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Identification Of Infants At Risk For Potential Developmental Problems Secondary To Stress In Their Mothers.

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This thesis, directed and approved by the candidate's committee, has been accepted by the Graduate Committee of The University of New Mexico in partial fulfillment of the requirements for the degree of

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Identification of Infants at Risk for Potential
Title Developmental Problems Secondary to Stress in
Their Mothers

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IDENTIFICATION OF INFANTS AT RISK
FOR POTENTIAL DEVELOPMENTAL PROBLEMS
SECONDARY TO STRESS IN THEIR MOTHERS

BY
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THESIS

Submitted in Partial Fulfillment of the
Requirements for the Degree of
Master of Arts
in the Graduate School of
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IDENTIFICATION OF INFANTS AT RISK
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ABSTRACT OF THESIS

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ABSTRACT

One of the first tasks of mothering is the feeding of the child. It is recognized that certain mothers have difficulty carrying out this function. If the mother has extreme difficulty with this task, her child is at risk for neurologic and the subsequent educational problems.

This study looked at the amount of stress in the mother in the year preceding delivery to the rate of weight gain in her child. The hypothesis that mothers with increased stress would have the greatest difficulty feeding their infants could not be accepted. There was, however, an indication that once the total stress in the mother exceeded 300 points, the observed weight gain decreased.

Physical growth is only one measurement of mother-child interaction. The overall development of competence in children may be influenced by the mother's ability to respond to the increased motor activity and demand for language in the one- to two-year-old child. The role of stress in the mother over time needs to be investigated in the framework of the mother-child interaction.

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CHAPTER I

INTRODUCTION

We tend to frequently think of education as beginning on entry into formal school programs while indeed the developmental process of interaction, maturation, and integration of experience has been going on at a very rapid rate since birth. " ... divergence with respect to the development of educability and overall competence first becomes manifest during the second year of life," according to Burton White (1973). He goes on to suggest that developmental divergence is a "major national problem of the six year old entering the school system" (p. 20).

For optimal school performance, educators need a competent child entering the system as well as then having the responsibility of providing an education to produce competent adults. The following is a model of the educational cycle.

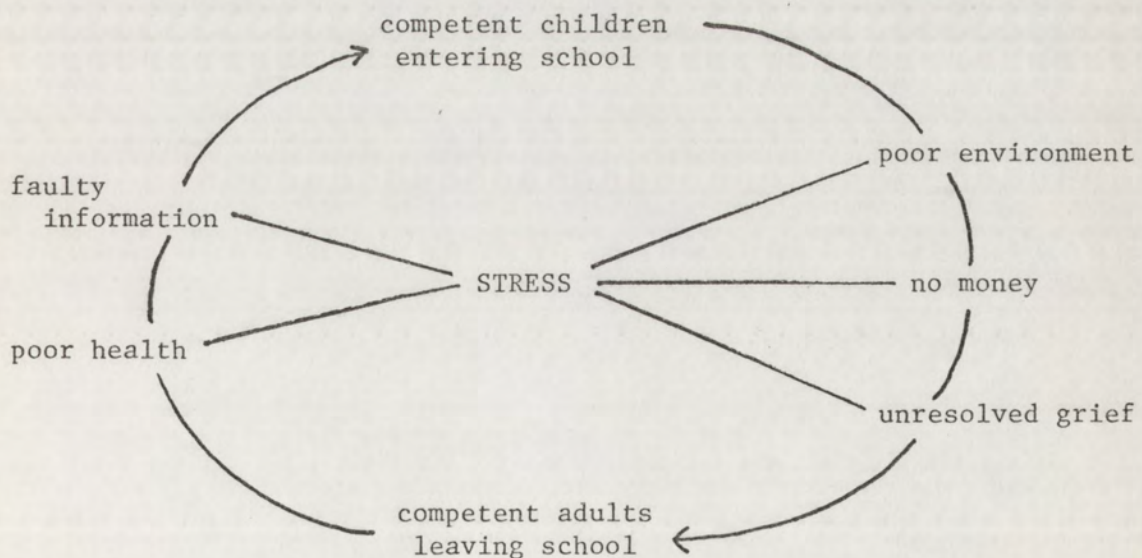


FIGURE 1.

Stress as Relates to Competent Children and Adults.

This model emphasizes stress as interfering with the natural developmental process toward competence. Stress has an interfering role as applied to the child as well as to the adults who are parenting (teaching) him throughout his lifetime.

A model of this nature assumes a definition of competence. Competence as defined by Webster (1961) means fitness of ability with suggested synonyms of capability, capacity, sufficiency, and skill. Robert White (1959) in his development of the concept of competence felt it was a "suitable word because it embodies such things as grasping and exploring, crawling and walking, attention and preception, language and thinking, manipulating and changing the surroundings all of which promote an effective interaction with the environment." This involves discovering the effects the child can have on the environment and effects the environment will have on him. White goes on to explore that competence is a motivational concept. He uses Piaget's description of his son Laurent as an example. "He (Laurent) selects for continuous treatment those aspects of his environment which he finds it possible to affect in some way" (p. 120). This urge toward competence is inferred specifically from behavior that shows a lasting focalization and has characteristics of exploration and experimentation, a kind of variation within the focus.

Not all children attain the same degree of competence at the point they enter "formalized" education. This is what Burton White then sees as developmental divergence. One of the big unanswered questions is how competence develops. White's study is attempting to prospectively answer this. They have developed a tentative hypothesis that the manner

of response of the mother to the emergence of locomotor mobility in her child as well as the family's response to the child's increasing language between ages one and two years may be critical factors in the problem of developmental divergence. Overall, though, knowledge of how competence develops in the young child is lacking at this point in time.

With the definition of competence relying on the child's interaction with his environment, including both objects and people, plus the mother's major interactive role in the development of her child's competence, I would like to look at what stress does to the mother's role. All reflective adults appreciate that when they are worried, it is difficult for them to attend to other matters at hand. Hans Selye (1955), a Canadian physiologist, has brought this problem to the attention of the modern world with biochemical measurement in animals and man of body changes (i.e., adrenal) to stress. This approach has been modified by psychiatry (Holmes & Rake, 1967; Paykel, 1971) in the development of stress scales. They have demonstrated a relationship between illness, life experiences, and the social environment.

How stress in the mother relates to her ability to mother a competent child has never been studied prospectively. A retrospective study by Hepner (1971) gives a glimmer of such a relationship. He looked at growth rate, nutrient intake, and "mothering" as determinants of malnutrition in disadvantaged children. When he embarked on his five-year study of 9,000 children, he was most concerned with laboratory measurement: vitamins A and C, hematocrit, and iron. Observations by the staff led them to discover that the overburdened and stressed family were the ones who had the malnourished children. "A mother may have the best intentions and desire to perform adequately but her priority for this

effort may be deflected by inundating life circumstances beyond her control" (p. 221).

Those concerned with early childhood education cannot afford to wait until a child enters school to begin working with him. By the time a child is three or six years old, much of his development has occurred. While Burton White and others collect data on how competence develops, we continue with a responsibility to provide either specialized help to all in massive remediation programs or we need to develop a tool to identify high risk children for specific intervention. The former tack has been taken with massive "fix-up" programs such as Head Start, Home Start, and infant stimulation. Walsch (1973) writes on this concept:

"Of particular interest is prevention that relies chiefly on remediation. Evidence of this emphasis on remediation is vividly expressed in the nation's commitment to the Head Start Program with its focus on early evaluation of the child so that instruction and corrective assistance can be provided to enhance his physical, emotional, and educational well-being" (p. 353).

More specific "fix-up" programs have focused on (1) language (Bereiter & Englemann, 1966), (2) cognitive development (Ypsilanti Model, 1970), or (3) sensory-discrimination capacity (Deutsch, 1968). Variation in the emphasis in these programs exists, but all programs have developed because of a widely held belief that developmental divergence is present.

Early childhood education programs have met with varying degrees of success. The mere fact that no one program is a panacea for the problem of developmental divergence points out that the problem is complex and suffers from the lack of knowledge of how competence develops. Even Jerome Kagan (1973), who feels that competence can emerge at many different ages, states, "American parents must be concerned with the early

psychological growth of their children. We live in a society in which the relative retardation of a four-year-old seriously influences his future opportunities because we have made relative retardation functionally synonymous with absolute retardation" (p. 960).

Ira Gordon (1969) has had extensive experience in "fix-up" programs. He wrote: "Our attrition data and our parent educator's comments indicate that there are mothers in this population (indigent) we were not able to serve in our type program. It may very well be that we could serve them if their other life needs were well met" (p. 959). Tulkin & Kagan (1972) write: "Thus a mother's attitudes toward her children are not independent of social and economic conditions, and interventionists must realize that attempts to change maternal behaviors without regard to the source of the behaviors--or the relation between these behaviors and other aspects of the social system--may not succeed" (p. 40).

Educators recognize the problem of developmental divergence but can not come to any agreement on successful remediation nor do they have available a tool for identification of which mother-child experiences are in jeopardy. The question asked specifically in this thesis is if there is a tool to predict difficulties in early infant-mother interaction. Since the first recognized task of the mother is to feed her child, this thesis will look at the hypothesis that mothers with increased stress during their pregnancy will have more difficulty in feeding their child as measured by weight gain. It will have to be assumed at this stage that the same stresses that prevent a mother from feeding her infant would also prevent her from competently mothering him later.

CHAPTER II

REVIEW OF RELATED LITERATURE

Brain and Body Growth

Medicine has been concerned with the problem of early identification of children not receiving enough calories to gain weight adequately. Myron Winick (1969), through extensive research on animal and human brain growth, has concluded that when malnutrition interferes with brain growth during the rapid cell proliferation phase, it is likely to retard brain growth irreversibly. This period of rapid growth begins in utero and continues for the first six months of life, after which there is little if any increase in brain cell number. "Malnutrition results in a large pool of poorly functioning people who in turn rear their children under conditions destined to produce a new generation of malnourished individuals" (p. 667).

Infants at full nine-months gestation may be born weighing much less than expected because of faulty nutrition or some other unknown cause. Fitzhardinge (1972) did a prospective study of small infants which has educational implications. Ninety-six full-term infants who weighed less than expected at the time of birth were matched with a sibling of the same sex and closest in age. These matched pairs were followed for six years and tests on the incidence and type of neurologic problems were done. In the small-at-birth group there was a higher incidence of minimal cerebral dysfunction as characterized by "hyperactivity, short attention span, learning difficulties, poor fine-motor coordination, and hyper-reflexia" (p. 50). Speech defects such as immaturity of reception

and expression were also seen more frequently than in the controls. While there was no overall significant difference in I.Q. between the test and control groups, 50% of the test group boys and 36% of the test group girls were described as having overall "poor school performance."

Cravioto (1970) feels that protein-calorie malnutrition occurring in the first year of life, if severe enough to markedly retard physical growth and force the infant's admittance to the hospital, may have adverse effects on mental development. In his study he also matched his test group with the sibling nearest in age. He found significant differences in audio-visual integration and in visual kinesthetic modalities. The distribution of I.Q. scores was definitely skewed toward the retarded range in those infants suffering from malnutrition. He concludes with:

"It became apparent from the animal studies and the research on children that a period of severe nutritional deprivation at a time when the vulnerability of the nervous system is high may be the cause of measurable damage to the CNS. Moreover, the time of hospitalization for severe malnutrition often coincides with an age when the development of behavioral competence depends on a normal environment with opportunities for experience. The consequences of early malnutrition on cognitive functioning may therefore reflect interference with experience and behavior differentiation as well. At the present time we do not have the evidence to distinguish the particular contribution of each of these mechanisms to defective cognitive function" (p. 409).

Maternal Attitudes

In the preceding consideration of nutrition deficiency conditions we see phenomena with educational implications. There are also deficiency patterns fostered by caretakers where child behavior patterns can evolve in such a way as to be labeled "retarded" or "backward". In a book edited by Dittmann (1968) work of Caldwell, Richmond, Provence, Spitz,

Bakwin, Bowlby and many others is presented and discussed. The privation-deprivation concept is used to unify much of their work.

"One facet of the joint concept, privation, involves the absence or an inadequate supply of essential stimuli to the child in the caretaking setting for lengthy periods in early life; the second aspect, deprivation, involves the removal of important stimuli from the child's setting, as in separation" (p. 154).

Patterns seen in the younger child include "developmental and intellectual arrest, depression, and apathy; and in older children, impaired social maturity may be involved" (p. 155).

Erikson (1963), as he discusses psychological development, begins with the early mother-child interaction around feeding. He believes that a predictable and comfortable feeding relationship lays the groundwork for man's basic sense of trust.

While we can establish a need to supply calories for optimal growth, the medical profession is continually confronted with the problem of mothers who with adequate food can still not nourish their child. Whitten (1972) looked at maternally deprived infants. Maternally deprived infants are usually diagnosed or identified by the clinical observation that a certain poorly nourished infant will gain weight rapidly when removed from his mother. It has long been felt that the absence of tender loving care as well as social and sensory stimulation has led to this state of poor nutrition.

Whitten set up a hypothesis that maternally deprived children were starved and did not grow because of this. He demonstrated that when infants who had sustained maternal deprivation in their homes were fed

as much as they wanted to eat in the hospital, most gained weight at an accelerated rate. Some continued to argue that the reason that children who were maternally deprived gained weight in the hospital was that when removed from the care of a rejecting mother, the infant's psychological state improved and therefore he could gain weight. To study this, Whitten then set up a home feeding program for maternally deprived infants to provide adequate calories without simultaneously interfering with the way the infant was handled by the mother. A hospital worker supervised scheduled feeding periods and the infants gained at an accelerated rate. He concluded that these mothers, left unsupervised, are unable to feed the infant enough calories, enough times during the day, because of the mother's psychological status resulting from significant stresses in her life.

Although Whitten specifically studied growth of infants with supervised feeding, he consistently related inability to feed infants with the mother's inability to stimulate her child as well.

"On the other hand, some mothers' capacity to care for their children effectively is impaired by situational factors that place her under exceptional stress--marital discord, inadequate income, an unwanted pregnancy, more children than she can manage, a husband who is unable to give her support, or no husband at all. The deprived child may exhibit behavioral patterns distasteful to the mother, may be of an unwanted sex, or its appearance may be repulsive to the mother. While the incapacitation which accompanies mental illness has long been understood, there has been a tendency, until recently, not to recognize that situational stress can be just as incapacitating" (p. 13).

Whitten concludes his studies with what he calls the unfortunate focus:

"Growth failure is not the most important feature of the inadequately

mothered child. It is far more likely that the child's ability to function in later life will be compromised by the effects of understimulation on his emotional, psychological, and mental development than by any degree of growth failure" (p. 14).

Another equally dramatic problem recognized in faulty mother-child interaction is that of child abuse. Kempe and Helfer (1972) have done much work to sensitize the public to this and to develop meaningful treatment programs. The abused or battered child is defined by them as "any child who receives nonaccidental physical injury(s) as a result of acts (or omissions) on the part of his parents or guardians" (p. iii). The parent or parents responsible for the battering appear to fit into a pattern which includes various factors such as inadequate exposure to parenting themselves, inability to trust others, a lack of positive support from their spouse, and unrealistic expectations for their child. Another part of the pattern is that there must be a child whom the parents single out as unusual or different. Lastly, they feel there must be some form of crisis, or stress, which sets the abusive act into motion. The crisis is seen as the precipitating factor in parents who already have the potential to abuse. Interestingly, as they have worked with these children, they have found that 33% of battered children have not grown as fast as would have been expected (failure to thrive).

"The subjective warnings of abnormal parent-child interaction require on the part of the physician and his associates an open mind and a careful eye toward clues which indicate that all is not well between parent and baby. Clearly, to wait for marked expression of the 'failure to thrive' syndrome or frank child abuse simply fails to focus on the importance of preventive medicine in this important field. When mothering of sufficient quality is not forthcoming on the part of his own mother or mother substitute, serious and predictable

long-term damage, which may not be repairable, will result. Early diagnosis of insufficient mothering is, therefore, an essential part of the care of the newborn and his mother" (p. 76).

Fischhoff (1971) did a retrospective study of mothers involved in the maternal deprivation syndrome. He found that most of these mothers had constellations of characteristics found in character disorders, such as:

- (1) disturbed early childhood histories,
- (2) poor performance in current day-to-day activities,
- (3) behavior on initial contact indicative of fairly severe pathology,
- (4) desire for an anaclitic relationship with a severe desire to be taken care of,
- (5) literal, concrete thinking patterns, with a limited capacity for abstraction or planning for the future,
- (6) the use of denial, isolation, and projection as major mechanisms of defense, and
- (7) a predisposition toward action or acting out as opposed to thought.

Barbero et al. (1963, 1967), also in retrospective studies, describe mothers of failure-to-thrive infants as depressed, angry, helpless, desperate, and with problems in maintaining self-esteem. Significant environmental factors they found included alcoholism, childhood deprivation, physical abuse between parents, and considerable strain brought on the parents by their own families.

Leonard and Solnit (1966) describe characteristics of mothers of infants who fail to thrive as including tension, anger, anxiety, depression, lacking self-esteem, inability to assess their baby's needs, and lack of nurturing in their own childhood.

Competence

Moving away from the more pathologic descriptions of mothering, we can look at what is an accepted description of a mentally healthy, competent adult. The Report of the Joint Commission of Mental Health of Children (1969) provides us with a tentative definition of a healthy adult:

- (1) is able to see and generally deal with the realities concerning him and his world,
- (2) is able to relate to other people in ways that are satisfying both to him and them,
- (3) is able to control and accept his impulses for sexual and aggressive behavior,
- (4) is able to learn and apply what he has learned,
- (5) has confidence,
- (6) has acquired a set of values on which he has based his life,
- (7) has a sense of community with others and a sureness of his own identity, and
- (8) continues to grow throughout his lifetime, building on earlier strengths and flexibilities as he meets new tasks and situations.

The mother described earlier by Burton White, who can build competence in a one- to two-year-old by tolerating increased motor activity and by responding to her child's emerging language, would fit into this description.

Sally Provence (1967) describes what she considers to be the implied tasks in nurturing infants. In much abbreviated form, these tasks include:

- (1) to be a consistent, reliable, loving caretaker,
- (2) to supply the basic elements of physical nurturance,
- (3) to supply adequate social and physical stimulation,
- (4) to promote the development of language and logical thought through talking to the infant about himself and his world,

- (5) to provide an environment that is consistent and predictable, plus some variety,
- (6) to provide and sponsor the use of toys for pleasure and to discharge feelings,
- (7) to provide opportunities for play,
- (8) to order the environment so the infant can have some peaceful moments, and
- (9) to provide opportunity for learning to live with others through imposing limits attuned to the child's particular stage of development.

Having reviewed what might be considered working descriptions of the competent adult and the competent mother, we need to look at a description of a competent child. Wenar (1964) describes a competent one-year-old mainly in terms of what he calls executive ability. He was investigating the effect of parental behavior on such things as self-confidence, task orientation, and ego-syntonic nature of learning which he saw as striking features of the second year of life. He defined executive competence in the one-year-old as "the child's ability to initiate and sustain locomotor, manipulative, and visual regarding activities at a given level of complexity and intensity, and with a given degree of self-sufficiency" (p. 336). A child with low competence would flit from one activity to another or sit on the floor gazing vaguely around, or demand to be held before becoming involved in any activity. He warns that this description of executive competence carries no value judgment.

"There is a natural tendency to think of high competence as being good and low as bad, in terms of mental health, ego development, or other criteria of adjustment. Along with this may go an equally natural tendency to want to raise the level of competence when it is low, again with the goal of giving a child more of the good things in life. It is much too early to go along with either of these notions" (p. 341).

Another description of a competent child is available from the Burton White study (p. 10-16). "The resultant list of distinguishing

abilities represents an observationally based differentiated description of what we mean by competence in preschool children."

Social Abilities:

- (1) to get and maintain the attention of adults in socially acceptable ways,
- (2) to use adults as resources,
- (3) to express both affection and hostility to adults,
- (4) to lead and follow peers,
- (5) to express both affection and hostility to peers,
- (6) to compete with peers,
- (7) to praise oneself and/or show pride in one's accomplishments, and
- (8) to involve oneself in adult role-playing behaviors or to otherwise express the desire to grow up.

Nonsocial Abilities:

- (1) Linguistic competence
- (2) Intellectual competence
- (3) Executive abilities
- (4) Attentional ability

Assessing Stress

The stress questionnaire of Holmes and Rahe (1967) was developed from observations that clusters of social events requiring change in ongoing life are significantly associated with the time of onset of illness. Appendix 1 includes the events found to require enough change to be considered stressful. These events pertain to major areas of dynamic significance in the social structure of our way of life. The occurrence of any of these life events is associated with some adaptive or coping behavior on the part of the individual. They have depended on the consensus of perceptions of events of a moderately large sample of subjects to validate the scale.

These life events were subsequently weighted as to the amount of stress produced in both middle-class whites, blacks, and Mexican popu-

lations by Komaroff, Masuda, and Holmes (1967). Age, sex, educational background, religious affiliation, and generation American appeared not to influence the evaluation. The correlation coefficient of the mean item score rank orders were closer between the Black and Mexican subgroups than either were to the White middle-income. "There was a significant agreement in the mean rank ordering of the items and a significant concordance in the interindividual rankings" (p. 121).

Rahe (1968) did a well-controlled prospective study to look at the clinical validity of the Holmes stress questionnaire in the situation of predicting illness among sailors while on a six-month cruise. He administered the questionnaire to 2,500 enlisted men about to embark on naval cruises. He then compared the number of illnesses sustained by the third of his population with the most stress, to the third with the least stress over the six-month time period. "Over the whole six months the high risk group had significantly more men who developed at least one illness" ($p=0.001$) (p. 1125).

Kempe, Helfer, and Pollack have been working for three years on a questionnaire to identify potentially abusive parents so they might implement a meaningful therapeutic program. While their tool is not specifically aimed at stress, their problems in developing a predictive instrument are important.

"Unfortunately, the ideal questionnaire will never be available for many reasons. An inherent problem in asking people questions is their tendency to respond with answers which are not necessarily true indicators of their feelings, but which may reflect feelings which are socially desirable" (p. 271).

A definitely valid and reliable predictive tool to evaluate which mother-child interactions might be in jeopardy is not currently available. Assessment of stress is still in its early stages of development. The Holmes scale may be a predictive tool to detect problems in mother-infant interaction.

Summary

The literature review, then, indicates that competence is desirable in both the child and the adult. However, if the adult caretaker is unable to properly feed her child, the child is at risk for decrease in overall brain cell number as well as some of the more subtle signs of neurologic damage which interfere at least with formalized schooling. While the stressed mother may create blatant malnutrition in her infant, it is also strongly suggested that there is psychologic-emotional damage as well which would interfere with the attaining of competence. Educators are well aware of the developmental divergence present in children entering schools. Mothers have been found, when stressed, to have difficulty in interacting meaningfully with their children. The process of researching stress is just beginning and instrumentation is in the early stages of development. It is hoped, then, that the available Holmes stress questionnaire can be shown to be a useful tool for getting at environmental stress experienced by mothers.

CHAPTER III

DESIGN AND PROCEDURES

This is a prospective correlative study of the relationship of stress experienced by the mother in the year preceding delivery to the weight gain seen in her infant during the first six weeks of life. This study was designed to look at stress rather than health reasons for differences in weight gain, so only mother-infant pairs who as far as known were free from disease were included. Variables such as gestational age, health of the mother, and so on were controlled for by the selection of subjects.

Subjects

The subjects for this study are mother-infant pairs who delivered at Bernalillo County Medical Center in Albuquerque, New Mexico in February, 1974. As many mother-infant pairs as the author had time to screen and interview were included. Mothers who agreed to the stress questionnaire interview as well as to the final weighing of their baby at six weeks of age were screened as reported in Selection of Subjects. Those mother-infant pairs who could be located at the time of the final weighing became the final Subjects N=19.

Instrumentation

The Holmes stress questionnaire is a subjective instrument used to record and weight events that the patient has experienced in the past year that are known to be stressful. See Appendix 1 for the complete instrument. The reliability and validity of this instrument is not

known except as inferred from follow-up observations showing an increased incidence of illnesses occurring in adults sustaining increased stress. This instrument was chosen as it relates to the topic of this study, stress, and as it is an available instrument in a quickly administered form.

The stress questionnaire was administered by the author to mothers on the post-partum floor prior to time of discharge. Mothers, when approached, were asked if any of the listed events had occurred in the past year. Their response was noted and the points for each stressful item were totaled as that particular mother's stress score.

Selection of Subjects

Infants selected were born vaginally at 37-40 weeks of gestation and had a birth weight appropriate for the length of their gestation. At the time of delivery and on initial exam in the newborn nursery, they were felt to be healthy and free from congenital anomalies. No infants developed any illnesses in the newborn nursery. This information was obtained by review of their hospital charts.

Mothers were selected who had no complications during pregnancy, labor, or delivery as ascertained by review of their hospital records. In order to make a follow-up home visit feasible, the study group was limited to residents of Bernalillo County. Number of children, economics, marital status, race, age of mother, or method of feeding were not taken into account except as might be inferred by the mother's responses to specific questions on the stress questionnaire.

Approximately forty charts of mother-infant pairs were initially reviewed. Of these, only twenty-three fit the criteria described above.

Two mothers did not want to be interviewed. Of the twenty-one interviewed only nineteen could be located at the address of record at the time of the final weight and therefore became the population of this study.

Data Gathering

Stress data. The Holmes stress questionnaire was administered to all mothers who agreed to the study. The introduction of the questionnaire stated, "I would like to know a little about some of the things that have been happening in your life during the past year. Tell me 'yes' if anything in this list occurred during the past year. You do not need to give me any details." Answers were recorded on the questionnaire in the space provided.

Initial weight. The official birth weight in pounds and ounces was obtained from review of the chart.

Final weight. The final weight was obtained at the time of the home visit when the infant was six weeks of age \pm two days. This weight was obtained in pounds and ounces on carefully balanced scales.

Mother-infant interaction. Some notes were made by the author on observations of the home and mother-infant interaction. There was no format for these observations, which were considered only as informal anecdotal information.

Data Processing

The mother's stress scores and the infant's weight gain were used for a scatter diagram as well as to fit a polynomial regression line by the method of least squares.

CHAPTER IV

PRESENTATION OF DATA AND FINDINGS

The nineteen mother-infant pairs which could be located at the time of the final weighing became the subjects of this study.

At the time of the final weighing it was noted that there seemed to be an extremely wide range of weight gains. This widely scattered array of data had not been anticipated at the conception of the study. These weight gains varied from zero ounces gained to a maximum gain of sixty-nine ounces.

The amount of stress incurred by mothers in the year preceding delivery also showed much variation. The subjective values of stress points incurred ranged from a low of 107 to a high of 343 points.

It was noted that the two mothers who subjectively felt they had very few stressful events in their lives in the preceding year were also the mothers of the infants who had gained the least amount of weight. The dependent variable, weight gain, did not seem to correlate with the independent variable, stress in the mother, in these two cases.

The scatter diagram (Figure 2) showed some clumping of mother-infant pairs. The two mother-infant pairs with the least stress in the mother and the smallest weight gain in the infant are much below the main body of mother-infant stress-weight points. If one looks at the one-third ($N=6$) of mothers with the least amount of stress, the weight gains in their infants ranges over the complete spectrum of observed weight gains, that is, from zero to sixty-six ounces. If one looks

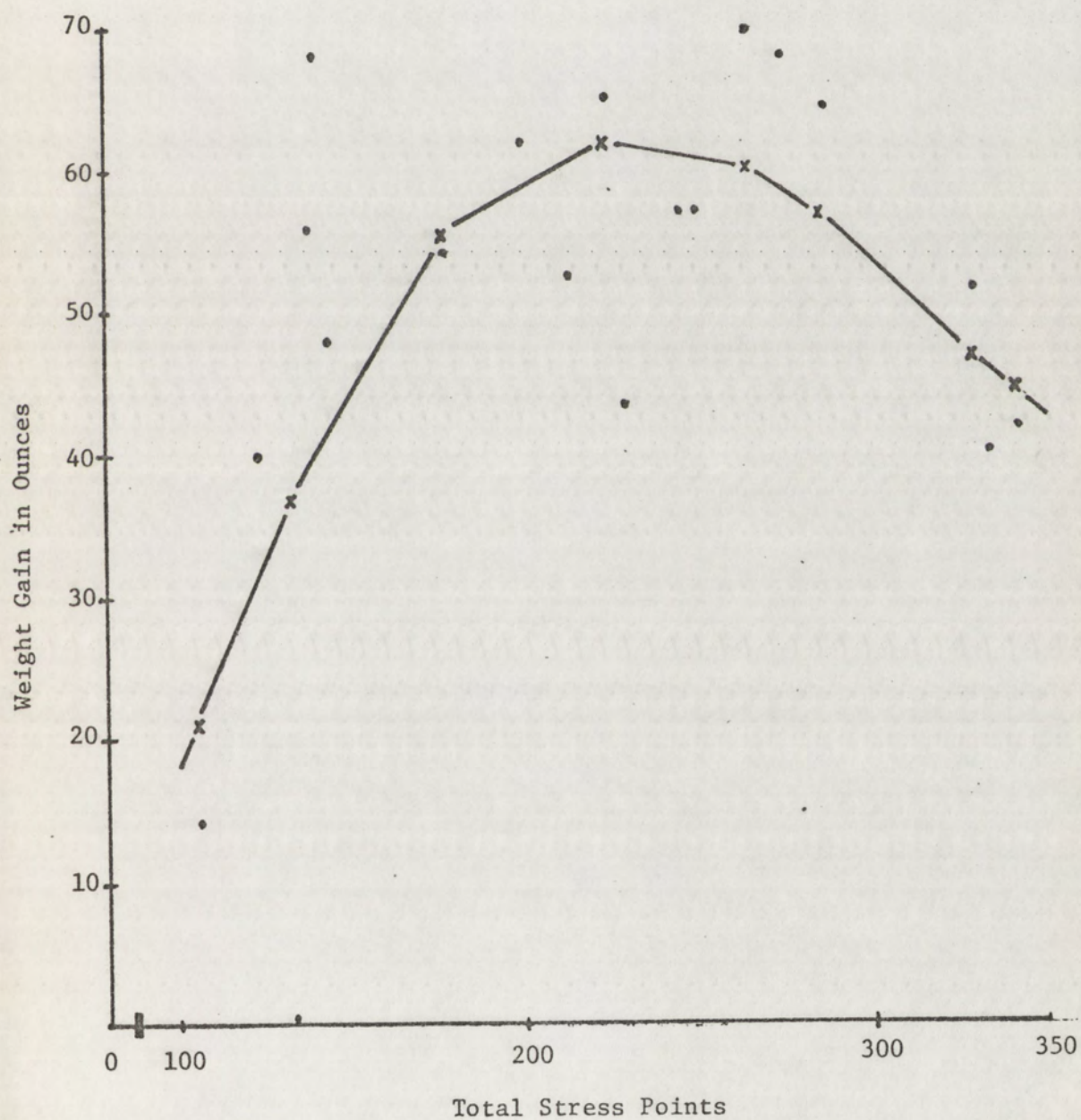


FIGURE 2.
Relationship between weight gain and stress for 19 infants with
quadratic regression line ($y = -59.1 + .99x - 0.0020x^2$)

at the upper one-third of weight gains, the corresponding stress in the mothers ranges from 133 points to nearly 300 points. There is a final clump of three mother-infant pairs that are distinguished by the mothers incurring stress in the greater than 300 point range. All infants in this clump had weight gains in the middle range of observed weight gains, that is, between forty and fifty-two ounces.

Figure 2 also shows a quadratic regression line which suggests by the analysis of the variance from a straight line a trend toward lower weight gains once the mother's stress approaches or passes 300 points ($p=0.01$).

The initial hypothesis that there would be a correlation between the stress experienced in the mother in the year preceding delivery and the rate of weight gain as seen in her infant cannot be accepted using the Holmes stress questionnaire. The suggestion is present that once the stress in the mother approaches or exceeds 300 points there may be difficulty in feeding.

The Holmes stress questionnaire and a recent modification by Paykel is the only quickly administered stress test available. This instrument may not be sensitive enough to measure all the significant stress involved in the preparation for motherhood. There may be a difference, then, in the type(s) of stress that are predictive of onset of illnesses as opposed to the type(s) of stress that are predictive of difficulty in mothering (feeding). Mothers may not have been able to freely respond to the questionnaire because of the way it was presented, because it was too personal, or for other unknown reasons.

Stress as recalled by the mother in the preceding year is a static measurement. The actual birth of the child may have an effect of alleviating some of the stress experienced by some mothers. In other mothers, the birth of the child may have increased their stress in ways they had not anticipated at the time of the interview. There may be a problem in that the stress interview occurred at a single point in time while the weight gain in the child was a cumulative measurement over six weeks.

Several limitations of this study occurred because of the short time period of the data collection. The sample size was necessarily small. Only one follow-up weight was obtained on each infant. Possibly a larger sample with more weights over time would have shown a different trend.

Stress as measured on the Holmes questionnaire may not be the only or even a valid predictor of poor weight gain in an infant. A predictive tool for assessing character disorders coupled with the stress questionnaire might be a more appropriate screen to identify at-risk mother-infant interactions, for example.

Concominent Data

Some other observations were made during this study which do not appear in the data as part of the initial hypothesis. These observations may throw some light on the complexities involved in the mother-infant interaction.

Case 1.

T.S. is a 16-year-old unmarried woman, who was well groomed and comfortable during the stress interview in the hospital. She told me that her mother would help care for the baby. Secondary to the pregnancy T.S. had made changes in her sleep and eating habits which she felt stressful. She had vacationed more and had a different Christmas routine. A 16-year-old cousin had been killed in an auto accident. Total points on the stress questionnaire = 133.

At the time of the follow-up visit, the landlady told me various people in the neighborhood had been caring for the baby and she had not seen T.S. for several days. In fact, the maternal grandmother of the infant had also disappeared and had left an 8-year-old daughter alone at home with no food or money. The landlady led me to the back single-room dwelling to see if the baby was home. The 8-year-old sister of T.S. told me that the baby was with his paternal great-grandmother and volunteered to lead me there. The great-grandmother lived in a very dilapidated dwelling by herself and was obviously ill. The baby was clean, lying in a basket with a bottle of sugar-water propped. The great-grandmother was delighted to see me as she had no food for the baby and was afraid he was sick and might die while she was taking care of him. The baby had no name.

The baby at birth weighed six pounds and one ounce and at the final visit weighed six pounds and zero ounces. The baby appeared too weak to suck and was admitted to Bernalillo County Medical Center with a diagnosis of malnutrition. After twelve hours in the hospital, the infant gained ten ounces and continued to gain weight at a very rapid rate. The mother visited the baby once accompanied by five young men. It was subsequently learned that T.S. had two brothers who had been removed from the home secondary to neglect. T.S. did not show up for the placement hearing and the infant was subsequently discharged to a foster home. The discharge diagnosis was maternal deprivation.

Discussion of Case 1.

The relationship of T.S. with her infant falls into the definition of maternal deprivation. Whether T.S. has a character disorder as described by Fischhoff is open to speculation. There is certainly a suggestion that T.S. had a disturbed early childhood, that she had difficulty performing daily activities, had a desire to be taken care of, and used denial as a major mechanism of defense. A person with much denial and inability to assess their own needs may not be able to respond to a stress questionnaire with any degree of awareness.

Case 2.

G.M. is a 23-year-old married woman whose husband is a student at the University of New Mexico. Changes that had occurred in her life during the preceding year included a brother-in-law had been staying with the couple and she had had to stop working when she became pregnant. Her husband had also stopped working. They had loans of less than \$10,000. Her points on the stress questionnaire totaled 213.

G.M. lived in the upstairs of a well-cared-for old home which was very sparsely furnished, except for a large book collection owned by her husband and another man jointly.

At the time of the visit G.M. was playing with the nude baby on the floor. There was much physical contact and talking. She was showing him alphabet blocks and colored beads. G.M. told me that a friend brought him the gifts so he could learn while she changed his diaper. She showed me the books she had been reading: Give Your Child a More Superior Mind, by Siegfried and Therese Engelmann; and Exercise For Children, 0-3 Years, by Earl Wallace and Jean Logan. As we continued to talk she told me about her retarded brother-in-law. She also had a juicer and was beginning to give the baby carrot juice, which she felt made him more alert and awake (from 6 a.m. to midnight). The baby had gained three pounds and seven ounces since birth.

Discussion of Case 2.

G.M. was very involved in stimulating her child when I arrived. She seemed very relaxed with her baby and to thoroughly enjoy him. Stress in G.M. may have been a motivating factor out of the awareness of retardation in the family.

Case 3.

S.H. is a 16-year-old unmarried girl who had a total of 224 points on the stress questionnaire. Included in this was the death of her mother which had occurred two months before the birth of her infant.

S.H. and her 20-year-old unmarried sister live alone in a rather run-down house with water standing in the front yard which smelled of sewage. S.H. has been taking care of four other children who ranged in age from six months to six years. The children were alternately crying and running around when I visited. S.H. was continually threatening them, "I'll hit you if you ... " She and the two-year-old got into a shouting battle and he finally got hit. The baby looked stuffed and had gained four pounds and one ounce in the six weeks. S.H. commented on how he looks all around and listens to voices and the TV.

Discussion of Case 3.

S.H.'s infant had gained weight very well and his mother seemed relaxed with him and excited by how much he liked looking around and listening to sounds. She seemed to experience some difficulty in relating to older verbal and mobile children. Whether this was only a situational problem or whether it will continue as her baby grows older remains for speculation.

CHAPTER V

CONCLUSIONS AND IMPLICATIONS

Conclusions

The Holmes questionnaire was used in the study to identify stress experienced by mothers during the year preceding delivery. The hypothesis that mothers with increased stress would be less able to adequately feed their newborn infants was not supported by the data. There was, however, a suggestion that when the mother's stress approached 300 points that the rate of weight gain in her infant would be less than that found in less stressed mothers.

Enough was seen in the process of this study to suspect that a relationship between stress and the mother-infant interaction around feeding is present but just not measured by the Holmes instrument. The use of total stress scores rather than factor analysis of stressful items may be involved. A more differentiated definition of stress that could, for example, select out the mother's awareness of stress would be helpful.

Implications

This small study represents an attempt to use an available stress questionnaire to look at weight gain in children as an early indicator of mother-child interaction around feeding. While the initial hypothesis could not be supported, it was very apparent that we do need some tool to predict which mother-child interactions are in jeopardy. For example,

the infant described in Case 1 is now at risk for neurologic and educational problems.

Another important question raised in this study is the role of stress over time. The mother may initially be able to feed her child adequately, but whether she can carry out some of the other functions felt important by Burton White and others needs to be investigated. Can a mother who is stressed by environmental factors respond to her child's increased mobility and demand for language between the first and second year? Does the mother's ability to respond to her child co-vary with stress over time? This might be answered with a longitudinal study.

Identifying faulty mother-child interactions is the first step. Programs of early identification must not only find children at risk but in the process of finding children must make the institutional changes which will make the discovery worth while. If the only aim is the identification, then it will only be an academic exercise. Such programs of early identification must be translatable into valid intervention.

APPENDIX

Holmes Stress Questionnaire

Holmes Stress Questionnaire

Baby's Name _____ Birthdate _____

Gestational Age _____ Nursery Exam _____ Complications _____

Weight: 6 Wks. _____ Initial _____ Gain _____

Mother's Name _____ Age _____

Address: _____ Contact Phone _____

Complications:

Pregnancy _____ Labor _____ Delivery _____

Stress Points

- 40 1. Pregnancy in past year?
- 65 2. Have you separated from husband, boyfriend in the past year?
- 73 3. Have you been divorced this past year?
- 50 4. Did you get married this past year?
- 45 5. Has there been a marital reconciliation?
- 39 6. Have you been uncomfortable with sexual relations this past year?
- 35 7. Has there been a change in the number of arguments with your husband this past year?
- 39 8. Have there been any new people added to your family?
- 28 9. Have there been any outstanding personal achievements?
- 24 10. Have you had to make any changes in your personal habits?
- 16 11. Change in sleep habits?
- 15 12. Change in eating habits?
- 13 13. Did you vacation?
- 12 14. Did you have a different Christmas routine?
- 15 15. Was there a change in family get togethers?
- 29 16. Trouble with in-laws?
- 29 17. Have any of your children left home?
- 36 18. Have you changed jobs?
- 47 19. Did you lose a job?
- 29 20. Any change in your responsibilities at work?
- 23 21. Any trouble with your boss?
- 20 22. Any change in your hours or working conditions?
- 26 23. Did you begin or end a school program?
- 20 24. Did you change schools?
- 53 25. Have you had any serious illnesses or injuries?
- 44 26. Change in health of family member?
- 25 27. Has there been any change in your living conditions?
- 20 28. Change in residence?
- 31 29. Mortgage or loan greater than 10,000?
- 17 30. Mortgage or loan less than 10,000?
- 30 31. Foreclosure on mortgage or loan?
- 26 32. Did your husband begin or stop work?

- 38 33. Have your finances changed?
- 39 34. Has there been a business re-adjustment?
- 37 35. Has there been a death of a close friend?
- 63 36. Death of close family member?
- 100 37. Death of spouse?
- 11 38. Have you been involved in any minor violations of the law?
- 63 39. Have you been jailed?
- 19 40. Change in recreation?
- 19 41. Change in church activities?
- 18 42. Change in social activities?

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