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Discordant Twins: Personality and Cognitive Development

Cynthia Schroeder
Loyola University Chicago

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DISCORDANT TWINS:
PERSONALITY AND COGNITIVE DEVELOPMENT

by
CYNTHIA L. SCHROEDER

A Thesis Submitted to the Faculty of the Graduate School
of Loyola University of Chicago in Partial Fulfillment
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VITA

The author is the daughter of Carl J. Schroeder and Lucille M. Schroeder. She was born July 11, 1959 in Taipei, Taiwan. Her elementary education was obtained at Morrison Academy in Taiwan (grades K-3), Lincoln Elementary School in New Brunswick, New Jersey (grade 4), and Western Avenue Elementary School in Flossmoor, Illinois (grades 5-6). She also attended Flossmoor Junior High School and Ottawa Hills High School in Grand Rapids, Michigan.

In September, 1977 the author entered Hope College in Holland, Michigan and in May, 1981 received a B.A. with a major in Psychology and a minor in English. She entered the Clinical Psychology doctoral program at Loyola University of Chicago in September, 1982.

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CHAPTER I

INTRODUCTION

As a result of the perinatal complexities and hazards involved, monozygotic pairs, although genetically identical, are sometimes quite discordant in such characteristics as weight, body length, and overall medical condition at birth. A variety of intrapair differences, for example, have been attributed to a circulatory imbalance known as the "transfusion syndrome," in which one twin continuously transfuses the other through channels joining their placental vessels (Driscoll, 1964). This phenomenon is just one of many in utero experiences which can lead to a higher degree of obstetric risk in one twin, as well as a marked discrepancy in physical appearance, compared to its partner.

Researchers investigating the development of discordant monozygotic twins have traditionally viewed the smaller and lighter member as developmentally impaired relative to its counterpart, especially in terms of cognitive growth. A positive relationship between birth weight and intelligence within twin pairs has been reported by Allen and Kallman (1962), Babson, et al. (1964, 1973), Churchill (1965), Willerman and Churchill (1967), and Scarr (1969). The heavier twin at birth is reported to demonstrate the higher intelligence test scores later. Babson and Phillips (1973), for example, observed that in nine pairs of monozygotic twins, the smaller-at-birth member "continued to be inferior

in both growth and intelligence into adult life" (p. 939). The authors note that their sample (socioeconomic status unspecified) may have been biased by selective referral on the basis of suspected neonatal problems. Churchill (1965), using the Wechsler Intelligence Scale for Children on a low-socioeconomic-status, racially mixed sample, found that while the heavier twin showed superiority on the full-scale and performance IQ measures, no significant difference in verbal IQ was found between heavier and lighter twins. Churchill related this finding to the relatively greater effect of environmental experiences on verbal skills. Also noted was the report of Beck and Lam (1955) that defects in brain structure resulted in a lesser impairment of verbal abilities. Churchill therefore speculated that the effects of greater intrauterine impoverishment on the smaller twin are least evident in the verbal realm, where the twins' environmental similarity diminishes their intra-pair differences. Upon reexamination of these data in addition to a new, white middle-class sample, Willerman and Churchill (1967) report a confirmation of the previous findings that smaller twins showed lower overall and performance IQ's; again, no difference was found in verbal IQ.

Other investigators have questioned the reported relationship between birth weight and intelligence in twin pairs. Kaelber and Pugh (1969) commented that the previous studies consisted of small and highly select twin samples. Kaelber and Pugh report that using a "larger and more representative" sample (socioeconomic status unspecified), an association between heavier birth weight and higher IQ score was found only in

monozygotic pairs with large birth-weight differences (300 grams or more). These authors also point out that the advantage shown by a heavier twin is not large, usually about five IQ points. Similarly, Scarr (1969) found that "the size of IQ differences between co-twins was not affected by the absolute weight of the twins but by the size of the weight differences between them" (p. 254). Scarr, whose sample is reported to be representative of the Boston metropolitan area in social class and ethnic origin, reported most noticeable IQ differences (about 13 points) in pairs with one twin weighing over 2500 grams and the other less than 2500 grams. When both weighed either more or less than 2500 grams, their IQ difference was reported as five to six points. In addition, Scarr noted the difficulty of separating the effects of birth weight from those of social class, since "the relationship between birth weight and intelligence is highly biased by social class variables" (p. 253). Low birth weight, for example, may be associated with low socioeconomic status; and the effects of low birth weight in itself then need to be separated from the effects of low SES upon intelligence. Moreover, the smaller of a pair of twins might be less likely to "catch up" to its partner when parents are low in SES and have fewer resources to promote intellectual growth. Such effects, however, have frequently been neglected by investigators in this area, and the socioeconomic characteristics of the sample have often not been addressed.

More recently, studies of cognitive development and birth weight in twins have failed to confirm the earlier findings. Fujikura and Froehlich (1974) found no significant differences between co-twins, even

those with a large birth-weight discrepancy, in Bayley Mental and Motor scores at eight months of age nor Stanford-Binet IQ at four years. Emphasizing the problems inherent in previous studies regarding small samples, reliance on retrospective data, and unreliable methods of determining twin monozygosity, these authors used a large, biracial, prospectively-collected sample in which black children were analyzed separately from white. Although socioeconomic status is not identified, the authors report that socioeconomic index was measured and the groups did not differ significantly in this regard. Bauer (1977) studied 19 sets of multiple-birth infants in which one sibling required neonatal intensive care. Surprisingly, followup observations for a two-year period demonstrated that the sicker sibling showed accelerated mental and motor development as well as a more aggressive, outgoing personality. Socioeconomic status was not addressed by Bauer, although it seems likely that such variables were involved in these findings.

Wilson (1972a, 1972b, 1974, 1975, 1977a, 1977b, 1978) reports that data from the longitudinal Louisville Twin Study have indicated a high concordance between identical twins in mental development. This sample included a wide range of socioeconomic status, with an emphasis on the lower levels. A comparison (1977) at age six of pairs who had large birth-weight differences revealed no significant IQ difference, even though weight differences were still evident. Wilson (1977) further reported that, in an overall comparison of heavier vs. lighter twins, no association between very low birth weight and later IQ was found. Wilson states that "the common genotype appeared to speak through the ine-

qualities of prenatal growth and pull both twins toward a common level" (p. 324). Results showed that in mental development, monozygotic twins became increasingly concordant with age and also paralleled each other for "spurts and lags" in development, whereas dizygotic twins became decreasingly concordant with age (Wilson, 1978). Even during the first two years of life, twins showed a high within-pair concordance for level of development and rate of gain across ages, as measured with the Bayley Scales of Infant Development (Wilson, 1972). Indeed, Wilson noted that "the correlations for monozygotic twins approached the reliability of the test itself" (p. 277). Additionally, it was found that development was temporarily retarded by low birth weight but not affected by socioeconomic status of the home. Wilson stated that prematurity had its major effect on developmental status during the first six months of life (1972b).

Similarly, Wilson (1974) found that through the ages of 1 1/2 to six years, monozygotic twins were significantly more concordant than dizygotic twins in mental and motor development. By age five, IQ's had stabilized so that age-to-age changes were no longer a significant source of variance. Wilson observed that while twins initially appeared depressed in developmental status, they "ultimately reached parity with singletons by age six" (p. 580). In Wilson's view, in most cases environmental conditions are sufficient to allow the individual's genetic blueprint to act as the principal determinant of mental development.

In summarizing the research on cognitive development in discordant twins, the strongest evidence suggests that despite discrepant perinatal

experiences, monozygotic pairs follow a similar, genetically-determined pattern of cognitive growth. It appears that the researchers reporting the largest intertwin IQ differences used small and specialized samples, suggesting that characteristics of their samples were important factors in their results. Sample characteristics, most importantly socio-economic variables, have yet to be studied with regard to their influence on the cognitive development of discordant twins. Information regarding specific factors which mediate the effects of birth weight on intelligence, such as socioeconomic status, may shed light on the discrepancies between various studies.

If perinatal discordance has a minimal effect on the relative cognitive abilities of co-twins, one might ask whether discordance has a minimal influence on other areas of development as well. In fact, a number of investigators have reported that perinatal differences are highly significant factors in the emotional and personality development of twins. Differences in the mother-child relationship even at birth were reported by Klaus and Kennell (1976), who described the maternal attachment to the weaker twin as more unstable. These authors report that clinical observations of twins in which the larger twin was discharged from the hospital, while its smaller counterpart remained in the nursery, suggested a higher incidence of "mothering disorders" (e.g., child abuse or failure to thrive) in the smaller twins. Similar mother-child relationship differences, as well as a variety of personality contrasts between co-twins, have been cited by investigators of monozygotic pairs discordant for schizophrenia (Rosenthal, 1959; Kringlen, 1964).

Personality differences between twins have often been reported to appear during the first year of life (Allen, et al., 1971, 1976; Wilson, et al., 1971; Cohen, et al., 1972). Characteristics commonly found to differentiate between co-twins are dependence/independence, emotionality, sociability, curiosity, and activity/passivity. Wilson, et al., (1971) investigated 17 behavioral variables in a longitudinal study, and reported that twins were frequently discordant on attention span, temper, vocalization, and smiling. At one year of age, co-twins were differentiated primarily by temper and attention span, while at four years of age, sociability was the significant differentiating factor.

Gifford, et al. (1970), in a study of identical twin girls, delineated three factors interacting in the development of personality: 1) innate constitutional (genetic and nongenetic) differences; 2) parental responses to these differences; and 3) the relationship between the co-twins. The importance of including in the concept of "constitutional" both perinatal factors and genetic factors was emphasized.

Allen, et al. (1971) also emphasized the significance of perinatal factors, stating that the resulting constitutional differences are likely to lead to differential perceptions and treatment of the twins by the parents. Further, Allen, et al. (1976) found that most families perceive a sicker twin as weaker, more passive, less competent and curious, and in need of more attention and care. These authors also underlined the importance of parental characteristics in twin personality development, since they found that "parents who valued individuality tended to emphasize differences between the twins, while parents who

placed greater importance on fairness and equality tended to deny differences and to emphasize similarities of the twins" (p. 66).

Parental influences which result in differential identity formation between co-twins are viewed by Bank and Kahn (1982) as the healthy process of assigning each family member a unique "psychological space." According to Bank and Kahn, role definitions are based on pregnancy and birth factors as well as temperamental contrasts evident during infancy. "Such arbitrary factors as which twin is born first, and which is heavier or lighter, help determine, for possibly a lifetime, such identity elements as intelligence, strength, and vulnerability" (Bank & Kahn, p. 23). Researchers, then, have seen perinatal discordance as an important factor in the personality development of twins, often playing a major role in the establishment of a separate identity for each member of the pair.

Clearly, the literature indicates that identical twins have often shown differences in personality characteristics, differences rated by researchers as well as by parents. The acknowledgement of these differences between co-twins has been described as an important part of the development of separate psychological identities. Most investigators have explained the process of twin personality development as a complex interplay between early constitutional differences, early temperamental characteristics, and parental responses to these differences. Discordant infant characteristics were described as eliciting different responses and forming the basis of parental perceptions, and it was suggested that these factors lead to differential identity assignments for

co-twins.

In light of the twin personality research, it would seem likely that personality variables relevant to co-twins would influence their cognitive development. For example, a twin perceived as stronger and more competent may receive greater parental encouragement to achieve and may feel more self-confident, factors which are likely to facilitate greater development of cognitive skills. However, most of the twin IQ studies which employed relatively large and diverse samples found either a small advantage for the heavier twin or no significant IQ differences between co-twins. Based on these studies, it is suggested that most often, IQ differences between discordant twins will be relatively small, and that in general, twins' identical genotypes will result in a fairly similar pattern of cognitive growth despite different birth experiences. It is the author's belief that perinatal differences exert a stronger influence on twins' later personalities by affecting parental attitudes toward co-twins, which in turn become reflected in parent-child relationships. As a result of a more physically traumatic birth condition, one twin of a pair may be perceived by parents as weaker, less competent, and more dependent. Based on this identity assignment and the associated parental behavior, this twin is likely to perceive him/herself in a similar way and to act accordingly. In school, for example, such a child is likely to feel less confident and to function more poorly than his/her twin. My view is that in most cases, due to the identical genetic components working toward concordance in cognitive development, differing birth experiences would be expected to have their

most pronounced effect upon the personality and identity development of monozygotic twins.

CHAPTER II

METHOD

Rationale and Relevant Literature

This study investigates twin development by exploring the case histories of two sets of four-year-old identical twins who had discordant perinatal experiences. Longitudinal data regarding these twins has been gathered due to their participation in an ongoing research project involving high-risk infants. The availability of comprehensive, long-term developmental information about such a small sample of twins seemed best suited to a case-study research approach. It was believed that examination of the unique developmental histories of these individuals, especially since they came from intact, middle-class families, would yield valuable information regarding the hypothesis that high-risk infants (including twins) from higher SES levels show fewer lasting developmental impairments. These twins might therefore demonstrate that given sufficient resources, early impairments, and possibly intrapair differences, tend to disappear over time. These data presented an opportunity to track the development of twin pairs with discordant birth experiences over the course of four years, drawing upon multiple data sources regarding physical, cognitive, and social/emotional development. This case study thus provided an opportunity to confirm or disconfirm a number of hypotheses drawn from the twin literature as applied to this

specific, highly select sample, and also to generate new hypotheses regarding salient mediating factors in twin development to be tested with larger groups in the future.

The single-case study has been employed relatively infrequently in psychology, although it has a long history in scientific research (Hersen & Barlow, 1976). According to DeWolfe (1978), two trends have served to attribute an "aura of scientific unrespectability" to the case study: 1) attacks by behaviorists on the introspective methods of Wundt and Titchener; and 2) the rise of Fisherian statistics, with its emphasis on group analysis and statistical significance.

Despite the relative infrequency of case studies in psychological research, important contributions have been made using this approach. As noted by DeWolfe (1978) recent trends, mostly in the clinical and personality areas, have sparked an increased interest in the case study. Among these trends are research in applied problems (e.g., psychotherapy) and the use of projective tests in clinical and academic arenas. Significant work on personality using individual case analysis was done by Allport (1942). Arguing for the use of personal documents in the study of personality, Allport viewed idiographic methods as complementary to nomothetic methods, and he developed methods for studying personal documents more objectively (1942). Additional support for the case study has come from the development of quasi-experimental designs in applied research settings (e.g., Campbell & Stanley, 1963). These designs have helped increase the value and status of research done in settings in which complete control of variables is not possible. More

recently, proponents of the N=1 approach (e.g., Hersen & Barlow, 1976) have advocated increased structure (reversal, withdrawal, multiple baseline techniques) as a way to increase the objectivity of the single case study.

Dukes (1965) surveyed the literature in psychological research from 1939 to 1963, and found 246 single case studies, mostly in the areas of personality and mental health. Dukes proposed that single case studies are most valuable in the following situations: 1) when between-individual variability for the factor under study is negligible; 2) when a single in-depth case is representative of a larger group; 3) when a single case provides evidence to refute a hypothesis held as generally applicable; 4) in the case of a rare opportunity (e.g., multiple personality); 5) when the research requires a long time, specialized training, or difficult controls; 6) when an investigator wants to focus on a problem in order to define questions and develop an approach for future research. In the present study, Dukes' fourth and fifth criteria are especially relevant. The relative infrequency of discordant monozygotic twin births, in combination with the comprehensive, longitudinal nature of the data involved in the project (requiring long-term effort and cooperation of subjects as well as investigators) serve to justify the use of a case-study approach. It is also expected that this study will identify useful questions for future nomothetical research.

The method of analysis in this study is most similar to the "continuous reimmersion" method described by DeWolfe (1978), which involves the inclusion of multiple sources of information without predetermining the

aspects of personality to be studied or otherwise restricting the scope of interpretation with apriori hypotheses. In this method, the salient dimensions are derived from the data itself, through the investigator's continual reimmersion and conceptualization.

DeWolfe emphasizes the problems involved in selection and interpretation of data in single case analysis, and underscores the suggestions of Allport (1942) in this regard. Bias in selecting data for inclusion in the case study is a potential problem; in the present study, the inclusion of all data available on the twins' development helps reduce systematic exclusion of information. Additional guards against bias in this study are: sampling across an extended period of time and across situations; the use of objective, standardized measures as well as more subjective measures; and the use of blind raters in the objective measures.

The possibility of bias in interpretation must also be guarded against. Allport (1942) listed criteria for judging interpretations, including: 1) internal consistency; 2) simplicity and directness (parsimony); 3) conformity with the known facts; 4) agreement by independent experts; 5) value in understanding the subject under study; and 6) predictive power of the interpretation. DeWolfe (1978) states that in the continuous reimmersion approach, the value of the researcher's conceptualization "is based on its adequacy and usefulness in describing, explaining and understanding, and predicting the future actions of the person who is being studied" (p. 11). All of the above guidelines will be considered when evaluating the interpretations resulting from

study of the present data. Allport's fourth criteria (agreement by independent experts) will be addressed through the consensus of the author's thesis committee members.

Subjects

Two pairs of monozygotic twins discordant in perinatal experiences are the subjects of study. These twins have been participants since birth in an ongoing longitudinal research project involving high-risk infants at Evanston Hospital, Evanston, Illinois. Both twin pairs are from middle-class, intact families in which at least one parent holds a professional position. These parents had previously indicated a willingness to participate in further studies. All twins are female and currently four years old. In order to protect the confidentiality of the subjects and their families, all names and initials used in this document are fictional.

Procedure

As part of the research project mentioned above, the following data were collected for all subjects at the ages indicated:

- 1) Denver Developmental Screening Test (2, 6, 9, 12, 18 months). This measure is designed to screen for developmental delays in four areas: Personal-Social, Fine Motor-Adaptive, Language, and Gross Motor. Children's performance can be rated, according to norms for their age level, as Normal, Questionable, or Abnormal. Scoring has been based on the revised criteria outlined by Frankenburg, et al. (1971).

- 2) Parent Perception Questionnaire (2, 6, 18, 39 months). Modelled

after Broussard and Hartner's (1970) scale, this measures a mother's perceptions of her child and the average child in the areas of crying, sleeping, size, alertness, activity level, deviance, happiness, and maternal concern. The mother rates her child and the average child on each dimension along a 7-point Likert scale. By summing scores across items, a total score is then computed to represent the general positive-ness of the mother's perceptions of her child and the average child.

3) Carey Infant Characteristics Questionnaire (2, 6 months). A short 3-point multiple-choice questionnaire completed by the infant's mother, this instrument assesses nine dimensions of temperament: activity, rhythmicity, adaptability, approach, threshold, intensity, mood, distractibility, and persistence. The questionnaire is based on Thomas and Chess' research (1977) and is designed to identify the "difficult baby syndrome," a profile characterized by irregularity, slow adaptability, initial withdrawal, high intensity, and negative mood (Carey, 1973). Infants are categorized as Easy, Intermediate (Low or High), or Difficult on the basis of their ratings in those five dimensions found to be most important in infant temperament. The remaining four dimensions (activity, distractibility, persistence, threshold) are described by Carey (1973) as less stable and less relevant to behavior problems in infancy. According to Carey, the questionnaire provides valuable objective information regarding an infant's actual behavior, and is most useful when combined with an open-ended interview to determine the nature of the parents' interaction with the infant.

4) Carey Toddler Temperament Scale (18 months). This scale, designed

for children aged 12 to 39 months, assesses the same nine temperamental dimensions as the infant scale described above, and similarly categorizes children as Easy, Intermediate, or Difficult. The toddler scale, however, asks the mother to rate her child along a 7-point scale regarding the relative frequency of occurrence of each behavioral item. For example, for the item "the child cries after a fall or bump" the child is rated on a scale ranging from "almost never" to "almost always."

5) Bayley Scales of Infant Development (18 months). These scales include three measures of developmental status: Mental Scale, Motor Scale, and Infant Behavior Record. The Mental Scale measures such functions as perception, memory, vocalization, and problem-solving. The Motor Scale measures gross motor skills. The Behavior Record, completed by the examiner after the previous scales are administered, assesses aspects of personality development such as social/emotional behavior, attention span, persistence, and goal-directedness. The Mental and Motor scales yield separate developmental indices, expressed as normalized standard scores with a mean of 100 and standard deviation of 16.

6) Bzoch-League Expressive Emergent Language Scale (18 months). This is a measure of language skills completed by the child's mother. The child's language ability is expressed in terms of receptive, expressive, and combined "language age" (age-equivalent level). In addition, quotients can be derived for receptive, expressive, and overall language abilities.

7) Stanford-Binet Intelligence Scale (39 months). A measure of general intellectual level, the Stanford-Binet expresses a child's perform-

ance in terms of mental age, which is then used to derive an IQ. Due to the size of error in measurement of a Stanford-Binet IQ, Anastasi (1982) recommends an allowance for chance variation of 10 points on either side of the obtained IQ. Anastasi also emphasizes that the test tends to be less reliable for younger ages and for higher IQ levels.

8) Physical status reports (birth; 2, 4, 6, 9, 12, 18 months). Descriptions of physical condition (weight, body length, general health, special problems) were recorded. Also completed were an Obstetric Complications scoring sheet (OCS) and a Postnatal Complications scoring sheet (PCS), both developed by Littman and Parmelee (1974). Ratings of medical events during hospitalization and after discharge were also available.

In addition to these previously collected data, the current investigator gathered the following information:

1) Wechsler Preschool and Primary Scale of Intelligence (48 months). This measure consists of 11 subtests, of which 10 are used in computing IQ. The subtests are grouped into a Verbal Scale and a Performance Scale, from which a Verbal IQ, Performance IQ, and Full Scale IQ are derived. These are deviation IQ's with a mean of 100 and standard deviation of 15. The various subtests are designed to measure specific ability areas (e.g., vocabulary, arithmetic, mazes). Clinicians typically allow for chance variation of six points above and below the derived IQ (Anastasi, 1982). Comparing the Wechsler scales with the Stanford-Binet, Anastasi also states that younger subjects tend to obtain higher IQ's on the Stanford-Binet than on the Wechsler.

2) Carey Toddler Temperament Scale (48 months).

3) Vineland Adaptive Behavior Scales (48 months). Representing a revision of the Vineland Social Maturity Scale, the current form assesses abilities in four domains: Communication (Receptive, Expressive, and Written); Daily Living Skills (Personal, Domestic, and Community); Socialization (Interpersonal Relationships, Play and Leisure Time, and Coping Skills); and Motor Skills (Gross and Fine). Information is obtained by interviewing an informant, who in this case was the mother. The child's scores for each domain are converted to standard scores, which are then used to compute an Adaptive Level (Low, Adequate, High) for each ability area. In addition, a composite score can be computed to form an overall adaptive behavior level.

4) Unstructured interview (48 months). Following the administration of the Vineland, the author interviewed the mother in an open-ended manner regarding any specific issues not covered by the Vineland (e.g., sibling interaction, unique family circumstances). This interview was audiotaped with the mother's written consent.

All measures which were not parent-administered were administered separately for each twin by independent, trained examiners who were unaware of the relative birth status of their subject. This procedure, in addition to the use of objective, standardized instruments, guards against bias in these data sources.

CHAPTER III

CASE STUDY #1

General Background

Mary and Lisa J. were born after a fullterm pregnancy, with a gestational age of 40 weeks. Both parents are highly educated musicians. Mr. J., who has a Ph.D. in music, composes and is a professor of theory and composition at a prominent university. Mrs. J., who holds a B.A., has been a public school teacher and a violinist in a philharmonic orchestra, and currently teaches the violin on a part-time basis. At the time of the twins' birth, Mrs. J. was 32 years old and had one child, a five-year-old daughter.

Hospital records indicate that Mary, who was first to be born, was delivered spontaneously in a vertex position after labor of a normal duration. With a birth weight of 2410 grams and body length of 48.5 cm., Mary was given Apgar scores of 9 at one minute and 9 at 5 minutes after birth. No medical problems were listed either at birth or thereafter. Her OCS score was 121, indicating a minimal level of perinatal complications.

In contrast, Lisa was delivered by emergency Caesarian section. She had a prolapsed cord and since her heart rate and respiration were not stabilizing, she was placed on oxygen and taken to the Intensive Care Nursery. Lisa's birth weight was 1500 grams and body length was 43 cm.;

her Apgar scores were 2 at one minute and 7 at five minutes. Her OCS score was 71, indicating fairly serious perinatal complications. Medical problems listed for Lisa were birth asphyxia, prolapsed cord, and dysmaturity. Because of these difficulties, Lisa was kept in the hospital for two weeks, while Mary was discharged along with Mrs. J.

Physical status data for the first few months of life indicate no continuing medical problems, although Lisa continued to be smaller, weighing four or five pounds less and measuring several inches shorter, even at age four. Lisa also had a cleft upper eyelid on the left side. At four months, progress notes stated that the parents' concern about a lack of eye contact and social responsiveness had abated. By Mr. and Mrs. J.'s description, Lisa had "rejected" them and wouldn't look at them, even when held in a face-to-face position. Mrs. J. stated, "Maybe because of being in Intensive Care, she really and truly rejected us, except for Mary." Both parents recalled that when the two babies were placed at separate ends of their crib, Lisa would move over to sleep next to Mary. Mr. J. commented, "She was the runt of the litter, as it were." According to both parents, Lisa began responding to them at four months of age. They reported noticing that she did respond visually to her musical mobile, and when they tried singing to her rather than talking, Lisa suddenly appeared more responsive. It is interesting that Mr. and Mrs. J. found a way to interact with Lisa which was personally meaningful (music).

Mrs. J. described Mary as a more cuddly infant, whereas Lisa was more skinny and wiry. Mary was breastfed, but Lisa was not, since there were

so many rules from the hospital about her feeding. Regarding breastfeeding, Mrs. J. indicated on a later questionnaire that "I enjoyed it to a degree with Mary, but Lisa was more difficult. I felt too much pressure having to feed both of the babies by myself in their early months." Mrs. J. said that during Lisa's early infancy, "we were scared to death" about caring for her, and added "everything was just a little bit more scary with Lisa than with Mary."

At six months, hospital progress notes indicated delayed development in both twins, noting poor eye coordination and delayed motor skills in general. At nine months, a continued marked delay was recorded, with an expressed concern about failure to thrive. An infant stimulation program was recommended by the infant development researchers, and Mrs. J. had been encouraged to participate.

Researchers at this point appear to have been concerned about Mrs. J.'s level of involvement with her babies. Although there is no way to determine from the data what factors were involved in the mother-child relationship at this time, it is possible that Mrs. J. was experiencing a psychological depression. Clearly, the words she uses in describing this period retrospectively, during the unstructured parent interview, indicate that she felt overwhelmed and anxious about her parental role. Mrs. J. also felt an initial rejection by Lisa, which probably heightened her anxiety about her adequacy as a mother. In contrast to the literature reporting that mother-infant problems tend to occur with the sicker twin, Mrs. J. showed difficulties in parenting both of her twins. However, her descriptions indicate that her relationship with Lisa may

have been less positive and more anxious than with Mary.

Developmental lags at the nine-month point are also reflected in the Denver data, which show substantial variability in progress for both twins. At two months, Lisa was rated as Questionable, showing delays in smiling spontaneously and responsively. However, her progress then appeared within normal boundaries for the remainder of the 18 months, except for her nine-month assessment. At this point Lisa received an Abnormal rating showing delays in fine-motor and language skills. Thereafter, at 12 and 18 months, no delays were evident. Mary, in contrast, showed normal progress until nine months, at which time delays in both fine-motor and gross-motor abilities were recorded. Mary continued to show gross-motor delays, although not as marked, at 12 and 18 months of age.

By one year, progress notes described the twins as "catching up" but still delayed, especially in gross-motor skills. It was added that the mother and babies were more relaxed and that less crying was observed. For whatever reason, mother-child interactions appear to have improved. Similarly, at the 18-month assessment the Bayley scales showed normal mental development for both children, although continued motor delays of four to five months were evident.

It is important to note that Lisa's physical problems were not limited to early infancy. Mrs. J. reported that when Lisa was about two years old, visual problems were discovered. She had poor vision in one eye, and as a result she wears eyeglasses and frequently an eyepatch as well. Moreover, Lisa's eyes "wander" due to weak eye muscles, a condition

which will require corrective surgery. Also, when Lisa was three years old, a hearing impairment was discovered, apparently caused by a defect present at birth. Subsequent to receiving a hearing aid, according to Lisa's parents, she has shown much less "frustration," especially in noisy places (e.g., restaurants). The clinic which evaluated Lisa's hearing also recommended speech therapy, since Lisa showed difficulty with certain vowel sounds. Lisa currently attends speech classes.

Clearly, Lisa has had to cope with a variety of physical impairments and frequent visits to doctors and clinics, experiences which her twin has not shared. Quite possibly these impairments have played an important role in Lisa's development, causing her at least a certain amount of anxiety and frustration. In addition, Lisa has experienced extra parental attention (and anxiety). By report, her grandparents still show more concern for Lisa than Mary because of these problems, and Mrs. J. commented "she's always needed a different kind of attention."

Mary, it appears, expresses envy regarding the special attention Lisa receives. Mary doesn't attend speech therapy, even though her mother reports that she exhibits speech errors similar to Lisa's. Apparently, the diagnostic clinic was not concerned about Mary's speech since her hearing is not impaired. This similarity in speech is probably related to the close relationship between the twins. They share, for example, a special name for each other which they do not use around other people. Mr. J. stated that for as long as he can remember, the twins have called each other "Aga," or "Aga-Mary" and "Aga-Lisa."

Personality Development

The twins' ratings on the 18-month Bayley assessment revealed striking differences between the two in social-emotional behavior. Lisa was described as fearful, withdrawn, uncooperative, and difficult to test, whereas Mary behaved in a relatively accepting, cooperative, and pleasant manner. Ratings in specific areas are as follows:

1) Social orientation: Lisa appeared to be constantly affected by awareness of other persons. Her response to the examiner was avoiding and withdrawn, while her response to her mother was initiating and demanding. Mary responded with interest to persons present. Her response to the examiner was accepting, and to her mother, friendly.

2) Cooperativeness: While Lisa did not cooperate (refusing test materials, turning away), Mary appeared to enjoy interacting with the examiner.

3) Fearfulness: Lisa seemed bothered by the situation, rated as wary, apprehensive, turning/clinging to mother, crying, and vocally protesting. In addition, continued fearfulness was indicated by persistent inhibition and cautious play. In contrast, Mary exhibited only slight initial vigilance and was able to engage in easy play.

4) Tension: Lisa's body was stiff and tense over half of the testing time; Mary's body was generally relaxed.

5) General emotional tone: Lisa appeared unhappy most of the time (crying, fussing, whining, unhappy expressions, protesting), although she did respond occasionally by smiling or laughing. Mary appeared generally in a happy state of wellbeing (smiling and animated expressions).

6) Object orientation: Lisa showed a lack of sustained interest in toys, and did not play imaginatively or exhibit an attachment to a specific object. Mary showed sustained interest in each new object as presented and was able to play imaginatively, although not showing any specific attachments.

7) Goal directedness: Lisa was rated as slightly less persistent than Mary. Both were rated as somewhat distractible in pursuing goals.

8) Attention span: Lisa appeared able to attend but easily distractible; Mary showed a moderate to sustained attention span.

9) Endurance: Lisa was given the lowest rating in this category. She tired easily and quickly regressed to lower levels of functioning; it was noted that she was irritable and cried throughout the test. Mary held up well throughout the session.

10) Activity: Lisa showed little gross bodily movement, while Mary showed moderate activity and entered games freely.

11) Reactivity: Both Lisa and Mary demonstrated fairly high levels of sensitivity and excitability, with Lisa rated as slightly higher.

12) Energy and coordination: Both Lisa and Mary were rated as somewhat low in energy and coordination for their age. Lisa showed relatively better fine-muscle coordination, while Mary showed better gross-muscle coordination.

Overall, Mary was judged to be functioning at an average level, whereas Lisa behaved so uncooperatively, and was so wary of the test situation, that the examiner was uncertain of the accuracy of her overall evaluation.

In addition to indicating a high level of situational anxiety, Lisa's behavior during the Bayley suggests certain temperamental features which are supported by her scores on the Carey Questionnaire. These data indicated that at two months, the twins were rated as most different in the dimensions of activity level, persistence, rhythmicity, and mood. Lisa showed a higher activity level, more negative mood, lower persistence, and less rhythmicity. Both children nevertheless received an overall classification of Easy at two months.

By 18 months, the twins had become highly similar in most of the above dimensions. The major difference at this age was that Lisa was rated by her mother as less adaptable than Mary, which earned her an Intermediate-Low classification while Mary remained Easy. Lisa was still rated as more active and less persistent and rhythmic, although the difference between twins was less pronounced at this age. Lisa's lower adaptability rating is consistent with her wary, uncooperative reaction to the Bayley testing situation at 18 months.

Carey assessments at 36 and 48 months reveal a stabilization of differences in certain dimensions, as well as continued change in others. Intertwin distinctions appearing fairly stable included Lisa as scoring higher in activity and intensity, and to a lesser degree, as less adaptable and rhythmic. Most pronounced changes over time were evident in the following dimensions: distractibility, with Lisa becoming less distractible than Mary by 48 months; threshold, in which both twins scored progressively lower over time; and persistence, in which both twins showed a progressively higher level. Dimensions in which Lisa and

Mary were most similar across ages were threshold, persistence, mood and approach.

The Carey data appear quite consistent with verbal descriptions made by Mr. and Mrs. J. during the unstructured interview at 48 months. Both parents stated that Lisa is more "volatile" and problematic than Mary. Lisa was described as displaying more frequent temper tantrums, whereas Mary is calmer and "much more controlled." Mrs. J. commented, "Lisa does everything with a little bit more aggression," and added that Lisa may be more determined and outgoing. Also consistent with these perceptions are the twins' ratings on the Vineland: although they received extremely similar adaptive levels, Lisa showed more problematic behaviors on the maladaptive behavior scale. Specifically, Lisa demonstrated high impulsivity and nocturnal enuresis. Unlike Mary, Lisa wears a diaper at night.

Mr. and Mrs. J., then, view Mary as more passive, calm, and controlled; and they see Lisa as more active, volatile, and impulsive. These terms correspond roughly with the Carey dimensions of activity, intensity, adaptability, and rhythmicity, which were the dimensions showing the most marked and stable differences between twins. Given these verbal descriptions, however, a greater discrepancy in the Carey mood dimension might have been expected. At two months Lisa had been rated as markedly more negative than Mary in mood, which may have been related to Lisa's greater physical distress. By 18 months, however, the twins appeared quite similar in mood; and at 39 and 48 months, Lisa showed only a slightly more negative mood. It may be that Lisa's over-

all mood has in fact become more similar to Mary's over time, but that her parents' perceptions are still strongly influenced by Lisa's mood in infancy. The Carey Questionnaire, more objective and behavior-based in nature, may be a more accurate reflection of Lisa's typical mood, whereas the unstructured interview may be a clearer indication of parental perceptions, however biased they may be.

The dimension of dependence/independence, not directly addressed by the Carey Questionnaire, was prominent in Mr. and Mrs. J.'s descriptions of their children. Overall, Lisa is perceived as more independent. According to Mrs. J., despite the fact that Lisa's eye patch singles her out as different from her peers, she is nevertheless quite popular. In Mrs. J.'s words, "She doesn't care whether people like her. She doesn't seek friends, they approach her. She is surprised when people like her. She's a free spirit." Mary, in contrast, was described as having greater difficulty with separation from her twin (e.g., at preschool) and as more jealous of Lisa's friends. However, within the twin-twin relationship, Mrs. J. views Mary as directing the play, while "Lisa has to give in a little bit more." Perhaps Lisa is more compliant with Mary because, in the context of a more emotionally significant relationship she feels a stronger need to be liked. In addition, she may at some level feel inferior to Mary, who has no physical impairments, therefore allowing Mary to assume a more dominant role. At any rate, it seems highly likely that Lisa experiences greater anxiety and lower self-esteem than does Mary, and that these are related to her greater emotional intensity as well as her relatively submissive position with Mary.

The differences in parental descriptions of the twins also suggest differences between twins in the parent-child relationship. First, both parents reported greater anxiety, concern, and attention on their part regarding Lisa's wellbeing, especially in early infancy when her health was precarious. In addition, they both initially perceived Lisa as more difficult to relate to than her twin. She was viewed as less socially responsive, less cuddly, and less pleasant in mood. Subsequently, in early childhood, Lisa is perceived by her parents as more aggressive, volatile, impulsive, and independent than Mary. It seems that her parents still perceive Lisa as more difficult to relate to, and they continue to express greater concern in general regarding Lisa as compared to Mary.

Clearly Lisa shows more undercontrolled affect and her parents find her more difficult to manage than her twin. This can be interpreted as related to early constitutional differences and the resulting parental responses. Because of Lisa's more unstable physiological condition and her parents' anxiety regarding her health, Mr. and Mrs. J. may have been more hesitant to discipline her and to place parental limits on her behavior. Greater parental permissiveness may have resulted in fewer internalized controls in Lisa's case relative to her twin. Furthermore, an awareness of her parent's anxiety and concern, combined with minimal firm parental limits is likely to result in the high anxiety level previously suggested. Additional indications of anxiety and a lack of internalized controls, evident in Lisa's WPPSI performance, will be discussed in the following section. This interpretation seems consistent

with the temperamental data as well as the test performances of both twins (Bayley, WPPSI).

Cognitive Development

The functioning of both twins reveals an upward trend in intellectual development over their first four years. Mary, for example, scored 107 at 18 months (Bayley Mental Scale), 117 at 36 months (Stanford-Binet IQ), and 137 at 48 months (WPPSI IQ). Similarly, Lisa earned scores of 96 at 18 months, 119 at 36 months, and 131 at 48 months. Clearly, while both twins functioned at approximately an average level at 18 months, their performance reached a Very Superior (Wechsler, 1967) level of intellectual functioning by 48 months of age.

The twins' cognitive abilities seem to have become progressively more concordant, with the greatest gap between the two appearing at 18 months (an 11-point advantage for Mary). Lisa appears to have caught up to her twin during the next several years, surpassing Mary by two points at 36 months and trailing by only six points at 48 months. It should be noted that Mary's exact WPPSI IQ is somewhat unclear. Her performance on the Mazes subtest was much lower than all other subtests. The examiner felt that Mary may not have understood the task, and especially since the score was so discrepant, the Mazes score was omitted and her IQ was based on a prorated total score. Interestingly, if her Mazes score had been included, she would have received exactly the same IQ as Lisa, who also did poorly in Mazes. Thus it seems likely that the gap between twins at age 48 months is actually smaller than six IQ points, and that their cognitive levels are approximately equivalent.

Nevertheless, examination of the twins' performance across the various subtests of the WPPSI reveals interesting differences. First, Mary's profile suggests a more solid performance, whereas Lisa's profile shows greater variability between subtests. Lisa shows both higher peaks and lower valleys in her profile as compared to her twin, whose performance was more consistent across ability areas. Mary's only outstanding score, in fact, was a weakness in Information, which in preschool years is primarily associated with the range of experiences to which a child has been exposed. Since Lisa also scored relatively low in this subtest, the twins may have a fairly narrow breadth of experience at this age.

Lisa showed significant strengths in two verbal subtests: Vocabulary and Similarities. This may reflect her interest and skill in reading, described by her parents as greater than that of her twin. Lisa appeared notably weaker in the performance area, especially in the Mazes task. However, this task is known to be influenced by familiarity with mazes; and since Mary likewise did poorly in this subtest, both twins may be disadvantaged by an unfamiliarity with the task. Nevertheless, Lisa's relatively low scores on other performance tasks (especially Geometric Design) suggest a problem with visual-motor coordination. The examiner commented, in her notes regarding Lisa's WPPSI performance, that Lisa showed a relative difficulty in fine-motor, paper-and-pencil tasks, and that she tended to use verbal mediators to assist her in these tasks. Furthermore, Lisa appeared to be aware of her limitations in these areas and tended to become frustrated, although she tried to

conceal this from the examiner.

A relative difficulty in visual-motor coordination may well be related to Lisa's visual impairment, which was detected only two years ago. Since the problem is still being treated (she is wearing glasses and an eye patch until she has eye surgery), Lisa is likely to experience difficulty in visual-motor tasks. The problem, though, appears more related to the motor component of the task rather than to visual acuity, since her score in Picture Completion, a visual perception task, was relatively high. Because Lisa appears to be aware of these limitations (and tries to conceal them), she may be attempting to compensate by developing her verbal skills, as suggested by her efforts at learning to read and her high verbal scores. This is also suggested by her use of verbal mediators in performance tasks. She appears frustrated by her difficulties, and seems to deal with this by using verbal skills as aids.

Lisa's general approach to the WPPSI testing situation reflects some of the behaviors noted during the administration of the Bayley at 18 months, although to a less pronounced degree. She still appeared easily frustrated and lacking in internal direction, and showed approval-seeking, dependent behavior. This evidence of a lack of inner control is consistent with the temperament data previously described, and supports the related interpretation regarding relatively weak parental limit-setting.

Along with these continued problems, though, Lisa also showed progress since her 18-month assessment. Specifically, she demonstrated an abil-

ity to engage easily in nonthreatening tasks, a greater degree of cooperation, less fearfulness of the testing situation, and a more positive overall emotional tone. Therefore, although some of the emotional responses Lisa shows are likely to interfere with her intellectual performance, she appears to have gained a certain degree of control and mastery since her 18-month assessment. The recognition and treatment of her perceptual impairments has most likely contributed to this progress.

In regard to verbal skills, Mary and Lisa do not evidence the marked language delay predicted by the twin development literature. Their progress from two to 18 months, as assessed by the Denver, shows no language delays except at the nine-month visit. As previously discussed, both twins exhibited delays in a number of areas at this time. At 18 months, language ability as measured by the Receptive-Expressive Emergent Language Scale was found to be at an 18 to 20-month level for both twins, indicating age-appropriate progress.

Predictions from past research of a lower verbal IQ on the WPPSI relative to performance and overall IQ's were confirmed only in Mary's case. Her verbal IQ was 12 points lower than her performance IQ and 10 points lower than her full-scale IQ. A 12-point verbal-performance discrepancy, according to Kaufman (1979), is not infrequent: 33% of normal children show a difference of this magnitude. However, Kaufman also states that children of professionals tend to score higher in verbal than performance domains. Since Mary's verbal-performance discrepancy is in the opposite direction, the difference is most likely a significant one.

Lisa's verbal IQ, on the other hand, was seven points higher than her performance IQ and equivalent to her full-scale IQ. This reversed pattern may be related to Lisa's perceptual-motor difficulties and relatively greater reliance on verbal skills, as described above. Overall, neither twin showed language abilities lower than expected for their age. However, Mary's functioning suggests a lower verbal ability compared to her abilities in other areas, which is consistent with the twin literature. Lisa's pattern of abilities appears more related to her individual deficits than to her twinship condition, and suggests that the extent to which twins manifest an inferiority in language depends on a variety of factors.

Overall, the developmental data on the J. twins reveal several major themes. First, Lisa's perceptual impairments have evidently highlighted and increased the discordance existing between co-twins at birth. Moreover, these impairments appear to be related to certain intertwined differences in both cognitive and personality functioning. However, since the general intellectual level of these twins has become increasingly concordant, it appears that the most pronounced and lasting differences between co-twins are related to personality characteristics. For these twins, important differentiating dimensions included activity level, intensity, independence, impulsivity, and anxiety.

CHAPTER IV

CASE STUDY #2

General Background

At age four, Margie and Ellen N. appear so physically similar that it was difficult for the examiners to tell them apart, although Mrs. N. states she has rarely confused the two. The twins have two siblings, a six-year-old sister and a nineteen-month-old brother. Mrs. N. is a former elementary school teacher of nine years and has completed some graduate coursework. She stopped working several weeks before the twins' birth and cites the cost of child care as her primary reason for not returning to work. Mr. N. has a college degree and is currently vice-president of a suburban company.

The twins were born when Mrs. N. was 33 years old, after 37 weeks gestation. Delivery was spontaneous and in a vaginal vertex position. The outstanding feature of the birth was twin-twin transfusion: Margie was transfusing blood into Ellen. Because of this, Margie was weaker and smaller, weighing 1760 grams. Ellen weighed over 2500 grams, but due to engorged capillaries experienced respiratory problems shortly after birth. According to Mrs. N., it was for this reason that the babies were brought to the Intensive Care Nursery. Hospital records listed birth problems for Margie as SGA (small for gestational age), anemia, and hypotension; and for Ellen, hyperbilirubinemia. Apgar scores for

Margie were 9 at one minute and 10 at five minutes after birth. Scores for Ellen are unavailable but were most likely similar to Margie's. OCS scores are 103 for Margie and 112 for for Ellen, indicating slightly less favorable obstetric factors in Margie's case.

Mrs. N. reports "only a couple days difference" between twins in their length of stay in the hospital. According to her, the only medical concern was that Margie gain enough weight, since she was so weak that she had difficulty sucking on a bottle. Physical status records indicate that Margie did in fact gain weight rapidly, and by six or seven months Margie was similar to her twin in size. No developmental problems were noted in the records except that at 18 months, a slight delay in walking was observed. It was commented that this was "very likely a function of mother not pushing."

According to Mrs. N., the twins began walking at 16 months. She explained this by saying "they didn't need to walk because they had this entertaining little person right next to them." Mrs. N. also stated that she didn't see this as a significant delay, since her oldest daughter walked at 12 months, and her youngest child is not yet walking at 14 months.

Developmental progress as measured by the Denver from two to 18 months was indicated as generally within normal boundaries for both twins. Ratings of Normal were received by Ellen and Margie at all ages except for the two-month assessment. At this point Ellen was rated as Questionable, showing delays in language and gross motor areas. Two-month data on Margie is unavailable. Apparently, the birth experience of

these twins was most detrimental to their developmental progress during the first several months of their lives.

Comparison of the twins on specific items reveals a slight advantage for Margie in language development (evident at 12 and 18 months) and a slight advantage for Ellen in gross motor skills (evident at four through 18 months). Similarly, Mrs. N. described Ellen as ahead of Margie in motor abilities. The 12-month assessment indicated that both children were relatively slow in starting to walk, as suggested by Mrs. N.'s report. By 18 months, however, both twins had achieved age-appropriate gross motor milestones.

Results of the Bayley scales at the 18-month assessment also indicate a high level of functioning for both twins. On the mental scale, Margie scored 124 and Ellen scored 126; on the motor scale, both children scored 133. The most marked differences were evident in the area of coordination: while Ellen showed smooth functioning in both gross-muscle and fine-muscle movements, Margie was rated as fairly poor in both areas. This is consistent with the Denver data and the mother's verbal report, as noted above. Overall, both children were judged to be functioning normally and as showing no unusual behaviors.

When the twins were three years old, Mrs. N. was hospitalized and subsequently bedridden, an event which she sees as a significant influence on the twins' development. Suffering from a slipped disc, Mrs. N. reported that she spent two months in the hospital, after which she was, in her words, "flat on my back" for six months. During this time Mrs. N. was somewhat unavailable to her children. She commented, "even when

I was home I couldn't do things for them," and stated that the twins were often cared for by a babysitter. Mrs. N. described Margie and Ellen as becoming more "independent" by necessity, since they had to do many things on their own, such as dressing themselves, making beds, and clearing dishes from the table.

Mrs. N. views the twins as above their age level in self-care skills, certainly ahead of their older sister's abilities when she was their age. Interestingly, the Vineland data at age four indicates that while Ellen is functioning at a Moderately High level in Daily Living Skills, Margie is functioning at an Adequate level. More specifically, Margie shows a lower level of functioning in personal care skills, although she is on a par with Ellen in domestic skills. Item analysis reveals that this is largely due to fine motor coordination, since Margie (unlike Ellen) has not yet mastered tying her shoelaces.

Mrs. N. expressed a belief that her period of physical disability also significantly influenced the twins' emotional development. She described both twins as subsequently experiencing greater anxiety about separation from their mother; however, she sees Margie as more distressed than Ellen. This issue, as related to personality contrasts, will be addressed in the following section.

Personality Development

The Bayley data at 18 months show that the twins were rated quite similarly across the various emotional/behavioral subcategories of the Infant Behavior Record. Both exhibited a friendly, responsive social orientation, although Ellen behaved in a more initiating manner toward

her mother than did Margie. Both children were highly cooperative and adapted with little evidence of fear. Margie was rated as higher in body tension than Ellen, who generally appeared relaxed. General emotional tone was described as between happy and radiant for both; and both received similarly high ratings for persistence, attention span, and endurance. Reactivity or excitability was similarly high for both, and activity level was rated as moderate, but slightly higher for Margie.

Carey Questionnaire data for Margie and Ellen (available only at two, six, and 18 months) reveals some different trends. Although both twins received Intermediate temperament classifications at all ages, an interesting switch occurred between two and six months. Margie, who was initially rated as Intermediate-Low, received subsequent ratings (at six and 18 months) of Intermediate-High, indicating a higher level of difficulty in temperament. The opposite pattern was seen in Ellen's scores: rated as Intermediate-High at two months, she appears less difficult in later assessments, receiving Intermediate-Low labels. Analysis of the specific dimensions contributing to these categorizations reveals that at two months, Margie was slightly more rhythmic than Ellen, resulting in the less difficult label. At six months, however, a higher score in approach led to Margie's higher difficulty rating. Margie continued to score higher than her twin in approach, with the difference between twins increasingly slightly by 18 months. This is consistent with the mother's verbal description at 48 months. She stated that Margie tends to be more actively demanding and assertive, whereas Ellen tends to

withdraw, especially when upset.

At two months the twins were most differentiated by the following dimensions: threshold (Margie lower), mood (Margie more negative), and activity (Margie lower). These characteristics seem quite likely to be related to physical differences between twins. At six months, the twins were rated as highly similar in all traits except for small differences in mood (Margie more negative) and approach (Margie higher). By 18 months, the following dimensions showed the most contrast: intensity (Margie higher) and rhythmicity (Margie more rhythmic). In addition, at 18 months Margie appeared slightly less distractible and more persistent, active, and adaptable. It appears that at two months the twins were differentiated by dimensions related to their discrepancy in physical condition, a discrepancy which was greatly diminished by six months of age. Subsequently at 18 months the twins were differentiated by other dimensions which appear less directly related to physical characteristics and more indicative of interpersonal style and orientation to the environment. Most of these differences, however, do not appear on objective measures (Bayley or Carey) to be large in magnitude.

The clearest temperamental differentiation between twins is evident in the open-ended interview with Mrs. N. at the 48-month visit. She indicated that mood is an important differentiating feature, describing Ellen as generally happier and referring to her nickname, "Singing Bird." According to Mrs. N., Ellen is more bubbly and giggly, and also "her highs are higher and her lows are lower." Margie is viewed as "more uniform emotionally," with less variability in mood. Mrs. N.

described her as more pouty and unhappy, and said "I don't think Margie will ever be the kind of bubbly personality that Ellen is." Interestingly, the Carey data do not indicate as marked a difference in mood as Mrs. N.'s words suggest. Although Margie was consistently rated as more negative in mood, the difference became increasingly smaller over the assessment period. However, the twins may have in fact become more disparate in mood after age three, following their mother's hospitalization, a time period not covered by the Carey data.

Mrs. N. certainly views Margie as experiencing more negative reactions to the hospitalization. She reported that Margie has more sleep problems. In addition to having nightmares, Margie resists going to bed, and tends to stay up later than Elizabeth. In Mrs. N.'s opinion, Margie's reluctance is a reaction to the period of separation from her mother: "she's checking up on me and making sure I'm still there." Ellen, in contrast, reportedly goes to bed independently when she is tired and falls asleep easily. Mrs. N. described Ellen as "wonderful" and attributed Ellen's apparently easier adjustment to her ability to "content herself" by sucking her thumb and clutching a favorite blanket. Margie, in Mrs. N.'s view, "does not attach" to an object like a blanket or doll, and Mrs. N. believes Margie would be happier if she made such attachments.

Another differentiating characteristic which emerged in the interview with Mrs. N. is that of dominance/submission. Although she initially stated that Margie and Ellen alternate between the roles of leader and follower, she later described Margie as more "bossy," strongwilled, and

assertive. Regarding sibling interactions, Mrs. N. indicated that C., her oldest daughter, tends to play with Ellen rather than Margie, because Ellen is "easier to get along with," whereas Margie tends not to "let C. push her around quite as much." As a result of C.'s preference for Ellen, according to Mrs. N., "Margie is sometimes odd man out, and her nose gets out of joint." In Mrs. N.'s perception, then, Margie is more assertive, dominant, and demanding, whereas Ellen is more submissive, cooperative, easygoing, and soothable.

This interview material suggests that Margie experiences greater anxiety about separation from her mother, which might be interpreted as a fear of being abandoned. Compared to her twin, Margie does seem to have a less positive relationship with her mother, who describes Margie as though she ought to be more like Ellen. Moreover, Mrs. N.'s words and tone of voice while describing the twins suggest that she feels closer to, and perhaps identifies more with, Ellen rather than Margie. At some level, Margie is likely to experience herself as less favored by her mother. Furthermore, by Mrs. N.'s report, Margie frequently experiences overt rejection by her sister, C., who prefers to play with Ellen, resulting in Margie being left out. Margie's demanding behavior might then be interpreted as related to the feeling that her needs will not be met unless she actively asserts herself. Her behavior also seems indicative of a generally high level of anxiety, perhaps related to these issues.

Ellen's behavior, in contrast, suggests that she experiences, and expects, a fair amount of attention. Her interpersonal manner during

the WPPSI testing session at 48 months is particularly telling. The examiner indicated in her notes that Ellen initially presented herself as compliant and cooperative, and displayed an "overtly feminine" style characterized by "wide-eyed looks and coyish smiles." Upon being stressed, Ellen first exhibited "histrionic" behaviors, and if these produced no effect, she behaved in a passive-aggressive manner. This suggests that histrionic behavior frequently succeeds in gaining attention for Ellen and rescuing her from difficult situations. Furthermore, the fact that Ellen evidences fewer difficulties than does Margie with sleep habits and separations from her mother suggests that she feels more secure and less anxious about her needs being met within the mother-child relationship. Unlike Margie, Ellen may not find it necessary to be actively demanding.

These interpretations are based largely on information from the parent interview, but they are consistent with trends in the objective temperament data. The unstructured interview in this case supplied a wealth of information, not only through the mother's verbal descriptions but also in terms of the mother-child interactions observed during the 48-month visit. An overall impression was that the family functioned in a disorganized, chaotic manner, an impression supported by preliminary phone contacts with Mrs. N. At these times she appeared to have difficulty both in managing her children while talking on the phone and in establishing a definite appointment to meet with the investigators. In addition, during the visit Mrs. N. interacted in an overly intrusive fashion with her children. Moreover she tended to take responsibility for them

rather than encouraging independent behavior (putting on their boots, snapping their coats). In light of these dynamics, both twins might be expected to exhibit dependent characteristics and a lack of organized, goal-directed behavior. Their performance in the WPPSI testing session provides evidence of this, as will be examined in the following section.

Cognitive Development

On intellectual measures, Margie and Ellen have scored very similarly and at a consistently high level across ages. Ellen scored 126 at 18 months (Bayley Mental Scale), 123 at 36 months (Stanford-Binet IQ), and 126 at 48 months (WPPSI IQ). Margie showed slightly more upward progress on these measures: 124 at 18 months, 123 at 36 months, and 129 at 48 months. The WPPSI IQ's of both twins place them within the Superior range of intellectual functioning (Wechsler, 1967).

Examination of the twins' scores across subtests of the WPPSI reveals differences in their pattern of abilities. Among verbal subtests, Margie performed fairly consistently and demonstrated much less variability than did Ellen, whose verbal scores varied widely. A significant strength for Ellen was Vocabulary, while her weakest areas were Arithmetic and Similarities. Both of the latter tasks involve abstract concepts and logical thinking; Arithmetic also requires a high degree of attention and concentration. Margie did not demonstrate similar weaknesses, nor did she show a strength in Vocabulary. Item analysis, though, suggests that Margie's knowledge of vocabulary may be better than her performance indicated. She gave up sooner than her twin and tended to answer "I don't know" rather than guess and receive partial

credit, as Ellen did.

Among performance subtests, Margie showed more variation in her abilities. Her scores suggested a weakness in Animal House, a task involving the association of signs with symbols, and which requires memory, concentration, goal awareness, and finger/manual dexterity (Wechsler, 1967). In light of Margie's previously noted delays in motor coordination (Denver, Bayley, and Vineland ratings), her low scores in Animal House and also Block Design subtests are likely to be related to fine motor coordination. Although she did perform better on the Geometric Design drawing task, this is an untimed subtest, so that Margie would not be penalized for working slowly. It may be that her scores were lower in the previous two subtests since they are timed and thus require a rapid execution of fine motor skills.

An outstanding strength in Margie's performance was Picture Completion, a visual perception and recognition task. In addition to an indication of visual acuity, an extremely high score in this subtest can be an indicator of a high anxiety level. This is consistent with parental interview data, as reported in the previous section.

Ellen's performance scores revealed no significant strengths or weaknesses, although like Margie, she performed relatively better on Picture Completion than on Animal House. Ellen received her lowest score on the Geometric Design task. This may be related to a lack of interest and effort, since the examiner's notes indicated that during the final subtests, Ellen "wanted to quit and did not push herself."

Both twins were in fact described by their examiners as easily dis-

tracted and quick to give up on tasks. In addition, during the testing session both twins, who were in separate rooms, appeared acutely aware of the presence of their mother and baby brother in an adjacent room. When the baby cried, both twins would leave their testing rooms to see what was happening. In consideration of these fluctuating attentional and motivational factors, which most likely interfered with the twins' WPPSI performance, the reliability of their scores across subtests is difficult to ascertain. However, their overall IQ's are quite consistent with their Bayley and Stanford-Binet scores, and thus appear to be a reliable indication of their general intellectual level.

In regard to the twins' verbal abilities, both children did receive a lower verbal IQ than performance and full-scale IQ's. However, verbal-performance differences were not large: seven points for Ellen and eight points for Margie. As suggested by Kaufman (1979), a discrepancy of less than 12 points is not considered significant. If the twins' verbal skills are delayed relative to their other cognitive abilities, the delay appears to be minimal.

Margie's verbal IQ is slightly higher than Ellen's, and as noted above, Margie's verbal abilities appear more solid and consistent than Ellen's. This is consistent with previous language ratings (Denver and Receptive-Expressive Emergent Language scale). On the REEL scale at 18 months, Margie was rated at a 20 to 22-month level, while Ellen was rated at 18 to 20 months. Neither twin appears significantly delayed in language development; however, Margie may be functioning at a slightly higher level in this area than her twin. This discrepancy, although a

slight one, can be viewed as related to personality variables. Margie, as a more actively demanding and assertive child, may have relied more heavily on verbal skills in her interpersonal behavior, thus accelerating her language development. Ellen, on the other hand, appears more passive and tends to withdraw, and therefore may not have developed language proficiency as quickly.

The data from this set of twins, then, suggest a high degree of concordance in overall intellectual development, although their performance on IQ measures indicated varying influences from certain personality factors. Dimensions of temperament emerging as salient discriminators between twins included activity level, emotional intensity, dominance, assertiveness, mood, and anxiety. In this case history, the magnitude of intertwin differences on objective measures appeared less marked than in the previous case study, with the most pronounced differentiation evident in the open-ended interview with the mother.

CHAPTER V

DISCUSSION

The developmental histories of these two sets of twins have provided an opportunity to examine a variety of hypotheses from the twin literature, while searching for factors which mediate these effects in individual cases. The following section will review major hypotheses raised by past research and discuss the extent to which they were supported by the present study. Finally, based on these case histories and the author's conceptualizations of them, hypotheses for further study will be suggested.

One of the most frequent hypotheses regarding twin development has been the reported relationship between birth weight and intelligence: that the heavier twin shows a higher IQ score than his/her partner. Churchill's (1965) findings specifying an advantage for the heavier twin in performance and full-scale IQ's but not verbal IQ were not supported by this study. These twins showed differences in verbal skills as well as in other areas. Predictions of a five or six-point IQ advantage for the heavier twin (Kaelber & Pugh, 1969; Scarr, 1969) were not consistently supported. In the J. twins, the smaller twin scored 11 points lower at 18 months, two points higher at 36 months, and six points lower at 48 months. In the N. twins, the smaller twin scored two points lower at 18 months, equal to her twin at 36 months, and four points higher at

48 months. Considering the measurement error involved in these tests (6 to 10 points on either side of the obtained IQ), these intertwin differences are minimal. These findings, then, are most consistent with the studies reporting no significant IQ differences between co-twins (Fujikura & Froehlich, 1974; Wilson, 1977).

Hypotheses regarding language delays in twins were likewise not strongly supported. On the language measure (REEL scale) at 18 months, all four children demonstrated at least age-appropriate language development. Their development of language skills from two through 18 months, as assessed by the Denver test, indicates variability in language progress as in other skill areas. Although intertwin differences in language ability were sometimes evident, the data do not demonstrate a marked overall language inferiority for these twins.

WPPSI IQ scores of the twins, however, suggest a trend somewhat supportive of Willerman and Churchill's (1967) report that twins showed lower verbal IQ's than performance and full-scale IQ's. This was true for all twins except Lisa J. The verbal-performance discrepancies, though, tended to be relatively small and of questionable significance. In Lisa's case, her relatively superior verbal skills were interpreted as related to a perceptual-motor deficit and her greater reliance on the verbal realm.

Cognitive data suggested that variability between twins in their abilities across different skill areas may be related to differences in motivation, attention, and other aspects of personality style. For example, Margie's slightly advanced verbal skill as compared to Ellen

was interpreted as related to her more demanding, assertive interpersonal style which involves a greater reliance on verbal communication. Furthermore, Ellen's relatively low scores on some WPPSI subtests appeared to be the result of a lack of attention and effort on her part, rather than a clear indication of her cognitive abilities.

Personality differentiation between co-twins was clearly revealed by measures of parental perceptions in this study. Characteristics reported in the twin literature as common differentiating features (emotionality, dependence/independence, activity/passivity, dominance/submission, sociability) did emerge as important dimensions for these twins. An association between birth condition and temperament was evident in only two dimensions of temperament: both smaller twins tended to be rated higher than their partners in activity and intensity. A variety of individual intervening factors appear to be involved in other personality distinctions. The weaker twin at birth, for instance, was not necessarily described later as passive, submissive, helpless, or incompetent. In the N. twins, Margie is in fact seen as less passive and submissive. Among the J. twins, Lisa is perceived as more aggressive and independent except in her relationship to her twin, where she shows more submission. Furthermore, in spite of Lisa's physical impairments, she is characterized by her parents as physically stronger, more "wiry," and more rapid in gross-motor development.

Both of the initially smaller twins, though, were perceived by their parents as more problematic and difficult to parent than their partners. More frequent emotional and behavioral problems were reported for the

smaller twin: difficulties in sleeping, temper tantrums, enuresis, negative mood. In general, these twins showed more symptoms of anxiety. These indicators were more readily apparent in Lisa J., for whom difficulties were evident in testing situations as well as in parents' verbal descriptions.

In Margie's case, indicators of greater emotional/behavioral difficulties than her twin emerged primarily in the interview with her mother. This seems to be related to two factors: first, both N. twins demonstrated dependency, distractibility, and separation problems during the 48-month testing session; and second, Mrs. N. tended to emphasize similarities between the twins, and only well into the interview did she point out their differences. Her responses on the Carey Questionnaires showed relatively minimal differentiation between the two. In this family, then, intertwine differences were harder to pinpoint, since both twins exhibited emotional difficulties and their mother's tendency was to highlight their similarities. In this case, the subjective, open-ended interview added important information to the objective measures.

Examination of mother-child relationships in these case histories suggests that the reports of previous investigators of a less stable maternal attachment to the weaker twin may warrant further study. There were indications in both twin pairs that the quality of the maternal relationship differed between co-twins. The mother's relationship with the smaller twin appeared less positive and was characterized by more anxiety and conflict (e.g., discipline problems). Parental interview data revealed that in both cases, mothers felt this twin was harder to relate

to and less able to form positive attachments. These qualities suggest that the mother feels less close emotionally and perhaps more ambivalent toward the smaller twin. Further research focusing on the mother-child relationship would provide valuable information in this regard.

In summary, these case histories suggest that given sufficient resources, the detrimental effects of twinship on general developmental progress tend to be minimal, having their greatest impact on the first few months of life. Furthermore, the developmental disadvantage of the twin who experienced greater perinatal trauma appears greatly diminished by 18 months of age. The most lasting intertwin differences were observed in the area of personality characteristics. Common to both pairs were tendencies for the smaller twin to be rated higher in activity and intensity and to be described by parents as more problematic and aggressive. Indications of greater anxiety and a less positive mother-child relationship were also noted in the smaller twins.

These trends could profitably be addressed in further research utilizing groups of discordant monozygotic twins. Ideally, studies should include twins of both sexes and diverse socioeconomic levels. The issue of socioeconomic status is an important one; twins who have access to fewer resources might tend to show greater lasting impairments related to perinatal difficulties. Furthermore, a marked language inferiority might be more likely among low-SES twins or in males, who have traditionally been described as slower than females in verbal development.

Further investigation of the maternal relationship with the co-twins is also needed. This might be assessed using a mother-child interactive

task or a home observation technique.

The use of an open-ended parental interview in the present study added valuable information to the objective instruments. The interview data identified a variety of personality distinctions not addressed by the objective measures, particularly when a parent tended to de-emphasize intertwin differences in general. It is therefore recommended that future studies include subjective, qualitative measures as well as objective assessments. Measures should be as varied as possible and include parental perceptions as well as the child's behavior in standardized situations.

The indications in the present study of greater anxiety and behavioral problems in the smaller twin should also be investigated in group research. Along with measures of temperament such as the Carey Questionnaire, studies might include objective measures of child anxiety and maladaptive behaviors. Depending on the age of the sample, child behavior could be rated by teachers as well as by parents. A measure of child self-esteem, such as a self-concept scale, is also recommended based on this study.

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APPROVAL SHEET

The thesis submitted by Cynthia L. Schroeder has been read and approved by the following committee:

Deborah Holmes, Ph.D., Director
Professor, Psychology
Loyola University of Chicago

Jill Nagy Reich, Ph.D.
Professor, Psychology
Loyola University of Chicago

The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the thesis is now given final approval by the Committee with reference to content and form.

The thesis is therefore accepted in partial fulfillment of the requirements for the degree of Master of Arts.

July 1, 1985
Date

Deborah L. Holmes, PhD
Director's Signature