).

The present study uses a seven-cluster scoring system for the Brazelton scale (Lester _et al._, 1978). This _a priori_ scoring system groups the 46 Brazelton items into the following clusters:

1. Habituation: How well does the infant maintain state control in the presence of nonharmful environmental

irritants? How quickly does the infant habituate to those irritants?

2. Orientation: What is the infant's capacity to attend to and process simple and complex environmental events? How does the infant respond to auditory and/or visual stimuli?
3. Motor performance: How well is the infant able to maintain adequate muscle tone and to control motor behavior?
4. Range of state: How easily is the infant irritated? How stable or changeable is the infant's behavioral state?
5. Regulation of state: How capable is the infant of controlling his/her own state, or how responsive to a caretaker's ministrations is he/she, once irritated?
6. Autonomic regulation: How integrated are the child's basic control mechanisms with regard to skin color and nonelicited muscular reflexes?
7. Reflexes: What are the signs of possible neurologic defects or insults?

The decision rules for assigning the appropriate scores for each category are outlined in Appendix D.

This system of scoring has several advantages:

1. Several of the Brazelton scales are U-shaped functions. The scoring system makes these scales unidirectional and monotonic.

2. By collapsing several related items into a single variable, the composite score may be more reliable than any single score.

3. The 46 items of the Brazelton scale are reduced to a more manageable number of items.

A clustering approach with the Brazelton scale has been used successfully in a number of studies to discriminate between groups of infants. A four-cluster approach has been used to discriminate between small-for-gestational-age infants and appropriate-for-gestational-age infants (Als, Tronick, Adamson & Brazelton, 1976). Sepkoski, Coll and Lester (1976) were able to use this same approach to classify successfully 58-80% of a group of neonates as being at risk due to obstetric factors. The seven-cluster approach was recently developed to be a more sensitive measure of infant abilities.

Know Your Baby Scale. The Know Your Baby Scale was designed to measure the mother's attitudes toward her young infant. This scale is based upon the Neonatal Perception Inventory or the average baby scale of Broussard and Hartner (1971). In the original version, this instrument consisted of six items referring to negative or unpleasant aspects of caregiving (crying, difficulty with caregiving, difficulty with bowel movements). The mother was given a card containing these six items and asked to describe her impression of the average baby by checking a five-point scale, from "a great deal" to "none" for each item. Then the mother was handed a second card and asked to describe her own baby on the same scales. To get a score for a mother, the scores for the two cards were subtracted.

There are a number of statistical difficulties with the Neonatal Perception Inventory (NPI). Such category scales "do not produce estimates of the perceptual magnitudes of the stimuli used, but rather produce estimates of the relative discriminability of the stimuli" (Shinn, 1974). That is, the relationship of the points on the scale used in the NPI assumes a different meaning for each stimulus.

Secondly, category scales are based upon the assumption that the "equal appearing intervals" between the response categories are indeed equal. This assumption rarely holds and the distances between categories usually becomes greater at the extremes (Shinn, 1974). The data from such a scale will be nonlinear and probably ordinal and therefore incompatible with most common statistical procedures (Shinn, 1974).

Thirdly, instruments like the NPI have severely truncated ranges: ceiling and floor effects must be expected. Once again, this has the effect of invalidating or at least weakening the more common statistical procedures.

Finally, using subtraction of two category scales to obtain a final score for a subject simply compounds the problems discussed. When there are already problems due to nonlinearity, unequal intervals, and truncated ranges, it is difficult to assign a theoretical meaning to a result obtained by subtraction.

With the Know Your Baby Scale, the technique of magnitude estimation scaling (MES) was used to avoid the problems presented by the original instrument. The process actually simplified the instrument since each pair of items became a single item. Additional, positive items were added to generate a more complete and, hopefully, more reliable measure of the parents' attitudes toward their child.

When using MES, the subjects "attempt to match the magnitude of a number to the magnitude of the sensation produced by a stimulus . . ." (Hamblin, 1974). To facilitate this process the experimenter should define a standard (in this case, the score of the average baby) and a zero point.

The data generated by the MES procedure are generally log normally distributed. In the bivariate case, one transforms the results to a linear form by the following formula:

$$d = \log (c + x)$$

where d = transformed score

c = integer constant determined by plotting the original data: the integer above the point at which the graph crosses the axis

x = original score

After this transformation, the data will have all the properties of a ratio scale and will be amenable for use with most common statistical procedures.

However, in systemic models, in which a variable is both estimated and used as an estimator, one must search for an appropriate transformation. To accomplish this, one uses an iterative procedure to produce transformations similar to the log transformation above. In the present case, the author used $(x + c)^k$ where x = the original data, c = -1, =½, 0, ½, 1 and k = -1, -½, 0, ½ and 1, which produces transformations on either side of the one discussed above. (When the coefficient k = 0, the transformation log (x + c) was used.) After doing these iterations for all variables on the Know Your Baby Scale, the statistical qualities of each transformation were evaluated. The skewness (degree to which a distribution approximates a normal curve) and kurtosis (relative peakedness or flatness of a curve defined by a distribution) of each transformation was examined to determine which one produced the distribution that most closely approximated a normal curve, i.e., produced values closest to zero for each statistic (Nie, Hall, Jenkins, Steinbrunner & Bent, 1975).

As indicators of positive maternal attitudes, the ratings for the questions regarding smiling, cooing, playing with the infant, cuddling, and how much the infant enjoyed being fed and playing with the mother were used.

The transformation that was most effective with this group of variables was log (x + 1). After the transformation, these six items form a scale of positive maternal affect with an alpha coefficient of .81. Thus positive maternal affect appears to be a reliable scale as measured by the Know Your Baby Scale.

A second transformation $[(x + 1)^{1/2}]$ was the best choice for the negative maternal affect scale which included items such as crying, spitting up, and having trouble with feeding, sleeping, bowel movements, and "settling down to a regular pattern of eating and sleeping." After the transformation, the negative maternal affect scale had an alpha coefficient of .62 indicating that this scale is not as internally consistent as the scale of positive affect. Interestingly, the scale of negative affect is based directly upon the scale of Broussard and Hartner (1970).

The original NPI has been used to predict the need for therapeutic intervention with the mother-infant pair. In a sample of 85 mother-infant pairs, when the primiparous mothers' attitudes toward the child at month one were negative, two-thirds of the cases needed intervention by age 4½. When the mothers' attitudes at one month were positive, about one-fifth of the cases needed intervention. Furthermore, when mothers' attitudes toward the infant were consistently negative over time, the need for intervention was much more likely than when the mothers' attitudes were consistently positive. In that study, the need for intervention was associated with the mothers' attitudes but not with the "educational level of the mother or father, the father's occupation, changes in income since delivery, prenatal or postpartum complications, type of delivery, age of mother at delivery, religious preference of the mother, moves, or sex of the child" (Broussard & Hartner, 1971). The Know Your Baby Scale, with its improved statistical qualities, should prove to be at least as predictive of the need for intervention as the NPI.

Home Observation Form. The Child Home Observation Scale was developed by Parmelee and Beckwith (1972) to study mother-infant interaction in the home environment. Designed to be used during a sleep-awake-sleep cycle during the first three months, the instrument allows one to record what behavior is occurring, who is producing the behavior, and to whom the behavior may be contingent or directed. The observer wears an earphone that emits a click every 15 seconds. The observer then records all behaviors that occurred during that 15 second interval.

Most measures, with the exception noted below, will be ratio scores, derived from the frequency counts of the number of 15 second units in which a given behavior occurs divided by the length of awake time during the observation. Contingent responses to baby's vocalizations will be expressed as a percentage of nondistress vocalization;

contingency to distress will be expressed as a percentage of distress signal episodes; mean length of a hold will be reported as a frequency of 15 second episodes.

Beckwith assessed the observer reliability with the instrument during 30 minute observation samples of 10 babies. Reliability coefficients of individual categories on the instrument ranged from .80 to .98 with the majority greater than .90 (Beckwith *et al*., 1976).

The instrument used for the present study (Appendix C) is a variation of one used by Beckwith and Parmelee. In a telephone conversation with Beckwith, the author determined which items were least reliable or were least useful in differentiating between types of mothering behavior. The Home Observation Form and its instruction manual (Appendix B) were developed based upon the original items and the suggestions of Beckwith.

In a study of caregiver-infant interactions with 51 infants who were born prematurely, the items on the Child Home Observation Scale were shown to be related to the child's later development. Specifically, at three months, control, defined by the categories "commands," "criticisms," and "stress musculature," was significantly related to the infant's Gesell Development Quotient scores at nine months of age. Smiling at age three months and mutual gazing at one month were significantly related to sensorimotor skills at nine months of age. It was also discovered that infants who obtained higher Gesell Development Quotients at nine months of age, spent less of their waking time at one and three months in physical care, that is, in being burped, diapered, dressed or bathed. Finally, at three months, those infants who had experienced more contingent responses to their fuss cries did attain higher sensorimotor scores at nine months (Beckwith, 1976).

For the present study, a rigorous training program was developed for the observers. Videotapes of mother-infant interaction were obtained from another research project. These tapes were scored numerous times by the research staff until concensus scores were obtained and the conceptual definitions of the behavioral categories were sharpened. Training sessions were also held with live mothers and babies both in artificial and home settings. These training sessions were concentrated in the first few weeks of the project but were also held every three to four weeks throughout the project. Data for calculating interrater reliabilities were collected approximately every 90 days. The interrater reliability coefficients for the observation items are shown in Table 7. Behavior in other categories did not occur frequently enough during the testing sessions for accurate reliabilities to be calculated.

<u>Home Environment Form</u>. The Home Environment Assessment Form is based upon the Purdue Home Stimulation Inventory of Wachs, Francis and McQuiston (1978, 1979). As Wachs (1978) describes it:

Table 7

Interrater Reliabilities for Observation Items

Variable	Alpha
Bottle Feed	.994
Held/Pick Up	.922
Stress Musculature	.853
Affectionate Touch/Pat/Rock	.982
Talk/Vocalize	.973
Infant Fuss	.980
Infant Nondistress Vocalization	.863
Look	.897
Average	.933

> The Purdue Home Stimulation Inventories (PHSI) Sections I-III is [sic] an attempt to measure physical parameters of the child's home environment. The emphasis of this instrument is on the physical stage upon which social interpersonal interactions take place rather than upon the social interpersonal transactions themselves.

The PHSI was designed as an improvement over the Caldwell Inventory of Home Stimulation (1966) which mixes social and physical stimuli, and the Yarrow Instrument (1975), which is quite limited in scope (Wachs, 1978).

The interrater reliability of the individual items on the PHSI ranged from .46 to 1.00 according to Wachs (1978). For the present study, an interrater reliability of .90 was achieved during training.

There were a number of difficulties with the PHSI which prompted the development of the present instrument. The items in the PHSI were quite poor statistically. Scales for these items were variously multidimensional, categorical, nonlinear, had truncated ranges and were otherwise inadequate for most statistical uses. The present instrument was developed in an attempt to correct these difficulties by eliminating some items of questionable value, and by using magnitude estimation scaling (see page 91 for a detailed explanation). The data gathered by these procedures are more reliable and stable than that gathered by the PHSI. Additionally, the items are much more amenable to statistical analysis. Those categorical items that remain are used for descriptive purposes only.

Michigan Infant Temperament Scale. The MITS was developed by Bonem (1978) as an alternative to the most widely used instrument for measuring temperament, the Carey Infant Temperament Scale (CITS) (Carey, 1970). Bonem has demonstrated that the scales of the CITS do not reliably measure the nine temperamental variables: activity, adaptability, intensity, threshold, persistence, mood, approach, distractibility, and rhythmicity. The coefficient alphas ranged from .30 to .68, indicating a low level of internal consistency. The MITS on the other hand, has coefficient alphas ranging from .71 to .86 on eight of the nine scales (persistence was dropped as a variable since it appears to be a multidimensional item with low reliability at its present level of development).

In addition, the MITS scale was shown to have a high degree of short term stability (r = .62-.89 after two weeks) and a moderate level of temporal stability over a longer period (r = .41-.64). These stability figures are similar to those achieved by other measures of infant temperament (Bonem, 1978; Persson-Blennow & McNeil, 1979).

The key for the Michigan Infant Temperament Scale is in Appendix D.

Data Coding

With the exception of the Home Observation Form, all instruments used in this study were designed to be pre-coded to eliminate the need for a separate coding operation and to facilitate entering data into the CDC 750 computer. As each completed instrument was given to the data coding staff, it was reviewed for completeness and legibility. Any questions about the instrument were immediately referred to the staff member who had completed it. Information from complete and legible forms was typed directly into disk-stored computer files. Later, another staff member compared a print-out of each computer file with the completed instrument to detect errors in data entry. Any such errors were then corrected.

The Initial Interview Form had one question that required coding. When subjects were asked about their occupation, the researcher entered a complete description of the job on the form. Using tables from Reiss, Duncan, Hatt and North (1961) two trained members of the coding staff independently assigned a prestige score to each subject based upon the job description. Whenever there were disagreements in the assignment of a score, the two staff members conferred until an agreement was reached. When an agreement could not be reached, the author was consulted to make the final decision.

The Home Observation Form is a complex instrument requiring a great deal of effort to code. For the present analysis, the data on this form were coded in the form of frequency counts. In each behavior category, a count was made of the number of times that each code was entered. Because of the complexity and tedium of this task (there were 35 behavior categories, six behavior codes and up to 480 observation periods per form), each form was double checked by a second coder before being entered into a computer file. As with the other forms, the computer print-out was also checked for accuracy and any errors were corrected.

Analysis

The primary analysis for this study consisted of an estimation and evaluation of the model that was developed in Chapter II (Figure 1, p. 65). This model was evaluated by using a computer program called LISREL®, the analysis of linear structural relationships by the method of maximum likelihood (Jöreskog & Sörbom, 1978). LISREL is specifically designed to handle causal models similar to that in Figure 1, especially those with cases of mutual causality.

There are a number of advantages to the use of LISREL in the analysis of complex causal models. First, LISREL allows one to use models with two parts: a measurement model and a theoretical model. The measurement model allows the researcher to specify how the theoretical or unobserved variables will be measured using the observed variables. For each theoretical variable that uses more than one observed variable as an indicator, a factor analysis is performed to define the theoretical variable by means of the common underlying variance of the indicators. The reliabilities for the measurements of the observed variables (e.g., interrater reliabilities) may be supplied by the researcher or they may be calculated by the program. The theoretical model or the structural equation model indicates the causal effects (Jöreskog & Sörbom, 1978).

Second, LISREL allows the researcher to evaluate not just the specific causal linkages but also the entire causal model. LISREL performs a chi-square goodness-of-fit test to determine how well the estimated model explains the variance of the data. For exploratory research, this goodness-of-fit test provides the researcher with important information about which causal linkages are most or least useful.

Third, LISREL is a full-information maximum likelihood statistical routine. This means that LISREL uses the information that is available for all variables in the model to make each estimate. It also means that LISREL's estimates of population parameters are those values of the population parameters that are most likely to have generated the observed sample data. For these two reasons, the LISREL estimates are both consistent and efficient (Fink, 1980).

The model presented in Chapter II is a theoretical model. The complete research model for the present study is presented in Figure 3. A definition of the symbols used in the model is presented in Table 8. The structural equations for the theoretical model are presented in Table 9. The equations for the measurement model are presented in Table 10.

The following decisions were made with regard to the measurement of certain variables used in the model in Figure 3 (see Table 8 also).

1. As an indicator of SES, total family income was used rather than the income of specific individuals. The objective was to measure the total financial resources that were available in the child's immediate environment.

2. As another indicator of SES, maternal education was used. It was often the case that the husband or, in the case of unwed teenagers, the parents had a higher education level than the mother. However, the mother in

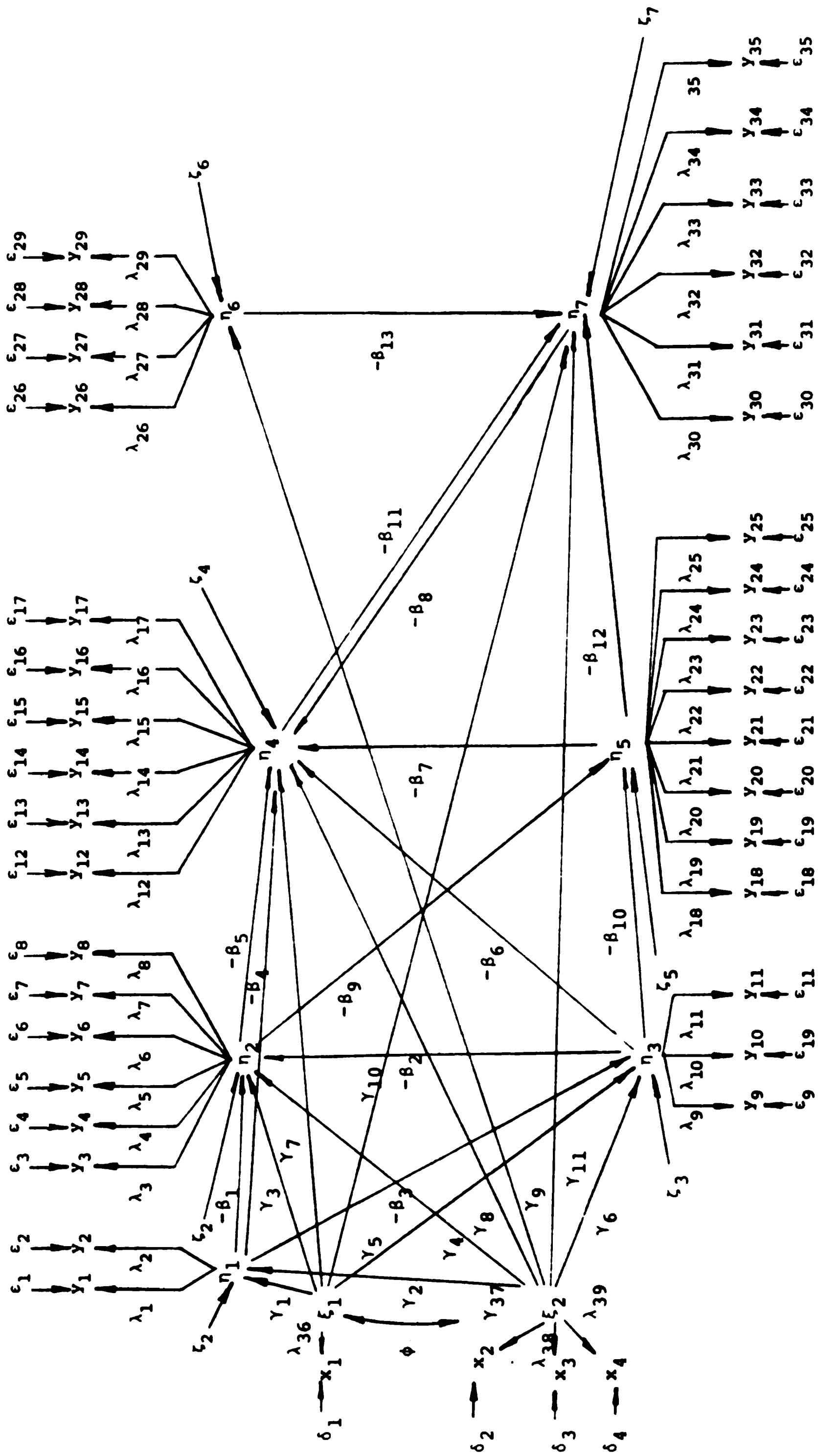


Figure 3.--Research Model for Examining the Effect of Maternal Age Upon Child Development.

Table 8

Definition of Symbols Used in Figure 3

ξ_1 = maternal age

x_1 = mother's age at the time of delivery

ξ_2 = socioeconomic status

x_2 = the highest occupational prestige rating among the household members

x_3 = maternal education level

x_4 = family income, total income from all sources of all family members in the household (divided by 1,000)

η_1 = prenatal preparation

y_1 = did the mother participate in a birth preparation class (1 = yes, 2 = no)

y_2 = month of pregnancy in which prenatal care began

η_2 = neurological and behavioral status at birth

y_3 = Brazelton Neonatal Behavioral Assessment Scale (BNBAS) orientation summary score

y_4 = BNBAS motor performance summary score

y_5 = BNBAS range of state summary score

y_6 = BNBAS regulation of state summary score

y_7 = BNBAS autonomic regulation summary score

y_8 = BNBAS reflexes summary score

Note: the BNBAS habituation summary score was removed from the model due to an excessive amount of missing data

η_3 = physical indicators of neonatal status

y_9 = birth weight of infant, in kilo grams

Table 8 (continued)

y_{10}= gestational age at birth, in weeks

y_{11}= 5-minute Apgar score

η_4 = maternal attitudes toward child

y_{12} = positive attitude index from month 1

y_{13} = negative attitude index from month 1

y_{14} = positive attitude index from month 2

y_{15} = negative attitude index from month 2

y_{16} = positive attitude index from month 3

y_{17} = negative attitude index from month 3

η_5 = infant temperament

y_{18} = Michigan Infant Temperament Scale (MITS) activity score

y_{19} = MITS mood score

y_{20} = MITS intensity score

y_{21} = MITS threshold score

y_{22} = MITS distractibility score

y_{23} = MITS rhythmicity score

y_{24} = MITS approach score

y_{25} = MITS adaptibility score

η_6 = home environment stimulation

y_{26} = the number of rooms per person measured at 3 months

y_{27} = number of caregivers reported at 3 months

y_{28} = is there a quiet place where the child can be put when sleeping?

1 = yes   2 = no

y_{29} = number of audio/visual response toys at 3 months

Table 8 (continued)

η_7 = quality of the mother-infant interactions (all 3 months)

y_{30} = percentage of time mother held child while he/she was awake

y_{31} = percentage of time mother talked to child

y_{32} = percentage of time child vocalized

y_{33} = percentage of distress periods responded to by mother in 45 seconds or less

y_{34} = percentage of time spent in mutual gaze

y_{35} = percentage of time spent in feeding and care-taking activities, i.e., feeding, burping, bathing and diapering

λs (lambda) = regression coefficients relating unobserved or theoretical variables to observed variables

ϕ (phi) = covariance of the exogenous theoretical variables ξ_1 and ξ_2

γs (gamma) = regression coefficients relating exogenous, theoretical variables (ξ's) to the endogenous variables (η's)

βs (Beta) = regression coefficients interrelating the endogenous theoretical variables

δs and εs (delta and epsilon) = measurement errors in observed variables, x and y, respectively

ζs (zeta) = errors of prediction

Table 9

Structural Equations for the Theoretical Model in Figure 3

$$\eta_1 = \gamma_1\xi_1 + \gamma_2\xi_2 + \zeta_1$$

$$\eta_2 = \gamma_3\xi_1 + \gamma_4\xi_2 + -\beta_1\eta_1 + -\beta_2\eta_3 + \zeta_4$$

$$\eta_3 = \gamma_5\xi_1 + \gamma_6\xi_2 + -\beta_3\eta_1 + \zeta_3$$

$$\eta_4 = \gamma_7\xi_1 + \gamma_8\xi_2 + -\beta_4\eta_1 + -\beta_5\eta_2 + -\beta_6\eta_3 + -\beta_7\eta_5 + -\beta_8\eta_7 + \zeta_4$$

$$\eta_5 = -\beta_9\eta_2 + -\beta_{10}\eta_3 + \zeta_5$$

$$\eta_6 = \gamma_9\xi_2 + \zeta_6$$

$$\eta_7 = \gamma_{10}\xi_1 + \gamma_{11}\xi_2 + -\beta_{11}\eta_4 + -\beta_{12}\eta_5 + -\beta_{13}\eta_6 + \zeta_7$$

every case was the primary caregiver. The mother's intellectual resourcefulness, vocabulary, knowledge, and motivation would constitute or shape the child's environment more than would those qualities of any other person and therefore have a greater impact upon the child's development (cf.: Leibowitz, 1974a, 1974b).

3. All home environment variables were measured during the third month. These measures were quite unstable during the first three months. Many mothers spent four to six weeks with the baby before returning to school or work, thus having greatly different numbers of caretakers from month 1 to month 3. Several mothers in both age groups moved during the child's first three months (one older mother moved three times), thus completely changing the measured physical environment during this time. The third

Table 10

Structural Equations for the Measurement Models in Figure 3

$y_1 = \lambda_1\eta_1 + \varepsilon_1$	$y_{21} = \lambda_{21}\eta_5 + \varepsilon_{21}$
$y_2 = \lambda_2\eta_1 + \varepsilon_2$	$y_{22} = \lambda_{22}\eta_5 + \varepsilon_{22}$
$y_3 = \lambda_3\eta_2 + \varepsilon_3$	$y_{23} = \lambda_{23}\eta_5 + \varepsilon_{23}$
$y_4 = \lambda_4\eta_2 + \varepsilon_4$	$y_{24} = \lambda_{24}\eta_5 + \varepsilon_{24}$
$y_5 = \lambda_5\eta_2 + \varepsilon_5$	$y_{25} = \lambda_{25}\eta_5 + \varepsilon_{25}$
$y_6 = \lambda_6\eta_2 + \varepsilon_6$	$y_{26} = \lambda_{26}\eta_6 + \varepsilon_{26}$
$y_7 = \lambda_7\eta_2 + \varepsilon_7$	$y_{27} = \lambda_{27}\eta_6 + \varepsilon_{27}$
$y_8 = \lambda_8\eta_2 + \varepsilon_8$	$y_{28} = \lambda_{28}\eta_6 + \varepsilon_{28}$
$y_9 = \lambda_9\eta_3 + \varepsilon_9$	$y_{29} = \lambda_{29}\eta_6 + \varepsilon_{29}$
$y_{10} = \lambda_{10}\eta_3 + \varepsilon_{10}$	$y_{30} = \lambda_{30}\eta_7 + \varepsilon_{30}$
$y_{11} = \lambda_{11}\eta_3 + \varepsilon_{11}$	$y_{31} = \lambda_{31}\eta_7 + \varepsilon_{31}$
$y_{12} = \lambda_{12}\eta_4 + \varepsilon_{12}$	$y_{32} = \lambda_{32}\eta_7 + \varepsilon_{32}$
$y_{13} = \lambda_{13}\eta_4 + \varepsilon_{13}$	$y_{33} = \lambda_{33}\eta_7 + \varepsilon_{33}$
$y_{14} = \lambda_{14}\eta_4 + \varepsilon_{14}$	$y_{34} = \lambda_{34}\eta_7 + \varepsilon_{34}$
$y_{15} = \lambda_{15}\eta_4 + \varepsilon_{15}$	$y_{35} = \lambda_{35}\eta_7 + \varepsilon_{35}$
$y_{16} = \lambda_{16}\eta_4 + \varepsilon_{16}$	
$y_{17} = \lambda_{17}\eta_4 + \varepsilon_{17}$	$x_1 = \lambda_{36}\xi_1 + \delta_1$
$y_{18} = \lambda_{18}\eta_5 + \varepsilon_{18}$	$x_2 = \lambda_{37}\xi_2 + \delta_2$
$y_{19} = \lambda_{19}\eta_5 + \varepsilon_{19}$	$x_3 = \lambda_{38}\xi_2 + \delta_3$
$y_{20} = \lambda_{20}\eta_5 + \varepsilon_{20}$	$x_4 = \lambda_{39}\xi_2 + \delta_4$

A. $\lambda_{36} = 1$; $\delta_1 = 0$ since ξ_1 has a single indicator.

B. λ_1, λ_3, λ_9, λ_{12}, λ_{18}, λ_{26}, λ_{30}, λ_{37} were set equal to 1 so that the measurement model for each theoretical variable was identified.

month measures were assumed to be more stable than first month measures and to be more indicative of maternal preparations or plans.

4. The measures of the quality of mother-infant interaction are based on data from all three observations. By combining the data from all the observations, these measures are more representative of the true state of the mother-infant dyad than are measures from any one observation. Measures based upon a single observation could be quite misleading if the visit was extremely short (a common occurrence during the first observation) or if the mother or infant were experiencing an atypical day.

All other measures were quite straightforward as defined in Table 8. In the few cases in which there were missing data, the mean values for the appropriate age group were substituted.

One of the critical issues in the estimation of such a complex model is that of identification. Essentially this is the issue of whether or not there is enough information available to make the estimates requested. Models which are underidentified cannot be estimated. Models which are just identified can be estimated but cannot be tested. Overidentified models are constrained to have a unique solution and the degree of overidentification (the amount of excess information available upon which to base the estimates) is related to the reliability of the results.

The model in Figure 3 meets the necessary conditions for overidentification with 679 degrees of freedom (Jöreskog & Sörbom, 1978).

CHAPTER IV

RESULTS AND DISCUSSION

To facilitate the presentation of the analysis, this chapter has been divided into two parts. In the first part, the data describing the characteristics of the two groups of mothers and infants will be presented and discussed. In the second part, the estimation of the research model will be presented and discussed.

Characteristics of the Two Groups of Mothers and Infants

The literature review suggested that teenage mothers and their infants may differ from older mothers and their infants in some ways that are critical to the infants' development. The data analysis that follows indicates that, indeed, these two groups do differ in many ways that may affect infant development. However, not all of the differences favor the older mothers. Only differences for which $p < .05$ will be considered significant.

Socioeconomic Status

As might be expected, the two groups of mothers differed greatly in measures of socioeconomic status

(Table 11). The teenage mothers had significantly fewer years of education (though several were still in school; see Table 12), their families had significantly lower total incomes, and the workers in teenage families held significantly less prestigious jobs. The males involved in the teenage pregnancies in this sample also had significantly less education than their older counterparts.

None of these socioeconomic results are surprising since education, income and occupational prestige are all functions of age, to a certain extent. As shown in Table 12, most of the teenage mothers were still in school and thus were not part of the labor force. Furthermore, almost half of the young families depended upon public assistance for their income, a significantly larger proportion than in the older families. In those cases in which a teenage mother or her male partner were working, the jobs they held were often entry-level or part-time.

Two older mothers and one younger mother reported no income. In all three cases the mother was living alone and was being supported by her family. This family support apparently varied as did the mothers' needs and was not regular. These mothers had applied for, and were expecting to receive, public assistance.

Note also the differences in the standard deviations of the two groups for the variables in Table 11. One of the assumptions of the *F*-test is homoskedasticity: the variances of the two samples are assumed to be equal

Table 11

Socioeconomic Characteristics of Study Families by Maternal Age

	Teenage Mothers n = 14	Older Mothers n = 48	*F*	
Years of Education Completed				
Mother				
mean	10.8	14.83	37.6	($p<.01$)
SD	1.5	2.30	df=(1,60)	
range	9-14	12-21		
Father*				
mean	10.7	15.20	19.8	($p<.01$)
SD	1.4	2.60	df=(1,50)	
range	9-12	12-20		
Family Income				
mean	$8,385	$21,553	13.9	($p<.01$)
SD	9,051	12,264	df=(1,60)	
range	0-34,400	0-54,000		
Occupational Prestige				
mean	25.1	57.6	18.1	($p<.01$)
SD	24.2	25.3	df=(1,60)	
range	0-72	0-93		

*For fathers, n = 7 for the teenagers and n = 45 for the older group.

Table 12

Descriptive Characteristics of Subjects by Maternal Age

	Teenage Mothers n = 14 Frequency (percent)	Older Mothers n = 48 Frequency (percent)
Mother in School	10 (71%)	8 (17%)
Father in School	1 (14%)	10 (22%)
Mother Works	2 (14%)	33 (69%)
Father Works	5 (71%)	41 (91%)
Family receives public assistance	6 (43%)	4 (8%)
Maintains relationship with infant's father	7 (50%)	45 (94%)
Race - Mother		
White	11 (79%)	48 (100%)
Black	3 (21%)	0 (0%)
Father		
White	6 (86%)	40 (89%)
Black	1 (14%)	0 (0%)
Hispanic	0 (0%)	3 (7%)
Other	0 (0%)	2 (4%)
Living Arrangements of Mother		
with male	2 (14%)	43 (90%)
with her parents	6 (43%)	0 (0%)
alone	3 (21%)	4 (8%)
with male & other relative	1 (7%)	0 (0%)
with other relative	1 (7%)	0 (0%)
with female roommate	1 (7%)	1 (2%)

Table 12 (continued)

	Teenage Mothers n = 14 Frequency (percent)	Older Mothers n = 48 Frequency (percent)
Age - Mother		
mean	17.3	26.0
range	15-19	20-32
Father*		
mean	22.1	27.0
range	17-31	22-37

*For fathers, n = 7 for the teenage families and n = 45 for the older families.

(SD = $\sqrt{\text{variance}}$). If the differences between the variances of the two groups are statistically significant, the F-test is inappropriate and the results in Figure 11 may be misleading (Glass & Stanley, 1970). These are numerous instances of possible heteroskedasticity (unequal variances) in the tables that follow and the interpretation of the results should reflect this potential source of bias.

There are several possible explanations for the instances of possible heteroskedasticity mentioned above. First, one group may have given more accurate responses to the questions and scales than the other. Second, the small number of teenage mothers in the study suggests that the sample may not have been large enough for an accurate estimation of the means for this group. Third, heteroskedasticity can result from bounded ranges due to the homogeneity of the sample. In this case, the relationship of one variable to another may not be linear and transformations may need to be found to produce linear relationships before applying most statistical techniques (cf.: Hanushek & Jackson, 1977, pp. 142-144).

Other Demographic Characteristics

In this sample, teenage families had higher incomes and prestige scores if the mother continued to live with her parents. In some of these cases, the higher income was achieved simply by having more persons under one roof receiving public assistance. In both age groups, mothers who lived alone were more likely to receive public assistance than were the other mothers.

Half of the teenage mothers maintained a relationship with the father of the infant during and after the pregnancy, while almost all (94%) of the older mothers maintained such a relationship. All but one of the older mothers who maintained such a relationship with the infant's father were married to him. Among the younger mothers, fewer than half of those who maintained a relationship with the infant's father were married to him. (These comparisons may be misleading since staff field notes indicate that many of the unmarried couples appeared to be cohabiting by the third month postpartum.)

Table 12 also contains the distribution of the study families by race, living arrangements and age. The samples were predominantly or all white. While 90% of the older mothers lived with the infant's father at the time of the initial interview, only 21% of the teenagers did so. Almost half of the teenagers continued to live at home. Several mothers in each group lived alone during and after the pregnancy. In the age distributions in Table 12, it is interesting to note the age difference between the teenage mothers and their mates. The teenage mothers apparently selected (or were selected by) mates who were several years older than themselves, though only two of the males were older than 21.

Pregnancy and Delivery Experiences

In Table 13, information about the pregnancy and delivery experiences of the two groups of mothers are displayed. The rate of participation in prenatal classes (Lamaze, Leboyer, LaLeche) among the older group of mothers was more than double that of the young mothers. The difference between the participation rates of the men is even greater with a considerably larger proportion of the men in the older group participating.

Though there was very little difference between the two groups of mothers in the type of prenatal care received, there was a significant difference in the timing of the onset of that care (Table 13). On the average, teenage mothers in this sample began prenatal care almost one month later than did older mothers. Even more important than the average is the fact that some teenage mothers did not begin prenatal care until the seventh month or third trimester of the pregnancy. None of the older mothers began prenatal care later than the fifth month or second trimester. Note the possible heteroskedasticity.

There was very little difference between the two groups of mothers in the amount of weight gained during pregnancy (Table 13). Interestingly, the teenagers appear to have done a better job of weight management during pregnancy and avoided the extremes experienced by some of the older women.

Table 13

Characteristics of Pregnancy and Delivery by Maternal Age

	Teenage Mothers n = 14	Older Mothers n = 48	F	
Mother participated in birth preparation classes	5 (36%)	40 (83%)		
Father participated in birth preparation classes*	1 (14%)	37 (82%)		
Type of prenatal care				
personal physician	10 (71%)	41 (85%)		
clinic	4 (29%)	7 (15%)		
Month of pregnancy that prenatal care began				
mean	3.10	2.30	5.89	$p<.05$
SD	.40	.14		
range	1-7	1-5	df=(1,60)	
Weight gain during pregnancy (lbs.)				
mean	27.60	30.50	.93	
SD	8.40	10.57		
range	18-51	15-73	df=(1,60)	
Expected a partner to attend delivery	12 (86%)	46 (96%)		
A partner attended delivery	12 (86%)	43 (90%)		
Partner was father	4 (29%)	41 (85%)		
Type of delivery				
normal vaginal	12 (86%)	29 (60%)		
forceps	1 (7%)	12 (25%)		
caesarian section	1 (7%)	7 (15%)		

Table 13 (continued)

	Teenage Mothers n = 14	Older Mothers n = 48	F
Sex of child			
female	9 (64%)	21 (44%)	
male	5 (36%)	27 (56%)	
Planned to breast-feed	9 (64%)	46 (96%)	
Actually did breastfeed	8 (57%)	41 (85%)	

*For fathers, n = 7 for the teenage sample and n = 45 for the older group.

The age groups had similar expectations with regard to having a partner with them during the delivery, and in most cases, their expectations were correct. However, if the mother was older, the father of the infant was much more likely to be the mother's partner than if the mother was young. On the other hand, of those teenagers who maintained a relationship with the father, over half had the father with them during delivery. Significantly fewer teenage mothers than older mothers planned, or did, breastfeed the infant.

The data in Table 13 also indicate that the teenage mothers generally had easier deliveries than the older mothers. A larger percentage of teenage mothers had normal vaginal deliveries than did the older mothers. Data on the length of labor and the complications experienced during pregnancy, labor and delivery were incomplete and in many cases quite unreliable (due to varying definitions and means of reporting) and therefore are not reported here.

Neonatal Status

In Table 14, the indicators of neonatal status taken from medical records are shown. Overall, the two groups of infants were quite similar with respect to gestational age, birth weight, length, head circumference, and Apgar scores. Though the differences in the average gestational age and length of the two groups were statistically significant, the differences are small and the means for the infants of

Table 14

Characteristics of Newborns by Maternal Age

	Teenage Mothers n = 14	Older Mothers n = 48	*F*	
Gestational Age (weeks)				
mean	38.86	40.04	5.44	$p<.05$
SD	1.96	1.58		
range	34-41	36-44	df=(1,60)	
Weight (grams)				
mean	3,201.71	3,523.04	3.53	
SD	717.41	512.58		
range	1,960-4,536	1,512-4,564	df=(1,60)	
Length (centimeters)				
mean	49.71	51.58	4.78	$p<.05$
SD	3.47	2.54		
range	43-56	42-56	df=(1,57)	
Head circumference (centimeters)				
mean	33.31 (n=13)	34.02 (n=41)	1.12	
SD	2.56	1.98		
range	29-38	30-37	df=(1,52)	
1-minute Apgar				
mean	7.73 (n=11)	7.68 (n=44)	0.01	
SD	1.73	1.25		
range	4-10	3-9	df=(1,53)	
5-minute Apgar				
mean	8.82	8.88 (n=45)	0.10	
SD	.98	.57		
range	6-10	7-10	df=(1,54)	

teenagers are well within the normal range. However, the teenage mothers in this study did tend to deliver slightly smaller babies and to have shorter pregnancies than the older mothers. It is noteworthy that only two teenagers and one older mother gave birth to an infant weighing less than 2,500 gms., and that no infant weighed less than 1,500 gms. at birth. Note the possible heteroskedasticity.

The Brazelton 7-Cluster Summary scores are shown in Table 15. Once again, the two groups of infants are quite similar with only one significant difference between them, that being their motor performance scores. The difference in motor performance scores primarily was due to the more optimal scores received by the children of older mothers on two of the Brazelton Scales: activity level and defensive movements. However, it is interesting to note that the infants of teenagers consistently score lower than the infants of older mothers on each of the items. The sample sizes for the habituation item were reduced because this item could be scored only if the infant were asleep when testing began.

Maternal Attitudes and Infant Temperament

There were no significant differences between the attitudes toward their infants that the two groups of mothers expressed (see Table 16). Each group rated their infants high on the positive scales and low on the negative scales. However, the younger mothers had a broader range

Table 15

Brazelton Summary Scores of Newborns by Maternal Age

	Teenage Mothers n = 14	Older Mothers n = 48	*F*	
Reflexes				
mean	.79	1.06	.72	
SD	1.05	1.08		
range	1-4	0-5	df=(1,60)	
Habituation*				
mean	3.38	3.86	.21	
SD	3.25	3.50		
range	3.0-8.0	1.5-9.0	df=(1,34)	
Orientation				
mean	6.18	6.38	.24	
SD	1.03	1.46		
range	4.5-8.0	2.8-8.8	df=(1,60)	
Motor Performance				
mean	4.97	5.39	4.29	$p<.05$
SD	.82	.61		
range	3.6-6.0	4.0-6.6	df=(1,60)	
Range of State				
mean	3.46	3.95	3.10	
SD	1.03	.88		
range	1.5-4.8	1.5-5.0	df=(1,60)	
Regulation of State				
mean	4.77	5.11	.94	
SD	.98	1.21		
range	3.3-6.5	2.3-7.5	df=(1,60)	
Autonomic Regulation				
mean	5.93	6.65	3.51	
SD	1.56	1.17		
range	2.0-8.3	3.3-8.5	df=(1,60)	

*n = 8 and 28, respectively.

Table 16

Attitudes Toward Child by Maternal Age As
Measured By the Know Your Baby Scale

	Teenage Mothers n = 14	Older Mothers n = 48	*F*
Positive attitude summary scores			
Month 1			
mean	31.389	31.327	0.00
SD	6.005	3.216	
range	22.6-47.3	26.8-39.9	df=(1,60)
Month 2			
mean	34.162	33.244	.275
SD	8.977	4.490	
range	26.1-60.3	22.7-44.6	df=(1,60)
Month 3			
mean	33.661	34.051	.051
SD	9.406	4.142	
range	25.8-59.2	27.3-44.5	df=(1,60)
Negative attitude summary scores			
Month 1			
mean	15.220	15.083	.024
SD	2.291	3.037	
range	10.9-17.7	8.6-20.5	df=(1,60)
Month 2			
mean	15.892	15.843	.003
SD	3.503	3.059	
range	10.2-22.0	7.9-22.3	df=(1,60)
Month 3			
mean	16.277	16.036	.077
SD	3.031	2.811	
range	11.0-19.1	9.0-20.2	df=(1,60)

(on the high end of the scale) and a larger standard deviation on the positive scales than the older mothers. On the negative scales, the teenage mothers gave a narrower range of ratings than did the older mothers. Thus it seems that some of the teenagers seemed to assign quite high positive scores to their children while all teenagers seemed to consider their infants as relatively average on the negative items. This may indicate a social desirability bias in the response of the teenage mothers.

The results of the Michigan Infant Temperament Scale are shown in Table 17. There were no significant differences or consistent patterns of differences between the two groups on the eight temperament variables for which a "1" indicates a high level of the attribute and a "0" indicates the complete absence of the attribute.

Home Environment

Though there were no significant differences in maternal attitudes or infant temperament, there were several differences in the environments the mothers provided for their infants. The teenage mothers in this study lived in more crowded conditions than did the older mothers (Table 18). The homes in which the teenage mothers lived had both more occupants (note the possible heteroskedasticity) and less space per occupant than the homes of the older mothers. These differences are due, in part, to the fact that several teenagers lived with their parents or other relatives while

Table 17

Infant Temperament Characteristics by Maternal Age--Results of the Michigan Infant Temperament Scale

	Teenage Mothers n = 14	Older Mothers n = 48	F
Activity Score			
mean	.40	.46	1.74
SD	.14	.16	df=(1,60)
Mood Score			
mean	.67	.64	.20
SD	.16	.16	df=(1,60)
Intensity Score			
mean	.40	.37	.24
SD	.15	.17	df=(1,60)
Threshold Score			
mean	.66	.64	.09
SD	.19	.22	df=(1,60)
Distractibility Score			
mean	.46	.50	.40
SD	.23	.21	df=(1,60)
Rhythmicity Score			
mean	.64	.63	.03
SD	.23	.17	df=(1,60)
Approachability Score			
mean	.85	.87	.22
SD	.17	.14	df=(1,60)
Adaptability Score			
mean	.71	.67	.59
SD	.19	.19	df=(1,60)

Table 18

Characteristics of the Home Environment at Three Months by Maternal Age

	Teenage Mothers n = 14	Older Mothers n = 48	*F*	
Number of adults living in house				
mean	2.60	1.96	13.174	$p<.01$
SD	1.27	.20		
range	1-5	1-2	df=(1,60)	
Density (number of rooms per person)				
mean	1.43	1.73	4.043	$p<.05$
SD	.51	.49		
range	.89-2.33	1.00-3.00	df=(1,60)	
House has quiet place for baby	9 (64%)	47(98%)		
Baby's room is decorated with pictures that stand out from background	10 (71%)	41 (85%)		
Window shades are not drawn all the time	11 (79%)	43 (90%)		
Number of toys with audio-visual response				
mean	5.10	8.70	3.895	
SD	3.63	6.54		
range	0-12	2-35	df=(1,60)	
There are noncommercial items infant can use as toys	13 (93%)	37 (77%)		
There is a mobile over the crib	6 (43%)	44 (92%)		

the older mothers lived with their spouse or alone (see Table 12). The socioeconomic differences cited earlier probably contributed to the differences in crowdedness (r = .31-.45 between education, occupation, income, and density; p < .05; see correlation tables, Appendix E).

Because of the relatively crowded conditions of the teenage mothers' homes, a significantly smaller proportion of their homes, compared to the older mothers' homes, had a quiet place where the infant could be put during naps. Also, the homes of the older mothers were slightly more likely to provide stimulation to the infant from the wall decorations and open windows than were the homes of younger mothers.

In terms of other sources of stimulation, the older mothers provided their infants with more audio-visual response toys than the younger mothers provided their infants; one younger mother provided none of these toys by three months. However, the homes of younger mothers offered more noncommercial items that the infant could use as toys (small ashtrays, knick-knacks) than those of the older mothers. A significantly larger percentage of the older mothers than the younger mothers had a mobile over the infant's crib.

The Caretaking Environment

The caretaking environment of the two groups of mothers is described in Table 19. There was very little

Table 19

Characteristics of the Caretaking Environment at Three Months by Maternal Age

	Teenage Mothers n = 14	Older Mothers n = 48	*F*
Number of caretakers			
mean	2.400	2.600	0.25
SD	0.940	.870	
range	1-4	1-6	df=(1,60)
Proportion of times that mother is primary caretaker			
mean	.704	.723	0.08
SD	.227	.201	
range	.333-1.000	.286-1.000	df=(1,60)
Number of times mother and infant left neighborhood in week prior to the 3-month visit			
mean	4.100	5.600	2.03
SD	2.540	3.690	
range	0-10	1-18	df=(1,60)
Number of times mother and infant visited neighbors in week prior to the 3-month visit			
mean	2.400	1.700	0.59
SD	4.400	2.400	
range	0-15	0-11	df=(1,60)
Infant's sleep schedule			
regular	8 (57%)	12 (25%)	
demand	6 (43%)	16 (33%)	
variable	0 (0%)	20 (42%)	
Infant's eating schedule			
regular	5 (36%)	11 (23%)	
demand	7 (50%)	20 (42%)	
variable	2 (14%)	17 (35%)	

difference between the groups in either the number of caretakers or the proportion of time that the mother was the primary caretaker. It appears that the older mothers made trips beyond their neighborhood somewhat more often than younger mothers, probably due in part to the older mothers' greater access to cars. However, teenage mothers took their infants to visit with neighbors more often than did older mothers. The teenage mothers in this study also had more persons in the home during the observation period than did the older mothers, the result of living with more people and of having more visitors during this time period.

In Table 19, the eating and sleeping schedules of the two groups of infants are compared. Significantly more of the teenagers than the older mothers described their infant as having a regular sleep schedule as opposed to sleeping only whenever he/she was tired or varying between these alternatives. While none of the teenage mothers described their infant's sleep schedule as variable, over 40% of the older mothers did so. The eating schedules of the two groups of infants were similar, though again fewer teenage mothers considered their infants' eating schedule to vary between "regular" and "demand." The pattern of the responses suggests that a social desirability bias could be operating here.

The characteristics of the mother-infant interaction patterns of the two groups of mothers are described in Tables 20, 21 and 22. As is shown in Table 20, the two

Table 20

Characteristics of Mother-Infant Interaction by Maternal Age: Maternal Behaviors as a Proportion of Infant's Awake Time

	Teenage Mothers n = 14	Older Mothers n = 48	*F*	
Mother holds infant				
mean	.686	.690	.005	
SD	.232	.185	df=(1,60)	
Mean length of hold (no. of 15-second periods)				
mean	38.891	35.882	.249	
SD	24.261	18.451	df=(1,60)	
Mother affectionately touched, patted or rocked infant				
mean	.346	.437	1.842	
SD	.228	.216	df=(1,60)	
Mother used positive commands with infant				
mean	.013	.030	1.989	
SD	.014	.042	df=(1,60)	
Mother used negative commands with infant				
mean	.007	.006	.067	
SD	.008	.009	df=(1,60)	
Mother talked to infant				
mean	.309	.478	8.070	$p<.01$
SD	.218	.189	df=(1,60)	
Caretaking activities				
mean	.485	.502	.137	
SD	.155	.157	df=(1,60)	

Table 20 (continued)

	Teenage Mothers n = 14	Older Mothers n = 48	F
Mother aroused, stimulated, soothed infant			
mean	.033	.059	1.584
SD	.084	.064	df=(1,60)
Radio, television or loud appliance on			
mean	.730	.617	.950
SD	.352	.387	df=(1,60)

Table 21

Contingent Responsivity by Maternal Age

	Teenage Mothers n = 14	Older Mothers n = 48	F	
Proportion of awake time spent in mutual gaze with mother vocalizing				
mean	.069	.114	5.187	$p<.05$
SD	.053	.068	df=(1,60)	
Proportion of non-distress vocalizations to which mother responded contingently				
mean	.153	.202	1.652	
SD	.147	.119	df=(1,60)	
Proportion of distress vocalizations to which mother responded contingently				
mean	.360	.561	12.504	$p<.01$
SD	2.09	.180	df=(1,60)	

Table 22

Characteristics of Mother-Infant Interaction by Maternal Age--Infant Behaviors as a Ratio of the Infant's Awake Time

	Teenage Mothers n = 14	Older Mothers n = 48	*F*
Fussing			
mean	.073	.072	.003
SD	.053	.036	df=(1,60)
Nondistress vocalizations			
mean	.214	.263	1.527
SD	.142	.127	df=(1,60)
Mouthing			
mean	.044	.055	.341
SD	.053	.061	df=(1,60)
Playing with objects			
mean	.033	.028	.141
SD	.061	.036	df=(1,60)
Looking at people			
mean	.244	.219	.825
SD	.120	.083	df=(1,60)
Smiling			
mean	.031	.040	1.083
SD	.027	.030	df=(1,60)
Smiling during mutual gaze			
mean	.015	.025	2.485
SD	.014	.023	df=(1,60)

groups of mothers are similar in the proportion of time they held their infants, touched their infants affectionately, or used positive or negative commands with their infants. The proportion of time spent in caretaking activities or in stimulating the infant and the proportion of time that a radio, television, or loud appliance was on also were similar for the two groups. However, older mothers spent a significantly larger portion of the infant's awake time talking to the infant than did younger mothers, almost 50% of the infant's awake time compared to less than one-third.

In Table 21, we see that on two of the three variables the older mothers were contingently responsive to their infant's signals significantly more often than were the younger mothers. Older mothers spent a significantly larger proportion of time than the younger mothers vocalizing to the infant while mother and infant were looking at one another's eyes. The older mothers also were significantly more responsive to the infant's distress signals than were the younger mothers. The older mothers appear to have been slightly more responsive to the infant's nondistress vocalizations as well.

There were no significant differences between the activities of the two groups of infants (Table 22). The infants of teenage mothers spent slightly more time than the infants of older mothers looking at people, including their mothers. The infants of the older mothers spent slightly more of their time vocalizing, mouthing, smiling, and smiling during mutual gaze.

Discussion of the Descriptive Analysis

The Continuum of Reproductive Casualty

As suggested in the review of the literature, the teenage mothers in this study did differ from the older mothers on some variables on the continuum of reproductive casualty. The teenage mothers had shorter pregnancies than the older mothers, and their infants were slightly smaller than those of the older mothers, supporting the findings of numerous studies of teenage pregnancy (see Table 2, p. 21). However, the teenage mothers also had easier deliveries than the older mothers (cf.: Mednick *et al*., 1979), though the younger mothers started prenatal care later and were less likely than the older mothers to take birth preparation training courses. For this sample there was no relationship between prenatal care and delivery experiences (see the table of correlations, Appendix E). Note that in a total of 15 tests we could expect to find one significant at the $p < .05$ level just by chance. In fact, five tests were significant. Note also that these tests were not independent (see Appendix E). The differences that were found in the pregnancy and delivery experiences of the two groups of mothers do not appear to have had much effect upon the status of the infants after birth: there was no difference in the Apgar scores of the two groups of infants and only one of seven Brazelton scores differentiated between the two groups.

Thus, the continuum of reproductive risk does not seem to be significant, by itself, in differentiating between the teenage and older mothers. The differences that did exist between the two groups of mothers were few and relatively small. Unless the caretaking environments of these infants interacted directly with the reported differences, there is no reason to believe that the variables of the continuum of reproductive casualty should be related to any developmental differences that may be found to exist between the children of these two groups of mothers at a later date.

The Continuum of Caretaking Casualty

Maternal Attitudes. The review of the literature suggested that there might be differences between teenagers and older mothers in their attitudes toward their infants. Since teenage pregnancy is usually unplanned and therefore causes major disruptions in the mother's life, it would not be surprising to find that adolescent mothers held less positive attitudes toward their infants than did older mothers. As measured by the Know Your Baby Scale, there were no differences between the maternal attitudes of the two groups of mothers in this study. There was no evidence for the negative or ambivalent attitudes of teenage mothers reported elsewhere (Crumidy, 1966; Mercer, 1980). It should be pointed out that in both the Crumidy (1966) and Mercer (1980) studies, maternal attitudes were rated by an observer and neither study compared the attitudes of young mothers directly with a comparison group of older mothers.

Home Environment. In the review of literature, it was reported that various elements of the home environment apparently had an effect upon a child's development. There was no direct evidence that the homes of teenage mothers differed from those of older mothers. However, since teenage mothers and older first-time mothers generally differ in SES level (Card & Wise, 1978), and since home environments generally differ by SES level (Wachs *et al.*, 1971; Tulkin & Kagan, 1972), one would suspect the home environments of teenage mothers to differ from those of older mothers.

The homes of the teenage mothers in this study did differ from those of older mothers in the types and amount of stimulation each provided to the infants. In the homes of the teenager there were more adults, there was less space per person, and there were more people in the home during the observation period than in the homes of older mothers. Thus, it appears that the infants of teenage mothers were exposed to considerably more social stimulation than the infants of older mothers. Furthermore, the teenagers' homes were less likely than those of the older mothers to have a quiet place where the infant could be put to escape from stimulation when upset or tired. Since there are no clear definitions of under, optimal, or excessive levels of social stimulation, it is impossible to draw any firm conclusions about the implications of these data. It is at least a possibility that the infants of some of the teenage mothers in this study received excessive amounts of social stimulation from which they could not escape.

On the other hand, the teenagers' homes offered fewer opportunities than the older mothers' homes for some sources of nonsocial stimulation that have been related to cognitive development. Compared to the homes of the older mothers, the teenagers' homes were less likely to have contrasting decorations in the baby's room which would attract the infant's attention, less likely to have a mobile over the infant's crib, and there were fewer audio-visual response toys to stimulate the infant. Though the teenagers' homes were more likely than the older mothers' homes to have noncommercial items that the infant could use as toys, these items not provide the same stimulation as audio-visual response toys nor was there any effort to use these items as toys in the author's experiences during observations.

Thus, there were a number of significant differences between the environments provided for the infants of the two groups of mothers during the infants' first three months. The infants of teenagers received less stimulation from their nonhuman environment than the infants of older mothers. The infants of teenage mothers lived in more crowded conditions than the infants of older mothers. Were the above cited environmental differences to persist, one would expect that the environments provided for the two groups of infants would be a significant contributor to the developmental differences cited by Oppel and Royston (1971) and Hardy *et al*. (1978).

Socioeconomic Status. The differences between the two groups of mothers on the SES variables were quite large. The older mothers averaged four years more education, over two-and-a-half times as much family income, and had family job prestige levels that were double those of the younger mothers. Generally speaking, these comparisons indicate that the older mothers had many more material, informational and experiential resources than the younger mothers to help them in their role as parents.

The pervasive influence of SES on the various aspects of child development is apparent from a review of the correlation tables for the variables in the research model (Table 23; see also Appendix E). Not only are maternal age and the three indicators of SES highly positively correlated, but each of the four variables are highly correlated, positively or negatively, with several of the variables from the continuum of reproductive casualty as well as the home environment, maternal attitudes, and mother-infant

Table 23

Selected Correlations Between Maternal Variables and Variables Related to Child Development*

	Age	Family Occupation Status	Education	Family Income
Birth weight	.23	.17	.21	.17
Gestational age	.23	.14	.29	.15
Home density	.40	.31	.40	.45
Number of A/V toys	.23	.09	.26	.17
Talks to infant	.30	.22	.25	.42
Mutual gaze	.19	.07	.10	.25
Response to distress	.38	.21	.40	.39

*If $r \geq .25$, $p < .05$.

interaction variables. Thus, it appears that, as suggested in the review of the literature, both maternal age and SES are potentially strong influences upon child development. Whether the influences of maternal age and SES are independent or complementary remains to be seen.

Mother-Infant Interaction. Measures of infant characteristics that influence mother-infant interaction indicated that there were no significant differences between the two groups of infants on eight temperament characteristics. There was no reason to suspect that any differences in temperament should exist since temperament is an inherited characteristic which underlies personality and personal style (Thomas *et al*., 1963). However, one would expect that infant temperament would be related to maternal attitudes and mother-infant interaction. A review of the correlation tables (Appendix E) shows that this is not the case. Of the 98 correlations between the temperament variables and the maternal attitudes or mother-infant interaction variables, only three are statistically significant, approximately as many as one would expect to find by chance. Unfortunately, bivariate correlations hide any influence that temperament may have on attitudes or interaction since correlations are gross measures that reflect both direct and indirect influences.

Among the more direct measures of mother-infant interaction, only three significant differences were found between the two groups of mothers and infants. Older mothers talked to their infants more, spent more time vocalizing during mutual gaze, and were contingently responsive to the infants' distress signals more often than the younger mothers. These three interaction variables have been found to be significantly related to a child's cognitive development (cf.: Beckwith, 1971; Yarrow et al., 1972; Beckwith et al., 1976). Furthermore, both vocalizing during mutual gazing and responding to distress signals are the types of contingent responses that are thought to play a significant role in the development of attachment as well as in the child's socioemotional and cognitive development (cf.: Ainsworth, 1969, 1973; Ainsworth & Bell, 1973; Ainsworth et al., 1974; Blehar et al., 1977; Brazelton, 1976; Lewis & Goldberg, 1969; Lozoff, 1977; Robson, 1967; Sander, 1977; Sroufe, 1979). The difference in the type and quantity of mother-infant interaction between older mothers and their infants and between teenagers and their infants on these three critical variables is potentially related to the developmental differences reported by Hardy et al. (1978) and Oppel and Royston (1971).

Another interesting relationship is found by reviewing the correlation tables (Table 23; Appendix E). The three SES variables are correlated with the three interaction variables and each of these correlations approaches significance or is significant at the $p < .05$ level. Thus, once again, the causal influences of maternal age and SES are confounded.

<u>Summary</u>

The descriptive analysis has shown that the results of this study generally support the findings in the research literature. Teenage mothers generally began prenatal care later in their pregnancies, had shorter pregnancies, and gave birth to slightly smaller infants; their homes provided more human and less nonhuman stimulation, they had fewer material or educational resources to apply to child rearing, and they generally exhibited less contingent interaction with their infants than the older mothers. Furthermore, SES was found to be as strongly related to most of the variables discussed as was maternal age. It was noted that some of the differences between the two groups may be due to the violation of the homoskedasticity assumption of the F-test.

However, the teenage mothers were found to have had easier deliveries than the older mothers despite beginning prenatal care later. No differences were found between the maternal attitudes of the two groups of mothers or between the temperament characteristics of the infants and only one difference was found between the two groups on the Brazelton summary scores. In general, the teenage mothers in this study exhibited much more positive characteristics than have been reported in the research literature.

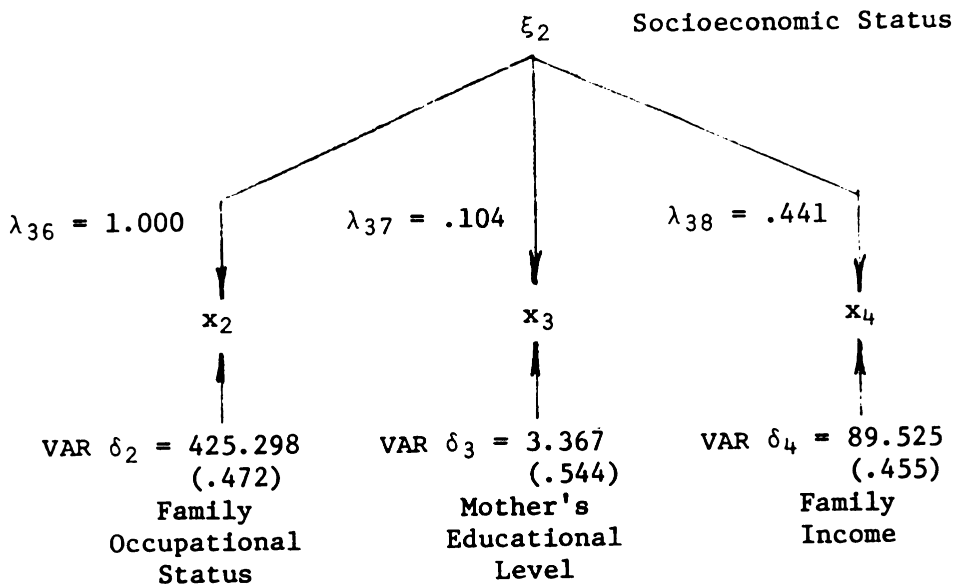
The bivariate relationships that were examined have generally supported the research model (Figure 3, p. 103). However, because of the complex relationships that are hypothesized to occur among these variables, an examination of bivariate relationships cannot provide sufficient information about the value of the theoretical model in Figure 3. An evaluation of the research model will be presented in the sections that follow.

The Estimates of the Parameters of the Research Model

The analysis of the research model was done using LISREL, a full-information maximum-likelihood method of estimating and evaluating systems of linear structural equations (Jöreskog & Sörbom, 1978). In LISREL, information about all the relationships in a model are used to generate estimates for each parameter of that model. Though a full-information analysis technique was used, for ease of discussion the results will be presented separately for each section of the model. (The entire analysis also appears in Appendix F.)

The Measurement Models

Figures 4 through 10 contain the results of the estimation of the measurement model for each of the theoretical variables. The parameter estimates of the measurement model for the exogenous variable ξ_2, socioeconomic status, are shown in Figure 4. As in all the measurement



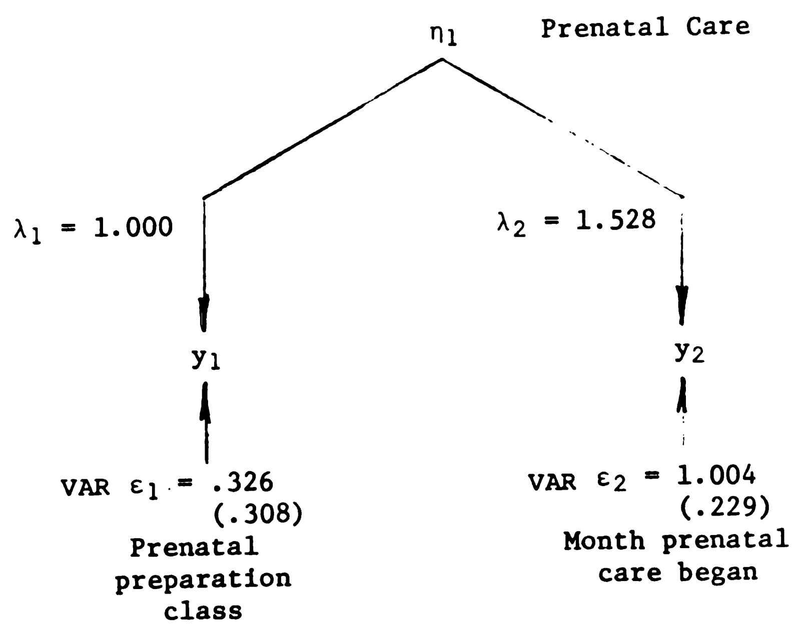


Figure 4.--LISREL Estimates for the Measurement Models for the Socioeconomic Status Variable ξ_2 and the Prenatal Care Variable η_1 (Reliabilities in Parentheses).

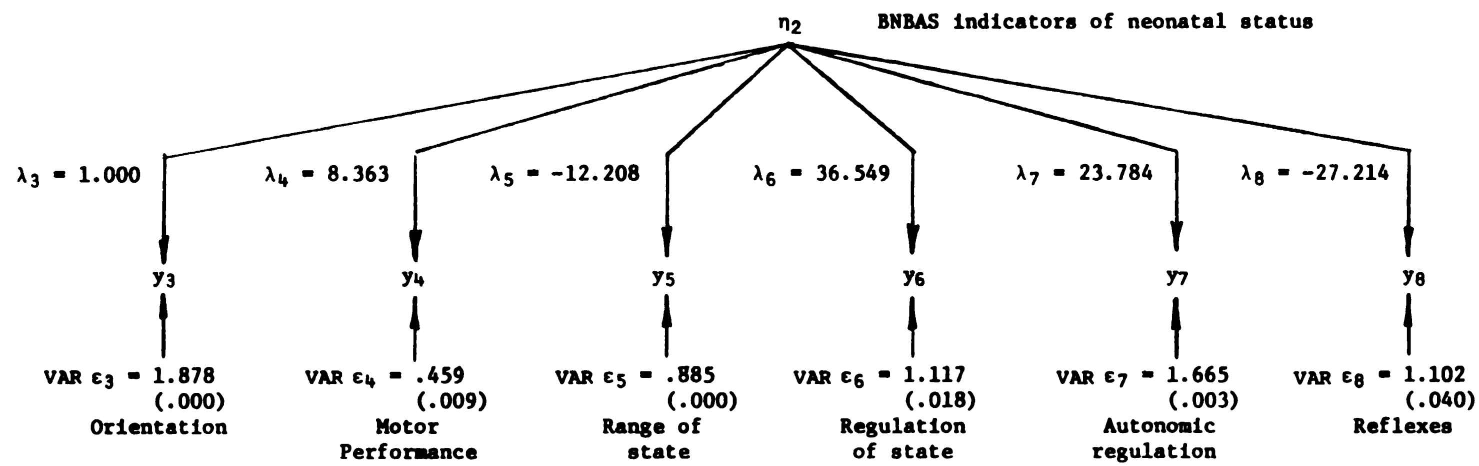


Figure 5.--LISREL Estimates for the Measurement Models for the Neonatal Status Variable η_2 (Reliabilities in Parentheses).

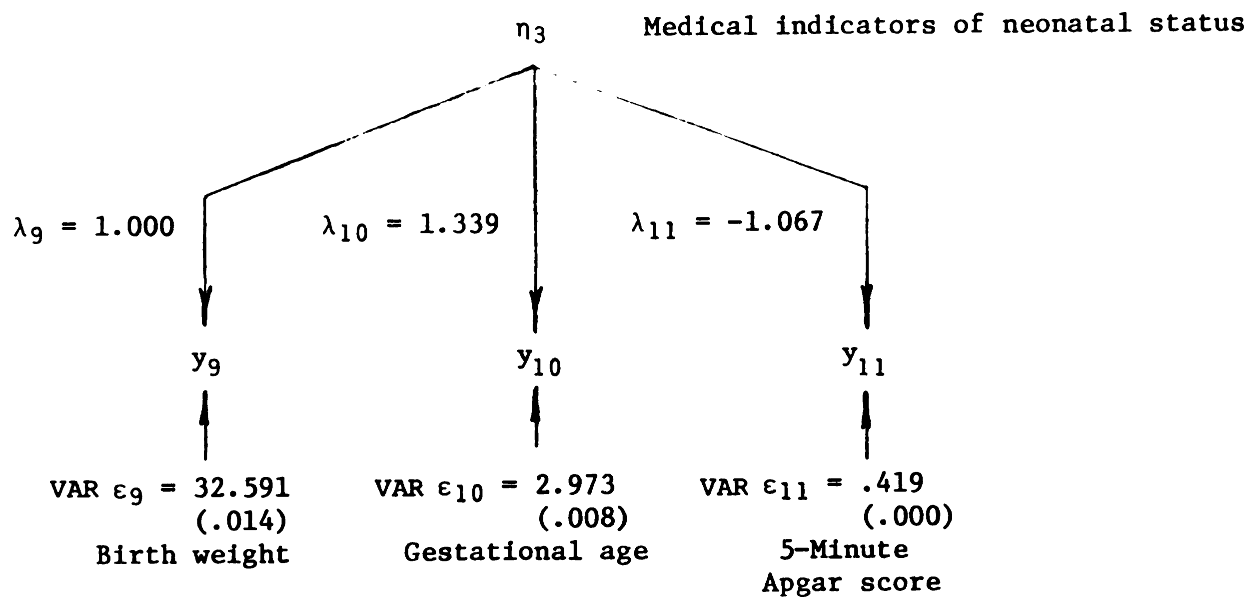


Figure 6.--LISREL Estimates for the Measurement Model for the Neonatal Status Variable η_3 (Reliabilities in Parentheses).

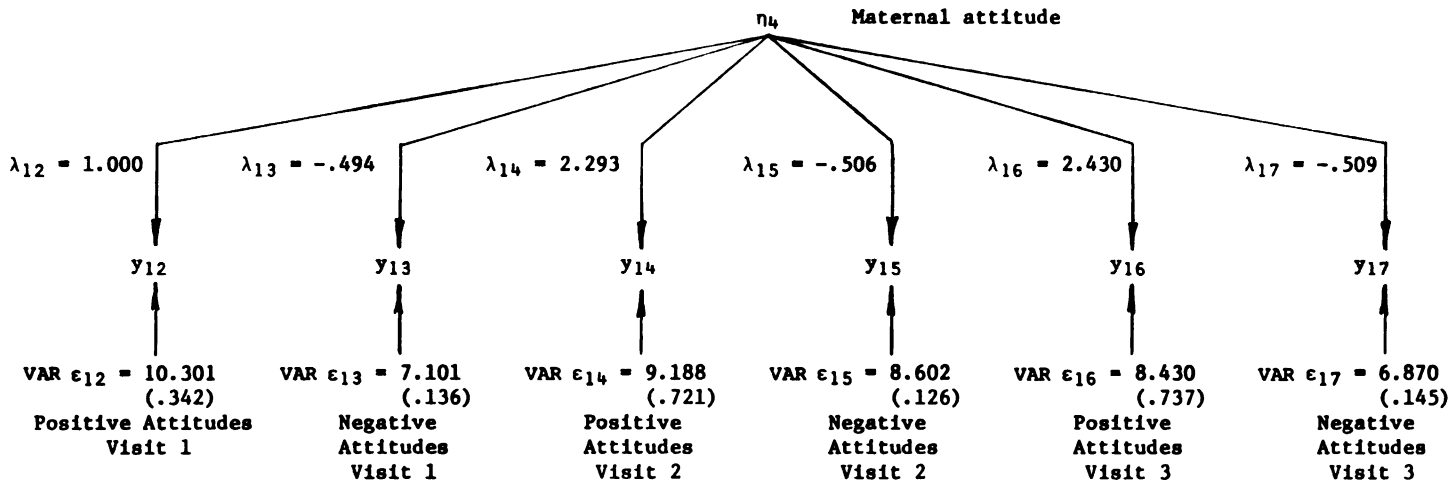


Figure 7.--LISREL Estimate for the Measurement Model for the Maternal Attitude Variable η_4 (Reliabilities in Parentheses).

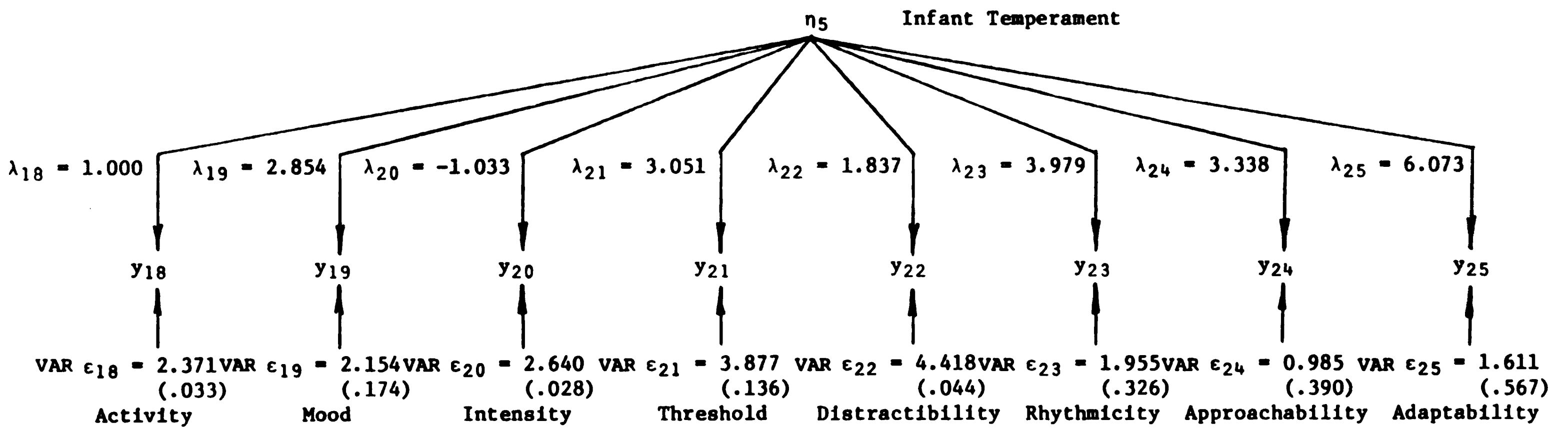


Figure 8.--LISREL Estimate for the Measurement Model for Infant Temperament Variable η_5 (Reliabilities in Parentheses).

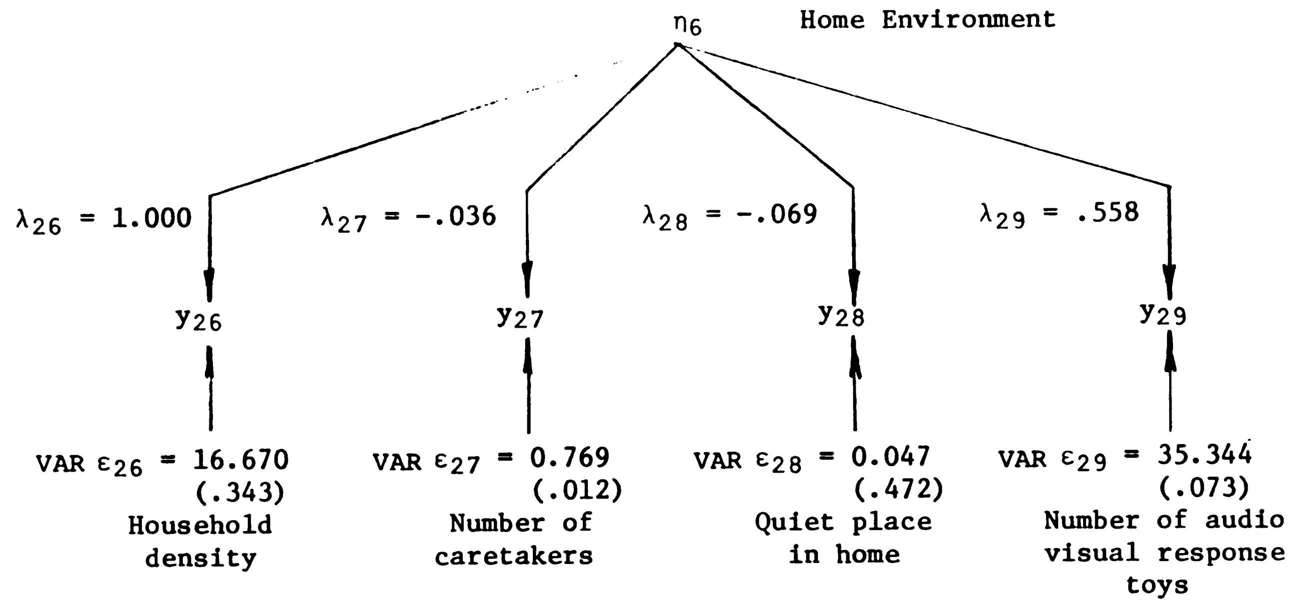


Figure 9.--LISREL Estimate for the Measurement Model for the Home Environment Variable η_6 (Reliabilities in Parentheses).

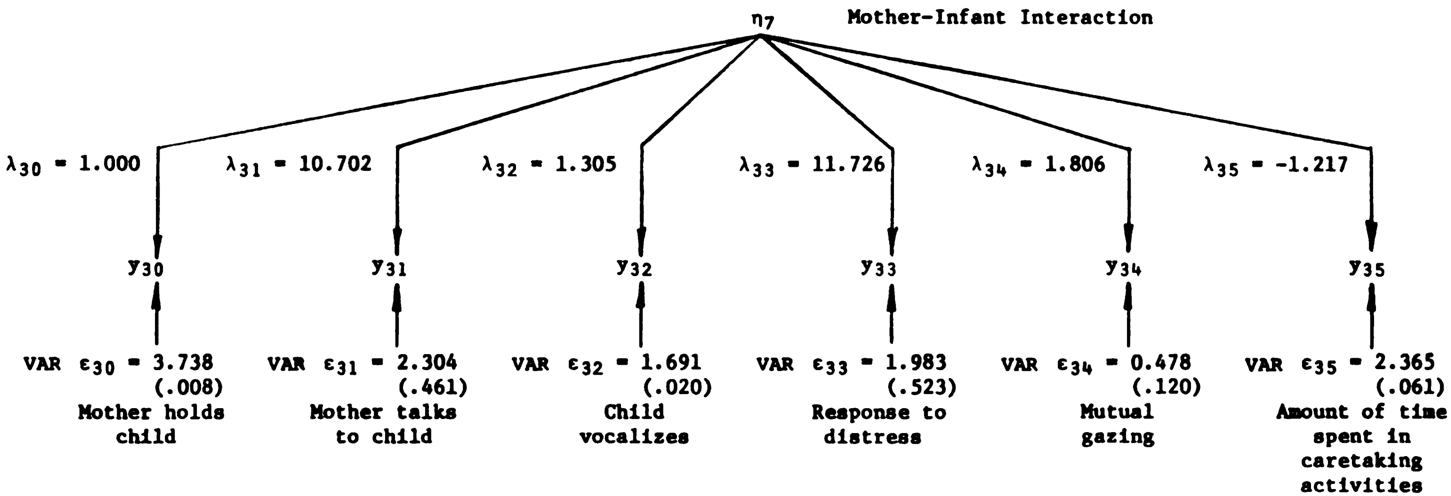


Figure 10.--LISREL Estimate for the Measurement Model for the Mother-Infant Interaction Variable η_7 (Reliabilities in Parentheses).

models, one of the coefficients relating the theoretical variable ξ_2 to its indicators, the observed variables x_2 (family occupational status), x_3 (mother's education level), and x_4 (family income), was set equal to one. Arbitrarily the coefficient for the first indicator was chosen to be the "reference indicator" in each case. Without this restriction, each measurement model would be underidentified and an infinite set of consistent estimates would be possible, with no means of choosing among them. As a result of this restriction, each measurement model has a unique solution and the estimated coefficients are calculated relative to the restricted parameter (Fink, 1980).

For the analysis presented here, the variance-covariance matrix for the 39 observed variables was analyzed. Therefore the socioeconomic status measurement model in Figure 4 has the following interpretation:

$$\text{Var } x_2 = 1.000 \text{ Var } \xi_2 + 425.298$$

$$\text{Var } x_3 = .104 \text{ Var } \xi_2 + 3.367$$

$$\text{Var } x_4 = .441 \text{ Var } \xi_2 + 89.525$$

where Var = variance.

That is, ξ_2 is created by factor analyzing x_2, x_3, and x_4. The coefficients indicate how the variance of ξ_2 would be used to recreate the observed variables. The δs, or error of measurement terms, indicate how much of the variance of the observed variables is not accounted for or recreated by the decomposition of ξ_2. (The εs for the y-variables are interpreted similarly.) The size of the error terms depend on both the measurement scales that were used and upon the amount of common underlying variance (degree of intercorrelation) of the indicator variables. A large measurement error does not indicate that the measurement of a particular indicator variable was poorly done, only that the measurement of that indicator as it relates to the theoretical variable in this model is poor. Thus, if the indicator variables are not highly intercorrelated, the measurement errors will be large. For comparison purposes, the reliabilities of the measurements (again as related to the theoretical variables) were calculated by using the following formula and were written in parentheses under each measurement error term:

$$\text{Reliability} = 1 - \frac{\text{Error variance}}{\text{Total variance}}$$

One way to evaluate the significance of an estimate is to compare it to its standard error. This comparison is provided in Table 24. If an estimate is at least twice as large as its standard error, it is significant at the $\underline{p} < .05$ level (Hanushek & Jackson, 1977; Wheaton, Muthén, Alwin & Summers, 1977). Most of the ratios in Table 24 are considerably less than 2.0 indicating that few of the estimates for the measurement models are significant.

Another important aspect of the measurement models is the interpretation of the directionality of the created

Table 24

Standard Errors for the Estimates of the Parameters of the Measurement Models

Parameter	Estimate	Standard Error[a]	Standard Error/ Estimate[b]
λ_{2}	1.528	.408	3.75
λ_{4}	8.363	519.975	0.02
λ_{5}	-12.208	851.734	-0.01
λ_{6}	36.549	2493.883	0.01
λ_{7}	23.784	1625.900	0.01
λ_{8}	-27.214	1811.687	-0.02
λ_{10}	1.339	.590	2.27
λ_{11}	-1.067	.501	-2.13
λ_{13}	-.494	.169	-.72
λ_{14}	2.293	.407	5.63
λ_{15}	-.505	.184	-2.74
λ_{16}	2.430	.413	5.88
λ_{17}	-.509	.168	-3.03
λ_{19}	2.854	2.318	1.23
λ_{20}	-1.033	1.235	-.84
λ_{21}	3.051	2.561	1.19
λ_{22}	1.837	1.875	.98
λ_{23}	3.979	3.162	1.26
λ_{24}	3.338	2.592	1.29
λ_{25}	6.073	4.926	1.23
λ_{27}	-.036	.040	-0.90
λ_{28}	-.069	.016	4.31
λ_{29}	.558	.293	1.90
λ_{31}	10.702	220.419	0.05
λ_{32}	1.305	26.161	0.05
λ_{33}	11.726	237.815	0.05
λ_{34}	1.806	36.364	0.05
λ_{35}	-1.217	17.391	-0.07
λ_{37}	.104	.021	4.95
λ_{38}	.441	.084	5.25

[a]These values for the standard errors were taken from an approximate solution since none were available for the final solution.

[b]If greater than ±2.0, $p < .05$.

or unobserved variable. By assigning a regression coefficient of 1.0 to the first indicator, one forces the unobserved variable to vary in the same direction as the reference indicator. In Figure 4, increasing occupational status is indicative of increasing SES, thus the positive coefficient means that large values of ξ_2 indicate high SES.

On the other hand, in the lower half of Figure 4, prenatal class participation, as the variable is coded (1 = yes, 2 = no) is negatively related to quality prenatal care. Since the coefficient is positive, large values of η_1 indicate poor quality prenatal care and small values indicate a higher quality of prenatal care. Similarly, the month that prenatal care began is negatively related to quality prenatal care. However, the positive coefficient supports the inverted interpretation of η_1 given above.

In all the other measurement models, except for η_5 (Figure 8), the reference indicator is associated with positive aspects of the unobserved or theoretical variable. For η_5, infant temperament, high values of the reference indicator, activity, are indicative of a "difficult" infant, a possibly negative temperamental characteristic. Thus, high values of η_5 are indicative of difficult characteristics and low values, of more flexible characteristics.

<u>The Theoretical Model</u>

In Figures 11 and 12, the estimates of the parameters of the theoretical model are presented. The gammas (γ) and betas (β) are regression coefficients which

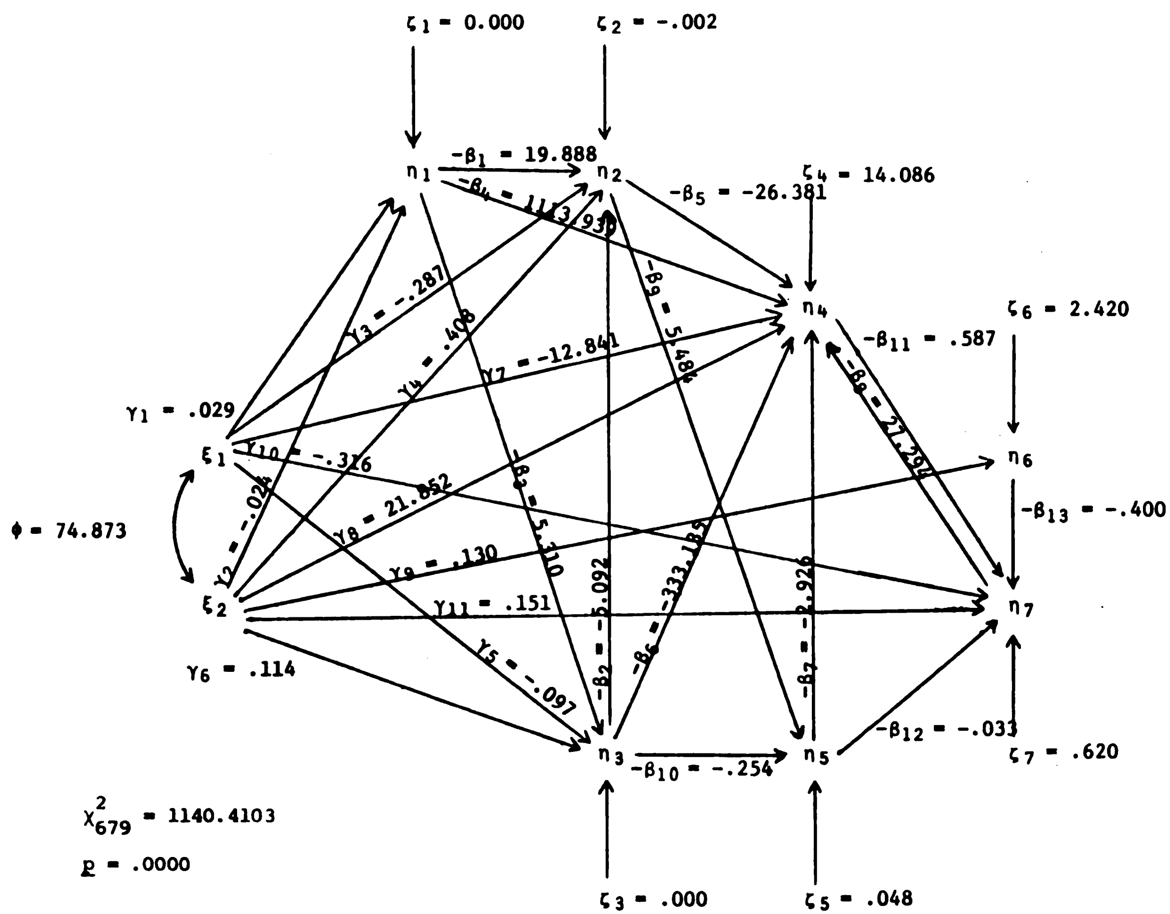


Figure 11.--LISREL Estimates for the Theoretical Model for Comparing the Childbearing and Childrearing Experiences of Teenage and Older Mothers.

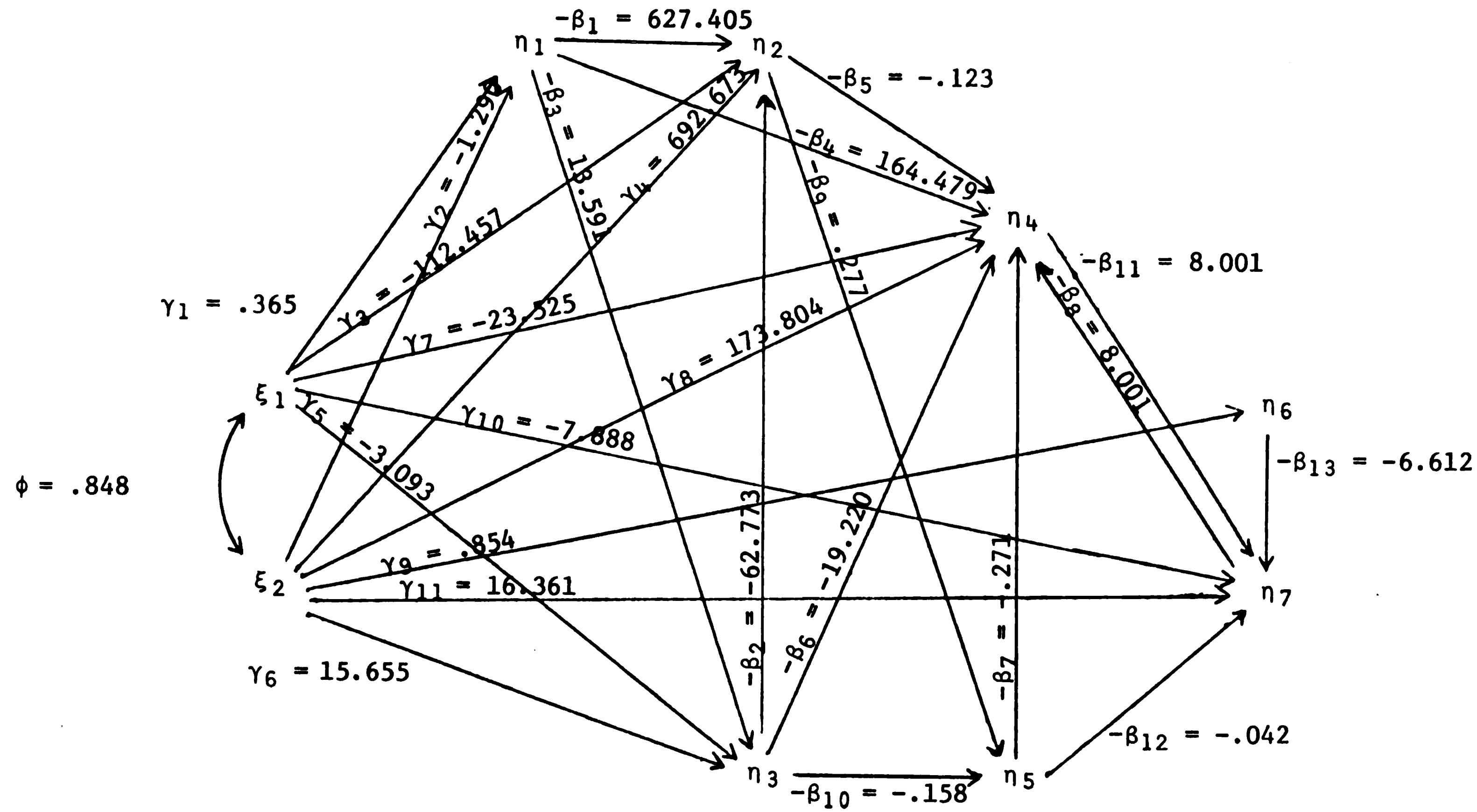


Figure 12.--Standardized Solution--LISREL Estimates for the Theoretical Model for Comparing the Childbearing and Childrearing Experiences of Teenage and Older Mothers.

indicate the relationships among the exogenous (ξ) and endogenous (η) theoretical variables. The size of a regression coefficient is sensitive both to the measurement scales of each of the two variables it relates, to the strength of the relationship between them, to the effects of other variables in that equation, and to the structure of the whole model. For these reasons, one cannot directly compare the coefficients in Figure 11 to one another. In order to compare regression coefficients, the standardized solution to the theoretical model, which is an accurate description of the relationships in the model when the model is not scale-free (Wheaton et al., 1977), is presented in Figure 12. (See also Appendix F.) In the standardized solution, the variance of each theoretical variable is 1.0.

In Figure 11, one of the first points to notice is the opposing direction of the effects of the two exogenous variables, ξ_1 (maternal age) and ξ_2. ξ_1 and ξ_2 were highly positively correlated as indicated in Figure 11 where ϕ represents the covariance of ξ_1 and ξ_2 and in Figure 12 where ϕ represents the correlation of ξ_1 and ξ_2. The gammas (γ) relating the exogenous variables to the endogenous variables indicate the independent effects of maternal age and of SES; that is, the effect of each exogenous variable after the effect of the other has been partialled out.

Thus, with the effect of SES accounted for, maternal age had a positive impact on prenatal care (η_1) and a negative impact on both neonatal status variables (η_2 and η_3), on maternal attitudes (η_4) and on mother-infant interaction (η_7). Since high scores on the prenatal care variable (η_1) are indicative of poor prenatal care, the positive relationship between ξ_1 and η_1 shows that given equal SES, younger mothers had better prenatal care than older mothers. In fact, all the coefficients for ξ_1 indicate that young mothers or their offspring did better than older mothers or their offspring on each of the endogenous variables.

With the effects of maternal age partialled out, SES had a negative impact upon prenatal care and a positive impact upon all the other endogenous variables it affected. In other words, high SES mothers or their infants did better than low SES mothers or infants on each of the predictors of child development incorporated in the model. The impact of SES was consistently larger than that of maternal age, or indeed, of any other variable (Figure 12).

According to the estimates in Figure 11, prenatal care (η_1) had a positive impact upon both neonatal status variables (η_2 and η_3) and upon maternal attitudes (η_4). Because of the inverted interpretation of η_1 these relationships mean that, when combined with the other predictors in the model, poor prenatal care (high values of η_1) contributes to good neonatal status and to positive maternal attitudes.

Brazelton neonatal status (η_2) had a negative impact on maternal attitudes (η_4) and a positive impact on infant temperament (η_5). That is, in combination with the other predictors, the high Brazelton status scores contributed to lower maternal attitude scores and to higher (more difficult) temperament scores.

Neonatal physical status (η_3) had negative impacts upon the Brazelton neonatal status variable (η_2), maternal attitudes (η_4) and infant temperament (η_5). High levels of physical status thus contributed to lower levels of Brazelton neonatal (η_2) status, lower or negative levels of maternal attitudes (η_4), and to lower (more positive) infant temperament scores (η_5), when used as a predictor with other variables as indicated in the model.

In combination with other predictors, high levels of infant temperament (η_5), which are indicative of a difficult child, had a negative impact upon both maternal attitudes and mother-infant interaction. Similarly, high levels of the home environment variable (η_6--associated with more space and toys) made a negative contribution to the level of mother-infant interaction. Finally, the level of mother-infant interaction made a positive contribution to maternal attitudes while maternal attitudes made a positive contribution to mother-infant interaction.

The ζs are the errors of prediction or the amount of the variance of the endogenous variables that are not linearly predicted by the variables associated with it. Comparing the values of the ζs with the variances of the endogenous variables (see Eta-Eta matrix, Appendix F, p. 294), we see that two of the errors of prediction (ζ_4

and ζ_7) have values larger than the variance of the variable with which they are associated. This may indicate that the assumption that the error terms for the indicators of η_4 and η_7 are uncorrelated is incorrect.

To evaluate the significance of the parameters of the theoretical model, the standard errors of the estimates are presented in Table 25. As the ratio of the estimates to their standard errors shows, few of the parameters are statistically significant (if ratio $\geq$ 2.0, p < .05).

Evaluation of the Research Model

To evaluate the significance of the complete research model, a χ^2 goodness-of-fit test was performed (Figure 11). This test is performed by comparing the original variance-covariance matrix of the 39 observed variables (Appendix F, pp. 279-280) with the estimated variance-covariance matrix (see Sigma matrix, Appendix F, pp. 291-292) which is based upon the paths or specifications of the research model. The goodness-of-fit test determines how well the original matrix is approximated by the estimated matrix (see S-Sigma matrix, Appendix F, pp. 292-294 for the matrix of differences between the estimated and original matrices).

In the goodness-of-fit test, the null hypothesis, H_o, is that the model as specified is the true model of the relationships among the variables or that the model accurately reproduces the variance-covariance matrix that was analyzed. The alternative hypothesis, H_1, is that

Table 25

Standard Errors for the Estimates of the Parameters of the Theoretical Model

Parameter	Estimate	Standard Error[a]	Standard Error/ Estimate[b]
γ_1	.029	.044	.65
γ_2	-.024	.012	-2.00
γ_3	-.287	101.071	-0.00
γ_4	.408	148.309	0.00
γ_5	-.097	22.947	-0.00
γ_6	.114	15.020	0.00
γ_7	-12.841	65,065.961	-0.00
γ_8	21.852	97,667.165	0.00
γ_9	.130	.037	3.51
γ_{10}	-.316	6.441	-0.05
γ_{11}	.151	3.117	0.05
$-\beta_1$	19.888	7,069.441	0.00
$-\beta_2$	-5.092	2,054.079	-0.00
$-\beta_3$	5.310	529.987	0.01
$-\beta_4$	1,113.939	4,674,356.085	0.00
$-\beta_5$	-26.381	323,656.130	-0.00
$-\beta_6$	-333.135	1,379,750.219	-0.00
$-\beta_7$	-2.926	5.041	-0.58
$-\beta_8$	27,294	575.436	0.05
$-\beta_9$	5.484	393.271	0.01
$-\beta_{10}$	-.254	.085	-2.99
$-\beta_{11}$	.587	15.374	0.04
$-\beta_{12}$	-.033	19.720	-0.00
$-\beta_{13}$	-.400	11.259	-0.04

[a]These values for the standard error were taken from an approximate solution since none were available from the final solution.

[b]If greater than or equal to ±2.0, $p < .05$ (Duncan, 1975; Wheaton et al., 1977).

the estimated matrix is any positive definite matrix (Joreskög & Sörbom, 1978). Contrary to most significance tests, the goal here is not to reject H_o. The probability level that is given in Figure 11 "is defined as the probability of getting a χ^2 value larger than the value actually obtained given that the hypothesized model is true" (Joreskög & Sörbom, 1978, p. 57). Thus large significance levels for the χ^2-test values approaching 1.0, under the assumptions of multinormality and in large samples, are indicative of models that fit the data well.

In Figure 11, the results of the goodness-of-fit test were $\chi^2_{679} = 1140.4103$, $\underline{p} = .0000$. If this test were the only means of evaluating the model, we would have to conclude that the model as specified in Figure 3 (and Figures 4 through 12) does not fit the data well. Furthermore, an error message suggests that one parameter, and therefore perhaps the whole model, is under-identified. If this is the case, the test results are irrelevant.

Discussion of the Estimated Model

Evaluation of the Model

According to goodness-of-fit test, the model does not fit the data well. However, the goodness-of-fit test is sensitive to sample size and must be interpreted cautiously (Joreskög, 1974, p. 4; 1978, p. 14; Wheaton *et al.*, 1977, p. 99). Instead of using the χ^2 value to accept or reject the model as a whole, the results of the goodness-of-fit test can be used to compare the fit of various models to the data:

> . . . if a value of χ^2 is obtained, which is large compared to the number of degrees of freedom, the fit may be examined by an inspection of the residuals, i.e., the discrepancies between observed and reproduced values. Often the results of an analysis, an inspection of residuals or other considerations will suggest ways to relax the model somewhat by introducing more parameters. The new model usually yields a smaller χ^2. A large drop in χ^2, compared to the difference in the degrees of freedom, indicates that the changes made in the model represent a real improvement (Joreskög, 1974, p. 4; see also Joreskög, 1978; Wheaton et al., 1977).

An inspection of the residuals matrix (the S-Sigma matrix, Appendix F, pp. 292-294) suggests that the model does a fairly good job of reproducing the original variance-covariance matrix. Most of the residuals are quite small, especially in comparison to the size of the corresponding variance or covariance terms. Furthermore, the χ^2/df ratio of 1.679 suggests that the present model is a reasonable representation of the data though it might be improved by the addition of theoretical variables and/or paths between variables (cf.: Wheaton et al., 1977, p. 99).

The present model is highly overidentified, that is, the number of the degrees of freedom is large. This degree of overidentification is the result of numerous assumptions that were made or restrictions that were placed upon the model (e.g., the error terms of the measurement models are uncorrelated and the error of prediction terms are uncorrelated). Because of the status of theory in the social sciences, there were no theoretical guides to the placement of these restrictions (cf.: Land & Felson, 1978, p. 288), some of which are quite strong assumptions. Therefore, after inspecting the residual matrix, there are numerous submodels that can be created by relaxing some of the over-identifying assumptions. These submodels can then be compared to the original model in the manner suggested by Joreskög above. Such a strategy should be applied to the present model according to the guidelines provided in the following section.

However, as the inspection of the standard errors above indicated, most of the parameter estimates of the model are not significant. While the estimates are consistent (a large sample property), with the sample size utilized many standard errors are so large that often the hypothesis that the estimate is zero cannot be rejected. By this criteria one cannot have faith that the estimates obtained are the true values of the parameters, reducing the usefulness of the model for making predictions with any degree of precision.

<u>Suggestions for alternative models</u>. A close inspection of the information in the LISREL analysis (Appendix F) provides several possible explanations for the large standard errors reported above and provides indications of ways to improve the model. First, as reported above, ξ_1 (maternal age) and ξ_2 (SES) were highly correlated. Highly correlated exogenous variables result in multicollinearity, a situation in which there is only limited information to separate out the independent effects

of each variable. Multicollinearity reduces the precision (increases the standard errors) of the estimates. Furthermore, because the estimates are based upon so little information (only the variance that is left after the joint effects are removed), they become very sensitive to slight modifications of the model specifications. Thus, in cases of multicollinearity, the estimates may prove to be artifacts of the sample used and the model specification (Hanushek & Jackson, 1977). One possible solution to multicollinearity is to create a single theoretical variable out of ξ_1 and ξ_2.

Second, the values of the variance-covariance matrix for the theoretical endogenous variables (see Eta-Eta matrix, Appendix F) show that the variances for η_2, η_3, η_5, and η_7 are quite small, with the variance of η_2 being ".000." This indicates that the sets of indicators for these variables were not good choices in that the amount of common underlying variance is so small. The intercorrelations for each set of indicators supports this conclusion (see Appendix E). This situation may result from the lack of precision of the scales used (not precise enough to show variability) or from the use of orthogonal (perfectly distinct) factors as indicators. It also may result from the use of small scaling metrics, e.g., scales with maximum values between 0 and 1. The message about insufficient arithmetic precision on the LISREL results appears to support the latter possibility (Appendix F).

For instance, each of the Brazelton summary scores is an indicator of neonatal well being. However, as the correlation matrix shows (Appendix E), the intercorrelations among the indicators are sometimes quite small suggesting that these variables are not indicators of a single construct. The extremely small measurement reliabilities for these indicators add strength to this contention. Similar conclusions can be reached for the indicators of η_3, η_4, and η_5. Two possible solutions to the problem of weak indicators are to (1) create additional unobserved variables or (2) reduce the number of indicators used for the unobserved variables (Fink & Mabee, 1978; Duncan, 1975; Costner & Schoenberg, 1973). The resultant sets of indicators should be characterized by relatively strong intercorrelations and by theoretical relevance.

The choice of indicators for maternal attitudes (η_4) poses another type of problem. Since these indicators are the results of repeated measurements, one would expect to find the measurement errors to not be truly random, but to reflect factors left out of the model which may be correlated, a possibility that was not reflected in the model. This possible misspecification is probably the cause of the inflated error of prediction for maternal attitudes (ζ_4). The model should be modified to allow the appropriate correlations among the error terms.

The standard error is also influenced by the quality of the measurement instruments. If the instruments do not have a high level of validity, we cannot be certain that we are measuring the construct of interest; that is, the relationship between that which is measured and the theoretical concept may be weak. If the instruments do not have a high level of reliability, a certain amount of the variation in the data will be due simply to the unreliability of the instruments that were used. Low reliability leads to larger measurement errors and to larger estimation errors.

As mentioned above, the fact that the estimates are consistent is a large sample property and the χ^2 test is a large sample test. One would expect an improvement in the estimates of the model and in the results of the goodness-of-fit test simply by increasing the sample size. An increase in the sample size would also reduce the size of the standard errors. Thus one alternative is to estimate the current model with data from much larger samples.

Multiple indicators were used throughout the model to improve the reliability of the measurements. However, in some cases (Brazelton items, MITS) the intercorrelations of the indicators were quite low, thus the validity of the resulting construct was probably quite low. Though the instruments used were the most reliable ones available, or were redesigned to improve reliability, none of the instruments was perfectly reliable. Obviously, some portion of the standard error is due to the reliability and validity of the measurements used.

If a model is "empirically underidentified," large standard errors will result (Fink, 1980). Though the number of degrees of freedom of the model (calculated by subtracting the number of estimates to be made from the number of elements in the data matrix) is large and nonnegative, this is only a necessary condition for being overidentified. However, "empirical" identification depends, for example, upon various covariances not being equal to zero (Fink, 1980). A review of the variance-covariance matrix (Appendix F, pp. 279-280) indicates that some covariances are quite small, possibly contributing to the size of certain standard error terms.

Finally, the instances of possible heteroskedasticity mentioned above imply that the assumption of a multivariate normal distribution, used to estimate the parameter estimates and used in the χ^2 test for goodness of fit, was violated. If some of the relationships in the model are not linear (one source of heteroskedasticity), the assumption for the estimates is violated and the model is misspecified. By choosing appropriate transformations, the specification problem can be corrected (e.g., the relationships may be made linear) and such transformations often produce normal distributions (cf.: Fink, 1980, pp. 134-135). Where heteroskedasticity exists in the model above, appropriate transformations could be found by using residual analysis of ordinary least squares regressions.

In summary, the research model does not completely account for all the variance that appears in the data set. It is possible that adding theoretical variables or causal linkages between variables would strengthen the model. The large standard errors for the estimated parameters reduce one's confidence in the research model. These large standard errors may be reduced by using the observed exogenous variables as indicators for a single unobserved exogenous variable. Improved measurements would help to reduce the standard errors also.

The Relationship of the Estimated Model to Theory

Given the results of the goodness-of-fit test and the large standard errors, it is difficult to provide an interpretation of the results with any degree of confidence. However, the discussion that follows provides an interpretation as though the estimated model were the true description of the theoretical linkages represented. Future research may provide evidence in support of, or in contrast to, that presented here.

One of the more interesting aspects of the results presented above is the finding that maternal age and SES have opposing effects upon the endogenous variables in the model. The fact that maternal age and SES have causal effects in opposite directions challenges much of what has been reported about teenage parenting. Even an examination of the correlation tables (Appendix E) suggests that the causal effects of these two variables would be similar, i.e., the size and direction of the correlation of each with the other variables are quite similar. It is the high positive correlation between maternal age and SES that creates this illusion and confounds the results of studies dealing with teenage childbearing.

It appears that the negative effects of adolescent childbearing upon child development are not due to maternal age *per se*. Instead, the negative effects are due to the correlates of early childbearing: truncated education, limited job opportunities, and reduced earning power for the mother and her male companion (cf.: Baldwin & Cain, 1980). Teenage parents have fewer material and nonmaterial resources to invest in their child's development. However, within the age range studied and given equal SES levels, the more optimal status of the young mother's reproductive system (at least for first births), her enthusiasm, and her energy tend to provide more optimal conditions for child development than that provided by older mothers.

It is also important to consider the relative size of the contribution of age and SES to the various aspects of childbearing and childrearing (Figure 12). In every case, the influence of SES is several times the size of the influence of age. This finding suggests that the positive aspects of early motherhood are probably more than offset by the negative impact of the low SES that is associated with early motherhood.

The results discussed above appear to conflict with those of Oppel and Royston (1971), who found developmental differences by maternal age after matching their adolescent and older mothers on SES, birth weight of the child, maternal parity, and maternal race. The current study suggests that SES is the major factor for explaining the developmental differences between the children of teenagers and older mothers. There are a number of possible explanations for this conflict:

1. Matching is not a satisfactory way of controlling for initial differences (Campbell & Stanley, 1963);
2. Depending upon the rules used for matching, Oppel and Royston may have selected very special subgroups of both age groups. If matching is done on broad categories its effectiveness is lost. If it is done on a very restrictive basis for all four variables, the samples selected may be unique;
3. By matching on both SES and birth weight, Oppel and Royston were selecting a subgroup of adolescents who did not experience the advantage reported above (i.e., given equal SES, teenage mothers had larger children) whether or not this experience was a typical one;
4. Oppel and Royston may have used a completely different definition of SES than that used in the present study, a common situation in social science research;

5. The Oppel and Royston study had a larger, and therefore, potentially more representative, sample than the present study;
6. The Oppel and Royston study was longitudinal and its dependent variables were measures of developmental status while the present study was short term and its "dependent" variables were predictors of developmental status. In the present study, one can only hypothesize about the relative developmental status of the two groups of children at a later date.

For at least these reasons, the results of the two studies may not be comparable.

Several of the relationships between the endogenous variables in the model were quite unusual and appeared to challenge both theory and logic. For instance, poor prenatal care (η_1) had a positive impact on the neonatal status variables (η_2 and η_3). This appears to directly conflict with the findings of Dwyer (1974) and others who have reported the onset of prenatal care to be predictive of improved neonatal status. The relationship between poor prenatal care and more positive maternal attitudes also appears to conflict with Leifer's contention that preparation for the birth improves maternal attitudes (1977).

The difference between the findings of Dwyer and Leifer and those of the present study probably stem from the types of analyses used. Both authors discussed their findings in a bivariate sense. The results above are much more complex and, therefore, more difficult to interpret.

For instance, consider only the relationship between maternal age (ξ_1), SES (ξ_2), prenatal care (ξ_3), and Brazelton neonatal status (η_1). As reported above, given equal SES, younger mothers had more positive prenatal care and their infants had better neonatal status than older mothers and their children. Also, given equal maternal ages, higher SES mothers had more positive prenatal care and their infants had better neonatal status than lower SES mothers and their children. However, the influence of maternal age and SES on neonatal status should not be considered without adding the impact of prenatal care; i.e., the estimates were generated by considering the influence of all three variables simultaneously (except for the purposes of this illustration we would also have to add the impact of physical status to the equation).

Thus, if all the influences upon Brazelton neonatal status are considered, the distinct contribution of prenatal care is negative. The positive impact of prenatal care upon neonatal status reported by others may then be explained by the direct effects of maternal age and SES upon neonatal status. That is, those mothers who have high quality prenatal care may have healthier babies (as measured by the Brazelton scales) but the enhanced neonatal status is due to their SES and age, not to the quality of their prenatal care. However, there is no apparent theoretical or logical reason for prenatal care to reduce the level of neonatal status as reported here. Given this relationship, the relative size of the effect of prenatal care upon neonatal status and maternal attitudes is also puzzling (Figure 12), especially when there was no apparent relationship between prenatal care and the delivery experiences of the mothers.

Other apparent anomalies in the results above have similarly complex explanations that appear to contradict current theory. For example, the quality of the home environment as measured in this study was expected to have a positive impact upon mother-infant interaction. However, when home environment is considered in conjunction with maternal attitudes, age, SES, and infant temperament, home environment had a negative impact upon interaction. This result may indicate that the positive aspects of home environment reported by others are explained by the direct impact of SES (the only variable in the model shown as a cause of home environment). With the impact of SES on mother-infant interaction accounted for by the direct linkage of those two variables, the remaining impact of home environment (space, number of toys) is negative. Again the exact reason for the direction of the remaining impact of home environment is not readily apparent. It is also possible that home environment has a direct impact upon child development and little or no indirect impact upon child development via mother-infant interaction as specified by the model. In this event, the model is misspecified.

Simply stated, the apparent contradictions between theory and the results of the LISREL analysis of the model reported above may be explained by the differences in the complexity of previous analyses and the current one. Bivariate analyses do not fully represent causal complexities. Those bivariate analyses that attempt to control for the effects of one or more variables are still distorting the richness of the transactions that are often the causes of behavior.

As an example, consider the various impacts of SES in the current research model. In every case in which SES is a causal variable it has a larger impact than any other variable in the equation (Figure 12). By controlling for the impact of SES, by whatever means, researchers are strongly distorting the causal realities of the phenomenon under consideration. When one considers the simultaneous impacts of several related variables upon another, the distortion implied by bivariate research becomes even more apparent. The transactions among the variables may produce results that are grossly different from those that occur when each variable is treated singly. Simply stated, when analyzing a system, the results very much depend upon whether one examines the whole system simultaneously or the pieces separately. To date, most research in the social sciences has paid lip service to examining systems while continuing to analyze the pieces of the system separately.

Summary

Numerous differences were found between the childbearing and childrearing experiences of teenagers and older mothers. Older mothers generally provided a more optimal milieu for child development than did the teenage mothers. However, in many ways the two groups of mothers and infants were quite similar and the teenagers were found to have easier deliveries than the older mothers. The teenage mothers in this study did not exhibit the negative or ambivalent attitudes toward motherhood that had been reported in the literature to be characteristic of them. However, the results of this study do support the claim that the children of teenage mothers are more likely than the children of older mothers to have developmental problems.

In the analysis of the system of childbearing and childrearing, it was found that SES was the most pervasive and strongest influence upon the predictors of infant development. When SES was controlled for, young mothers or their infants were rated higher on the predictors of child development than older mothers or their infants. It appears, then, that maternal age, *per se*, is not the critical variable in the finding that teenage childbearing has a negative impact upon infant development. Rather, the correlates of teenage childbearing that result in reduced SES may be the critical factors that explain adverse development among the infants of young mothers.

The results of the analysis of the system of child-bearing and childrearing must be interpreted cautiously. There were a number of indications that the model may not be a correct or complete representation of the phenomena being studied. The use of larger samples or the testing of alternative models is necessary to determine the value of the model used. Several recommendations for respecifying the model were made.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

Over one-half million teenagers give birth each year despite efforts by educators, family planning agencies, and parents to reduce these numbers. Researchers have consistently reported that teenage childbearing is strongly associated with truncated education, low SES levels, high probability of needing financial support from public assistance programs, high completed fertility and extremely high rates of marital instability. Furthermore, longitudinal studies have reported that the children of teenage mothers are characterized by a number of social-emotional, behavioral, and intellectual deficits by the time they are of school age.

The present study followed 62 primiparous mothers, aged 15-32, from the last trimester of their pregnancies through the third month postpartum. These mothers were interviewed in their homes, the medical records of their deliveries were reviewed, their infants were tested shortly after birth, the mothers and their infants were observed monthly for three months, the home environments these mothers provided for their children were evaluated, and the mothers completed scales assessing their infants' temperaments and their own attitudes toward their infants.

A comparison of those mothers below 20 years of age (n = 14) with those over 20 (n = 48) revealed a number of differences. The teenage mothers were living in relatively low SES conditions and almost half of them were on public assistance (cf.: David, 1972). Only half of the teenagers maintained a relationship with the infant's father and half of the teenage mothers continued to live with their parents or another relative. Though the teenage mothers began prenatal training later and were less likely to participate in birth preparation classes than were the older mothers (cf.: Dwyer, 1974), the younger mothers had easier deliveries (cf.: Mednick *et al*., 1979).

As has been reported in numerous other studies, the infants of teenage mothers in this study tended to have slightly shorter gestations and to be slightly smaller at birth than the infants of older mothers (see Table 2, p. 21). There were no differences between the Apgar scores of the two groups of infants (cf.: Sandler, 1979) and only one of seven Brazelton Scale summary scores (motor performance) differentiated between the two groups, with the infants of older mothers doing better (cf.: Lester, 1978; Sandler, 1979). In contrast to the reports of Crumidy (1966) and Mercer (1980), no differences were found between the maternal attitudes of the two groups of mothers. No differences were found between the temperament ratings of the infants either.

The homes of teenage mothers were more crowded than those of older mothers and were less likely to offer a quiet place where the infant could be put during naps to escape from stimulation. Teenagers' homes also provided fewer nonhuman sources of audio-visual stimulation than those of older mothers. The differences in the home environments were strongly related to the SES differences between the mothers (see Wachs et al., 1971; Tulkin & Kagan, 1972).

There were numerous similarities in the mother-infant interaction patterns of the two groups. However, as reported by Sandler (1979), the older mothers spent more time talking to their infants and talking to their infants during mutual gaze than did the younger mothers. The older mothers were also more responsive to their infants' distress signals than the younger mothers, supporting the contention of de Lissovoy (1973, 1975), Williams (1974), and Mercer (1980) that teenage mothers are less sensitive than older mothers to an infant's signals. There were no significant differences between the behaviors of the two groups of infants.

As suggested by the research questions posed in Chapter I and by the literature review, the background characteristics (primarily SES), the home environments, and the caretaking patterns of teenage mothers differed significantly from those of older mothers. These differences potentially are linked to the developmental deficits for the children of teenage mothers reported by Oppel and Royston (1971) and Hardy et al. (1978). However, none of the suspected differences in maternal attitudes, neonatal status, or infant temperament were found, presumably removing these variables from consideration as causes of the cited developmental differences. Furthermore, since the births of teenagers were easier than those of older mothers, there is no special reason to suspect the birth experience of teenagers to negatively influence maternal attitudes or to be related, directly or indirectly, to the cited developmental differences. On the contrary, the easier births may have played a role in enhancing the young mothers' attitudes toward their infants and parenting in general.

It needs to be emphasized that the childbearing and childrearing experiences of the teenagers in this study were much more positive than one would expect after reviewing the literature on teenage parenting. There were no statistically significant differences between the two groups of mothers on almost 75% of the bivariate tests that were performed. Furthermore, the teenagers in this study had easier deliveries than the older mothers. It is far too easy to concentrate on the negative aspects of teenage parenting while overlooking the positive aspects. Though the caretaking situations of teenage mothers may indeed be less optimal than those provided by older mothers, it is apparent that there are numerous important similarities between these two groups of mothers.

The data from the subjects in this study also were used to evaluate a multivariate model relating several theoretically crucial components of child development to maternal age, SES, and each other. Using LISREL, estimates were made for the causal linkages between the variables in the models and for evaluating the fit of the estimated model to the original data. However, there were numerous weaknesses in the model and it was determined that the estimated model probably does not adequately represent the data. The model could be improved by adding theoretically important variables, choosing more homogenous variables as indicators of the theoretical variables, and by developing better measurement instruments and instruments with more compatible scales. Therefore the results of this analysis must be used judiciously.

On the other hand, the estimated model indicated that maternal age and SES each make independent impacts upon variables that are important to child development. In general, SES is positively related to the intervening variables in child development used in this study while maternal age is negatively associated with these same variables. That is, given equal SES, younger mothers do better than older mothers. However, SES was shown to have a much stronger impact than maternal age, probably enough to overcome the benefits associated with young motherhood. Furthermore, since teenage motherhood is strongly related to low SES, there is little reason to emphasize the positive contributions of early motherhood.

Conclusions

Limitations

Before discussing the conclusions of the study, it is necessary to outline its limitations, its strengths, and its generalizability. Most of the limitations of the study are provided by the sample studied. The subjects of the study were volunteers, not a random sample, and the number of teenagers in the study is quite small. The data provide no apparent indications that either group of mothers was unique or nonrepresentative, but one cannot overlook the special nature of a volunteer sample.

There are two other weaknesses to the study. First, the study was short term and therefore one could only speculate about the long term effects of the differences found. Secondly, because the study was short term, no logical concluding variable, such as IQ or social-emotional status, was measured. It must be left to future research to replicate the methodology applied here in a longitudinal study which should produce more conclusive results. A longitudinal study was needed also to determine whether the findings of Oppel and Royston (1971) and Hardy *et al*. (1978) apply given today's medical and social programs.

Strengths

There are several strong points which, despite shortcomings, make the findings of the present study valuable. Research in adolescent parenting has been characterized by an almost complete lack of comparison groups. When comparison groups were used, they were often extremely unusual groups. In the present study, teenage mothers and their children were compared to a group of women from the normative age range for reproduction. This comparison is much more meaningful than simply describing the behavior of teenage mothers or comparing such behavior to that of other special samples. Furthermore, the sample studied, although mostly a white sample, was widely diversified in all other demographic aspects. A handicap of most research in adolescent parenting is the use of all black, urban, and poor samples, or samples that are unique in some aspect. Thus the sample studied is probably more representative of the U.S. population than that used in similar studies.

Another strength of the present study is its interdisciplinary, multivariate and systemic approach. Sociological, psychological, ecological, and medical data were gathered and analyzed. These data were organized into a systemic causal model based upon current theories of child development and analyzed as a whole. The method of analysis used was designed for such holistic and systemic analysis. Such an approach provides a more realistic view of the phenomena under consideration and avoids the bias of "multiple-bivariate" research which is common in the field.

Implications

Both the major strengths and weaknesses of the present study are related to the samples used. For this reason the data gathered are suspected of being representative but no faith can be put into any generalization that goes beyond the present sample. However, the findings of the present study should provide a firm foundation for further, hopefully longitudinal, research, which seeks answers to similar problems.

For the groups studied, several critical differences were found between the childbearing and childrearing experiences of teenagers and older mothers, differences that were theoretically related to developmental differences for the children involved. Thus, the results of this study provide support for earlier researchers who reported developmental deficits for the children of teenage mothers (Oppel & Royston, 1971; Hardy et al., 1978). However, in the present study specific causal mechanisms were suggested for the developmental differences that were reported. SES was implicated as the major source of differences between teenagers and older mothers with its influence distributed via neonatal status, maternal attitudes, home environments, and mother-infant interaction. If the findings of this study are supported in future studies, the identification of the specific causal mechanisms will be an important link in developing intervention programs to work with teenage mothers and their infants or to provide direction to existing programs.

Furthermore, if the independent contributions of SES and maternal age to infant development are as reported above, there are direct implications for programs concerned with adolescent parenting. Programs designed to prevent adolescent pregnancy would need to publicize the impact of early parenthood on SES and the impact of SES on child development. Secondly, programs working with young mothers should be encouraged to use the strengths of young mothers (apparently energy and enthusiasm) to overcome some of the weaknesses discussed above.

Adolescent parenting is an important social phenomenon. If the children of teenage parents, approximately one-fifth of all children in the U.S., will be handicapped in life by developmental problems, more resources need to be focused upon this phenomenon. However, before more funds are poured into ever more complex intervention programs, more research such as the present study, using larger samples and longitudinal designs, are needed to determine the appropriate content and procedures for existing programs. The need for confirmatory research before accepting or applying the findings of the present study cannot be overemphasized.

Finally, one of the more intriguing implications of the present study is the dire need for more multivariate, systemic analysis in child development. A number of relationships reported for the present study were difficult to explain and contrary to previous findings from studies that were primarily bivariate. Were these unusual findings simply artifacts of the model and sample used or do they represent our ignorance about the transactions that occur among variables in multivariate causal models? Only by applying both bivariate and systemic analyses to our research data can we begin to answer this question. When we begin to understand the complexities of the transactions among the variables used in child development research, our ability to predict developmental outcome will increase tremendously.

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APPENDIX A

SUBJECT RECRUITMENT LETTERS

APPENDIX A

SUBJECT RECRUITMENT LETTERS

Letter to Mothers--Tri-County Area

MICHIGAN STATE UNIVERSITY
Mother-Infant Project
Institute for Family and Child Study
East Lansing, Michigan 48824

To the Expectant Mother:

If you are between 15 and 30, and will be having your first baby in the next few months, I would like to include you in my study of mothering behavior. There are a large number of ways to care for children in our culture with vast differences between these ways. I am studying the many ways of caring for children and recording the differences. In order for all types of mothering behavior to be studied, it is important for mothers of all ages and from all walks of life to be included in the study.

The study includes:

1. One brief interview in your home before you give birth.
2. One brief examination of your child a few days after birth in the hospital.
3. Three visits by a trained observer who will come to your home once a month to watch you and your infant, to ask a few questions, and to have you fill out some questionnaires.

ALL DATA THAT IS COLLECTED IS STRICTLY CONFIDENTIAL

If you participate you will receive a one week supply of diapers (60 diapers) after each of the three home visits. You will get an additional week's supply of diapers for completing all three visits.

If you are interested in being part of this study or if you want more information, please call me at 353-6617 or fill out and send in the attached postcard. The study ends in June 1980.

Thank you,

Mark W. Roosa
Project Coordinator

Principal Investigators
Dr. H. Fitzgerald, Psychology
Dr. N. Carlson, Family and Child Sciences

Letter to Mothers--Alma Area

MICHIGAN STATE UNIVERSITY
Mother-Infant Project
Institute for Family and Child Study
East Lansing, Michigan 48824

To the Expectant Mother:

If you are between 15 and 30, and will be having your first baby in the next few months, I would like to include you in my study of mothering behavior. There are a large number of ways to care for children in our culture with vast differences between these ways. I am studying the many ways of caring for children and recording the differences. In order for all types of mothering behavior to be studied, it is important for mothers of all ages and from all walks of life to be included in the study.

The study includes:

1. One brief interview in your home before you give birth.
2. One brief examination of your child a few days after birth in the hospital.
3. Three visits by a trained observer who will come to your home once a month to watch you and your infant, to ask a few questions, and to have you fill out some questionnaires.

ALL DATA THAT IS COLLECTED IS STRICTLY CONFIDENTIAL WITH THE EXCEPTION THAT THE DATA WILL ALSO BECOME PART OF YOUR MEDICAL RECORDS.

If you participate you will receive a one week supply of diapers (60 diapers) after each of the three home visits. You will get an additional week's supply of diapers for completing all three visits.

If you are interested in being part of this study or if you want more information, please call me at 353-6617 or fill out and send in the attached postcard. The study ends in June 1980.

Thank you,

Mark W. Roosa
Project Coordinator

Principal Investigators
Dr. H. Fitzgerald, Psychology
Dr. N. Carlson, Family and Child Sciences

APPENDIX B

INFORMED CONSENT PROCEDURE MATERIALS

APPENDIX B

INFORMED CONSENT PROCEDURE MATERIALS

Mother-Infant Project
Schedule of Activities

Before Birth	Birth	1 Month	2 Months	3 Months
1. Explain study and answer questions	1. Infant exam	1. Observations in home	1. Observations in home	1. Observations in home
2. Informed consent and permission forms signed	2. Review hospital records of birth	2. Interview	2. Interview	2. Interview
3. Initial Interview		3. Questionnaire		3. Questionnaire
				4. Developmental test of child

Mother-Infant Project
Institute for Family and Child Study
Michigan State University
East Lansing, Michigan 48824

Mark W. Roosa
Project Coordinator

Informed Consent--Eaton, Clinton and Ingham Counties

Mother-Infant Project

Michigan State University
Institute for Family and Child Study

1. I have freely consented to take part in a scientific study being conducted by Mark W. Roosa under the supervision of Dr. H. Fitzgerald, Professor of Psychology and Dr. N. C. Carlson, Assistant Professor of Family and Child Sciences.

2. The study has been explained to me and I understand the explanation that has been given and what my participation will involve.

3. I understand that I am free to discontinue my participation in the study at any time without penalty.

4. I understand that the results of the study will be treated in strict confidence and that I will remain anonymous. Within these restrictions, the general results of the study will be made available to me at my request.

5. I understand that my participation in the study does not guarantee any beneficial results to me or to my infant.

6. I understand that, at my request, I can receive additional explanation of the study after my participation is completed.

7. I understand that I will receive a four week supply of diapers (240 diapers total) if I participate in the complete study.

Signed______________________________

Date_______________ Age_____________

____
(Husband--if applicable)

Date______________________________

____
(Parent/Probate Judge--if applicable)

Date______________________________

Physician's Name________________________

Hospital________________________________

Informed Consent--Gratiot County

Mother-Infant Project

Michigan State University
Institute for Family and Child Study

1. I have freely consented to take part in a scientific study being conducted by Mark W. Roosa under the supervision of Dr. H. Fitzgerald, Professor of Psychology and Dr. N. Carlson, Assistant Professor of Family and Child Sciences.

2. The study has been explained to me and I understand the explanation that has been given and what my participation will involve.

3. I understand that I am free to discontinue my participation in the study at any time without penalty.

4. I understand that the results of the study will be treated in strict confidence and that I will remain anonymous. I understand that my physician is cooperating with this project and he has requested that the information obtained from me will become part of my medical records. Within these restrictions, the general results of the study will be made available to me at my request.

5. I understand that my participation in the study does not guarantee any beneficial results to me or to my infant.

6. I understand that, at my request, I can receive additional explanation of the study after my participation is completed.

7. I understand that I will receive a four week supply of diapers (240 diapers total) if I participate in the complete study.

Signed______________________________

Date_____________ Age_______________

____
(Husband--if applicable)

Date_______________________________

____
(Parent/Probate Judge--if applicable)

Date_______________________________

Name of Physician__________________

Consent Form for Hospital Records and
Brazelton Examination

MICHIGAN STATE UNIVERSITY
Mother-Infant Project
Institute for Family and Child Study
East Lansing, Michigan 48824

I am participating in a study of mothers and infants being conducted by the Institute for Family and Child Study. It is generally believed that experiences during pregnancy and birth may have an effect upon both the mother and her child. Therefore the researchers are including obstetric information in their study. The obstetric information that they are collecting (length of gestation, size at birth, medications given during labor and birth, etc.) is that which the physician normally places in medical records at the hospital at the time of the birth.

It is also important to understand the baby's capabilities at birth. The Brazelton Neonatal Behavioral Assessment is designed to measure these capabilities within a few days after the birth. The Brazelton Assessment tests such things as the baby's response to a bright light or a ringing bell, how the baby's eyes follow an object or a face, and some of the baby's reflexes.

I have discussed the request of the researchers and I fully understand that request. I freely consent to allow the researchers from the Institute for Family and Child Study to obtain information from the hospital records of my delivery and to perform the Brazelton Assessment.

____
Study Participant

H. Fitzgerald
N. Carlson
Principal Investigators

M. Roosa
Project Coordinator

APPENDIX C

INSTRUMENTS

APPENDIX C

INSTRUMENTS

Mother-Infant Project: Initial Interview

ID______________ (1-4)

Date______________ (5-10)

Respondent	1 Mother (11)	2 Male (11) H F B O N (12)	3 Parent (11) M1 F1 M2 F2 O N (12)
1. Birthdate (e.g., Mo/Day/Yr) 03 24 58	______ (12-17)	______ (13-18)	______ (13-18)
2. Education (last year completed; 12=H.S. grad, 16=college grad, etc.)	______ (18-19)	______ (19-20)	______ (19-20)
3. Presently in school (1=yes; 2=no)	______ (20)	______ (21)	______ (21)
4. Employed? (1=yes; 2=no)	______ (21)	______ (22)	______ (22)

	Mother	Male	Parent
5. Occupation (complete description)	____	____	____
	____	____	____
	____	____	____
	____ (22-23)	____ (23-24)	____ (23-24)
6. Annual Income (from #5)	____ (24-28)	____ (25-29)	____ (25-29)
6a. Other Income	____ (29-33)	____ (30-34)	____ (30-34)
6b. Source of 6a.	1. parents 2. male 3. other relative____ 4. welfare 5. social security 6. unemployment 7. other____ (34)	____	____
7. On approximately what date did you become pregnant? (mo/yr)	____ (35-38)	When is baby expected?	____ (mo/yr)
8. Have you participated in a prenatal training program?	1. yes 2. no 3. committed to one to begin soon (39)	____ (36)	

	Mother	Male	Parent
9. How often do you go to the doctor for prenatal visits? (# weeks between visits)	______ (40-41)		
9a. Type of prenatal care	1. private practitioner 2. clinic 3. other______ (42)		
9b. During which month of pregnancy did prenatal care begin?	______		
10. Living arrangement	1. alone 2. with male 3. with her parents 4. with his parents 5. with male and her parents 6. with male and his parents 7. with other relatives______ 8. with male and other relatives 9. other______ (44)		
11. Marital status	1. never married 2. married (__ times) 3. separated (46) 4. divorced 5. widowed 6. other______ (45)	______ (37)	______ (36)

	Mother	Male	Parent
11a. If #1, do you plan to marry in the next 6 months?	______		
11b. If #2, date of last marriage (mo/year)	______ (48-51)	______ (39-42)	______ (38-41)
11c. If #3, 4, 5, date of event (mo/year)	______ (52-55)	______ (43-46)	______ (42-45)
12. Do you plan to breast feed your baby?	______ (56)		
13. Will someone be with you during delivery?	______ (57)		

13a. If yes, who?

1. spouse
2. father of child/not spouse
3. boyfriend/not father of child
4. your mother
5. your father
6. other ______ (58)

14. How is your pregnancy going? ______ (59)

very good	good	average	bad	very bad
1	2	3	4	5

Comments:

	Mother	Male	Parent
15. How much has the pregnancy changed your life?	______ (60)	______ (47)	______ (46)

none	very little	little	good bit	great deal
1	2	3	4	5

Comments:

	Mother	Male	Parent
16. How much has your diet changed since the pregnancy?	______ (61)		

none	very little	little	good bit	great deal
1	2	3	4	5

Comments:

	Mother	Male	Parent
17. How much experience have you had with children?	______ (62)	______ (48)	

none	very little	little	good bit	great deal
1	2	3	4	5

Comments:

	Mother	Male	Parent
18. What sex baby do you want?	1. female 2. male 3. doesn't matter (63)	________ (49)	________ (47)
18a. What sex baby do you think you will have?	1. female 2. male 3. don't know (64)	________ (50)	________ (48)
19. Race or ethnic group	1. White 2. Black 3. Hispanic 4. Indian 5. Oriental 6. Other________ (65)	________ (51)	________ (49)

Interviewer:________________________
(66)

Comments on Interviews:

Mother-Infant Project
Obstetric Information Form

ID________________
(1-4)

Date________________
(5-10)

1.	Date of Birth of Infant	________________		(11-16)
2.	Hospital of Birth	1. Sparrow 2. St. Lawrence 3. Lansing General 4. Gratiot Community 5. Eaton Rapids Community 6. Hayes-Green-Beach (Charlotte) 7. Ingham Medical 8. Mason General 9. Provincial 0. Other		(17)
3.	Gestational age of the infant at birth	______	weeks	(18-19)
	or			
	Date of onset of the mother's last menstrual cycle	______		(20-25)
	Dubowitz score	______		(26-27)
4.	Weight of the Infant at Birth	______	gms	(28-31)
5.	Height of the Infant at Birth	______	cm	(32-33)
6.	Head Circumference	______	cm	(34-35)
7.	Length of Labor (e.g., 01.5)	______	hrs	(36-38)
8.	First Apgar Score	______		(39-40)
9.	Second Apgar Score	______		(41-42)
10.	Mother's Weight at the Beginning of Pregnancy	______	lbs	(43-45)
11.	Mother's Weight at Delivery	______	lbs	(46-48)

12. Was an obstetric medication used? ________

a. If yes, what type? (Please check the appropriate column in the following list.)

Obstetrical Medications

L = Labor (49-50)
D = Delivery (51-52)

Premedication Agents

	L	D	
Uterine Muscle Stimulants			
oxytoxics			
ergot alkaloids			
ergonovine (Ergotrate)	_	_	01
methylergonovine (Methergine)	_	_	02
oxytocin (Pitocin, Syntocinon)	_	_	03
prostaglandin E_2	_	_	04
Narcotic Analgesics			
alphaprodine (Nisentil)	_	_	05
meperidine (Demerol)	_	_	06
morphone	_	_	07
Narcotic Antagonists			
levallorphan (Lorfan)	_	_	08
nalorphine (Nalline)	_	_	09
naloxone (Narcan)	_	_	10
Sedative-Hypnotics			
barbiturate			
pentobarbital (Nembutol)	_	_	11
secobarbital (Seconal)[a]	_	_	12
amobarbital (Amytal)[a]	_	_	13
nonbarbiturate			
diazepam (Valium)	_	_	14
scopolamine (hyoscine)	_	_	15
Tranquilizers			
chlorpromazine (Thorazine)	_	_	16
hydroxyzine (Atarax, Vistaril)	_	_	17
promazine (Sparine)	_	_	18
promethazine (Phenergan)	_	_	19
propriomazine (Largon)	_	_	20
triflupromazine (Vesprin)	_	_	21

[a]Seconal and Amytal are often combined as Tuinal.

General Anesthetic and Related Agents

	L	D	
Inhalant Anesthetics			
cyclopropane	_	_	22
enflurane (Ethrane)	_	_	23
halothane (Fluothane)	_	_	24
methoxyflurane (Penthrane)	_	_	25
nitrous Oxide	_	_	26
trichloroethylene (Trilene)	_	_	27
Intravenous Anesthetics			
barbiturate			
thiopental (Penthothal)	_	_	28
methohexital (Brevital)	_	_	29
nonbarbiturate			
ketamine (Ketalar, Ketaject)	_	_	30
Neuromuscular Blocking Agents			
d-tubocurarine (Curare)	_	_	31
gallamine (Flaxedil)	_	_	32
succinylcholine (Anectin, Quelicin, Sucostrin)	_	_	33
Antimuscarinic Agents			
atropine	_	_	34
Scopolamine (hyoscine)	_	_	35

Local Anesthetic and Related Agents

	L	D	
Procaine Analogs and Related Compounds			
bupivacaine (Marcaine)	_	_	36
chloroprocaine (Nesacaine)	_	_	37
etidocaine (Duranest)	_	_	38
lidocaine (Xylocaine)	_	_	39
mepivicaine (Carbocaine)	_	_	40
prilocaine (Citanest)	_	_	41
tetracaine (Pontocaine)	_	_	42
Vasopressors/Vasoconstrictors (Antihypotensives)			
ephedrine	_	_	43
epinephrine (Adrenalin)	_	_	44
mephentermine (Wyamine)	_	_	45
metaraminol (Aramine)	_	_	46
methoxamine (Vasoxyl)	_	_	47
norepinephrine, levarterenol (Levophed)	_	_	48
phenylephrine (Neo-Synephrine)	_	_	49

13. Type of delivery (53)
    1. normal vaginal
    2. forceps
    3. breech
    4. Caesarean section
    5. other______________

14. Number of complications during pregnancy ______________ (54-55)

15. Number of complications during delivery ______________ (56)

16. Comments on Labor and delivery, the severity of any complications, etc.:

____

____

____

____

____

17. Medications given during pregnancy:

____

____

____

____

RECORDER______________________
(57)

Mother-Infant Project:
Brazelton Behavioral and Neurological Scale

ID____________ DATE______________ RATER________________
(1-4) (5-10) (11)

Sex 1 F
2 M (12)

Age__________days (13-14)

Apparent Race 1 W (15)
2 B
3 H
4 I
5 O
6 Other

Time of Exam______________(16-19)

Time of Last Feed______________ (20-23)

Type of Feeding 1 Br (24)
2 Bo

Initial State: Observe 2 minutes

1	2	3	4	5	6	
deep	light	drowsy	alert	active	crying	(25)

Predominant states (mark two)

1	2	3	4	5	6	(26)

Elicited Responses

		O*	1 L	2 M	3 H	4 A†
(27)	Plantar grasp		1	2	3	
	Hand grasp		1	2	3	
	Ankle clonus		1	2	3	
	Babinski		1	2	3	
	Standing		1	2	3	
(32)	Automatic walking		1	2	3	
	Placing		1	2	3	
	Incurvation		1	2	3	
	Crawling		1	2	3	
	Glabella		1	2	3	
(37)	Tonic deviation of head and eyes		1	2	3	
	Nystagmus		1	2	3	
	Tonic Neck reflex		1	2	3	
	Moro		1	2	3	
	Rooting (intensity)		1	2	3	
(42)	Sucking (intensity)		1	2	3	
	Passive movement					
	Arms R		1	2	3	
	L		1	2	3	
	Legs R		1	2	3	
(46)	L		1	2	3	

O* = response not elicited (omitted)
A† = asymmetry

Descriptive Paragraph
(optional)

Attractive	0	1	2	3	(47)
Interfering variables	0	1	2	3	
Need for stimulation	0	1	2	3	

What activity does he use to quiet self? (50)

1 hand to mouth
2 sucking with nothing in mouth
3 locking onto visual or auritory stimuli
4 postural changes
5 state change for no observable reason

COMMENTS:

1.	Response decrement to light (2, 3)	____________(51)
2.	Response decrement to rattle (2, 3)	____________(52)
3.	Response decrement to bell (2, 3)	____________(53)
4.	Response decrement to pinprick (1, 2, 3)	____________(54)
5.	Orientation inanimate visual (4 only)	____________(55)
6.	Orientation inanimate auditory (4, 5)	____________(56)
7.	Orientation animate visual (4 only)	____________(57)
8.	Orientation animate auditory (4, 5)	____________(58)
9.	Orientation animate visual & auditory (4 only)	____________(59)
10.	Alertness (4 only)	____________(60)
11.	General tonus (4, 5)	____________(61)
12.	Motor Maturity (4, 5)	____________(62)
13.	Pull-to-sit (3, 5)	____________(63)
14.	Cuddliness (4, 5)	____________(64)
15.	Defensive movements (4)	____________(65)
16.	Consolability (6 to 5, 4, 3, 2)	____________(66)
17.	Peak of excitement (6)	____________(67)
18.	Rapidity of buildup (from 1, 2 to 6)	____________(68)
19.	Irritability (3, 4, 5)	____________(69)
20.	Activity (alert states)	____________(70)
21.	Tremulousness (all states)	____________(71)
22.	Startle (3, 4, 5, 6)	____________(72)
23.	Lability of skin color (from 1 to 6)	____________(73)
24.	Lability of states (all states)	____________(74)
25.	Self-quieting activity (6, 5 to 4, 3, 2, 1)	____________(75)
26.	Hand-mouth facility (all states)	____________(76)
27.	Smiles (all states)	____________(77)

Mother-Infant Project
Home Observation Form
(1 of 20 pages, each with 24 observation periods)
(Adapted from Parmelee/Beckwith, 1971)

	BABY STATE						ACTIVITY			FEEDING				CONTACT			
ID_______(1-4) DATE______(5-10) OBS #_____(11) V. #______(12) P. #______ OBS PER	eyes closed without movement	eyes closed with movement	drowsy	quiet awake	active awake	cry	burping	diapering	bathing	feeding bottle	feeding breast	feeding solids	bottle propped	held/pick up	stress musc./adjust position	affectionate touch/pat/rock	interfering touch
	01	02	03	04	05	06	11	12	13	21	22	23	24	31	32	33	34
001																	
002																	
003																	
004																	
005																	
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022																	
023																	
024																	

	VERBAL				OBJECTS			B. VOC.		B. ACTIVITY				NON-V COMM		ENV. STIM.			
OBS PER	commands positive	commands negative	talk/vocalize	talk to others	arouse, stim., soothe w/obj.	tease with object	social play	fuss (cry)	non-distress vocalization	mouth	self-play	object play	not eats/not sucks	looks	smiles	tv on	radio or phono on	loud appliance on	COMMENTS
	41	42	43	44	51	52	53	61	62	71	72	73	74	81	82	91	92	93	
001																			
002																			
003																			
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Know Your Baby Scale

ID____________

Although this is your first baby, you probably have some ideas of what most little babies are like. I am going to ask you several questions about your baby and I would like you to compare your baby to the average baby. For each of the questions I ask, let's say the average baby scores 20 units. I want you to give me a number that shows how your baby reacts compared to the average baby. For instance, if your baby does something twice as often as the average baby, you would say 40. If your baby does something three times as much as the average baby, you would say 60. If half as much as the average baby, you would say 10; if your baby does not do something at all, you would say zero. You may use any number you wish that shows how your baby compares to the average baby. Any questions?

If the average baby is 20?

a. How often is your baby hungry? (Probe meaning of response.) ____________

b. How much illness has your baby experienced? (Probe meaning of response.) ____________

c. How much does your baby sleep? ____________

d. How much milk does your baby take during a feeding? ____________

e. How much does your baby respond to strangers? ____________

ID	________	(1-4)
DATE	________	(5-10)
VISIT	________	(11)
RATER	________	(12)

If the average baby is 20?

1.	How much crying has your baby done?	______	(13-15)
2.	How often does your baby smile?	______	(16-18)
3.	How much trouble has your baby had feeding?	______	(19-21)
4.	How often does your baby coo, babble, make pleasant sounds?	______	(22-24)
5.	How much spitting up or vomiting has your baby done?	______	(25-27)
6.	How well does your baby play with you?	______	(28-30)
7.	How much difficulty has your baby had in sleeping?	______	(31-33)
8.	How much does your baby enjoy his/her feedings?	______	(34-36)
9.	How much difficulty has your baby had with bowel movements?	______	(37-39)
10.	How much does your baby enjoy it when you play with him/her?	______	(40-42)
11.	How much trouble has your baby had in settling down to a predictable pattern of eating and sleeping?	______	(43-45)
12.	How often does your baby sleep through the night?	______	(46-48)
13.	How much does your baby "cuddle?"	______	(49-51)

14. Respondent:
1. mother
2. spouse
3. father of child/not spouse
4. boyfriend/not father
5. her mother
6. her father
7. his mother
8. his father
9. other (52)

Mother-Infant Project:
Home Environment Form

ID__________ (1-4)

Date__________ (5-10) Age of Infant____mo. (13)

Hour__________ (11-12) Rater______________ (14)

People at home with child:______________________

____

I. Interview items:

1. The number of times the child was taken out of the neighborhood during the past week (shopping, etc.). _______ (15-16)

2. The number of times that mother and child visited the neighbors during the past week. _______ (17-18)

3. The number of adults living at home. _______ (19)

4. The number of cats and/or dogs in the home. _______ (20)

5. The number of adults who actively take care of the child. _______ (21)

   Person A _______ hours per day
   (22-23)
   (average) mother

   Person B _______ hours per day
   (24-25)
   (average) ______________
   (26)

   Person C _______ hours per day
   (27-28)
   (average) ______________
   (29)

   Person D _______ hours per day
   (30-31)
   (average) ______________
   (32)

6. With how many adults does child interact daily? _______ (33-34)

7. Does the child have a regular naptime (1), does he/she sleep whenever tired (2), or is this variable or in transition (3)? ________ (35)

8. Does the child eat at regular times (1), does he/she eat on a demand schedule (2), or is this variable or in transition (3)? ________ (36)

9. How comfortable is home for mother and child? (20 = average; 0 = totally unacceptable) ________ (37-39)

10. How satisfied is mother that child is girl (boy)? (20 = average; 0 = totally dissatisfied) ________ (40-42)

11. Did some non-medical person attend the delivery? (1 = Yes; 2 = No) ________ (43)

    11(a). If Yes, who?
    1 = Spouse
    2 = Father of child/not spouse
    3 = Boyfriend/not father of child
    4 = Her mother
    5 = Her father
    6 = His mother
    7 = His father
    8 = Other ________________

II. Static Observation Items (where applicable 20 = average; 0 = bottom):

12. Rate maternal speech for:

    a. Intelligibility ________ (45-47)

    b. Speed ________ (48-50)

13. $\frac{\text{Number of rooms in house (excluding bathrooms \& closets)}}{\text{Number of people in house}}$ ________ (51-53)

14. Rate sound level inside home during observation ________ (54-56)

15. Rate activity level in home during observation ________ (57-59)

16. Total number of people in house during observation _______ (60-61)

17. How many toys does child have that make a definite audio/ visual response when activated? _______ (62-63)

III. Descriptive Items Only (1 = yes; 2 = No; 9 = DK)

18. Is there a place where the child is put where he/she is out of earshot of noises of home and away from other people? _______ (64)

19. Does the home have several small manipulatable items other than commercial toys that could be used as toys (i.e., ashtrays, bricabrac)? _______ (65)

20. a. Is there a mobile over or near the crib? _______ (66)

    b. Does it move when crib is gently rocked? _______ (67)

21. Is the child's room or the place where he/she sleeps decorated with pictures that stand out from the background of the wall? _______ (68)

22. Are the child's toys kept in one place (1) or scattered all over the home (2)? 3 = None; 9 = DK _______ (69)

23. Are the shades or curtains drawn all the time? (3 - half & half) _______ (70)

M.I.T.S.
(Bonem, 1978)

____
Today's Date

ID________

This questionnaire is designed to find out how your infant behaves in a variety of everyday situations. Read each item carefully and decide whether it is true or mostly true, or false or mostly false for your child. Mark your answer by putting a T (true) or F (false) on the line beside the item.

Example: _____1A. Infant often plays with his/her food.

If your infant often plays with his or her food, then you would mark your answer like this:

__T__1A. Infant often plays with his/her food.

Should your child not play with food while eating, then you would put an F beside the question like this:

__F__1A. Infant often plays with his/her food.

Please read and try to answer all items. If a question is completely inappropriate, then you may omit it (be sure to skip the space on the questionnaire). If your child has outgrown an activity or behavior mentioned in an item, answer the item according to how he/she <u>used to</u> act. That is, if your child drinks only from a cup, answer items regarding breast and bottle-feeding from your memory of his/her feeding habits.

We have worked very hard to make all items equally applicable to infants of both sexes and to those who have been breast or bottle-fed. Please do the best you can in answering as accurately as possible.

All information on this questionnaire is confidential, and will only be handled by the research staff, with no names attached. Please be sure to put today's date at the top of this page. If you have any questions, please contact one of the examiners.

REMEMBER, ANSWER ALL QUESTIONS

ID______________
(1-4)

DATE________ RATER________ VISIT________ CARD__1__
(5) (6) (7)

______ 1. Baby is irritable or cranky after sleep. (8)

______ 2. There is a great deal of fussing and crying with any illness.

______ 3. When waiting to be fed, baby is generally still.

______ 4. Responses to diapering and dressing are usually intense with much laughing or crying.

______ 5. When lights are turned on in the room, infant is usually not awakened.

______ 6. Child does lots of squirming or kicking while being diapered or dressed.

______ 7. Stops eating if hears noise such as bell, radio, etc.

______ 8. During play the infant is usually very active and vocal.

______ 9. When playing with one toy, the infant is easily distracted by another.

______ 10. Child kicks, splashes or wiggles throughout bath.

______ 11. Child usually fusses during diapering and dressing. (18)

______ 12. There is no clearly evident pattern in the time for child's bowel movement, it varies from day to day.

______ 13. Child's initial reaction to most foods, solids, liquids or vitamins, is to accept them without much fussing.

______ 14. Child is usually willing to be held and cuddled by strangers.

______ 15. Infant generally appears happy upon waking up.

_____ 16. If playing with one toy, the infant does not usually become distracted by others.

_____ 17. Infant's times for liquid feeding are unpredictable--vary more than 1 hour.

_____ 18. Child's reaction to bath, whether she likes or dislikes it, is mild and not very excited.

_____ 19. Infant's time of waking is not consistent from day to day (times vary more than half an hour).

_____ 20. When child is with one person, she/he will easily go to another person.

_____ 21. During diapering and dressing, child's expressions are mild--little smiling or fussing. (28)

_____ 22. The infant shows discomfort with changes of place and situation even after continued exposure.

_____ 23. Child is generally happy when left alone in a room; will occupy herself.

_____ 24. Child is a heavy sleeper; it takes a loud noise to wake him/her.

_____ 25. Baby reacts to an undesired food in a mild way.

_____ 26. Child notices and reacts to small amounts of urine in diaper.

_____ 27. When crying from getting a shot, infant can easily be calmed by milk, pacifier, etc.

_____ 28. If bath is given in new place, infant readily accepts change.

_____ 29. Infant is active or playful on a fairly regular schedule.

_____ 30. Child protested when put into bath for the first time.

_____ 31. During feeding, the child will continue to suck even if there is much activity around him/her. (38)

______ 32. If left on the floor, infant will usually move to another area.

______ 33. Before going to sleep, child is often fussy.

______ 34. Infant's general reaction to familiar people is intense--crying or laughing.

______ 35. Child can be left on couch or chair for period of time without moving very much.

______ 36. Baby usually does not accept company (visitors).

______ 37. Child liked his/her first tub bath.

______ 38. During diapering and dressing, child is generally pleasant and smiling.

______ 39. During milk feedings, child is not easily distracted and continues to suck undisturbed.

______ 40. Child does not seem to mind changes in amounts, kinds, or tastes of solid foods.

______ 41. Baby often consumes close to the same amount of food during a feeding. (48)

______ 42. Infant's general reaction to familiar people is mild--frown or smile.

______ 43. Child generally indicates that he/she has soiled.

______ 44. Infant's play involves much movement and exploration.

______ 45. Infant is easily distracted during breast or bottle-feeding.

______ 46. Infant does not like to be bathed by different people.

______ 47. Infant does not adjust easily to efforts at changing feeding schedule.

______ 48. While playing with one toy, child can easily be distracted by another.

_____ 49. Child will rarely allow strangers to hold or cuddle him.

_____ 50. Child protested considerably to first bath.

_____ 51. When going to sleep, infant is usually happy. (58)

_____ 52. While playing, the infant is easily distracted by everyday occurrences like the ringing phone or doorbell.

_____ 53. Infant reacts to slight temperature changes (in room or outside).

_____ 54. When given a food which he does not want, he reacts in a strong manner--response is intense or powerful.

_____ 55. Infant exhibits regular, easily identifiable actions around meal time.

_____ 56. Infant falls asleep at about the same time most nights--within half an hour.

_____ 57. When lying in crib, infant moves around a great deal.

_____ 58. Does not readily accept changes in types or characteristics of foods. (65)

_____ 59. Child continues to object to grooming procedures (combing, washing, nail cutting, etc.) even after experiencing them several times.

_____ 60. Sudden appearances of strangers will cause crying and/or a turning away.

CARD____2_____
(7)

_____ 61. When in carriage or stroller, baby is usually quiet and still. (8)

_____ 62. Infant's general reaction to familiar people is friendly with laughing and smiling.

_____ 63. Changes in lighting will not stop the baby's crying.

_____ 64. Whether he likes or dislikes bathing, the infant's reaction is usually intense or energetic.

_____ 65. When being washed or dressed, baby is generally pleasant, smiling, etc.

_____ 66. Infant initially accepts new foods.

_____ 67. When infant is full, he/she simply turns head away and lets food drool out of mouth.

_____ 68. If left on the floor, child rarely moves from spot.

_____ 69. Diapers must be heavily soiled before infant reacts.

_____ 70. Baby often wakes during naps.

_____ 71. When playing, baby will respond to hearing his/her name called. (18)

_____ 72. Child is a light sleeper. It takes only the slightest noise to wake him/her.

_____ 73. Infant shows a mild reaction to light or sound with little or no crying.

_____ 74. Child has a loud response to a wet or soiled diaper.

_____ 75. Child initially does not accept most new procedures; usually cries, fusses or does not cooperate.

_____ 76. Infant takes nap at approximately the same time each day--within a half hour.

______ 77. Infant is generally fussy during play.

______ 78. After receiving a shot, it is difficult to stop baby's crying.

______ 79. In playpen or on floor, infant is active; gets into things, pulls at objects, or puts nearby objects in mouth.

______ 80. When the lights are turned on in his/her room, child is easily awakened.

______ 81. When infant cries because of hunger, she will usually stop for at least a minute if she is picked up, given a pacifier, etc. (28)

______ 82. Does not follow a regular nightly sleeping pattern.

______ 83. If there is any activity around him, child stops sucking during feeding.

______ 84. Infant can be fed at same time each day.

______ 85. When she is hungry, almost nothing can make infant stop crying.

______ 86. Infant notices and reacts to slightly soiled diapers.

______ 87. When there are interruptions in solid or milk feedings, the child generally remains happy.

______ 88. Diapers are usually very wet before baby shows any reaction.

______ 89. Even after several trials, infant continues to reject most new foods.

______ 90. The baby will eat his meals at varying times during the week.

______ 91. Baby drinks a predictable amount of milk (If bottle-fed, varies less than 2 ounces; if breast fed, time sucking does not greatly vary).

______ 92. Infant usually lies still while being diapered or dressed. (39)

______ 93. Child cheerfully tries new foods whether he/she ultimately likes them.

______ 94. Initial reaction to strangers is relatively mild such as a frown or smile.

______ 95. Child generally takes milk around the same time of day; does not vary more than 1 hour.

______ 96. Child still exhibits strong reactions even after repeated contacts with bright light or loud sound.

______ 97. Infant does not become easily accustomed to changes in caretakers--babysitters, grandparents, etc.

______ 98. Whether liking or disliking a food, baby's response to it is dramatic.

______ 99. Infant initially accepts any new procedure.

______100. Infant generally cries when solid or milk feedings are interrupted.

______101. In her stroller, infant is usually quite active or noisy. (48)

______102. Child makes himself at home most anywhere; appears comfortable in new situations.

______103. It is difficult to predict infant's activity or play time.

______104. Child resists going to different persons.

______105. When brought to the doctor for a well baby check-up, child is usually fussy.

______106. Baby adjusts easily to different caretakers.

______107. When left lying in crib, infant usually lies quite still.

______108. Infant's reaction to animals is intense with much laughing or crying.

______109. While playing child does not notice or react to his/her name being called.

______110. Baby readily accepts bathing by a new or different person on the first or second time.

______111. When diaper is wet or soiled, child makes no fuss or whimpers slightly.

______112. Infant cannot be left for very long on couch or bed because he might wiggle off. (59)

______113. Child wakes up from napping at approximately the same time every day (within half an hour).

______114. After 1-2 tries baby adjusts easily to changes in feeding schedule.

______115. The infant initially tolerates or enjoys new places and situations.

______116. When left alone for more than 5 minutes, child generally fusses or cries.

______117. Baby shows little reaction to bright lights or loud noises.

______118. Child usually indicates that diaper is wet.

______119. Child initially reacts to strangers with much laughing or crying.

______120. Infant will readily accept bathing by a different person or in a different place. (67)

CARD ____3____
(7)

______121. Child seldom seems to notice or react to differences in the taste, consistency, or temperature of foods. (8)

______122. Changes in sound (voices, TV, radio) will not stop baby's crying.

______123. Child usually rejects new foods.

______124. Infant takes 3 or more days to adjust to changes in daily schedule.

______125. At the doctor's for a well baby check-up infant is usually friendly and smiling.

______126. Baby smiles, gurgles, or plays with new people.

______127. Child seemed to dislike his/her first car ride.

______128. Infant does not readily tolerate or enjoy new places and situations.

______129. Child has low tolerance for pain.

______130. Baby lies fairly still while he/she sleeps.

______131. Child seldom or never indicates that diaper is wet. (18)

______132. Infant has no regular time pattern for napping each day (varies more than 1/2 hour).

______133. While playing, infant generally does more quiet observing than active exploring.

______134. When engaged in play, baby is usually actively moving and making sounds

______135. Child seemed to enjoy his first car ride.

______136. Child seldom or never indicates that he/she has soiled (b.m.).

______137. Child will usually lie and watch a hanging mobile for just a short period of time (30 seconds or less).

______138. If an object is out of reach, infant continues to reach for it for several minutes.

______139. Baby does not persist in attempts at turning over, crawling, or walking. Gives up easily.

______140. When given a toy, the infant plays with it for many minutes.

______141. Baby usually fusses during bath. (28)

______142. Baby persists in attempts to crawl or walk until a few steps are taken.

______143. When seeing a new animal, child's initial reaction is one of interest and attraction.

______144. When being washed or dressed, infant generally cries or fusses.

______145. If child wants a toy that is on the other side of the room, he will crawl until she reaches it; or, if unable to crawl, child will continue to show an interest in it for quite a while.

______146. Infant cannot occupy himself in crib or playpen for more than a few minutes.

______147. The infant often continues playing no matter what goes on around him.

______148. Infant does not notice or react to changes in voice quality or level.

______149. When napping, baby almost always sleeps through without waking.

______150. Infant usually stops trying for a toy out of reach in less than 1 minute.

______151. When trying to turn over or crawl, child tries for a minute or two, then gives up. (38)

______152. Child is not very active during play. He displays few movements and makes few sounds.

______153. When given a food, he/she does not like, infant protests briefly but soon takes it anyway.

______154. Infant plays with one toy for only about 1-2 minutes.

______155. Diapering is often a battle.

______156. Even after first 2 weeks of bath, child continued to protest.

______157. Child will not crawl across room to another toy if there are other toys nearer to him/her.

______158. Baby shows little reaction to animals (dogs, cats, etc.).

______159. Infant explores very little; needs help to find play objects.

______160. In a crib or play pen, infant can amuse him/herself for quite a while.

______161. Infant usually plays quietly and calmly. (48)

______162. For at least 3-5 minutes, child will lie and watch a hanging mobile.

______163. Infant is usually cheerful during play; laughing, smiling, etc.

______164. If fussy during grooming procedures (nail cutting, hair brushing, etc.), baby is not easily distracted. (51)

APPENDIX D

SCORING AND INSTRUCTION MANUALS

Criteria for Seven Cluster Scoring of the Brazelton Scale
(Lester, Als, & Brazelton, 1978)

Cluster	Brazelton Scale Item	Recode	Cluster Score
1. Habituation	Light	--	Mean
	Rattle	--	
	Bell	--	
	Pinprick	--	
2. Orientation	Inanimate visual	--	Mean
	Inanimate auditory	--	
	Animate visual	--	
	Animate auditory	--	
	Visual and auditory	--	
	Alertness	--	
3. Motor Performance	Tonus	9/1=1; 8/2=2; 7/3=3;4=4;5=5;6=6	Mean
	Maturity	--	
	Pull-to-sit	--	
	Defense	--	
	Activity	9/1=1;8/2=2;7/3=3;4/6=4;5=5	
4. Range of State	Peak of Excitement	9/1=1;8/2=2;4/3=3;7/5=4;6=5	Mean
	Rapidity of Buildup	9/1=1;8/2=2;7/3=3;4=4;5=5;6=6	
	Irritability	9/1=1;8=2;7=3;6=4;5=5;2,3,4=6	
	Lability of State	1,7,8,9=1;5,6=2;4=3;3=4;2=5	

Cluster	Brazelton Scale Item	Recode	Cluster Score
5. Regulation of State	Cuddliness	--	Mean
	Consolability	--	
	Self-quieting	--	
	Hand-to-mouth	--	
6. Autonomic Regulation	Tremors	Invert: 9=1 (1=9);8=2 (2=8); etc.	Mean
	Startles	If 1, drop; otherwise invert 2=9 on 8-point scale	
	Skin	9,1=1;8=2;7=3;6=4;5=5;3,4=6;2=7	
7. Reflexes	An abnormal score is defined as 0, 1, or 3 for all reflexes except clonus, nystagmus, or TNR where 0, 1, and 2 are normal and 3 is abnormal. Reflex score = total number of abnormal reflex scores.		

The Instructional Manual For Assessing Infant-Caretaker Interaction in the Home was developed by Parmelee (1972) and Beckwith (1973). It is used in this study with changes that were suggested to the author (Beckwith, 1979, personal communication). All changes are enclosed in brackets ([ ]).

Instructional Manual for Assessing Infant-Caretaker Interaction in the Home

This manual defines procedures for assessing infant-caretaker interaction in the home. The observations are based on continuous 15 second time sampling.

The behavior in the following category is mutually exclusive: baby's state. Once a behavior in a mutually exclusive category is chosen, that category is not marked again until a change occurs. The more transitory behaviors are not mutually exclusive and are marked within each time period that they occur. The coding assumes that the interactions are between the baby and [its mother]. A set of modifiers, to be added to the coded behavior, is used when the baby interacts with someone other than the [mother].

In order to record dyadic interplay a modifier is used to indicate the contingency of the response for either member of the dyad. A group of modifiers is available for use when an individual's behavior is in response to the baby's signals. For example, modifiers indicating contingency are used when the primary caretaker imitates the baby's cooing or when the primary caretaker picks up the baby in response to the baby's fussing.

In similar manner, a set of modifiers is available to indicate when the baby's behavior is in direct response to another person's behavior. For example, if the primary caretaker says "say baba" and the baby babbles, or if the primary caretaker interferes with a baby's playing and the baby starts to fuss, the contingency of the baby's response may be indicated in such a way that they are both mutually involved in the same act, then a modifier indicating mutuality is used. For example, when mother and baby are engaged in mutual visual regard or when primary caretaker and baby are cooing to each other, the code for mutuality is used. Definitions of the modifiers are given after the definitions of the behavioral predicates.

The occurrence of a behavior without a modifier is indicated by checking in the appropriate box on the observation form. To indicate a modifier rather than check, note the number of that modifier in the appropriate box. Only one modifier may be used per box. If [mother] and some other person interact with the baby in the same way in the same time period, score only [mother].

<u>State</u>

A. These categories are mutually exclusive. Score once and do not score again until state changes.

01. <u>Eyes closed without movement</u>. Score when eyes are 3/4 or more closed and when there is no movement of head, trunk or extremities. There may be movements of face, e.g., grimacing, sucking, smiling.

02. <u>Eyes closed with movement</u>. Score when eyes are 3/4 or more closed and there is any movement of head, trunk, or extremities. There may or may not be movements of the face.

03. <u>Drowsy</u>. Score when eyes are neither 3/4 open nor 3/4 closed or are opening and closing with or without body movement.

04. <u>Quiet awake</u>. Score when eyes are 3/4 or more open and there is no movement, at all, of head, trunk or extremities. There may or may not be facial movements such as sucking or smiling.

05. <u>Active awake</u>. Score when eyes are 3/4 or more open and there is any movement of head, trunk or extremities. There may or may not be facial movements such as sucking or smiling.

06. <u>Cry</u>. Score when baby emits sustained distress vocalizations associated with vigorous, diffuse motor activity. Fuss (#61) and cry are mutually exclusive. They may not be scored in the same time period.

<u>Activity</u>

[A. These categories are mutually exclusive. Score a 1 to begin and score again, with a 2, only when an activity stops. Includes only direct interaction with the infant; does not include preparation or caretaking of the environment.

11. Burping. Primary caretaker pats infant vigorously on back while infant's torso is in an upright position.

12. Diapering. Primary caregiver is involved in all those activities (removing diaper, wiping/washing infant, powdering, putting on diaper, etc.) associated with changing diapers. Also includes dressing.

13. Bathing. Scored from the time that infant comes into contact with bath water. Also scored for sponge bath or other extensive washing of the infant. Ends after drying is completed.]

Feeding

A. These are marked each time they occur.

21. Feeding bottle. Primary caretaker must be holding bottle but need not be holding baby.

[22. Feeding breast. Score when caregiver offers a breast to the infant.]

23. Feeding solids. Score when caretaker offers solids. Primary caretaker can either feed with spoon or offer finger foods.

24. Bottle propped. Primary caretaker holds neither baby nor bottle and baby does not hold bottle himself.

Contact

A. These categories are not mutually exclusive. Score any category which occurs in the time period.

B. Score each time period the behavior occurs, even if the behavior continues from the previous period.

31. Hold/Pick up. [categories combined] Hold: Caretaker holds infant in any position so that the primary support for the infant is provided by the caretaker's body or extremities. If the infant is held in a sitting or standing position and partially supports himself, also code stress musculature (32). If mother uses hold to interfere with baby's activity also score interfering touch./ Pick Up: Caretaker lifts baby more than momentarily. If caretaker holds or places infant in sitting or standing position so that infant is required to at least partially support his own weight, also score stress musculature (32).

32. Stress musculature/Adjust position. [categories combined] Stress Musculature: Mother holds or places infant in sitting or standing position so that infant is required to at least partially support his own weight./ Adjust Position: Turn baby from side to side, adjust in infant seat, move from caretaker's hip to shoulder, or move quickly from one place to another in room. Include adjusting position that is part of social play (e.g., throwing in air).

33. Affectionate touch/Pats/Rocks. [categories combined] Affectionate Touch: Kiss, pat, hug, nuzzle, etc. If affectionate touch occurs within social play (53) score both./ Pats: Caretaker gently pats baby with repetitive motion./ Rocks: Score if caretaker provides any rocking or jiggling motion by using her own body or holding the baby in a rocking chair, or moving a carriage back and forth, etc.

34. Interfering touch. Caretaker touches baby to distract or inhibit ongoing activity. This may include removing object from hand, hitting, or pulling back, etc.

Verbal

A. These categories are not mutually exclusive. Score all which occur in any time segment.

B. Score each time period the behavior occurs.

41. Command positive. A clear request to initiate action. A categorical imperative offering essentially no option for responding in any other way than that called for by the request. Indicates an act which the child must do but is not now doing, i.e., "Sit still"; "Come here"; Put that down"; "Make nice to the doggie"; "Wave bye-bye." Suggestions to initiate action which are stated as questions or offers are scored as [talk/vocalize] #43--i.e., "Have a cookie, honey"; or "Are you ready to put your nightgown on now?" or "It is time for lunch."

42. <u>Command negative</u>. A clear request to terminate action; for example, "Don't touch"; "No! No!"; "Don't cry"; "Sh!" may be coded as a negative command or as a noise (43) depending on tone of voice. The difficult distinction between a positive and negative command is based on the presence of an inhibitory word in the negative command. For example, "Be quiet" would be scored as a positive command while "Don't cry" would be a negative command.

43. [Talk/verbalize] [categories combined] This category includes all verbalization that are not commands. It may include any of the following:

<u>Criticism and threats</u>. Score when verbalizations are critical, hostile, derogatory, accusatory, belittling, or taunting. For example, "Your father thinks you are a moron," "You spit up on my dress," "The lady is going to take you back to the hospital if you are not good," "Can't you do anything right?" The decision to score a statement as criticism is made according to content of the statement, not the tone of voice in which it is made.

<u>Praise or approval</u>. This category includes statements which enhance self-esteem. Score statement of praise, approval, and encouragement. For example, "You are getting so big," "You smell so sweet," "I love you," "You can do it."

Comments. This category includes all verbalizations which are not commands, criticism, praise, or instructional comments.

Instructs. This category includes statements which label. Also includes reading or showing pictures with discussion. For example, "That's a doggie," "This is your nose."

Noise. This category includes sounds made to the baby which do not contain words. For example, humming, clicking, imitation of baby noises. Score also for singing.

Laughs. Score only when caretaker laughs during face to face interaction with the baby.

44. Talks to others. Score only when caretaker talks to others (including observer or animals) when holding baby or immediately adjacent to baby.

Objects

A. These categories are not mutually exclusive. Score all which occur in any time period.

B. Score each time period the behavior occurs even if it is a continuation of a transaction from a previous time period.

51. Arouse/stimulate/soothe with objects. Caretaker presents object to infant in a manner which encourages

visual and/or tactile exploration. Also score if caretaker presents an object which is not within sight or reach but provides auditory stimulation. [Includes offering pacifier.] [Also includes sustained, shared play, or interaction between baby and other person involving an object. This category may include demonstration of the uses of an object (e.g., building a tower with blocks or putting a spoon in a cup).]

52. Tease with object. Playful or hostile interference. Score when baby reaches for object and caretaker moves it just out of reach. When baby is laughing and seems to be enjoying the exchange, add a modifier (4) to indicate the teasing is mutual.

53. Social play. Caretaker arouses or stimulates infant without using an object. Does so by engaging in animated play with a fun-like quality where the apparent attempt is to amuse the baby or to play a game with recognizable rules (e.g., pat-a-cake). Do not score if interaction is purely verbal. In addition to scoring social play, score all component behaviors. If baby responds, use a modifier (4) to indicate that the play is mutual.

Baby Vocalization

A. These categories are not mutually exclusive. Score each category which occurs in a given time period.

B. Score each time period the behavior occurs.

61. Fuss. Score when baby emits distress vocalizations of lower amplitude than a cry, not characterized by vigorous diffuse motor activity. Do not score in same time period as cry #06.

62. Non-distress vocalization. Score when baby emits vocalizations such as cooing, grunts or babbling but which excludes crying, fussing, or vegetative sounds such as burps, coughs, hiccoughs, etc.

Baby Activity

A. These categories are not mutually exclusive. For any time period score each category which occurs.

71. Mouths. This category is scored when baby introduces part of self or an object into his mouth.

72. Self play. Self play is attention directed toward parts of own body. This is focused exploratory behavior directed at oneself and is defined as looking at or exploration of one's body.

73. Object play. Score when an intentional interaction with an object occurs. Must include visual as well as haptic exploration, i.e., looking at a rattle and shaking it as opposed to stepping on it or shaking it without visual regard.

74. Not eats--not sucks. Score when baby is offered food or pacifier and baby refuses by spitting out, closing mouth, or not sucking.

Nonverbal Communication

A. These categories are not mutually exclusive. Score each category which occurs in a given time period.

B. Score each time period the behavior occurs.

81. Looks. Score only when baby is looking at a person. Use modifier to indicate person at whom baby is looking. Mutual visual regard with caretaker is scored with modifier 4.

82. Smiles. This behavior can be scored when baby is awake or asleep. Use modifier to indicate recipient of smile. Smiling subsumes looking.

[Environmental Stimulation

A. These categories are not mutually exclusive. Score a 1 to begin and score again, with a 2, only when an activity stops.

91. Television on. Scored when television is turned on, with or without sound.

92. Radio or Phono on. Score when radio, stereo, tape deck, etc. are emitting sound. Score when television sound is on without a picture.

93. Other noisy appliances on. Score when mixer, blender, vacuum cleaner, or other appliance which creates an intensive noise is on.]

Modifiers

Behaviors directed toward the baby

The codes for the modifiers to be used with behavior directed toward the baby (categories 21-24, 31-34, 41-44, 51-53) are as follows:

1. [Mother] contingent to distress. Score when behavior occurs in response to baby's fussing (61) or crying (06). May also be scored if behavior occurs in response to other instances of distress such as choking, falling, etc.
2. [Mother] contingent to nondistress. Score when behavior occurs in response to baby's smiling (82) [or other nondistress behavior.]
3. [Mother] contingent to vocalization. Score when behavior occurs in response to baby's nondistress vocalization (62). The response may or may not be directly imitative.
4. [Mother] mutual. Score when baby and primary caretaker are both engaged in [any mutual activity] regardless of who initiates it.
5. Other [person.] Score when [person] other than [mother] is interacting with baby.
6. Other [person] contingent. Score when [person] other than [mother] responds to any behavior of baby such as fussing (61), crying (06), smiling (82), gesturing (86), or nondistress vocalizing (62).

Emitted by baby

The modifiers to be used with behaviors emitted by the baby (behaviors 61, 62, 71, 81, 82) are as follows:

1. Baby's behavior directed to [mother]. Score when baby looks at (81) or smiles at (82). Use modifier 4 when behavior is mutual (such as visual regard or smiling) or when baby acts in compliance with or response to primary caretaker's behavior.

[2. Baby's behavior directed to other person. Score when baby's behavior is directed at person other than [mother] or observer.]

3. Baby's behavior directed to observer. Score when baby initiates behavior to observer, such as: looks at (81), smiles at (82).

4. Baby's action is contingent to [mother's] behavior or mutual with it. Score 4 for mutual visual regard or mutual smiling. Also score 4 when baby complies with a command, or responds to primary caretaker's behavior. For example, use 4 when baby offers object in compliance with a positive command, or when baby vocalizes in response to primary caretaker's talking to him.

5. Self. Score when baby mouths (71) part of self, such as thumb sucking.

Definition of duration of observation at 1, [2], and 3 months

Observation should start when baby is waking up and go [to the beginning] of the next sleep period. The observation must include a milk feeding and awake time before or after feeding.

Michigan Infant Temperament Scale Scoring Key
(Bonem & Zucker, 1979)

Below is the scoring key for the Michigan Infant Temperament Scale (Bonem, 1978). This scale consists of 164 true-false items and yields scores on 10 temperamental attributes. These attributes are based on those proposed by the New York Longitudinal Study (Thomas *et al*., 1963, 1969, 1977).

All items on the scale are to be scored with a "1" assigned to items marked True and a "0" given to items marked False by the informant. Items that have been skipped should not be scored. Items listed below that are followed by an * should be scored in the reverse manner: False = 1 and True = 0. Items for each scale should be summed and divided by the number of items in the scale; divide only by the number of items endorsed by the informant. Thus if the scale contains 17 items and 2 of them were skipped, the summed total should be divided by 15.

Please note that this scale has been designed to be used with infants age three to twelve months. The M.I.T.S. has been found to be a statistically reliable and temporally stable instrument with subjects of this age. Use of subjects older than 12 months is, at this time, not recommended.

Below are the M.I.T.S. items organized according to the scale on which they are scored. Note that a * means that reverse scoring is to be used on that item.

Activity
3, 6, 10, 35*, 44, 57, 61*, 68*, 79, 92*, 101, 107*, 112, 130*, 133*, 134   N = 16

Mood
1*, 2*, 11*, 15, 23, 33*, 38, 51, 62, 65, 77*, 87, 93, 100*, 105*, 116), 125   N = 17

Intensity
4, 8, 18*, 21*, 25*, 34, 42*, 54, 64, 67*, 73*, 74, 94*, 98, 108, 111*, 119   N = 17

Threshold
5, 24, 26*, 43*, 53*, 69, 72*, 80*, 86*, 88, 102, 117, 118*, 121, 129, 131, 136   N = 17

Distractibility
7, 9, 16*, 27, 31*, 39*, 45, 48, 52, 63*, 71, 78*, 81, 83, 85*, 109*, 122*   N = 17

<u>Rhythmicity</u>
12, 17*, 19*, 29, 41, 55, 56, 70*, 76, 82*, 84, 90*, 91, 95, 103*, 113, 132 N = 17

<u>Approach</u>
13, 14, 30*, 36*, 37, 49*, 50*, 60*, 66, 75*, 99, 115, 123*, 126, 127*, 128*, 135 N = 17

<u>Adaptibility</u>
22, 22*, 28, 40, 46*, 47*, 58*, 59*, 89*, 96*, 97*, 104*, 106, 110, 114, 120, 124* N = 17

$\underline{P_1}$ (an experimental scale attempting to measure a form of "persistence")[1]
138, 138*, 140, 141*, 142, 143, 145, 148*, 150*, 151*, 152*, 153*, 155, 156*, 157*, 158*, 159*, 163 N = 18

$\underline{P_2}$ (same as P_1, an experimental scale looking at an aspect of "persistence")
137*, 144*, 146*, 147, 149, 154*, 160, 161, 162, 164*
N = 10

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[1]See unpublished masters thesis (Bonem, 1978) for complete discussion of "persistence."

APPENDIX E

CORRELATION TABLES FOR THE RESEARCH MODEL AND GLOSSARY OF TERMS

APPENDIX E

CORRELATION TABLES FOR THE RESEARCH MODEL AND GLOSSARY OF TERMS

Glossary of Terms Used in Computer Analysis

ξ_1 = maternal age

x_1 = mother's age at the time of delivery (AGEMO)

ξ_2 = socioeconomic status

x_2 = the highest occupational prestige rating among the household members (FAMOCCUP)

x_3 = maternal education level (EDMO)

x_4 = family income, total income from all sources of all family members in the household (divided by 1,000) (FAMINC)

η_1 = prenatal preparation

y = did the mother participate in a birth preparation class (1 = yes, 2 = no) (PRENATMO)

y_2 = month of pregnancy in which prenatal care began (PRENATF)

η_2 = neurological and behavioral status at birth

y_3 = Brazelton Neonatal Behavioral Assessment Scale (BNBAS) orientation summary score (ORIENT)

y_4 = BNBAS motor performance summary score (MOTORPER)

y_5 = BNBAS range of state summary score (RANGSTAT)

y_6 = BNBAS regulation of state summary score (REGSTAT)

y_7 = BNBAS autonomic regulation summary score (AUTOREG)

y_8 = BNBAS reflexes summary score (REFLEXES)

Note: The BNBAS habituation summary score was removed from the model due to an excessive amount of missing data

η_3 = physical indicators of neonatal status

y_9 = birth weight of infant, in grams (divided by 1,000) (WTINF)

y_{10} = gestational age at birth, in weeks (GESTAGE)

y_{11} = 5-minute Apgar score (APGAR2)

η_4 = maternal attitudes toward child

y_{12} = positive attitude index from month 1 (POSATT1)

y_{13} = negative attitude index from month 1 (NEGATT1)

y_{14} = positive attitude index from month 2 (POSATT2)

y_{15} = negative attitude index from month 2 (NEGATT2)

y_{16} = positive attitude index from month 3 (POSATT3)

y_{17} = negative attitude index from month 3 (NEGATT3)

η_5 = infant temperament

y_{18} = Michigan Infant Temperament Scale (MITS) activity score (ACTIVITY)

y_{19} = MITS mood score (MOOD)

y_{20} = MITS intensity score (INTENSE)

y_{21} = MITS threshold score (THRESH)

y_{22} = MITS distractibility score (DISTRACT)

y_{23} = MITS rhythmicity score (RHYTHM)

y_{24} = MITS approach score (APPROCH)

y_{25} = MITS adaptability score (ADAPT)

η_6 = home environment stimulation

y_{26} = the number of rooms per person measured at 3 months (RATIO)

y_{27} = number of caregivers reported at 3 months (ADULTS)

y_{28} = is there a quiet place where the child can be put when sleeping? 1 = yes 2 = no (QUIETPL)

y_{29} = number of audio/visual response toys at 3 months (TOYS1)

η_7 = quality of the mother-infant interactions (all 3 months)

y_{30} = percentage of time mother held child while he/ she was awake (HELDMR2)

y_{31} = percentage of time mother talked to child (TALK3MR2)

y_{32} = percentage of time child vocalized (NDVOCR)

y_{33} = percentage of distress periods responded to by mother in 45 seconds or less (FUSSRAT)

y_{34} = percentage of time spent in mutual gaze (LOOK4R2)

y_{35} = percentage of time spent in feeding and care-taking activities, i.e., feeding, burping, bathing and diapering (FEDCRR2)

λ's (lambda) = regression coefficients relating unobserved or theoretical variables to observed variables

ϕ (phi) = covariance of the exogenous theoretical variables and

γ's (gamma) = regression coefficients relating exogenous, theoretical variables ('s) to the endogenous variables ('s)

β's (Beta) = regression coefficients interrelating the endogenous theoretical variables

δ's and ε's (delta and epsilon) = measurement errors in observed variables, x and y, respectively

ζ's (zeta) = errors of prediction

Correlation Tables for the Research Model

	PREMATMO	PREMATF	ORIENT	MOTOPPER	RANGSTAT	REGSTAT	AUTOREG	REFLEXES	WTINF	GESTAGE
PREMATMO	1.000									
PREMATF	.130	1.000								
ORIENT	.092	-.031	1.000							
MOTOPPER	-.227	.060	.316	1.000						
RANGSTAT	.057	-.030	-.040	.023	1.000					
REGSTAT	-.276	-.123	.007	.106	.049	1.000				
AUTOREG	-.130	-.343	.195	-.115	.155	-.092	1.000			
REFLEXES	-.045	.067	.056	.031	-.019	-.103	-.012	1.000		
WTINF	-.143	-.036	.072	.175	.184	-.122	.009	-.077	1.000	
GESTAGE	-.174	-.056	.179	.169	.293	.004	.172	.124	.512	1.000
APGAR2	-.201	.037	-.114	.209	-.004	.275	.021	-.413	.054	.157
POSATT1	.100	.166	.109	.033	.034	-.075	.030	.020	.135	.315
NEGATT1	-.255	-.055	-.307	-.039	-.042	-.006	.037	-.056	-.029	-.107
POSATT2	.207	.445	.098	.044	.004	-.109	-.163	-.030	.166	.225
NEGATT2	-.328	.024	-.104	.199	-.101	.033	-.034	.055	-.119	-.170
POSATT3	.197	.363	.156	.203	.003	-.052	-.004	-.006	.000	.199
NEGATT3	-.136	.036	-.101	.145	-.102	.033	.005	-.059	-.125	-.103
ACTIVTY	-.087	-.155	-.230	.015	.233	-.193	.007	.043	.000	.045
MOOD	.019	-.139	-.063	-.010	-.130	.102	.027	-.153	.093	-.037
INTENSE	.101	.116	-.022	.051	-.147	-.263	-.062	.011	-.052	-.144
THRESH	-.019	-.229	.020	.114	-.141	.145	-.044	-.302	-.064	-.144
DISTRACT	-.205	-.306	-.103	.137	.103	.044	.175	-.113	.219	.201
RHYTHM	-.217	-.298	.007	-.035	-.031	.004	.100	-.190	.133	-.191
APPROCH	-.064	-.236	-.107	.044	.027	.235	.079	.005	.164	-.095
ADAPT	.050	-.361	-.211	-.037	-.036	.150	-.057	-.126	.125	-.166
RATIO	-.277	-.299	.176	.255	-.047	.200	.027	-.114	.100	-.024
ADULTS	.006	-.017	.175	.053	-.054	-.107	.005	.174	.033	.155
QUIETPL	.295	.333	-.040	-.337	-.040	-.255	-.002	-.051	-.074	.043
TOYS1	-.193	-.100	-.069	.079	.027	-.005	.000	.079	.057	.125
HELDMR2	.100	-.050	-.002	-.011	-.025	-.179	-.003	-.090	.275	.070
TALK3MR2	-.231	-.170	-.003	.069	.150	.070	.040	-.005	.173	.195
NOVOCR	-.261	.173	-.022	.044	-.057	.116	.036	-.063	.160	.053
FUSSRAT	-.170	-.060	.160	.300	.055	-.123	-.017	.205	.202	.260
LOOKMR2	-.177	-.109	-.147	.037	-.143	.027	.047	-.040	.026	.016
FEDCMR2	.040	-.192	.024	-.051	.142	.031	-.120	.036	.147	.135
AGEMO	-.421	-.314	.010	.355	.139	.150	.224	-.027	.226	.225
FAMOCCUP	-.343	-.271	-.104	.133	.013	.253	.177	-.153	.170	.140
EDMO	-.427	-.279	.090	.294	.057	.223	.325	-.011	.206	.292
FAMINC	-.437	-.276	-.029	.155	.037	.294	.065	-.071	.171	.151

MATRIX TO BE ANALYZED

	APGAR2	POSATT1	NEGATT1	POSATT2	NEGATT2	POSATT3	NEGATT3	ACTIVTY	MOOD	INTENSE
APGAR2	1.000									
POSATT1	.100	1.000								
NEGATT1	.021	-.151	1.000							
POSATT2	.121	.595	-.307	1.000						
NEGATT2	-.019	-.010	.522	-.324	1.000					
POSATT3	.310	.570	-.333	.015	-.300	1.000				
NEGATT3	.102	.024	.561	-.299	.645	-.301	1.000			
ACTIVTY	.020	-.140	.120	-.104	.162	-.095	-.001	1.000		
MOOD	.267	-.207	-.170	-.020	-.336	-.134	-.355	.021	1.000	
INTENSE	.001	.060	-.015	.203	-.025	.055	-.006	.336	-.015	1.000
THRESH	.027	-.030	.024	-.243	.120	-.197	.270	-.236	.169	-.204
DISTRACT	.120	-.106	.200	-.203	.177	-.195	.105	.311	-.050	.039
RHYTHM	.087	-.331	.080	-.244	.194	-.229	.070	.082	.261	.039

APPROCH	.164	-.136	-.056	-.225	.026	-.115	.002	.247	.295	-.137
ADAPT	.038	-.156	-.076	-.239	.057	-.115	-.079	.179	.321	-.159
RATIO	-.020	-.132	-.101	-.196	.050	-.231	-.032	.004	.145	-.209
ADULTS	-.244	-.100	-.015	-.101	-.014	.017	-.092	.199	.103	.001
QUIETPL	-.020	-.117	-.073	.107	-.167	.095	-.151	.071	-.022	.072
TOYS1	-.324	.091	.032	-.037	.133	.012	.063	.216	-.061	.062
MELDMR2	.168	.067	-.065	.126	-.177	-.006	.002	-.104	.008	.203
TALK3MR2	.110	.239	-.264	.197	-.084	.233	-.209	.136	.138	.020
NOVOCP	.034	-.047	-.173	.065	.026	.045	-.025	-.132	.030	.021
FUSSWAT	-.056	.149	-.118	.199	-.021	.253	-.047	.049	.040	-.056
LOOK4P2	.239	.032	.131	-.106	.193	-.011	.069	.034	.200	.031
FEDCRR2	-.046	-.169	-.034	-.205	-.352	-.221	-.067	.171	-.013	-.024
AGEMO	.053	.052	-.052	-.115	.163	-.012	.041	.093	.043	-.170
FAMOCCUP	.309	.026	.019	-.190	.159	-.149	.159	.195	-.024	-.091
EDMO	.146	.171	.089	-.052	.124	-.003	.097	.005	-.007	-.149
FAMINC	.165	-.142	-.040	-.230	.151	-.233	-.010	.104	.177	-.099

MATRIX TO BE ANALYZED

	THRESH..	DISTRACT	RHYTHM..	APPROACH.	ADAPT...	RATIO...	ADULTS..	QUIETPL.	TOYS1...	MELDMR2.
THRESH	1.000									
DISTRACT	.110	1.000								
RHYTHM	.381	.134	1.000							
APPROCH	.120	.050	.223	1.000						
ADAPT	.207	.161	.438	.564	1.000					
RATIO	.255	.004	.208	.158	.096	1.000				
ADULTS	-.157	-.007	-.117	.091	.153	-.125	1.000			
QUIETPL	-.194	-.126	-.102	-.145	-.005	-.423	.175	1.000		
TOYS1	.007	.152	.017	-.047	.028	.013	.260	-.269	1.000	
MELDMR2	.059	-.067	.004	.025	-.077	-.054	-.293	-.036	-.246	1.000
TALK3MR2	-.000	.016	.127	.057	.011	.149	-.057	-.319	.154	.205
NOVOCP	.020	.062	-.003	-.004	-.212	.061	.145	-.003	.206	-.100
FUSSWAT	.092	-.144	.124	.008	.070	.159	.051	-.309	.275	.105
LOOK4P2	.075	-.022	.207	.353	.234	-.078	.098	-.250	.110	.130
FEDCRR2	.006	.071	-.158	.036	-.113	.149	-.144	.050	-.114	.500
AGEMO	.164	.014	.072	.104	-.003	.395	-.035	-.526	.234	-.010
FAMOCCUP	.061	.144	.283	.156	.241	.314	-.122	-.290	.093	.005
EDMO	.260	.196	.216	.123	.003	.402	-.124	-.471	.255	-.133
FAMINC	.067	-.010	.177	.103	.165	.447	-.035	-.246	.172	-.050

MATRIX TO BE ANALYZED

	TALK3MR2	NOVOCP..	FUSSWAT.	LOOK4P2.	FEDCRR2.	AGEMO...	FAMOCCUP	EDMO....	FAMINC..
TALK3MR2	1.000								
NOVOCP	.230	1.000							
FUSSWAT	.465	.063	1.000						
LOOK4P2	.379	.067	.190	1.000					
FEDCRR2	.056	-.141	-.151	.313	1.000				
AGEMO	.299	.108	.379	.105	.122	1.000			
FAMOCCUP	.216	-.107	.214	.073	-.030	.561	1.000		
EDMO	.247	.039	.400	.098	-.053	.733	.596	1.000	
FAMINC	.416	.151	.390	.247	.005	.517	.622	.453	1.000

APPENDIX F

LISREL ANALYSIS OF RESEARCH MODEL

APPENDIX F

LISREL ANALYSIS OF RESEARCH MODEL

ANALYSIS OF LINEAR STRUCTURAL RELATIONSHIPS

BY THE METHOD OF MAXIMUM LIKELIHOOD

DISTRIBUTED BY·

INTERNATIONAL EDUCATIONAL SERVICES
1525 EAST 53RD STREET
CHICAGO, ILLINOIS 6015
(312) 684-4920

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UNTIL MONTH/DAY/YEAR = 4/ 1/81

L I S R E L I V

AN EVALUATION OF THE IMPACT OF MATERNAL AGE ON CHILD DEVELOPMENT

NUMBER OF INPUT VARIABLES	39
NUMBER OF Y - VARIABLES	35
NUMBER OF X - VARIABLES	4
NUMBER OF ETA - FACTORS	7
NUMBER OF KSI - FACTORS	2
NUMBER OF OBSERVATIONS	62

MODEL SPECIFICATION

LAMBDA Y	FULL , FIXED	LAMBDA X	FULL , FIXED
BETA	FULL , FIXED	GAMMA	FULL , FIXED
PHI	SYMM., FIXED	PSI	DIAG., FREE
THETA EPS	DIAG., FREE	THETA DELTA	DIAG., FIXED

OUTPUT REQUESTED

MATRIX TO BE ANALYZED	YES
TECHNICAL OUTPUT	NO
STANDARD ERRORS	YES
MATRICES OF T - VALUES	NO
CORRELATIONS OF ESTIMATES	NO
SIGMA, RESIDUALS, ETC.	YES
FACTOR SCORES REGRESSIONS	NO
FIRST ORDER DERIVATIVES	NO
STANDARDIZED SOLUTION	YES

AN EVALUATION OF THE IMPACT OF MATERNAL AGE ON CHILD DEVELOPMENT

MATRIX TO BE ANALYZED

	PRENATMO	PRENATF	ORIENT	MOTORPER	RANGSTAT	REGSTAT	AUTOREG	REFLEXES	WTINF	GESTAGE
PRENATMO	.471									
PRENATF	.108	1.303								
ORIENT	.086	-.048	1.870							
MOTORPER	-.106	.047	.294	.463						
RANGSTAT	.037	-.032	-.062	.015	.870					
REGSTAT	-.221	-.163	.139	.147	.054	1.362				
AUTOREG	-.115	-.506	.345	-.101	.187	-.139	1.670			
REFLEXES	-.033	.082	.082	.022	-.019	-.229	-.017	1.148		
WTINF	-.566	-.236	.570	.698	.988	-.816	.663	-.477	33.047	
GESTAGE	-.206	-.111	.425	.199	.474	.009	.386	.230	5.097	2.997
APGAR2	-.087	.026	-.098	.089	-.049	.202	.017	-.279	.196	.171
POSATT1	.488	.749	.588	.088	.125	-.350	.192	.118	3.067	2.155
NEGATT1	-.501	-.179	-1.203	-.077	-.113	-.286	.136	-.172	-.481	-.532
POSATT2	1.131	2.912	.772	.329	.449	-.721	-1.205	-.184	5.463	2.236
NEGATT2	-.705	.085	-.790	.424	-.297	.141	-.137	.184	-2.148	-.956
POSATT3	.764	2.348	1.206	.783	.436	-.346	-.615	-.051	2.864	1.953
NEGATT3	-.264	.118	-.702	.279	-.270	.110	.313	-.180	-2.036	-.897
ACTIVTY	-.093	-.278	-.493	.016	.340	-.353	.177	.072	.795	.121
MOOD	.021	-.256	-.138	-.019	-.196	.192	.056	-.264	.864	-.102
INTENSE	.114	.218	-.050	.057	-.227	-.505	-.132	.020	-.495	-.411
THRESH	-.027	-.553	.058	.164	-.278	.357	-.120	-.684	-.773	-.527
DISTRACT	-.421	-.751	-.303	.200	.207	.111	.485	-.260	2.709	.749
RHYTHM	-.254	-.580	.017	-.040	-.050	.166	.413	-.348	1.300	-.565
APPROCH	-.056	-.342	-.325	.073	.032	.349	.130	.116	1.195	-.210
ADAPT	.066	-.796	-.556	-.049	-.065	.355	-.143	-.260	1.382	-.553
RATIO	-.959	-1.661	1.211	.875	-.223	1.178	.175	-.615	3.128	-.209
ADULTS	.004	-.017	.212	.032	-.044	-.192	.097	.164	.170	.237
QUIETPL	.060	.113	-.019	-.068	-.013	-.089	-.031	-.016	-.126	.022
TOYS1	-.818	-1.326	-.584	.333	.154	-.612	.641	.525	2.021	1.331
HELDMR2	.250	-.128	-.005	-.014	-.045	-.402	-.006	-.203	3.069	.234
TALK3MR2	-.327	-.400	-.025	.098	.305	.188	.129	-.010	2.051	.700
MDVOCR	-.235	.260	-.039	.039	-.069	.178	.060	-.088	1.269	.121
FUSSRAT	-.250	-.139	.447	.539	.104	-.308	-.046	.448	3.311	.947
LOOK4R2	-.089	-.092	-.148	.019	-.098	.023	.045	-.031	.109	.020
FEDCRR2	.051	-.321	.050	-.053	.205	.056	-.239	.059	1.308	.360
AGEMO	-1.301	-1.615	.110	1.089	.584	.830	1.306	-.131	5.852	1.758
FAMOCCUP	-6.668	-8.776	-4.035	2.563	.340	8.375	6.490	-4.656	27.765	6.894
EDMO	-.804	-.876	.369	.550	.146	.715	1.152	-.033	3.256	1.391
FAMINC	-3.844	-4.033	-.510	1.354	.442	4.400	1.075	-.977	12.595	3.349

MATRIX TO BE ANALYZED

	APGAR2	POSATT1	NEGATT1	POSATT2	NEGATT2	POSATT3	NEGATT3	ACTIVTY	MOOD	INTENSE
APGAR2	.397									
POSATT1	.270	15.646								
NEGATT1	.038	-1.712	8.220							
POSATT2	.439	13.504	-5.050	32.878						
NEGATT2	-.039	-.128	4.697	-5.832	9.839					
POSATT3	.034	12.949	-5.405	26.455	-5.333	32.031				
NEGATT3	.182	.264	4.563	-4.856	5.732	-6.104	8.034			
ACTIVTY	.019	-.914	.573	-.935	.797	-.853	-.359	2.451		
MOOD	.272	-1.320	-.788	-.181	-1.699	-.955	-1.625	.054	2.607	
INTENSE	.084	.390	-.073	1.914	-.131	.509	-.026	.867	-.041	2.716
THRESH	.036	-.321	.143	-2.956	.797	-2.357	1.620	-.781	.580	-.993
DISTRACT	.162	-1.585	1.233	-2.502	1.192	-2.370	.642	1.047	-.200	.137
RHYTHM	.054	-.207	.390	-2.384	1.035	-2.194	.339	.218	.718	.109

APPROCH	.131	-.683	-.196	-1.636	.078	-.831	.006	.491	.606	-.288
ADAPT	.047	-1.188	-.423	-2.646	.344	-1.257	-.430	.540	.999	-.504
RATIO	-.064	-2.623	-2.617	-5.676	.943	-6.593	-.458	.031	1.181	-1.733
ADULTS	-.136	-.349	-.038	-.916	-.039	.085	-.231	.274	.147	.118
QUIETPL	-.005	-.138	-.062	.183	-.156	.165	-.128	.033	-.011	.036
TOYS1	-1.261	2.223	1.633	-3.437	2.577	.430	1.444	2.090	-.611	.628
HELDMR2	.230	.512	-.359	1.404	-1.079	-.068	.452	-.315	.025	.648
TALK3MR2	.154	1.943	-1.563	2.340	-.547	2.730	-1.225	.440	.460	.067
NDVOCR	.028	-.242	-.651	.493	.109	.332	-.095	-.271	.063	.045
FUSSRAT	-.072	1.200	-.692	2.332	-.137	2.917	-.273	.156	.157	-.189
LOOK4R2	.111	.094	.278	-.447	.446	-.047	.144	.039	.238	.038
FEDCRR2	-.045	-1.034	-.148	-1.817	-.254	-1.933	-.294	.413	-.033	-.062
AGEMO	.149	.927	-.669	-2.984	2.307	-.308	.518	.653	.312	-1.326
FAMOCCUP	5.529	2.974	1.564	-30.956	14.116	-23.935	12.798	8.674	-1.098	-4.274
EDMO	.253	1.864	.069	-.825	1.070	-.053	.752	.364	-.033	-.677
FAMINC	1.334	-7.200	-1.486	-16.886	6.072	-16.898	-.670	3.699	3.658	-2.090

MATRIX TO BE ANALYZED

	THRESH	DISTRACT	RHYTHM	APPROCH	ADAPT	RATIO	ADULTS	QUIETPL	TOYS1	HELDMR2
THRESH	4.486									
DISTRACT	.500	4.621								
RHYTHM	1.374	.490	2.902							
APPROCH	.322	.137	.483	1.615						
ADAPT	.847	.666	1.440	1.382	3.719					
RATIO	2.716	.043	1.784	1.011	.929	25.375				
ADULTS	-.293	-.012	-.175	.102	.260	-.560	.778			
QUIETPL	-.123	-.081	-.092	-.055	-.003	-.635	.046	.089		
TOYS1	1.142	2.015	.175	-.372	.334	.389	1.414	-.496	38.114	
HELDMR2	.244	-.281	.014	.061	-.289	-.526	-.502	-.021	-2.945	3.770
TALK3MR2	-.033	.070	.446	.149	.045	1.547	-.103	-.197	1.965	.824
NDVOCR	.057	.176	-.007	-.007	-.537	.404	.168	-.033	1.673	-.459
FUSSRAT	.396	-.630	.430	.229	.275	1.634	.091	-.188	3.458	.416
LOOK4R2	.117	-.035	.260	.331	.333	-.289	.064	-.057	.501	.185
FEDCRR2	.019	.234	-.416	.071	-.335	1.154	-.196	.023	-1.086	7.499
AGEMO	1.564	.140	.550	.598	-.024	8.973	-.140	-.707	6.527	-.087
FAMOCCUP	3.682	8.800	9.797	5.631	13.192	44.863	-3.060	-2.524	16.354	.262
EDMO	1.562	1.157	1.009	.430	.018	5.567	-.301	-.386	4.334	-.708
FAMINC	1.831	-.277	3.862	1.672	4.077	28.839	-.392	-.940	13.579	-1.239

MATRIX TO BE ANALYZED

	TALK3MR2	NDVOCR	FUSSRAT	LOOK4R2	FEDCRR2	AGEMO	FAMOCCUP	EDMO	FAMINC
TALK3MR2	4.272								
NDVOCR	.625	1.726							
FUSSRAT	1.958	.168	4.160						
LOOK4R2	.577	.065	.285	.543					
FEDCRR2	.178	-.299	-.475	.015	2.382				
AGEMO	2.787	.641	3.489	.613	.851	20.344			
FAMOCCUP	12.651	-.261	12.398	1.535	-1.654	74.355	805.206		
EDMO	1.400	.140	2.241	.198	-.224	9.083	46.453	7.551	
FAMINC	11.014	2.537	10.190	2.333	.091	29.899	226.260	15.954	164.159

AN EVALUATION OF THE IMPACT OF MATERNAL AGE ON CHILD DEVELOPMENT

PARAMETER SPECIFICATIONS

LAMBDA Y

	ETA 1	ETA 2	ETA 3	ETA 4	ETA 5	ETA 6	ETA 7
PRENATMO	0	0	0	0	0	0	0
PRENATF	1	0	0	0	0	0	0
ORIENT	0	0	0	0	0	0	0
MOTORPER	0	2	0	0	0	0	0
RANGSTAT	0	3	0	0	0	0	0
REGSTAT	0	4	0	0	0	0	0
AUTOREG	0	5	0	0	0	0	0
REFLEXES	0	6	0	0	0	0	0
WTINF	0	0	0	0	0	0	0
GESTAGE	0	0	7	0	0	0	0
APGAR2	0	0	8	0	0	0	0
POSATT1	0	0	0	0	0	0	0
NEGATT1	0	0	0	9	0	0	0
POSATT2	0	0	0	10	0	0	0
NEGATT2	0	0	0	11	0	0	0
POSATT3	0	0	0	12	0	0	0
NEGATT3	0	0	0	13	0	0	0
ACTIVTY	0	0	0	0	0	0	0
MOOD	0	0	0	0	14	0	0
INTENSE	0	0	0	0	15	0	0
THRESH	0	0	0	0	16	0	0
DISTRACT	0	0	0	0	17	0	0
RHYTHM	0	0	0	0	18	0	0
APPROCH	0	0	0	0	19	0	0
ADAPT	0	0	0	0	20	0	0
RATIO	0	0	0	0	0	0	0
ADULTS	0	0	0	0	0	21	0
QUIETPL	0	0	0	0	0	22	0
TOYS1	0	0	0	0	0	23	0
HELDMR2	0	0	0	0	0	0	0
TALK3MR2	0	0	0	0	0	0	24
MDVOCR	0	0	0	0	0	0	25
FUSSRAT	0	0	0	0	0	0	26
LOOK4R2	0	0	0	0	0	0	27
FEDCRR2	0	0	0	0	0	0	28

LAMBDA X

	KSI 1	KSI 2
AGEMO	0	0
FAMOCCUP	0	0
EDMO	0	29
FAMINC	0	30

BETA

	ETA 1	ETA 2	ETA 3	ETA 4	ETA 5	ETA 6	ETA 7
EQ. 1	0	0	0	0	0	0	0
EQ. 2	31	0	32	0	0	0	0
EQ. 3	33	0	0	0	0	0	0
EQ. 4	34	35	36	0	37	0	38
EQ. 5	0	39	40	0	0	0	0
EQ. 6	0	0	0	0	0	0	0

EQ. 7	0	0	0	41	42	43	0

GAMMA

	KSI 1	KSI 2
EQ. 1	44	45
EQ. 2	46	47
EQ. 3	48	49
EQ. 4	50	51
EQ. 5	0	0
EQ. 6	0	52
EQ. 7	53	54

PHI

	KSI 1	KSI 2
KSI 1	0	
KSI 2	55	56

PSI

	EQ. 1	EQ. 2	EQ. 3	EQ. 4	EQ. 5	EQ. 6	EQ. 7
1	57	58	59	60	61	62	63

THETA EPS

	PRENATPO	PRENATF	ORIENT	MOTORPER	RANGSTAT	REGSTAT	AUTOREG	REFLEXES	WTINF	GESTAGE
1	64	65	66	67	68	69	70	71	72	73

THETA EPS

	APGAR2	POSATT1	NEGATT1	POSATT2	NEGATT2	POSATT3	NEGATT3	ACTIVITY	MOOD	INTENSE
1	74	75	76	77	78	79	80	81	82	83

THETA EPS

	THRESH	DISTRACT	RHYTHM	APPROCH	ADAPT	RATIO	ADULTS	QUIETPL	TOYS1	MELDMR2
1	84	85	86	87	88	89	90	91	92	93

THETA EPS

	TALK3MR2	NOVOCR	FUSSRAT	LOOK4R2	FEDCRR2
1	94	95	96	97	98

THETA DELTA

	AGEMO	FAMOCCUP	EDMO	FAMINC
1	0	99	100	101

AN EVALUATION OF THE IMPACT OF MATERNAL AGE ON CHILD DEVELOPMENT

STARTING VALUES

LAMBDA Y

	ETA 1	ETA 2	ETA 3	ETA 4	ETA 5	ETA 6	ETA 7
PRENATMO	1.000	0.000	0.000	0.000	0.000	0.000	0.000
PRENATF	1.474	0.000	0.000	0.000	0.000	0.000	0.000
ORIENT	0.000	1.000	0.000	0.000	0.000	0.000	0.000
MOTORPER	0.000	9.862	0.000	0.000	0.000	0.000	0.000
RANGSTAT	0.000	-14.399	0.000	0.000	0.000	0.000	0.000
REGSTAT	0.000	43.094	0.000	0.000	0.000	0.000	0.000
AUTOREG	0.000	28.048	0.000	0.000	0.000	0.000	0.000
REFLEXES	0.000	-32.091	0.000	0.000	0.000	0.000	0.000
WTINF	0.000	0.000	1.000	0.000	0.000	0.000	0.000
GESTAGE	0.000	0.000	1.446	0.000	0.000	0.000	0.000
APGAR2	0.000	0.000	-1.230	0.000	0.000	0.000	0.000
POSATT1	0.000	0.000	0.000	1.000	0.000	0.000	0.000
NEGATT1	0.000	0.000	0.000	-.448	0.000	0.000	0.000
POSATT2	0.000	0.000	0.000	2.081	0.000	0.000	0.000
NEGATT2	0.000	0.000	0.000	-.458	0.000	0.000	0.000
POSATT3	0.000	0.000	0.000	2.213	0.000	0.000	0.000
NEGATT3	0.000	0.000	0.000	-.462	0.000	0.000	0.000
ACTIVTY	0.000	0.000	0.000	0.000	1.000	0.000	0.000
MOOD	0.000	0.000	0.000	0.000	2.868	0.000	0.000
INTENSE	0.000	0.000	0.000	0.000	-1.038	0.000	0.000
THRESH	0.000	0.000	0.000	0.000	3.065	0.000	0.000
DISTRACT	0.000	0.000	0.000	0.000	1.846	0.000	0.000
RHYTHM	0.000	0.000	0.000	0.000	3.998	0.000	0.000
APPROCH	0.000	0.000	0.000	0.000	3.355	0.000	0.000
ADAPT	0.000	0.000	0.000	0.000	6.103	0.000	0.000
RATIO	0.000	0.000	0.000	0.000	0.000	1.000	0.000
ADULTS	0.000	0.000	0.000	0.000	0.000	-.038	0.000
QUIETPL	0.000	0.000	0.000	0.000	0.000	-.074	0.000
TOYS1	0.000	0.000	0.000	0.000	0.000	.595	0.000
HELDMR2	0.000	0.000	0.000	0.000	0.000	0.000	1.000
TALK3MR2	0.000	0.000	0.000	0.000	0.000	0.000	10.293
NDVOCR	0.000	0.000	0.000	0.000	0.000	0.000	1.254
FUSSRAT	0.000	0.000	0.000	0.000	0.000	0.000	11.281
LOOK4R2	0.000	0.000	0.000	0.000	0.000	0.000	1.736
FEDCRR2	0.000	0.000	0.000	0.000	0.000	0.000	-1.172

LAMBDA X

	KSI 1	KSI 2
AGEMO	1.000	0.000
FAMOCCUP	0.000	1.000
EDMO	0.000	.109
FAMINC	0.000	.454

BETA

	ETA 1	ETA 2	ETA 3	ETA 4	ETA 5	ETA 6	ETA 7
EQ. 1	1.000	0.000	0.000	0.000	0.000	0.000	0.000
EQ. 2	-18.252	1.000	4.467	0.000	0.000	0.000	0.000
EQ. 3	-5.750	0.000	1.000	0.000	0.000	0.000	0.000
EQ. 4	-777.520	-35.887	239.938	1.000	7.380	0.000	-27.625
EQ. 5	0.000	-6.419	.286	0.000	1.000	0.000	0.000
EQ. 6	0.000	0.000	0.000	0.000	0.000	1.000	0.000

EQ. 7	0.000	0.000	0.000	-3.939	-6.629	-.086	1.000

GAMMA

	KSI 1	KSI 2
EQ. 1	.025	-.023
EQ. 2	-.221	.363
EQ. 3	-.090	.119
EQ. 4	-6.442	14.629
EQ. 5	0.000	0.000
EQ. 6	0.000	.124
EQ. 7	-1.005	.284

PHI

	KSI 1	KSI 2
KSI 1	20.344	
KSI 2	75.898	384.420

PSI

	EQ. 1	EQ. 2	EQ. 3	EQ. 4	EQ. 5	EQ. 6	EQ. 7
1	0.000	.003	0.000	.500	.040	2.654	5.927

THETA EPS

	PRENATMO	PRENATF	ORIENT	MOTORPER	RANGSTAT	REGSTAT	AUTOREG	REFLEXES	WTINF	GESTAGE
1	.339	1.036	1.893	.450	.848	1.271	1.637	1.127	32.000	2.959

THETA EPS

	APGAR2	POSATT1	NEGATT1	POSATT2	NEGATT2	POSATT3	NEGATT3	ACTIVITY	MOOD	INTENSE
1	.366	9.780	7.007	6.838	8.546	4.959	6.807	2.372	2.118	2.651

THETA EPS

	THRESH	DISTRACT	RHYTHM	APPROCH	ADAPT	RATIO	ADULTS	QUIETPL	TOYS1	HELDHR2
1	3.895	4.448	1.947	.972	1.546	16.805	.773	.042	35.084	3.760

THETA EPS

	TALK3HR2	NOYOCR	FUSSRAT	LOOK4R2	FEDCRR2
1	2.341	1.697	1.853	.493	2.349

THETA DELTA

	AGEMO	FAMOCCUP	EDMO	FAMINC
1	0.000	423.386	2.875	84.256

LY OF GROUP 1 WAS WRITTEN ON FILE PUNCH

LX OF GROUP 1 WAS WRITTEN ON FILE PUNCH

BE OF GROUP 1 WAS WRITTEN ON FILE PUNCH

GA OF GROUP 1 WAS WRITTEN ON FILE PUNCH

PH OF GROUP 1 WAS WRITTEN ON FILE PUNCH

PS OF GROUP 1 WAS WRITTEN ON FILE PUNCH

TE of Group 1 was written on file punch.

TD of Group 1 was written on file punch.

AN EVALUATION OF THE IMPACT OF MATERNAL AGE ON CHILD DEVELOPMENT

LISREL ESTIMATES

SERIOUS PROBLEMS WERE ENCOUNTERED DURING MINIMAZATION

EITHER THE MODEL IS INCONSISTENT WITH THE DATA

OR THE ARITHMETIC PRECISION WAS INSUFFICIENT

LAMBDA Y

	ETA 1	ETA 2	ETA 3	ETA 4	ETA 5	ETA 6	ETA 7
PRENATMO	1.000	0.000	0.000	0.000	0.000	0.000	0.000
PRENATF	1.528	0.000	0.000	0.000	0.000	0.000	0.000
ORIENT	0.000	1.000	0.000	0.000	0.000	0.000	0.000
MOTORPER	0.000	8.363	0.000	0.000	0.000	0.000	0.000
RANGSTAT	0.000	-12.208	0.000	0.000	0.000	0.000	0.000
REGSTAT	0.000	36.549	0.000	0.000	0.000	0.000	0.000
AUTOREG	0.000	23.784	0.000	0.000	0.000	0.000	0.000
REFLEXES	0.000	-27.214	0.000	0.000	0.000	0.000	0.000
WTINF	0.000	0.000	1.000	0.000	0.000	0.000	0.000
GESTAGE	0.000	0.000	1.339	0.000	0.000	0.000	0.000
APGAR2	0.000	0.000	-1.067	0.000	0.000	0.000	0.000
POSATT1	0.000	0.000	0.000	1.000	0.000	0.000	0.000
NEGATT1	0.000	0.000	0.000	-.494	0.000	0.000	0.000
POSATT2	0.000	0.000	0.000	2.293	0.000	0.000	0.000
NEGATT2	0.000	0.000	0.000	-.506	0.000	0.000	0.000
POSATT3	0.000	0.000	0.000	2.430	0.000	0.000	0.000
NEGATT3	0.000	0.000	0.000	-.509	0.000	0.000	0.000
ACTIVTY	0.000	0.000	0.000	0.000	1.000	0.000	0.000
MOOD	0.000	0.000	0.000	0.000	2.854	0.000	0.000
INTENSE	0.000	0.000	0.000	0.000	-1.033	0.000	0.000
THRESH	0.000	0.000	0.000	0.000	3.051	0.000	0.000
DISTRACT	0.000	0.000	0.000	0.000	1.637	0.000	0.000
RHYTHM	0.000	0.000	0.000	0.000	3.979	0.000	0.000
APPROCH	0.000	0.000	0.000	0.000	3.338	0.000	0.000
ADAPT	0.000	0.000	0.000	0.000	6.073	0.000	0.000
RATIO	0.000	0.000	0.000	0.000	0.000	1.000	0.000
ADULTS	0.000	0.000	0.000	0.000	0.000	-.036	0.000
QUIETPL	0.000	0.000	0.000	0.000	0.000	-.069	0.000
TOYS1	0.000	0.000	0.000	0.000	0.000	.558	0.000
HELDMR2	0.000	0.000	0.000	0.000	0.000	0.000	1.000
TALK3MR2	0.000	0.000	0.000	0.000	0.000	0.000	10.702
NDVOCR	0.000	0.000	0.000	0.000	0.000	0.000	1.305
FUSSRAT	0.000	0.000	0.000	0.000	0.000	0.000	11.726
LOOK4R2	0.000	0.000	0.000	0.000	0.000	0.000	1.806
FEDCRR2	0.000	0.000	0.000	0.000	0.000	0.000	-1.217

LAMBDA X

	KSI 1	KSI 2
AGEMO	1.000	0.000
FAMOCCUP	0.000	1.000
EDMO	0.000	.104
FAMINC	0.000	.441

BETA

	ETA 1	ETA 2	ETA 3	ETA 4	ETA 5	ETA 6	ETA 7
EQ. 1	1.000	0.000	0.000	0.000	0.000	0.000	0.000
EQ. 2	-19.888	1.000	5.092	0.000	0.000	0.000	0.000
EQ. 3	-5.310	0.000	1.000	0.000	0.000	0.000	0.000
EQ. 4	-1113.939	26.381	333.135	1.000	2.926	0.000	-27.294
EQ. 5	0.000	-5.484	.254	0.000	1.000	0.000	0.000
EQ. 6	0.000	0.000	0.000	0.000	0.000	1.000	0.000
EQ. 7	0.000	0.000	0.000	-.587	.033	.400	1.000

GAMMA

	KSI 1	KSI 2
EQ. 1	.029	-.024
EQ. 2	-.287	.408
EQ. 3	-.097	.114
EQ. 4	-12.841	21.852
EQ. 5	0.000	0.000
EQ. 6	0.000	.130
EQ. 7	-.316	.151

PHI

	KSI 1	KSI 2
KSI 1	20.344	
KSI 2	74.873	383.467

PSI

	EQ. 1	EQ. 2	EQ. 3	EQ. 4	EQ. 5	EQ. 6	EQ. 7
1	-.000	-.002	.000	14.086	.048	2.420	.620

THETA EPS

	PREMATPO	PREMATF	ORIENT	MGTORPER	RANGSTAT	REGSTAT	AUTOREG	REFLEXES	WTINF	GESTAGE
1	.326	1.084	1.878	.459	.885	1.117	1.665	1.102	32.591	2.973

THETA EPS

	APGAR2	POSAIT1	NEGAIT1	POSAIT2	NEGAIT2	POSAIT3	NEGAIT3	ACTIVTY	MOOD	INTENSE
1	.419	10.301	7.101	9.188	8.602	8.430	6.870	2.371	2.154	2.640

THETA EPS

	THRESH	DISTRACT	RHYTHM	APPROCH	ADAPT	RATIO	ADULTS	QUIETPL	TOYS1	HELDMR2
1	3.877	4.418	1.955	.985	1.611	16.670	.769	.047	35.344	3.738

THETA EPS

	TALK3MR2	MOVOCR	FUSSRAT	LOOK4R2	FEDCRR2
1	2.304	1.691	1.983	.478	2.365

THETA DELTA

	AGEMO	FAMOCCUP	EDMO	FAMINC
1	0.000	425.298	3.367	89.525

TEST OF GOODNESS OF FIT

CHI SQUARE WITH 679 DEGREES OF FREEDOM IS 1140.4103

Probability Level = .0000

The 60:th free parameter may not be identified

Standard errors and t-values can not be computed

STANDARD ERRORS (These values were taken from an approximate solution, not the one presented above.)

LAMBDA Y

	ETA 1	ETA 2	ETA 3	ETA 4	ETA 5	ETA 6	ETA 7
PRENATMO	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PRENATF	.408	0.000	0.000	0.000	0.000	0.000	0.000
ORIENT	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MOTORPER	0.000	515.975	0.000	0.000	0.000	0.000	0.000
RANGSTAT	0.000	851.734	0.000	0.000	0.000	0.000	0.000
REGSTAT	0.000	2493.683	0.000	0.000	0.000	0.000	0.000
AUTOREG	0.000	1625.900	0.000	0.000	0.000	0.000	0.000
REFLEXES	0.000	1811.687	0.000	0.000	0.000	0.000	0.000
WTINF	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GESTAGE	0.000	0.000	.590	0.000	0.000	0.000	0.000
APGAR2	0.000	0.000	.501	0.000	0.000	0.000	0.000
POSATT1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NEGATT1	0.000	0.000	0.000	.169	0.000	0.000	0.000
POSATT2	0.000	0.000	0.000	.407	0.000	0.000	0.000
NEGATT2	0.000	0.000	0.000	.184	0.000	0.000	0.000
POSATT3	0.000	0.000	0.000	.413	0.000	0.000	0.000
NEGATT3	0.000	0.000	0.000	.168	0.000	0.000	0.000
ACTIVTY	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MOOD	0.000	0.000	0.000	0.000	2.318	0.000	0.000
INTENSE	0.000	0.000	0.000	0.000	1.235	0.000	0.000
THRESH	0.000	0.000	0.000	0.000	2.561	0.000	0.000
DISTRACT	0.000	0.000	0.000	0.000	1.875	0.000	0.000
RHYTHM	0.000	0.000	0.000	0.000	3.162	0.000	0.000
APPROCH	0.000	0.000	0.000	0.000	2.552	0.000	0.000
ADAPT	0.000	0.000	0.000	0.000	4.926	0.000	0.000
RATIO	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ADULTS	0.000	0.000	0.000	0.000	0.000	.040	0.000
QUIETPL	0.000	0.000	0.000	0.000	0.000	.016	0.000
TOYS1	0.000	0.000	0.000	0.000	0.000	.293	0.000
HELDMR2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TALK3MR2	0.000	0.000	0.000	0.000	0.000	0.000	220.419
NOVOCK	0.000	0.000	0.000	0.000	0.000	0.000	26.161
FUSSRAT	0.000	0.000	0.000	0.000	0.000	0.000	237.815
LOOK4R2	0.000	0.000	0.000	0.000	0.000	0.000	36.364
FEDCRR2	0.000	0.000	0.000	0.000	0.000	0.000	17.391

LAMBDA X

	KSI 1	KSI 2
AGEMO	0.000	0.000
FAMOCCUP	0.000	0.000
EDMO	0.000	.021
FAMINC	0.000	.084

BETA

	ETA 1	ETA 2	ETA 3	ETA 4	ETA 5	ETA 6	ETA 7
EQ. 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
EQ. 2	7069.441	0.000	2054.074	0.000	0.000	0.000	0.000
EQ. 3	529.987	0.000	0.000	0.000	0.000	0.000	0.000
EQ. 4	4674356.085	323656.130	1379750.219	0.000	5.041	0.000	575.436
EQ. 5	0.000	393.271	.085	0.000	0.000	0.000	0.000
EQ. 6	0.000	0.000	0.000	0.000	0.000	0.000	0.000
EQ. 7	0.000	0.000	0.000	15.374	19.720	11.259	0.000

GAMMA

	KSI 1	KSI 2
EQ. 1	.044	.013
EQ. 2	101.071	146.309
EQ. 3	22.547	15.026
EQ. 4	65065.961	97667.165
EQ. 5	0.000	[illegible]
EQ. 6	0.000	.037
EQ. 7	6.441	3.117

PHI

	KSI 1	KSI 2
KSI 1	0.000	
KSI 2	[illegible]	[illegible]

PSI

1	EQ. 1 .042	EQ. 2 .163	EQ. 3 .224	EQ. 4 719.076	EQ. 5 .109	EQ. 6 1.754	EQ. 7 107.579			

THETA EPS

1	PERWAIMO .061	PREWAIT .203	ORIENT .338	MOTORPLR .083	REACSTAT .150	NEGSTAT .222	AUTOREG .305	REFLEXES .209	STYLE 5.962	GESTAGE .545

THETA EPS

1	AFFABL .050	POSATT1 1.881	NEGATT1 1.289	POSATT2 2.781	NEGATT2 1.568	POSATT3 2.183	NEGATT3 1.253	ACTIVITY .433	MOOD .414	INTENSE .483

THETA EPS

1	THRESH .741	DISTRACT .816	RHYTHM .421	APPROCH .222	ADAPT .513	RATIO 3.853	ADULTS .142	QUIETPL .011	TOYS1 6.502	HELDMP2 .681

THETA EPS

1	TALKAMP2 .569	NOVICE .308	FUSSEAT .535	LOOKAMP .086	FEDCRE .428

THETA DELTA

1	AGEMO 0.000	FAMOCCUP 84.540	EDMO .659	FAMINC 16.270

AN EVALUATION OF THE IMPACT OF MATERNAL AGE ON CHILD DEVELOPMENT

SIGMA, RESIDUALS, ETC.

SIGMA

	PRENATMO	PRENATF	ORIENT	MOTORPER	RANGSTAT	REGSTAT	AUTOREG	REFLEXES	WTINF	GESTAGE
PRENATMO	.458									
PRENATF	.202	1.313								
ORIENT	-.003	-.005	1.878							
MOTORPER	-.025	-.038	.001	.469						
RANGSTAT	.037	.056	-.002	-.014	.904					
REGSTAT	-.110	-.168	.005	.041	-.059	1.295				
AUTOREG	-.071	-.109	.003	.026	-.039	.115	1.740			
REFLEXES	.082	.125	-.004	-.030	.044	-.132	-.086	1.200		
WTINF	.025	.038	.000	.003	-.004	.012	.008	-.009	32.611	
GESTAGE	.033	.051	.000	.004	-.005	.016	.011	-.012	.027	3.009
APGAR2	-.027	-.041	-.000	-.003	.004	-.013	-.009	.010	-.022	-.029
POSATT1	.452	.691	-.016	-.132	.192	-.576	-.375	.429	.221	.296
NEGATT1	-.223	-.341	.008	.065	-.095	.284	.185	-.212	-.109	-.146
POSATT2	1.037	1.584	-.036	-.302	.441	-1.321	-.859	.983	.506	.678
NEGATT2	-.229	-.350	.008	.067	-.097	.291	.190	-.217	-.112	-.150
POSATT3	1.098	1.679	-.038	-.320	.467	-1.399	-.911	1.042	.536	.718
NEGATT3	-.230	-.352	.008	.067	-.098	.293	.191	-.218	-.112	-.151
ACTIVTY	-.023	-.035	.001	.005	-.008	.023	.015	-.017	-.003	-.004
MOOD	-.065	-.100	.002	.015	-.022	.067	.044	-.050	-.009	-.013
INTENSE	.024	.036	-.001	-.006	.008	-.024	-.016	.018	.003	.005
THRESH	-.070	-.106	.002	.016	-.024	.072	.047	-.053	-.010	-.013
DISTRACT	-.042	-.064	.001	.010	-.014	.043	.028	-.032	-.006	-.008
RHYTHM	-.091	-.139	.003	.021	-.031	.093	.061	-.070	-.013	-.018
APPROCH	-.076	-.117	.002	.018	-.026	.078	.051	-.058	-.011	-.015
ADAPT	-.139	-.212	.004	.033	-.048	.143	.093	-.106	-.020	-.027
RATIO	-.910	-1.390	.023	.188	-.275	.823	.536	-.613	-.110	-.148
ADULTS	.033	.050	-.001	-.007	.010	-.030	-.019	.022	.004	.005
QUIETPL	.062	.095	-.002	-.013	.019	-.056	-.037	.042	.008	.010
TOYS1	-.507	-.775	.013	.105	-.153	.459	.299	-.342	-.061	-.082
HELDMR2	-.047	-.072	-.000	-.002	.003	-.008	-.005	.006	-.008	-.011
TALK3MR2	-.501	-.766	-.002	-.019	.027	-.082	-.053	.061	-.084	-.113
NDVOCR	-.061	-.093	-.000	-.002	.003	-.010	-.007	.007	-.010	-.014
FUSSRAT	-.549	-.839	-.002	-.021	.030	-.090	-.059	.067	-.092	-.124
LOOK4R2	-.085	-.129	-.000	-.003	.005	-.014	-.009	.010	-.014	-.019
FEDCRR2	.057	.087	.000	.002	-.003	.009	.006	-.007	.010	.013
AGEMO	-1.196	-1.828	.025	.213	-.311	.931	.606	-.693	.170	.228
FAMOCCUP	-6.986	-10.677	.173	1.447	-2.112	6.324	4.115	-4.708	-.847	-1.134
EDMO	-.726	-1.110	.018	.150	-.220	.657	.428	-.489	-.088	-.118
FAMINC	-3.078	-4.704	.076	.637	-.931	2.786	1.813	-2.074	-.373	-.500

SIGMA

	APGAR2	POSATT1	NEGATT1	POSATT2	NEGATT2	POSATT3	NEGATT3	ACTIVTY	MOOD	INTENSE
APGAR2	.442									
POSATT1	-.225	16.363								
NEGATT1	.116	-2.994	8.581							
POSATT2	-.540	13.902	-6.867	41.070						
NEGATT2	.119	-3.068	1.516	-7.036	10.155					
POSATT3	-.572	14.731	-7.277	33.784	-7.456	44.230				
NEGATT3	.120	-3.088	1.525	-7.081	1.563	-7.504	8.443			
ACTIVTY	.004	-.130	.064	-.299	.066	-.317	.066	2.423		
MOOD	.010	-.372	.184	-.853	.188	-.904	.189	.149	2.579	
INTENSE	-.004	.135	-.067	.309	-.068	.327	-.069	-.054	-.154	2.696

THRESH	.011	-.398	.196	-.912	.201	-.966	.203	.159	.454	-.164
DISTRACT	.006	-.239	.118	-.549	.121	-.582	.122	.096	.273	-.099
RHYTHM	.014	-.519	.256	-1.189	.262	-1.260	.264	.207	.592	-.214
APPROCH	.012	-.435	.215	-.998	.220	-1.058	.222	.174	.497	-.180
ADAPT	.021	-.792	.391	-1.816	.401	-1.924	.403	.317	.904	-.327
RATIO	.118	-.830	.410	-1.903	.420	-2.016	.423	.152	.433	-.157
ADULTS	-.004	.030	-.015	.069	-.015	.073	-.015	-.005	-.016	.006
QUIETPL	-.008	.057	-.028	.130	-.029	.138	-.029	-.010	-.030	.011
TOYS1	.066	-.463	.229	-1.061	.234	-1.124	.236	.085	.241	-.087
HELDMR2	.008	.017	-.008	.038	-.008	.040	-.008	.006	.018	-.007
TALK3MR2	.050	.178	-.088	.409	-.090	.433	-.091	.069	.196	-.071
NDVOCR	.011	.022	-.011	.050	-.011	.053	-.011	.008	.024	-.009
FUSSRAT	.099	.195	-.096	.448	-.099	.475	-.100	.075	.215	-.078
LOOK4R2	.015	.030	-.015	.069	-.015	.073	-.015	.012	.033	-.012
FEDCRR2	-.010	-.020	.010	-.046	.010	-.049	.010	-.008	-.022	.008
AGEMO	-.182	-.780	.385	-1.788	.395	-1.895	.397	.096	.275	-.100
FAMOCCUP	.904	-19.871	9.816	-45.572	10.057	-48.291	10.122	1.164	3.322	-1.203
EDMO	.094	-2.066	1.020	-4.738	1.046	-5.020	1.052	.121	.345	-.125
FAMINC	.398	-8.754	4.324	-20.077	4.431	-21.275	4.459	.513	1.464	-.530

SIGMA

	THRESH	DISTRACT	RHYTHM	APPROCH	ADAPT	RATIO	ADULTS	QUIETPL	TOYS1	HELDMR2
THRESH	4.362									
DISTRACT	.292	4.594								
RHYTHM	.633	.381	2.780							
APPROCH	.531	.320	.693	1.566						
ADAPT	.966	.582	1.260	1.057	3.534					
RATIO	.462	.279	.603	.506	.921	25.593				
ADULTS	-.017	-.010	-.022	-.018	-.033	-.322	.780			
QUIETPL	-.032	-.019	-.041	-.035	-.063	-.612	.022	.089		
TOYS1	.258	.155	.336	.282	.513	4.975	-.180	-.341	38.118	
HELDMR2	.020	.012	.026	.021	.039	.397	-.014	-.027	.221	3.771
TALK3MR2	.210	.126	.273	.229	.417	4.251	-.153	-.291	2.370	.350
NDVOCR	.026	.015	.033	.028	.051	.518	-.019	-.036	.289	.043
FUSSRAT	.230	.138	.299	.251	.457	4.658	-.168	-.319	2.597	.383
LOOK4R2	.035	.021	.046	.039	.070	.717	-.026	-.049	.400	.059
FEDCRR2	-.024	-.014	-.031	-.026	-.047	-.483	.017	.033	-.269	-.040
AGEMO	.294	.177	.383	.322	.585	9.750	-.352	-.668	5.436	.515
FAMOCCUP	3.551	2.139	4.632	3.887	7.070	49.936	-1.803	-3.422	27.840	2.556
EDMO	.369	.222	.482	.404	.735	5.191	-.187	-.356	2.894	.266
FAMINC	1.565	.942	2.041	1.712	3.115	22.000	-.794	-1.508	12.265	1.126

SIGMA

	TALK3MR2	NDVOCR	FUSSRAT	LOOK4R2	FEDCRR2	AGEMO	FAMOCCUP	EDMO	FAMINC
TALK3MR2	6.045								
NDVOCR	.456	1.746							
FUSSRAT	4.099	.500	6.475						
LOOK4R2	.631	.077	.692	.584					
FEDCRR2	-.425	-.052	-.466	-.072	2.414				
AGEMO	5.508	.671	6.036	.930	-.626	20.344			
FAMOCCUP	27.349	3.334	29.968	4.615	-3.110	74.073	808.765		
EDMO	2.843	.347	3.115	.480	-.323	7.784	39.864	7.512	
FAMINC	12.049	1.469	13.202	2.033	-1.370	32.986	168.938	17.562	163.952

RESIDUALS : S - SIGMA

	PRENATMO	PRENATF	ORIENT	MOTORPER	RANGSTAT	REGSTAT	AUTOREG	REFLEXES	WTINF	GESTAGE
PRENATMO	.013									
PRENATF	-.094	-.010								

ORIENT	.089	-.043	-.008							
MOTORPER	-.021	.085	.293	-.006						
RANGSTAT	.000	-.088	-.060	.028	-.035					
REGSTAT	-.111	.005	.134	.107	.113	.067				
AUTOREG	-.044	-.397	.342	-.127	.226	-.255	-.071			
REFLEXES	-.115	-.043	.086	.053	-.063	-.097	.069	-.053		
WTINF	-.551	-.274	.570	.695	.992	-.828	.655	-.468	.436	
GESTAGE	-.240	-.162	.424	.195	.479	-.007	.375	.242	5.069	-.012
APGAR2	-.060	.067	-.098	.092	-.054	.216	.026	-.288	.218	.200
POSATT1	.036	.058	.604	.220	-.067	.226	.567	-.311	2.846	1.859
NEGATT1	-.278	.162	-1.211	-.142	-.018	-.571	-.049	.040	-.372	-.386
POSATT2	.054	1.328	.808	.631	.087	.599	-.346	-1.167	4.956	1.559
NEGATT2	-.476	.435	-.798	.357	-.199	-.150	-.327	.401	-2.036	-.806
POSATT3	-.335	.669	1.244	1.103	-.032	1.054	.296	-1.093	2.328	1.235
NEGATT3	-.034	.470	-.710	.212	-.172	-.183	.122	.038	-1.924	-.746
ACTIVTY	-.070	-.243	-.494	.011	.348	-.377	.162	.089	.798	.126
MOOD	.087	-.157	-.140	-.035	-.173	.125	.012	-.214	.874	-.090
INTENSE	.090	.182	-.050	.063	-.235	-.481	-.117	.002	-.498	-.415
THRESH	.043	-.447	.056	.147	-.254	.286	-.167	-.631	-.763	-.513
DISTRACT	-.379	-.687	-.304	.190	.221	.068	.457	-.228	2.715	.757
RHYTHM	-.163	-.441	.014	-.062	-.018	.073	.352	-.278	1.313	-.547
APPROCH	.020	-.225	-.327	.055	.050	.271	.079	.174	1.206	-.195
ADAPT	.205	-.584	-.560	-.082	-.018	.213	-.236	-.154	1.402	-.527
RATIO	-.049	-.270	1.189	.687	.052	.355	-.361	-.002	3.238	-.061
ADULTS	-.029	-.067	.213	.039	-.054	-.163	.117	.142	.166	.232
QUIETPL	-.002	.018	-.018	-.055	-.032	-.032	.005	-.058	-.134	.012
TOYS1	-.311	-.551	-.597	.228	.308	-1.071	.343	.866	2.082	1.413
HELDMR2	.297	-.057	-.005	-.012	-.040	-.395	-.001	-.209	3.077	.244
TALK3MR2	.174	.366	-.023	.116	.277	.270	.182	-.072	2.136	.012
NDVOCR	-.174	.353	-.039	.041	-.073	.188	.067	-.096	1.280	.135
FUSSRAT	.300	.701	.450	.559	.074	-.218	.013	.381	3.403	1.071
LOOK4R2	-.005	.038	-.148	.022	-.103	.037	.054	-.042	.123	.039
FEDCRR2	-.006	-.408	.050	-.055	.208	.047	-.245	.066	1.298	.347
AGEMO	-.106	.213	.085	.876	.894	-.100	.700	.562	5.682	1.530
FAMOCCUP	.318	1.902	-4.208	1.116	2.453	2.052	2.375	.053	28.612	8.028
EDMO	-.078	.234	.351	.399	.366	.058	.725	.457	3.344	1.509
FAMINC	-.766	.671	-.587	.717	1.373	1.614	-.738	1.097	12.968	3.849

RESIDUALS : S - SIGMA

	APGAR2	POSATT1	NEGATT1	POSATT2	NEGATT2	POSATT3	NEGATT3	ACTIVTY	MOOD	INTENSE
APGAR2	-.046									
POSATT1	.505	-.717								
NEGATT1	-.078	1.282	-.360							
POSATT2	.979	-.398	1.818	-8.192						
NEGATT2	-.158	2.940	3.182	1.204	-.316					
POSATT3	.606	-1.782	1.072	-7.329	2.123	-12.199				
NEGATT3	.062	3.352	3.038	2.225	4.169	1.480	-.409			
ACTIVTY	.016	-.783	.509	-.636	.731	-.536	-.426	.028		
MOOD	.262	-.948	-.972	.672	-1.888	-.051	-1.014	-.095	.028	
INTENSE	.087	.255	-.087	1.605	-.063	.182	.043	.921	.113	.020
THRESH	.025	.076	-.053	-2.044	.595	-1.391	1.417	-.940	.126	-.028
DISTRACT	.156	-1.345	1.114	-1.953	1.071	-1.788	.520	.952	-.473	.236
RHYTHM	.080	.311	.134	-1.194	.773	-.933	.075	.011	.126	.324
APPROCH	.120	-.248	-.411	-.638	-.142	.227	-.215	.317	.109	-.108
ADAPT	.025	-.396	-.014	-.030	-.057	.667	-.033	.224	.095	-.177
RATIO	-.182	-1.793	-3.027	-3.773	.523	-4.577	-.080	-.120	.748	-1.577
ADULTS	-.131	-.379	-.023	-.985	-.023	.012	-.216	.280	.162	.112
QUIETPL	.003	-.195	-.034	.053	-.127	.027	-.099	.043	.019	.025
TOYS1	-1.326	2.686	1.405	-2.377	2.343	1.554	1.209	2.006	-.852	.715
HELDMR2	.221	.495	-.351	1.366	-1.071	-.108	.460	-.321	.006	.655

TALK3MR2	.064	1.765	-1.475	1.931	-.456	2.297	-1.134	.371	.264	.138
NDVOCR	.017	-.264	-.640	.443	.120	.279	-.084	-.279	.039	.053
FUSSRAT	-.170	1.004	-.595	1.884	-.038	2.443	-.174	.081	-.058	-.111
LOOK4R2	.096	.064	.292	-.516	.461	-.128	.160	.027	.205	.050
FEDCRR2	-.034	-1.013	-.158	-1.770	-.264	-1.884	-.305	.421	-.011	-.070
AGEMO	.331	1.707	-1.054	-1.196	1.913	1.587	.121	.557	.037	-1.226
FAMOCCUP	4.625	22.845	-8.252	14.616	4.059	24.356	2.677	7.509	-4.420	-3.071
EDMO	.159	3.930	-.952	3.912	.024	4.967	-.300	.243	-.378	-.552
FAMINC	.936	1.555	-5.810	3.191	1.642	4.377	-5.129	3.186	2.194	-1.560

RESIDUALS : S - SIGMA

	THRESH	DISTRACT	RHYTHM	APPROCH	ADAPT	RATIO	ADULTS	QUIETPL	TOYS1	HELDMR2
THRESH	.124									
DISTRACT	.208	.027								
RHYTHM	.741	.109	.122							
APPROCH	-.209	-.183	-.209	.049						
ADAPT	-.119	.084	.180	.325	.186					
RATIO	2.254	-.236	1.181	.505	.008	-.218				
ADULTS	-.277	-.002	-.154	.120	.293	-.238	-.003			
QUIETPL	-.091	-.062	-.051	-.020	.060	-.023	.024	-.008		
TOYS1	.884	1.860	-.161	-.654	-.179	-4.586	1.594	-.155	-.004	
HELDMR2	.224	-.293	-.012	.039	-.328	-.923	-.488	.006	-3.167	-.000
TALK3MR2	-.242	-.056	.172	-.088	-.372	-2.703	.050	.095	-.405	.475
NDVOCR	.031	.160	-.040	-.035	-.588	-.114	.187	.003	1.384	-.502
FUSSRAT	.166	-.768	.130	-.022	-.182	-3.023	.260	.131	.861	.033
LOOK4R2	.082	-.056	.214	.292	.262	-1.006	.090	-.007	.101	.126
FEDCRR2	.043	.249	-.385	.097	-.287	1.637	-.214	-.010	-.016	1.539
AGEMO	1.270	-.037	.166	.277	-.609	-.777	.212	-.038	1.091	-.601
FAMOCCUP	.131	6.661	5.165	1.744	6.121	-5.074	-1.256	.899	-11.487	-2.293
EDMO	1.153	.935	.528	.026	-.717	.375	-.113	-.030	1.439	-.973
FAMINC	.266	-1.219	1.821	-.041	.962	6.839	.403	.567	1.313	-2.365

RESIDUALS : S - SIGMA

	TALK3MR2	NDVOCR	FUSSRAT	LOOK4R2	FEDCRR2	AGEMO	FAMOCCUP	EDMO	FAMINC
TALK3MR2	-1.772								
NDVOCR	.169	-.020							
FUSSRAT	-2.141	-.332	-2.315						
LOOK4R2	-.054	-.012	-.407	-.041					
FEDCRR2	.603	-.247	-.009	.087	-.032				
AGEMO	-2.721	-.031	-2.546	-.316	1.477	-.000			
FAMOCCUP	-14.698	-3.595	-17.569	-3.080	1.456	-.517	-3.559		
EDMO	-1.443	-.207	-.875	-.282	.099	1.300	6.588	.039	
FAMINC	-1.035	1.068	-3.012	.299	1.461	-3.086	57.322	-1.608	.207

ESTIMATED COVARIANCE MATRICES

ETA - ETA (= C)

	ETA 1	ETA 2	ETA 3	ETA 4	ETA 5	ETA 6	ETA 7
ETA 1	.132						
ETA 2	-.003	.000					
ETA 3	.025	.000	.020				
ETA 4	.452	-.016	.221	6.062			
ETA 5	-.023	.001	-.003	-.130	.052		
ETA 6	-.910	.023	-.110	-.830	.152	8.923	
ETA 7	-.047	-.000	-.008	.017	.006	.397	.033

ETA - KSI

	KSI 1	KSI 2
ETA 1	-1.196	-6.986
ETA 2	.025	.173
ETA 3	.178	-.847
ETA 4	-.780	-19.871
ETA 5	.096	1.164
ETA 6	9.750	49.936
ETA 7	.515	2.556

Y - ETA

	ETA 1	ETA 2	ETA 3	ETA 4	ETA 5	ETA 6	ETA 7
PRENATMO	.132	-.003	.025	.452	-.023	-.910	-.047
PRENATF	.202	-.005	.038	.691	-.035	-1.390	-.072
ORIENT	-.003	.000	.000	-.016	.001	.023	-.000
MOTORPER	-.025	.001	.003	-.132	.005	.188	-.002
RANGSTAT	.037	-.002	-.004	.192	-.008	-.275	.003
REGSTAT	-.110	.005	.012	-.576	.023	.823	-.008
AUTOREG	-.071	.003	.008	-.375	.015	.536	-.005
REFLEXES	.082	-.004	-.009	.429	-.017	-.613	.006
WTINF	.025	.000	.020	.221	-.003	-.110	-.008
GESTAGE	.033	.000	.027	.296	-.004	-.148	-.011
APGAR2	-.027	-.000	-.022	-.235	.004	.118	.008
POSATT1	.452	-.016	.221	6.062	-.130	-.830	.017
NEGATT1	-.223	.008	-.109	-2.994	.064	.410	-.008
POSATT2	1.037	-.036	.506	13.902	-.299	-1.903	.038
NEGATT2	-.229	.008	-.112	-3.068	.066	.420	-.008
POSATT3	1.098	-.038	.536	14.731	-.317	-2.016	.040
NEGATT3	-.230	.008	-.112	-3.088	.066	.423	-.008
ACTIVTY	-.023	.001	-.003	-.130	.052	.152	.006
MOOD	-.065	.002	-.009	-.372	.149	.433	.018
INTENSE	.024	-.001	.003	.135	-.054	-.157	-.007
THRESH	-.070	.002	-.010	-.398	.159	.462	.020
DISTRACT	-.042	.001	-.006	-.239	.096	.279	.012
RHYTHM	-.091	.003	-.013	-.519	.207	.603	.026
APPROCH	-.076	.002	-.011	-.435	.174	.506	.021
ADAPT	-.139	.004	-.020	-.792	.317	.921	.039
RATIO	-.910	.023	-.110	-.830	.152	8.923	.397
ADULTS	.033	-.001	.004	.030	-.005	-.322	-.014
QUIETPL	.062	-.002	.008	.057	-.010	-.612	-.027
TOYS1	-.507	.013	-.061	-.463	.085	4.975	.221
HELDMR2	-.047	-.000	-.008	.017	.006	.397	.033
TALK3MR2	-.501	-.002	-.084	.178	.069	4.251	.350
NDVOCR	-.061	-.000	-.010	.022	.008	.518	.043
FUSSRAT	-.549	-.002	-.092	.195	.075	4.658	.383
LOOK4R2	-.085	-.000	-.014	.030	.012	.717	.059
FEDCRR2	.057	.000	.010	-.020	-.008	-.483	-.040

Y - KSI

	KSI 1	KSI 2
PRENATMO	-1.196	-6.986
PRENATF	-1.828	-10.677
ORIENT	.025	.173
MOTORPER	.213	1.447
RANGSTAT	-.311	-2.112
REGSTAT	.931	6.324
AUTOREG	.606	4.115
REFLEXES	-.693	-4.708
WTINF	.170	-.847
GESTAGE	.228	-1.134

APGAR2	-.182	.904
POSATT1	-.780	-19.871
NEGATT1	.385	9.816
POSATT2	-1.788	-45.572
NEGATT2	.395	10.057
POSATT3	-1.895	-48.291
NEGATT3	.397	10.122
ACTIVTY	.096	1.164
MOOD	.275	3.322
INTENSE	-.100	-1.203
THRESH	.294	3.551
DISTRACT	.177	2.139
RHYTHM	.383	4.632
APPROCH	.322	3.887
ADAPT	.585	7.070
RATIO	9.750	49.936
ADULTS	-.352	-1.803
QUIETPL	-.668	-3.422
TOYS1	5.436	27.840
HELDMR2	.515	2.556
TALK3MR2	5.508	27.349
NOVOCR	.671	3.334
FUSSRAT	6.036	29.968
LOOK4R2	.930	4.615
FEDCRR2	-.626	-3.110

X - ETA

	ETA 1	ETA 2	ETA 3	ETA 4	ETA 5	ETA 6	ETA 7
AGEMO	-1.156	.025	.170	-.780	.096	9.750	.515
FAMOCCUP	-6.986	.173	-.847	-19.871	1.164	49.936	2.556
EDMO	-.726	.018	-.088	-2.066	.121	5.191	.266
FAMINC	-3.078	.076	-.373	-8.754	.513	22.000	1.126

X - KSI

	KSI 1	KSI 2
AGEMO	20.344	74.873
FAMOCCUP	74.873	383.467
EDMO	7.784	39.864
FAMINC	32.986	168.938

ESTIMATED REGRESSIONS

ETA ON KSI (= D)

	KSI 1	KSI 2
ETA 1	.029	-.024
ETA 2	-.001	.001
ETA 3	.059	-.014
ETA 4	.541	-.158
ETA 5	-.023	.008
ETA 6	0.000	.130
ETA 7	.003	.006

REGRESSION RESIDUAL COVARIANCES

	ETA 1	ETA 2	ETA 3	ETA 4	ETA 5	ETA 6	ETA 7
ETA 1	-.000						
ETA 2	.000	.000					

ETA 3	-.000	.001	-.001				
ETA 4	-.001	-.002	-.005	3.353			
ETA 5	.002	-.000	.007	.001	.046		
ETA 6	0.000	-.000	.000	1.758	-.009	2.420	
ETA 7	-.001	-.001	-.003	.141	-.001	.064	.016

Y ON KSI

	KSI 1	KSI 2
PRENATMO	.029	-.024
PRENATF	.045	-.037
ORIENT	-.001	.001
MOTORPER	-.012	.006
RANGSTAT	.018	-.009
REGSTAT	-.053	.027
AUTOREG	-.035	.017
REFLEXES	.040	-.020
WTINF	.059	-.014
GESTAGE	.079	-.018
APGAR2	-.063	.015
POSATT1	.541	-.158
NEGATT1	-.267	.078
POSATT2	1.242	-.361
NEGATT2	-.274	.080
POSATT3	1.316	-.383
NEGATT3	-.276	.080
ACTIVTY	-.023	.008
MOOD	-.065	.021
INTENSE	.024	-.008
THRESH	-.070	.023
DISTRACT	-.042	.014
RHYTHM	-.091	.030
APPROCH	-.076	.025
ADAPT	-.139	.046
RATIO	0.000	.130
ADULTS	0.000	-.005
QUIETPL	0.000	-.009
TOYS1	0.000	.073
HELDMR2	.003	.006
TALK3MR2	.029	.066
NDVOCR	.004	.008
FUSSRAT	.032	.072
LOOK4R2	.005	.011
FEDCRR2	-.003	-.007

REGRESSION RESIDUAL COVARIANCES

	PRENATMO	PRENATF	ORIENT	MOTORPER	RANGSTAT	REGSTAT	AUTOREG	REFLEXES	WTINF	GESTAGE
PRENATMO	.325									
PRENATF	-.000	1.004								
ORIENT	.000	.001	1.078							
MOTORPER	.003	.005	.000	.462						
RANGSTAT	-.005	-.007	-.001	-.004	.891					
REGSTAT	.014	.022	.002	.013	-.019	1.174				
AUTOREG	.009	.014	.001	.008	-.012	.037	1.689			
REFLEXES	-.011	-.016	-.001	-.010	.014	-.042	-.028	1.134		
WTINF	-.000	-.000	.001	.010	-.015	.044	.029	-.033	32.589	
GESTAGE	-.000	-.001	.002	.013	-.020	.059	.038	-.044	-.002	2.970
APGAR2	.000	.000	-.001	-.011	.016	-.047	-.031	.035	.001	.002
POSATT1	-.001	-.002	-.002	-.019	.028	-.084	-.054	.062	-.005	-.007
NEGATT1	.001	.001	.001	.009	-.014	.041	.027	-.031	.002	.003

POSATT2	-.003	-.004	-.005	-.044	.064	-.192	-.125	.143	-.011	-.015
NEGATT2	.001	.001	.001	.010	-.014	.042	.028	-.031	.003	.003
POSATT3	-.003	-.004	-.006	-.046	.068	-.203	-.132	.151	-.012	-.016
NEGATT3	.001	.001	.001	.010	-.014	.043	.028	-.032	.003	.003
ACTIVTY	.002	.003	-.000	-.001	.001	-.003	-.002	.002	.007	.009
MOOD	.006	.010	-.000	-.002	.003	-.008	-.005	.006	.020	.027
INTENSE	-.002	-.004	.000	.001	-.001	.003	.002	-.002	-.007	-.010
THRESH	.007	.010	-.000	-.002	.003	-.008	-.005	.006	.021	.028
DISTRACT	.004	.006	-.000	-.001	.002	-.005	-.003	.004	.013	.017
RHYTHM	.009	.014	-.000	-.002	.004	-.011	-.007	.008	.028	.037
APPROCH	.007	.011	-.000	-.002	.003	-.009	-.006	.007	.023	.031
ADAPT	.014	.021	-.000	-.004	.005	-.016	-.010	.012	.042	.057
RATIO	-.000	-.000	-.000	-.000	.000	-.000	-.000	.000	-.000	-.000
ADULTS	0.000	0.000	.000	.000	-.000	.000	.000	-.000	.000	.000
QUIETPL	0.000	.000	.000	.000	-.000	.000	.000	-.000	.000	.000
TOYS1	0.000	.000	-.000	-.000	.000	-.000	-.000	.000	-.000	-.000
HELDMR2	-.001	-.001	-.001	-.011	.016	-.049	-.032	.036	-.003	-.004
TALK3MR2	-.008	-.012	-.014	-.120	.175	-.524	-.341	.390	-.034	-.045
NDVOCR	-.001	-.001	-.002	-.015	.021	-.064	-.042	.048	-.004	-.006
FUSSRAT	-.009	-.013	-.016	-.131	.192	-.574	-.374	.428	-.037	-.050
LOOK4R2	-.001	-.002	-.002	-.020	.030	-.088	-.058	.066	-.006	-.008
FEDCRR2	.001	.001	.002	.014	-.020	.060	.039	-.044	.004	.005

REGRESSION RESIDUAL COVARIANCES

	APGAR2	POSATT1	NEGATT1	POSATT2	NEGATT2	POSATT3	NEGATT3	ACTIVTY	MOOD	INTENSE
APGAR2	.418									
POSATT1	.005	13.655								
NEGATT1	-.003	-1.656	7.920							
POSATT2	.012	7.691	-3.799	26.825						
NEGATT2	-.003	-1.697	.838	-3.892	9.461					
POSATT3	.013	8.149	-4.026	18.689	-4.125	28.235				
NEGATT3	-.003	-1.708	.844	-3.917	.865	-4.151	7.740			
ACTIVTY	-.007	.001	-.000	.002	-.000	.002	-.000	2.416		
MOOD	-.021	.003	-.001	.006	-.001	.006	-.001	.130	2.526	
INTENSE	.008	-.001	.000	-.002	.000	-.002	.000	-.047	-.134	2.689
THRESH	-.023	.003	-.001	.006	-.001	.007	-.001	.139	.397	-.144
DISTRACT	-.014	.002	-.001	.004	-.001	.004	-.001	.084	.239	-.087
RHYTHM	-.030	.004	-.002	.008	-.002	.009	-.002	.181	.518	-.188
APPROCH	-.025	.003	-.001	.007	-.001	.007	-.002	.152	.435	-.157
ADAPT	-.045	.005	-.003	.012	-.003	.013	-.003	.277	.790	-.286
RATIO	.000	1.758	-.868	4.032	-.890	4.272	-.895	-.000	-.000	.000
ADULTS	-.000	-.063	.031	-.146	.032	-.154	.032	.000	.000	-.000
QUIETPL	-.000	-.120	.060	-.276	.061	-.293	.061	.000	.000	-.000
TOYS1	.000	.980	-.484	2.248	-.496	2.382	-.499	-.000	-.000	.000
HELDMR2	.003	.141	-.069	.322	-.071	.342	-.072	-.001	-.003	.001
TALK3MR2	.036	1.504	-.743	3.450	-.761	3.656	-.766	-.011	-.030	.011
NDVOCR	.004	.183	-.091	.421	-.093	.446	-.093	-.001	-.004	.001
FUSSRAT	.039	1.648	-.814	3.781	-.834	4.006	-.840	-.012	-.033	.012
LOOK4R2	.006	.254	-.125	.582	-.128	.617	-.129	-.002	-.005	.002
FEDCRR2	-.004	-.171	.085	-.392	.087	-.416	.087	.001	.003	-.001

REGRESSION RESIDUAL COVARIANCES

	THRESH	DISTRACT	RHYTHM	APPROCH	ADAPT	RATIO	ADULTS	QUIETPL	TOYS1	HELDMR2
THRESH	4.302									
DISTRACT	.256	4.572								
RHYTHM	.554	.333	2.677							
APPROCH	.465	.280	.606	1.493						
ADAPT	.845	.509	1.102	.925	3.293					
RATIO	-.000	-.000	-.000	-.000	-.000	19.090				

ADULTS	.000	.000	.000	.000	.000	-.087	.772			
QUIETPL	.000	.000	.000	.000	.000	-.166	.006	.058		
TOYS1	-.000	-.000	-.000	-.000	-.000	1.349	-.049	-.092	36.097	
HELDMR2	-.003	-.002	-.004	-.003	-.006	.064	-.002	-.004	.036	3.753
TALK3MR2	-.032	-.019	-.042	-.035	-.064	.689	-.025	-.047	.384	.167
NDVOCR	-.004	-.002	-.005	-.004	-.008	.084	-.003	-.006	.047	.020
FUSSRAT	-.035	-.021	-.046	-.038	-.070	.755	-.027	-.052	.421	.183
LOOK4R2	-.005	-.003	-.007	-.006	-.011	.116	-.004	-.008	.065	.028
FEDCRR2	.004	.002	.005	.004	.007	-.078	.003	.005	-.044	-.019

REGRESSION RESIDUAL COVARIANCES

	TALK3MR2	NDVOCR	FUSSRAT	LOOK4R2	FEDCRR2
TALK3MR2	4.089				
NDVOCR	.218	1.717			
FUSSRAT	1.956	.238	4.127		
LOOK4R2	.301	.037	.330	.528	
FEDCRR2	-.203	-.025	-.222	-.034	2.388

AN EVALUATION OF THE IMPACT OF MATERNAL AGE ON CHILD DEVELOPMENT

STANDARDIZED SOLUTION

LAMBDA Y

	ETA 1	ETA 2	ETA 3	ETA 4	ETA 5	ETA 6	ETA 7
PRENATMO	.364	0.000	0.000	0.000	0.000	0.000	0.000
PRENATF	.556	0.000	0.000	0.000	0.000	0.000	0.000
ORIENT	0.000	.012	0.000	0.000	0.000	0.000	0.000
MOTORPER	0.000	.096	0.000	0.000	0.000	0.000	0.000
RANGSTAT	0.000	-.141	0.000	0.000	0.000	0.000	0.000
REGSTAT	0.000	.421	0.000	0.000	0.000	0.000	0.000
AUTOREG	0.000	.274	0.000	0.000	0.000	0.000	0.000
REFLEXES	0.000	-.314	0.000	0.000	0.000	0.000	0.000
WTINF	0.000	0.000	.142	0.000	0.000	0.000	0.000
GESTAGE	0.000	0.000	.190	0.000	0.000	0.000	0.000
APGAR2	0.000	0.000	-.152	0.000	0.000	0.000	0.000
POSATT1	0.000	0.000	0.000	2.462	0.000	0.000	0.000
NEGATT1	0.000	0.000	0.000	-1.216	0.000	0.000	0.000
POSATT2	0.000	0.000	0.000	5.646	0.000	0.000	0.000
NEGATT2	0.000	0.000	0.000	-1.246	0.000	0.000	0.000
POSATT3	0.000	0.000	0.000	5.983	0.000	0.000	0.000
NEGATT3	0.000	0.000	0.000	-1.254	0.000	0.000	0.000
ACTIVTY	0.000	0.000	0.000	0.000	.228	0.000	0.000
MOOD	0.000	0.000	0.000	0.000	.652	0.000	0.000
INTENSE	0.000	0.000	0.000	0.000	-.236	0.000	0.000
THRESH	0.000	0.000	0.000	0.000	.697	0.000	0.000
DISTRACT	0.000	0.000	0.000	0.000	.420	0.000	0.000
RHYTHM	0.000	0.000	0.000	0.000	.908	0.000	0.000
APPROCH	0.000	0.000	0.000	0.000	.762	0.000	0.000
ADAPT	0.000	0.000	0.000	0.000	1.387	0.000	0.000
RATIO	0.000	0.000	0.000	0.000	0.000	2.987	0.000
ADULTS	0.000	0.000	0.000	0.000	0.000	-.108	0.000
QUIETPL	0.000	0.000	0.000	0.000	0.000	-.205	0.000
TOYS1	0.000	0.000	0.000	0.000	0.000	1.665	0.000
HELDMR2	0.000	0.000	0.000	0.000	0.000	0.000	.181
TALK3MR2	0.000	0.000	0.000	0.000	0.000	0.000	1.934
MDVOCR	0.000	0.000	0.000	0.000	0.000	0.000	.236
FUSSRAT	0.000	0.000	0.000	0.000	0.000	0.000	2.119
LOOK4R2	0.000	0.000	0.000	0.000	0.000	0.000	.326
FEDCRR2	0.000	0.000	0.000	0.000	0.000	0.000	-.220

LAMBDA X

	KSI 1	KSI 2
AGEMO	4.510	0.000
FAMOCCUP	0.000	19.582
EDMO	0.000	2.036
FAMINC	0.000	8.627

BETA

	ETA 1	ETA 2	ETA 3	ETA 4	ETA 5	ETA 6	ETA 7
EQ. 1	1.000	0.000	0.000	0.000	0.000	0.000	0.000
EQ. 2	-627.405	1.000	62.773	0.000	0.000	0.000	0.000
EQ. 3	-13.591	0.000	1.000	0.000	0.000	0.000	0.000
EQ. 4	-164.479	.123	19.220	1.000	.271	0.000	-2.004
EQ. 5	0.000	-.277	.158	0.000	1.000	0.000	0.000
EQ. 6	0.000	0.000	0.000	0.000	0.000	1.000	0.000

EQ. 7	0.000	0.000	0.000	-8.001	.042	6.612	1.000

GAMMA

	KSI 1	KSI 2
EQ. 1	.365	-1.290
EQ. 2	-112.457	692.673
EQ. 3	-3.093	15.655
EQ. 4	-23.525	173.804
EQ. 5	0.000	0.000
EQ. 6	0.000	.854
EQ. 7	-7.888	16.361

PHI

	KSI 1	KSI 2
KSI 1	1.000	
KSI 2	.848	1.000

PSI

	EQ. 1	EQ. 2	EQ. 3	EQ. 4	EQ. 5	EQ. 6	EQ. 7
1	-.000	-12.175	.009	2.324	.916	.271	18.980

C (STANDARDIZED)

	ETA 1	ETA 2	ETA 3	ETA 4	ETA 5	ETA 6	ETA 7
ETA 1	1.000						
ETA 2	-.717	1.000					
ETA 3	.484	.205	1.000				
ETA 4	.505	-.555	.631	1.000			
ETA 5	-.275	.244	-.101	-.232	1.000		
ETA 6	-.838	.655	-.260	-.113	.222	1.000	
ETA 7	-.713	-.101	-.307	.037	.156	.736	1.000

D (STANDARDIZED)

	KSI 1	KSI 2
ETA 1	.365	-1.290
ETA 2	-.569	1.249
ETA 3	1.862	-1.883
ETA 4	.992	-1.253
ETA 5	-.452	.643
ETA 6	0.000	.854
ETA 7	.869	.664

THE PROBLEM COULD HAVE BEEN SOLVED WITH CM= 074000

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