THE TENDERNESS PROCESS IN MOTHER-INFANT COUPLES:
THE RELATIONSHIP OF MATERNAL PERCEPTION AND
ANXIETY TO INFANT SATIETY AND ANXIETY

by

DEIDRE MARION BLANK

A DISSERTATION

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The purpose of the study was to identify what impact, if any, maternal perception and anxiety had on an infant at the time of feeding. The framework for testing the relationship was Harry Stack Sullivan's interpersonal theory of psychiatry, as it related specifically to mother-infant tenderness. For the study, tenderness was restricted to a reciprocal process in which the infant had a physiochemical need for milk and the mother a complimentary need to satisfy the infant. Of importance to Sullivan was the fact that an infant had to depend on the intervention of others for survival and therefore manifested a need for milk recurrently. Thus, to ensure satisfaction of the physiochemical need, the infant and mother had to cooperate with one another. Maternal anxiety, however, according to Sullivan's premise, could disrupt the mother-infant cooperation by inhibiting maternal perception of infant needs, as well as by inducing anxiety in the infant. The result with such a premise was an infant who could
not direct bodily energy necessary for meeting life-sustaining needs. Sixty-five postpartum mother-infant couples participated in the study. In the first phase, mothers responded to a questionnaire on maternal perception of infant behavior. In the second phase, a feeding session acted as the stimulus to which the mothers responded to three questionnaires relating to state and trait anxiety; heel pricks for serum glucose and serum cortisol were obtained from the infants prior to and after feeding. Results indicated that there was a significant positive relationship between maternal perception scores and both maternal anxiety scores and infant satiety levels, as well as between maternal anxiety scores and infant anxiety levels. However, no significant relationships were found either between maternal anxiety scores and infant satiety levels or between maternal perception scores and infant anxiety levels. Finally, maternal perception and anxiety scores were significant predictors of infant satiety and anxiety levels.
DEDICATION

To an exacting, yet gentle scholar. To my husband, Michael.
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LIST OF ABBREVIATIONS

MASS

ng - nanogram
µg - microgram
mg - milligram
g - gram

VOLUME

ml - milliliter
dL - deciliter
L - liter

OTHER

% - percent
nmole - nanomole
mg% - milligrams percent
° - degree
CHAPTER I
INTRODUCTION

The Tenderness Process

The basis for the study was that portion of Harry Stack Sullivan's (1953) interpersonal theory of psychiatry which related to mother-infant tenderness. For the study, tenderness was restricted to a reciprocal process in which the infant had a physiochemical need for milk and the mother a complimentary need to satisfy the infant. Of importance to Sullivan was the fact that an infant had to depend on the intervention of others for survival and therefore manifested a need for milk recurrently. Thus, to ensure satisfaction of the reciprocal needs, ongoing cooperation between mother and infant was essential.

According to Sullivan (1953), a major factor responsible for disrupting the mother-infant cooperation was maternal anxiety. Specifically, maternal anxiety by Sullivan's premise inhibited maternal awareness or perception of infant needs, as well as induced anxiety in the infant. The result was an infant who could not direct bodily energy necessary for meeting life-sustaining needs.

Purpose

The purpose of the study was to identify what impact, if any, maternal perception and anxiety had on an infant at the time of feeding.
Statement of the Problem

Culture, the human aspect of all learning experiences, penetrates all of our daily actions and reactions (Herskovitz, 1948). One may therefore assume that all communication engaged in by human beings is culturally linked (Fischer & Merrill, 1976; Grove, 1976; Samovar & Porter, 1976). Thus while the mere mention of mother-infant tenderness suggests a somewhat affectionate state, the emphasis on such a state and the specific use of language and behavior to express that state can differ across cultures, as well as within a specific culture (De Rivera, 1977; Holtzman, 1979; Kaplan, 1955; Leininger, 1978; Pelto & Pelto, 1978). For the maternal-child nurse to assess the health status of a mother-child couple, it therefore is essential that the nurse be aware of how culture affects the dyadic interaction (Leininger, 1978; Spector, 1979).

According to Sullivan (1953), an interruption in the tenderness process within mother-infant couples manifested itself by malevolence. In the mothering one, malevolence resulted in the inability to meet an infant's needs for contact or physiochemical requirements necessary to sustain life. Malevolence at its worst could result in psychological, physiological, or physical harm to the infant. The literature on humans further suggested that mothers were more physically violent than fathers and inflicted the worst damage on their children (Rock, 1978). In addition, Harlow and Mears' (1979) work on rhesus monkeys demonstrated that maternal malevolence could be passed on to the next generation. That is, females separated from mothers and reared in
social isolation failed to develop normal social patterns; the females displayed inadequate or abusive behavior toward their offspring when they eventually became mothers.

From Sullivan's (1953) perspective, the foremost cause of an interruption in the human tenderness process during the very early stages of the mother-infant relationship was attributed mainly to anxiety in the mothering one. As such, maternal anxiety exerted two major effects on the mother-infant relationship. First, maternal anxiety penetrated the mother's actions (Sullivan, 1953). In particular, anxiety inhibited awareness. That is, a mother became less alert or perceptive to relevant cues in an interpersonal situation. As a result, it might be said that maternal anxiety limited the refinement and precision of a mother's actions with regard to the satisfaction of her infant's needs (Mullahy, 1970). Second, maternal anxiety also induced anxiety in the infant through an emotional linkage known as empathy. This anxious state in effect prohibited the infant from directing bodily energy appropriately for meeting essential life-sustaining needs. For example, anxiety within the mother-infant dyad was thought to interfere with the infant's feeding activity, even though the infant had a physiological need for milk (Sullivan, 1953). The question then was whether Sullivan's premises were correct and if so, in what way was the infant physiologically compromised, if at all, when exposed to an anxious, misperceiving mother.

Further, to Sullivan's (1953) beliefs, prolonged inability in meeting a child's needs for contact or physiochemical requirements along with imposed anxiety resulted in malevolent transformation
within the child. As such, malevolence was found in the timid, mischievous, and cruel child. Denied tender behavior from the parental figure, the child was treated in a manner which often provoked anxiety or pain in the child. Consequently, the child learned that it was disadvantageous to demonstrate a need for tender cooperation from the parental figure. Instead, the child learned to display a malevolent attitude which made it difficult for parents and others to treat the child tenderly (Sullivan, 1953).

Definition of Terms

Theoretical Definitions

Maternal Perception. Conscious awareness of the necessity to cooperate with the infant to fulfill a physiochemical need (Sullivan, 1953).

Maternal Anxiety. A threat to or actual loss of self-esteem due to the actual, anticipated, or imaginary disapproval of one's self or activities owing to the values and ideals one has acquired or developed (Mullahy, 1970; Sullivan, 1953).

Infant Satiety. A physiologic tension which demonstrates relaxation of an episodic or recurrent physiochemical need (Sullivan, 1953).

Infant Anxiety. A physiologic tension which demonstrates one's feeling of security and interferes with satisfying a physiochemical need (Sullivan, 1953).
Operational Definitions

**Maternal Perception.** Scores on the Maternal Perception of Infant Tender Behavior (MPIT8) Questionnaire were used to assess maternal perception (see Appendix A).

**Maternal Anxiety.** Scores on the two Self-Evaluation (STAI) Questionnaires of the State-Trait Anxiety Inventory (Spielberger, Gorsuch & Lushene, 1970) were used to measure maternal anxiety. Specifically, scores on the Self-Evaluation (STAI X-1) Questionnaire were used to measure state anxiety or the subjective, consciously perceived feelings of anxiety taking place at a particular moment and at a given level of intensity (see Appendix B). Scores on the Self-Evaluation (STAI X-2) Questionnaire were used to measure trait anxiety or the relatively stable individual differences in anxiety proneness (see Appendix C).

**Infant Satiety.** Infant serum glucose levels, and the amount of formula consumed by the infant were used to determine the level of infant satiety.

**Infant Anxiety.** Infant serum cortisol levels were used to determine the level of infant anxiety.

Theoretical Framework

The Impact of Culture

From the time of birth, the infant was exposed to cultural influences with each and every experience (Mullahy, 1970). According to
Sullivan (1953), experience occurred in three modes: the prototaxic, the parataxic, and the syntaxic. The prototaxic mode referred to those experiences without definite limits, while the parataxic mode related to experiences which were not connected in a logical fashion. Finally, the syntaxic mode involved a more sophisticated form of learning such as the meaning of signs, expressions, and language.

From the beginning of infancy the simplest, the earliest, and possibly the most abundant form of experience occurred through the prototaxic mode. To assure an optimal level of learning from such prototaxic experiences, the infant required a "mature social medium" in every phase of personality growth (Mullahy, 1970, p. 343). Thus, aside from satisfactory individual attributes and physical environment, the infant needed to interact with individuals who had attained suitable personal and behavioral characteristics necessary for the infant's interpersonal growth (Mullahy, 1970; Sullivan, 1953). This human-made part of the environment, aptly referred to as culture, emphasized the importance of interpersonal relationships or exchange with others (Herskovitz, 1948). Such a concept of culture acknowledged the fact that social stimuli did not impinge equally upon different people in different places at different times. This perspective on culture further assisted in categorizing and explaining the many important differences, as well as similarities, in human behavior (Segall, 1979). Thus, the definition of culture was thought to include the sharing and integration of learned behavioral traits which were characteristic of a particular society and which were usually
transmitted over time, but which were not biologically inherited (Hoebel, 1958).

In reality, the parent or surrogate was first and foremost responsible for supplying the essential elements of culture. One of the infant's earliest experiences with culture was through the feeling of tension and energy transformation as experienced in the interpersonal relationship with the mothering one (Mullahy, 1970; Sullivan, 1953). Specifically, cultural practices influenced the specifics of the maternal response, as well as the timing and effect of the response (Campbell & Taylor, 1979).

The tensions and energy transformations experienced by the very young infant were associated primarily with meeting needs, undergoing anxiety, and inducing sleep. The tension that periodically lowered the infant's state of well-being and affected biological equilibrium was called a need. As such, this tension of need referred to specific, recurrent physiochemical requirements which had to be relieved if the infant was to sustain life. To appreciate fully the process involved in satisfying these needs, the principle of communal existence required a brief examination. Whereas this principle suggested that a human being required constant exchange with his or her environment and culture for existence, the infant was not adequately equipped to maintain this absolutely communal existence. An assumption of this principle was that the infant must rely on someone, usually the mothering one, to help satisfy the recurrent physiochemical needs necessary to sustain life (Sullivan, 1953). Thus, the interactional relationship experienced via the alternation of need and satisfaction of
that need provided the infant with some of the earliest opportunities for interacting with his or her culture.

The Tenderness Process

Basically, the recurrent physiochemical requirements needed to sustain life created a state of biological disequilibrium within the infant. The disturbance in turn generated a level of physiologic tension in the infant, a prerequisite to prehension of the specific need. Prehension in the infant referred to a rudimentary form of perception or conscious awareness of a specific physiochemical need necessary to sustain life (Sullivan, 1953). Once the need was then recognized, the infant partitioned energy into specific actions to meet his or her needs. The infant then cooperated with the mothering one by expressing the appropriate behaviors. The exact direction of energy transfer was based on previous experience with the decrease and temporary extinction of a specific need (Mullahy, 1970; Sullivan, 1953).

This observed activity in the infant, originating from an unmet physiochemical need, awakened a certain tension known as tenderness in the mothering one. Maternal tenderness, as such, pertained to a physiologic tension which reflected the potential to act for the relief of the infant's physiochemical need (Sullivan, 1953). This state of tenderness assisted the mothering one to discriminate the infant's behavior before actually perceiving the need to give tenderness to the infant. Once the infant's need was recognized, the mothering one
cooperated by performing specific activities for fulfillment of the infant's need. The activities manifested by the mothering one were experienced by the infant as the undergoing of tender behavior. Thus the specific need of the infant took on the character of a general need for tenderness (see Figure 1). Both the satisfaction of need and the experiencing of tender behavior from the mothering one promoted an optimal state of well-being, which ultimately allowed for sleep (Mullahy, 1970; Sullivan, 1953).

**Anxiety**

The tension of anxiety interfered with an infant's attempt to achieve a desirable state of well-being. Although Sullivan (1953) admitted his uncertainty in terms of how early in life anxiety was first manifested, he recognized that infants during the first six to 20 months of life were known to display disturbed behavior in response to the emotional distress of the mother. Essentially, the tension of anxiety differed from the tension of need in two respects. First, the tension of anxiety related primarily to a human being's communal existence with a personal environment or culture; whereas, the tension of need referred to a communal existence with a physiochemical environment. Second, relaxation of the tension of anxiety resulted in interpersonal security; however, the relaxation of the tension of need resulted in satisfaction of a specific physiochemical need. Finally, while the tension of need originated from within the infant, the tension of anxiety in the very young infant was originally induced by
Figure 1. A theoretical model for the tenderness process as it pertains to the mother-infant couple.
anxiety in the mothering one (Sullivan, 1953). In retrospect, it appeared that satisfaction of a physiochemical need was not necessarily synonymous with satisfaction of an interpersonal need.

Zone Experience. The oral zone appeared to play a predominant role in satisfying the infant's physiochemical need for milk. When the infant was hungry, a cry was often heard; this action entailed the use of both vibratory and aural senses. Using the lips to grasp the nipple, the infant employed tactile, thermal, and kinesthetic senses. As the infant sucked and swallowed, the kinesthetic sense was used again. Finally, as the milk crossed the tongue and through the pharyngeal passage, tactile and gustatory senses came into play (Sullivan, 1953).

In contrast, the infant's experience with anxiety during feeding appeared before the nipple reached the infant's mouth. Wave discriminations as produced by the auditory and visual senses appeared to be the most important senses in detecting the mother's anxiety. While there was no physically discernable difference between the anxious versus the nonanxious mother, the infant (at some unknown time) began to differentiate the appearance of these two types of mothers through the identification of forbidding gestures. Examples of such signs included a difference in the mother's voice, postural tension, speed and rhythm of gross body movements, and manner in presentation of the bottle to the infant (Sullivan, 1953). The infant's ability either to satisfy a physiochemical need or to react to maternal anxiety appeared to depend upon the maturity of these special senses.
Empathy. The mechanism involved in the transference of the anxiety from mother to infant was empathy. The term, empathy, specifically referred to an emotional linkage between infant and mothering one, often manifested while the infant was nursing and appearing in connection with anxiety (Sullivan, 1953). Unfortunately, there was nothing specific about anxiety; therefore, the infant had no basis in the experience of early anxiety by which to direct activity to avoid or relieve the anxiety. Generally, the infant was limited in his or her ability to manipulate people, to the sole capacity to seek out tenderness by manifesting specific needs. Thus, the infant was incapable of discriminating and handling anxiety, and therefore unable to direct specific action toward the relief of anxiety (Sullivan, 1953).

Anxiety also interfered with any other tensions with which it coincided. As such it interfered with the infant's behavioral patterns necessary to sustain life, as well as the mothering one's ability to respond appropriately to the infant's specific needs. In essence, the greater the anxiety, the less chance that a physiochemical need was satisfied. Thus, anxiety was unmanageable. The only solution for restoring the infant's state of well-being was to rid the mothering one of the anxiety. Otherwise the continuing tension of unsatisfied needs along with the tension of anxiety further interrupted the infant's need for sleep, a state which not only occupied a large part of the infant's time but also was essential to sustain life (Sullivan, 1953).
The Infant's Ability to Adapt

To help ensure adequate sleep during emergency situations, the infant called upon two types of adaptive mechanisms. When experiencing unsatisfied and extremely aggravated physiochemical needs during early infancy, the infant used the adaptive mechanism of apathy. In this state the infant became indifferent to fulfilling a physiochemical need (Sullivan, 1953). At the same time, all the tensions of need were markedly attenuated with enough tension present to maintain life. The mother's mounting anxiety in response to such a state, however, served to aggravate further the infant's state of apathy. Finally in cases of prolonged severe anxiety, the infant mobilized the adaptive mechanism known as somnolent detachment. This state allowed the infant to become indifferent to fulfilling a personal security need (Sullivan, 1953). The capacity to adapt in this situation attenuated the infant's susceptibility to interpersonal insecurity. While Sullivan (1953) was unsure as to whether or not the somnolent detachment mechanism was evident in early infancy, he believed there was no difference in the clinical appearance of an infant manifesting either apathy or somnolent detachment. Nevertheless, successful application of either of these adaptive mechanisms ultimately lessened the infant's disturbed condition to a point at which the infant slept. Overuse of these adaptive mechanisms to the point where an infant spent a large part of his or her waking life in one of these states literally starved the infant, both physiologically and psychologically, until death eventually ensued (Sullivan, 1953).
Theoretical Model Tested

A portion of the theoretical framework was tested. Specifically, the study examined the relationship between maternal perception and anxiety, as well as the relationships existing among maternal perception and anxiety with infant satiety and anxiety (see Figure 2).

Significance of the Study

The major source of mother-infant contact during the early hospital postpartum period consists of the mother feeding the infant (Thoman, Turner, Leiderman, & Barnett, 1970). An examination of the tenderness process in mother-infant couples from the physiochemical perspective of the infant helps nurses to identify the physiological impact that maternal perception and anxiety have on infant satiety and anxiety levels. Analysis of the tenderness process within mother-infant couples also provides nurses with information on a complex process that is thought to be actively involved in health maintenance for all age groups, for both sexes, and for people of different cultures (Carty, 1978). Finally, a study from one predominant culture provides nurses with insight into the processes by which infants shape and are shaped by their culture (Coll, Sepkoski, & Lester, 1981).

Animal Research

In animals, recent studies on gorillas suggested that an infant's well-being was jeopardized when the mother's tenderness and emotional
Figure 2. A theoretical model for examining the relationship of maternal perception and anxiety to infant satiety and anxiety.
responsiveness broke down (Nadler, 1978). Current research on non-
human primates implied that a lack of tenderness in mothers and fa­
thers was significant in the identification and treatment of specific
child abuse cases, as well as for future guidance in family planning
(Nadler, 1980). In addition, Harlow and Mears' (1979) animal studies
on love and accompanying behaviors stated that there were possible
implications for child-rearing practices and the future role of men in
rearing infants. For example, it had been suggested that fathers
could substitute as the primary attachment figure in situations where­
in there was a disturbed mother-infant relationship (Campbell &
Taylor, 1979). Information gained from such a mother-infant interac­
tion study will help nurses to assess, from a legitimate basis, the
quality of the early mother-infant relationship from a psychophysio­
logic perspective.

Supplemental studies in rats supported the notion that mainte­
nance of maternal behavior underwent a change once maternal behavior
had appeared at parturition. Nonhormonal factors appeared to become
increasingly important once hormonal stimulation had triggered the
onset of maternal behavior around parturition (Terkel & Rosenblatt,
1972). Invariably, the female rat depended on the first contact with
her newborn pups after parturition to make the transition from the
prepartum hormonal to postpartum nonhormonal regulation of her mater­
nal behavior. While this early stage was considered to be a critical
period, the manner in which the period was critical for mother and
young was thought to differ greatly (Rosenblatt, 1975).
While not all animal research findings are applicable directly to humans, research on nonhuman primates and other animals has helped nevertheless to lay a foundation for generating ideas and offering interpretations regarding human conditions. Specifically in regard to nonhuman primate research, social environment has been found to be the critical difference between competent and abusive mothers. Human beings, like nonhuman primates, are social creatures. Unfortunately, the mother in today's world may not experience the optimum environment necessary for implementing satisfactory child-rearing practices (Nadler, 1980). A study of the mother-infant tenderness process helps to assess the important, early social environment found within mother-infant interactions.

**Human Research**

A review of recent studies on human maternal emotions and life stress supports the variable of anxiety as an important factor in the etiology of obstetric complications and abnormalities in the neonate. To the extent that high levels of anxiety contribute to maternal and neonatal complications, the reduction of anxiety by means of preventive intervention procedures might be of great benefit in reducing postnatal complications in both mother and infant (Spielberger & Jacobs, 1979). Whereas researchers have demonstrated a relationship between maternal anxiety during pregnancy and maternal-fetal complications, no one to date has shown a correlation between maternal anxiety
and infant satiety and anxiety as a response to mother-infant interaction during the early postpartum period.

In addition, the implications for failing to meet an infant's need for tenderness are great. For example, the rapid growth of an infant's brain in the first year of life depends to a great extent on glucose utilization. The failure of the mother to perceive a physiochemical need or to act to satisfy this nutritional need can result in a disturbance in glucose metabolism with its direct impact being upon brain development and function (Tulchinsky & Ryan, 1980).

Finally, a review of 16 cases of child psychosis by Mahler (1976) indicated an increased disturbance in the earliest rhythm between alternation of a physiological tension of need and satisfaction of that need. The pattern during infancy demonstrated that the infants had not passed beyond or had relapsed into the earliest infantile mode of perceiving increases in physiologic tension as a diffuse form of distress. In addition, the infants from as early as eight months and earlier were unable to learn from experience that physiologic tensions originated from within them, and that gratification of these needs originated from outside of them. As a result, the infants did not develop the ability to wait in response to hunger tension; instead, the tension followed with immediate, violent, and diffuse random activity. A lack of response to the tension by the parental figure usually resulted in apathetic withdrawal. Thus, a study of the relationship of maternal perception and anxiety to infant satiety and anxiety was warranted.
Assumptions

1. An infant must rely on someone, usually the mothering one, to help satisfy the recurrent physiochemical needs necessary to sustain life (Sullivan, 1953).

2. The tenderness process within the mother-infant couple consists of a reciprocal exchange of behaviors which have positive value for both participants.

3. An infant during the first 72 hours of life is physiologically capable of responding to the need for physiochemical nutrients.

4. An infant during the first 72 hours of life is physiologically capable of responding to maternal anxiety.

5. While culture is universal to human existence, each local or regional manifestation of culture is unique.

Research Hypotheses

1. Maternal perception scores are related to maternal anxiety scores.

2. Maternal anxiety scores are related to infant anxiety levels.

3. Maternal anxiety scores are related to infant satiety levels.

4. Maternal perception scores are related to infant satiety levels.

5. Maternal perception scores are related to infant anxiety levels.
6. Maternal perception and anxiety scores are predictors of infant satiety and anxiety levels.

Summary

The focus for the research study was that portion of Harry Stack Sullivan's (1953) interpersonal theory of psychiatry which related to mother-infant tenderness. The purpose of the study was to examine within a Sullivanian framework what impact, if any, maternal perception and anxiety had on an infant at the time of feeding. A case for the impact of interruption in the mother-infant tenderness process was made, as well as the significance in studying such a relationship. Operational definitions were offered to measure the variables, and assumptions were made regarding mother-infant capabilities and qualities. Finally, research hypotheses were formulated.
CHAPTER II
REVIEW OF LITERATURE

The Impact of Culture

All cultures tend to have specific rules for the care and rearing of their children. The child-rearing practices arising out of these rules begin prior to or at birth and extend throughout the socialization period necessary for adapting to the larger adult society (Johnston, 1980; Rucker & Mermelstein, 1979). There is, however, considerable subcultural variation within each adult society. In fact, recent research identifies more cultural variation within nations than across nations (Holtzman, 1979; Moss & Jones, 1977). To ensure increased power of the research design concerned with culture, the following factors should be considered: sex, age, and socioeconomic status (Davidson & Thomson, 1980; Derogatis, Covi, Lipman, Davis, & Rickels, 1971; Freedman & Hollingshead, 1957; Holtzman, 1979; Lee, 1980; Leff, 1977).

With regard to specific differences, the experiences of black Americans were thought to differ greatly from most white Americans. As a result, blacks' perceptions of the world, themselves, and their concepts were thought to differ considerably from whites (Halpern, 1973). A review of child-rearing studies by Jackson (1973) identified one study which further differentiated between lower socioeconomic
blacks and whites. In particular, neglect and physical abuse of children within the lower socioeconomic level were considerably more common in whites than blacks. A second study of black, white, and Puerto Rican mothers' patterns of child-rearing demonstrated significant differences among the ethnic groups with regard to weaning, toilet training, sex anxiety, dependency, aggression, child-rearing anxiety, child dominance, the use of praise, the giving of regular jobs, and disciplinary parent ($p < 0.01$). While the variable of permissiveness was insignificant, Puerto Rican mothers were found to be the most permissive; blacks were the least permissive and whites were found to be the most anxious about child-rearing and child dominance.

Antunes, Gordon, Gaitz, and Scott's (1974) study on ethnicity, socioeconomic status, and etiology of psychological distress addressed the frequently observed inverse association between socioeconomic status and presence of psychological symptoms. Their results showed a significantly lower mean number of symptomatic responses for both Mexican-American (2.7) and blacks (2.5) than for whites (3.9) ($F = 29.4, p < 0.001$). Finally, regardless of ethnicity, persons in the lower socioeconomic group reported a higher mean number of symptomatic psychological distress responses (3.4) than those in the higher socioeconomic group (2.7) ($F = 18.2, p < 0.001$).

While Samuels and Griffore (1977) reported that there was a lack of research regarding ethnic groups and anxiety levels, their investigation of 24 white mothers, 24 black mothers, and 24 Mexican-American mothers from the lower socioeconomic level revealed no significant
differences among the three ethnic groups in level of anxiety as measured by the Taylor Manifest Anxiety Scale \((F = 0.28, p < 0.75)\). In effect, socioeconomic status was considered by the authors to be a more influential factor than culture in determining differences in anxiety level.

A comparison study of child-rearing attitudes and behaviors of black, white, and Mexican-American parents by Bartz and Levine (1978) nevertheless suggested differences among ethnic groups. These differences reflected the strength of advocacy for certain practices, rather than in basic orientation toward child-rearing. Finally, the authors implied that the lower the social class, the more ethnic differences that were to be found.

In a second study by Levine and Bartz (1979), the authors affirmed that social class, culture, and sex of the parent were the main media for transmitting ethnic variation. In addition, their review of the literature supported the notion that social class cuts across ethnicity in determining many child-rearing practices. When social class was controlled for, there was little variation in child-rearing practices. However, the results of their study on low-income black, white, and Mexican-American parents indicated significant differences in child-rearing attitudes across groups \((p < 0.001 \text{ to } p < 0.05)\).

Finally, a study of initial mothering patterns of low-income black primiparas by Bampton, Jones, and Mancini (1981) indicated that black mothers demonstrated similar mothering behaviors to white mothers. The sequence of behaviors, however, was different. Instead of using the initial finger-tip touch and then approaching to the
entire hand and arm touch, as seen traditionally with white mothers and their infants, black mothers were found initially to use the entire hand and arm approach when touching their infants.

Maternal Perception

"...Just as there are no universal words, no sound complexes, which carry the same meaning the world over, there are no body motions, facial expressions, or gestures which provoke identical responses the world over" (Birdwhistell, 1970, p. 34). A review article by Ainsworth (1979) clearly demonstrated that maternal sensitivity to infant behavioral cues was essential for successful mother-infant interaction. Although according to Gottlieb (1978) the infant's behavior played a key role in eliciting maternal responses, it was the mother's ability to perceive and to interpret the infant's behavior that was the more crucial component in determining the quality of the mother-infant relationship.

A review of the literature by De Chateau (1977) also offered evidence for the impact of early maternal responses to infant signals in subsequent social interactions. More specifically, there was evidence suggesting that the interaction observed between mother and infant during the first day postpartum was indicative of subsequent interactions. Ainsworth's (1979) own findings further suggested that a mother's responsiveness to her infant during the feeding period was closely related to the security or lack of attachment that later developed. Finally, these same findings implied that mothers who were
responsive to their infants in one context tended to respond as sensi-
tively in other contexts. The importance of maternal perception in
mother-infant interaction was substantiated likewise by Blumberg
(1980), Broussard (1976), Rutter (1979), and Swanson (1978). Finally,
factors thought to affect a mother's perception of her infant included
parity, infant gender, and type of feeding (De Chateau, 1977; Freese &
Thoman, 1978; Jacobs & Moss, 1976; Stainton, 1980; Thoman et al.,
1970).

Maternal Anxiety

Effects on Mother, Fetus, and Infant

While there was a paucity of professional literature on the rela-
tionship of maternal anxiety to infant satisfaction, the literature
was replete with studies regarding maternal anxiety during pregnancy
and its effects on the fetus. In these latter studies, anxiety had
been shown to be associated with both maternal and fetal complica-
tions. In mothers, high levels of anxiety during pregnancy had been
associated with prolonged labors, premature deliveries, and abruptio
placenta (Ascher, 1978). A review of four studies by Spielberger and
Jacobs (1979) further suggested that high levels of maternal state
anxiety during pregnancy contributed to the development of obstetrical
complications.

Although anxiety levels had been studied in mothers both pre-
delivery and post-delivery by Meleis and Swendsen (1978), the time
frames were somewhat scattered with measurements taken at three to four months pre-delivery and four to five months post-delivery. In this experimental study, mothers' anxiety levels were noted to increase under all study conditions, whereas the fathers' anxiety levels decreased with nursing intervention during the same period.

A study of the concerns of multiparous mothers on day 3 postpartum by Moss (1981) indicated that bottle-feeding mothers had more concerns than breast-feeding mothers. Also, mothers in the lower socioeconomic level had slightly more concerns than mothers in the higher socioeconomic level.

Lastly, Avant's (1981) study of anxiety as a potential factor affecting maternal attachment demonstrated that maternal attachment and anxiety, as measured by the Taylor Manifest Anxiety Scale, covaried negatively on both day 1 and day 3 postpartum ($p < 0.02$ and $p < 0.05$). The author implied that a nurse who decreased a mother's anxiety helped to enhance the maternal attachment between the mother-infant pair. At the same time, if a nurse enhanced maternal attachment between the pair, the author believed that anxiety could be decreased in the mother.

In the infant, Crandon (1979) demonstrated that the Apgar score of infants born to highly anxious mothers was significantly less ($t = 14.17$, $p < 0.001$) than those born to mothers with lower anxiety scores. Blumberg (1980) showed that increased levels of neonatal risk were related to increased maternal anxiety and negative perceptions of the newborn. Drage and Berendes (1966) demonstrated a higher incidence of neurological abnormality at one year of age in infants with
lowered five-minute Apgar scores. As a result, a relationship was posited between highly anxious mothers and children with mental retardation (Crandon, 1979).

Finally, Ascher's (1978) review of both animal and human studies further supported an association between anxiety and fetal problems. For example, in animals the results of the majority of studies reviewed by Ascher (1978) indicated profound effects on the fetus after the mother had been exposed to psychological stress or given catecholamines. Similarly in humans, Ascher's (1978) review of prospective studies provided evidence for a significantly higher incidence of fetal asphyxia, congenital anomalies, stillbirths, and neonatal deaths among infants of highly anxious mothers. Retrospectively, one study reviewed by Ascher (1978) showed a greater incidence of prenatal stress in mothers of infants born with hyaline membrane disease. The strong evidence for the negative impact of maternal anxiety on the fetus appeared to warrant a study of mothers and their newborns to identify what impact, if any, maternal anxiety had on infants during this critical period of adaptability to extrauterine life.

Types of Anxiety

In analyzing state versus trait anxiety, Lazzerini, Cox, and Mackay (1979) through the use of factor analysis provided evidence for a trait rather than a situationally specific or state theory of anxiety. The percent of variance accounted for by the principal factor was 48.2%. Such a general factor suggested that trait anxiety
was more important than situational factors in the subjects' responses to the questionnaire. In contrast to the above, Standley, Soule, and Copans' (1979) study of prenatal anxiety asserted that anxiety was not a unitary construct. Factor analysis of their data demonstrated three identifiable dimensions or clusters of concerns: (1) anxiety about the pregnancy and approaching birth, (2) anxiety about parenting, and (3) psychiatric symptomatology. Variables worth considering from their study included the mother's age, educational level, and extent of formal preparation for childbirth.

Lastly, Weinberger, Schwartz, and Davidson's (1979) report of statistically significant differences in anxiety among repressor, low-anxious, and high-anxious subjects recognized the need to distinguish between these three types of subjects based not only on self-reports of anxiety, but also on behavioral or physiological responses. For example, according to Sullivan (1953) high levels of maternal anxiety interfered with meeting the infant's physiochemical needs while lower levels of anxiety allowed the mother to satisfy the infant's physiochemical needs. However, there might possibly be a group of mothers who reported low levels of anxiety, yet physiological measurements on their infants demonstrated that their physiochemical needs were not satisfied. This article (Weinberger et al., 1979) suggested that these latter mothers represented repressors or mothers who were anxious, yet they outwardly denied their own feelings. The clinical implications for such differentiation were numerous. For example, different interventions might be necessary to assist repressors versus high-anxious individuals if they were to deal with stress.
more effectively. In addition, repressors had been found to avoid seeking help, yet tended to have severe presenting problems.

**Infant Satiety: Glucose**

**Background**

Hunger is considered to be an appropriate response to a low blood glucose level. As such, eating has the affect of raising blood glucose levels. In turn, the continued absorption of glucose from the intestine causes the sensation of hunger to disappear with the resultant feeling of satiety causing a cessation of eating (Tepperman, 1973).

Due to the transition in nutritional environment from fetal to neonatal life, the infant must adapt quickly to changes in carbohydrate metabolism. Thus while the fetus receives a constant and plentiful supply of glucose from the mother, the neonate receives small amounts of glucose due to the low carbohydrate content of milk, and receives the milk periodically at that. Consequently, the human newborn is forced to regulate its own glucose (Stave, 1978). As a result of the abrupt cessation of maternal glucose supply, a transient fall in blood glucose level is found in the normal, full-term human neonate. The decrease usually occurs within one hour after birth dropping from 70 to 50 mg/dL, and stabilizes at levels of 40 to 50 mg/dL within three hours after birth (Stave, 1978; Tulchinsky & Ryan, 1980). The processes involved in maintaining an adequate supply
of glucose during this early period are glycogenolysis and gluconeogenesis (Korones & Lancaster, 1981; Wald, 1979). While glucose levels will usually remain constant for the first two to 24 hours of life, there is then a rise in glucose to euglycemic levels from day 1 to day 3 of life (Stave, 1978). However, a circadian periodicity is not evident in the human infant's blood glucose until approximately five to nine months of age (National Institute of Mental Health, 1970).

**Relevant Research**

A review of the literature by Norval, Kennedy, and Berkson (1949) indicated that blood sugar determinations in normal infants varied widely according to the methods used, the source of the blood samples, the length of fasting period, and the age of the infants. In their study of 51 normal newborns during the first six days of life, blood glucose levels drawn by heel prick and measured by spectrophotometer did not show any circadian rhythm when morning samples were compared to evening samples (p < 0.06). While the range of blood glucose determinations was found to be between 15 and 120 mg per 100 ml, no signs of hypoglycemia were observed in the newborns with low values.

Creery and Parkinson's (1953) study of 23 male and 23 female full-term newborns demonstrated that blood glucose levels drawn at 3, 6, 9, and 12 hours of age were not influenced by sex or weight of the newborns. The investigators suggested that all values between 30 and 75 mg per 100 ml were quite likely to be found in normal newborns in the first 12 hours of age.
Farquhar's (1954) study of 32 full-term newborns reported a rapid drop in mean blood glucose levels ($\bar{x} = 11.2 \text{ mg\%}$) during the first two hours of life with stabilization of levels at a range of 61 to 68 mg\% occurring by about four hours of age. The mean blood glucose levels on day 2 were 65.5 mg\% increasing to 82.7 mg\% by day 9.

Zamboni, Rigosa, Mantovanelli, Valentini, Albertini, and Zoppi's (1979) study of the first feed in full-term newborns demonstrated that despite its small volume the first feed constituted a physiologic stimulus for the pancreas of the newborn. Of the 36 infants sampled, 18 received a commercial milk formula while an additional 18 received a glucose solution. In each group, six infants had their first feed after fasting for six hours since birth, and the last six after fasting for 24 hours since birth. Blood glucose levels were drawn by way of venous samples immediately before and 60 minutes after the first feed. Glucose levels increased in all subjects after the feed by an average of 13.59 mg\% in the milk-fed infants and of 19.83 mg\% in those who had glucose.

In a review article by Hetenyi and Cowan (1980), it was proposed that blood glucose levels between 20 and 50 mg/dL were not uncommon in healthy newborns. While no correlation was found between glucose production and the level of plasma glucose, a close correlation was found between the turnover rate of glucose and the estimated weight of the brain ($r = 0.94$). While hypoglycemia in the adult induced hepatic glucose production from glucagon, a lack of a similar increase in hepatic glucose production from glucagon in response to hypoglycemia in the human newborn as reported in this article suggested that this
important mechanism was not functioning within the hypoglycemic domain of the human infant.

**Infant Anxiety: Cortisol**

**Background**

Of all the corticosteroids secreted by the human adrenal cortex, cortisol is considered to be one of the most important hormones in maintaining life and in protecting against stressful situations. Within the circulation, cortisol is present in at least three forms. The two forms which are bound to either corticosteroid-binding globulin (transcortin) or to albumin are relatively inactive biologically while the unbound or free cortisol is the physiologically active form of the steroid. With a biologic half-life of approximately 90 minutes, the total amount of cortisol found in the blood is used as a direct measure of the severity and duration of stress within an individual (Nelson, 1980; Williams, 1981). As such, many studies to date have demonstrated an increase in adrenocorticoid activity in response to direct tissue damage, as well as to emotional stress (Lederman, Lederman, Work, & McCann, 1978; Nelson, 1980; Williams, 1981). While there is no generally agreed upon definition of stress, the term applies to the source or producer, not to the effects. The internal state resulting from the stress is one of physiologic tension or anxiety (Wilson & Kneisl, 1979).
In the fetus, cord arterial levels of cortisol have been found to be higher than cord venous levels of cortisol indicating that the fetal adrenal is capable of secreting cortisol (Tulchinsky & Ryan, 1980). Levina's (1980) study of cortisol levels in cord blood demonstrates that cortisol is independent of season and unrelated to body weight and sex of newborn, Apgar score, autosomal trisomy or anencephaly. A review of earlier studies by the author also indicates that asphyxia in the infant does not alter cortisol levels during the first three days of postnatal life. In addition, cortisol levels in the neonate are not only independent of the factors associated with cord blood, but also independent of manner of delivery, hyperbilirubinemia, time of membrane rupture, prematurity, and postmaturity.

With regard to the neonate, the adrenal undergoes a dramatic structural reorganization during the first month of postnatal life. However, this structural change does not compromise the function of the neonate's adrenal gland. Accordingly, the adrenal gland is competent to carry out its metabolic and electrolyte regulatory functions, as well as to react to stress. Nevertheless, physiologic competence within the neonate does not necessarily mean that quantitative and qualitative patterns of steroid production are equivalent to the adult (Aarskog, 1965; Stave, 1978). For example, there is evidence for an increased half-life for plasma cortisol during the neonatal period (Bacon & Spencer, 1973; Stave, 1978; Tulchinsky & Ryan, 1980).

After birth, plasma concentrations of bound cortisol fall during the early hours of life, reaching a nadir by about 24 to 36 hours. At the same time, there is also a transient fall in plasma concentrations
of free cortisol (Tulchinsky & Ryan, 1980). Finally in support of the neonate's physiologic competence with regard to cortisol, a study of five normal, full-term newborn infants injected with 4-14 C- cortisol between six and 24 hours of age revealed that 79 to 85% of the injected dose could be recovered in the urine in the 48-hour period following injection (Kenny, Malvaux & Migeon, 1963).

Finally, it should be noted that cortisol is found in breast milk. The concentration varies from 0.8 to 3.5 µg/dL which accounts for 1 to 4% of the cortisol concentration found in the mother's plasma at term pregnancy. It is therefore estimated that 500 ml of breast milk would contain approximately 10 µg of cortisol (Tulchinsky & Ryan, 1980).

Relevant Research

Human Research. With regard to the relevant published research on cortisol during the neonatal period, Anders, Sachar, Kream, Roffwarg, and Hellman (1970) studied the effect of behavioral states on plasma cortisol levels in four newborns from one to nine weeks old. Using behavioral observation and continuous EEG recordings to determine crying, quiet wakefulness, rapid eye movement sleep, and non-rapid eye movement sleep states, cortisol was found to be significantly higher after crying than in the other three states when each state was sustained for 20 minutes (p < 0.001). No differences were found in relation to the three non-crying groups and time of the last
feed. In addition, there was no evidence of a circadian rhythm in the cortisol responses.

The investigation of adrenal response to physical stress by Gutai, George, Koeff, and Bacon (1972) found no significant differences in plasma cortisol levels of normal versus stressed newborns during the first six to 72 hours of postnatal life. Thus it was possible according to the authors that the degree of stress presented by such factors as low-birth weight, asphyxia, delivery by caesarean section, respiratory distress syndrome, fetal bradycardia, and febrile illness in the mother was insufficient to stimulate a normally functioning pituitary-adrenal axis.

Zurbrugg (1976) measured plasma cortisol levels at four-hour intervals in neonates using a spectrophotofluorimetric procedure. A distinct variation in cortisol concentration was manifested throughout the day in 3- to 7-day-old infants (N = 6). However, no adult-like circadian periodicity was evident. Daily mean plasma cortisol concentrations did not differ from adults (\(\bar{x} = 9.2 \pm 2.7 \mu g/100 \text{ ml}, p < 0.20\)). Finally, no correlations were found between cortisol variations with sleep and wakefulness, nor with environmental factors such as light, darkness, or feeding.

Kauppila, Koivisto, Pukka, and Tuimala's (1978) study of neonatal cortisol levels in 92 neonates, using a highly specific radioimmunoassay after Lipidex chromatography, also did not show any diurnal variation in cortisol for either term or preterm infants on the second, fourth, or sixth day of postnatal life. While gestational age only
slightly affected neonatal cortisol concentrations, the type of delivery did affect umbilical cord levels between 30 to 60 minutes after delivery with the elective caesarean section group being lower than both the vaginal delivery group ($p < 0.001$) and the emergency caesarean section group ($p < 0.05$). There was, however, no significant difference noted on the second, fourth, or sixth day of neonatal life. Fetal sex also had no effect on umbilical cord cortisol levels. Lastly, although the researchers reported a higher cortisol level in neonates who were awake ($N = 118$; $114 \pm 15$ nmole/L) than that of sleeping infants ($N = 203$; $90 \pm 10$ nmole/L) ($p < 0.05$), a question arose as to the interpretation of their results since their total number of neonates was 92 yet their total number of cases added up to 321.

A longitudinal study of plasma cortisol determined simultaneously in healthy mothers and infants at birth and during the early neonatal period (Sippell, Becker, Versmold, Bidlingmaier, & Knorr, 1978) showed no differences in cortisol levels as a result of either parity or time of day. Mean concentrations of cortisol found in the neonates were 27.2 ng/ml at 24 hours and 57.0 ng/ml at four days. No reference was made with regard to time of feeding and state of the infant.

A recent study by Vermes, Dohanics, Toth, and Pongracz (1980) using a radioimmunoassay technique further upheld the lack of a plasma cortisol periodicity during the first three days of extraterine life. Daily mean levels for plasma cortisol in 1-, 2-, and 3-day-old infants were $284 \pm 15$ ng/ml, $240 \pm 18$ ng/ml, and $182 \pm 16$ ng/ml, respectively. When the authors investigated the development of the circadian rhythm
of plasma cortisol in human neonates and infants, plasma cortisol levels were found to decrease during the first month of life with a continued unsynchronized fluctuation during a 24 hour period. An adult-like circadian rhythm was not found to start until the third month of life. The researchers maintained that this delayed periodicity of cortisol was not accounted for by an underdeveloped hypothalamus-pituitary-adrenal axis. Their conclusion was based first upon earlier unpublished observations by the researchers which demonstrated that the adrenal cortex of the 2-month-old infant was capable of responding to ACTH and dexamethasone. Second, an earlier study by Vermes, Kajtar, and Szabo (1979) demonstrated that stressful events (i.e., delivery) were found to activate the pituitary-adrenal axis in the human fetus.

A further study of serum cortisol levels in neonates via a heel prick from birth through the first ten days of life revealed mean cortisol levels of $45.1 \pm 10.7$ ng/ml at day 2 ($N = 14$) after birth and $37.5 \pm 9.7$ ng/ml at day 3 ($N = 28$) after birth (Kojima, Yanaihara, & Nakayama, 1981). These findings supported an earlier study by Sippell et al. (1978).

Lastly, Francis' (1981) study of the relationship between serum cortisol and trait anxiety as measured by Spielberger, Gorsuch, and Lushene's (1970) State-Trait Anxiety Inventory in male adults revealed no statistically significant correlation between the two variables. Francis therefore suggested that the pituitary-adrenal system was somewhat discriminating in its response to specific psychological stressors.
Animal Research. Smotherman, Hunt, McGinnis, and Levine's (1979) study of mother-infant separation in rhesus macaques reported a significant increase in plasma cortisol for infants separated from their mothers ($F = 12.51$, $p < 0.01$). Of importance was that the infants ranged in age from 6 to 20 weeks and were subjected repeatedly to both control and separation conditions. Specifically, the control conditions consisted of removing the mother-infant pair from a group cage and housing them as a pair in another cage. For the separation conditions, the mothers and infants were removed from the group cage and housed in individual cages, with auditory and visual contact permitted between the pair. Blood samples were drawn 3 hours after the designated experimental procedures.

At the same time, Mendoza, Smotherman, Miner, Kaplan, and Levine's (in press) study of cortisol levels in squirrel monkey mother-infant pairs failed to show an adrenocortical response 30 minutes after both brief separation and brief separation-reunion conditions. In addition, Levine, Coe, Smotherman, and Kaplan's (1978) follow-up study of separation-reunion conditions in squirrel monkey mother-infant pairs failed to demonstrate significant differences between the two conditions. Under these conditions, mother-infant pairs were separated for 30 minutes before blood was collected and then reunited for 30 minutes prior to the last blood being collected. As a result, Levine et al. (1978) suggested that while the pituitary-adrenal system of the infant squirrel monkey could be activated, a lengthy period of time was required to return cortisol levels to a basal level.
**Relationship Between Cortisol and Glucose**

In addition to its general role in stress, cortisol also plays an integral role in the general metabolism of carbohydrates, proteins, and fats. In times of physical stress, cortisol modifies metabolism by converting protein and fat into carbohydrates for use as energy by the body (Boddy, 1978; Guyton, 1968). In particular, the stress of hypoglycemia has been associated with high levels of ACTH and cortisol (Hetenyi & Cowan, 1980; Nelson, 1980; Williams, 1981).

Massip's (1980) study of the relationship between glucose and cortisol levels in the calf indicated a significant positive linear relationship between cortisol levels at birth and glucose levels one hour after birth ($p < 0.025$). This finding supposed that the transient rise in blood glucose found during this period might possibly have resulted from the calf's adrenal response to the stresses of birth and the postnatal environment.

Finally, Misra, Sharma, Singh, and Agarwal (1978) reported significant differences in plasma cortisol levels of 86 full-term newborns between those classified as normoglycemic and those considered hypoglycemic (below 30 mg% /dl) ($p < 0.001$). Levels for the first feed included a mean of 17.81 $\mu$g% ($\pm$ 0.74) for normoglycemic infants and 11.03 $\mu$g% ($\pm$ 0.83) for hypoglycemic infants.

**Summary**

A review of the literature was presented to identify the impact that maternal culture, perception, and anxiety had on the infant. In
addition, anxiety was classified as to type and effect. Finally, a case was made for using glucose as a measure of satiety and cortisol as a measure of anxiety.
CHAPTER III

METHODOLOGY

Purpose

The purpose of the study was to identify what impact, if any, maternal perception and anxiety had on an infant at the time of feeding.

Research Design

The basic method used in the study was that of descriptive and predictive correlational research. The approach allowed the investigator to examine the extent to which maternal perception and anxiety correlated with one another and also with infant satiety and anxiety. In addition, the approach permitted the investigator to examine maternal perception and anxiety as predictors of infant satiety and anxiety.

Research Hypotheses

1. Maternal perception scores are related to maternal anxiety scores.
2. Maternal anxiety scores are related to infant anxiety levels.
3. Maternal anxiety scores are related to infant satiety levels.

4. Maternal perception scores are related to infant satiety levels.

5. Maternal perception scores are related to infant anxiety levels.

6. Maternal perception and anxiety scores are predictors of infant satiety and anxiety levels.

Statistical Hypotheses

1. There is no relationship between maternal perception scores and maternal anxiety scores.

The exact relationships to be tested included: scores on the MPITB Questionnaire with scores on both the first and second administrations of the STAI X-1 Questionnaire, as well as the STAI X-2 Questionnaire. In addition, scores on the appropriate factor(s) after factors analysis of the MPITR Questionnaire were to be examined for any relationship with scores from the second administration of the STAI X-1 Questionnaire.

2. There is no relationship between maternal anxiety scores and infant anxiety levels.

The exact relationships to be tested included scores on both the first and second administration of the STAI X-1 Questionnaire and the STAI X-2 Questionnaire with both infant prefeed and postfeed serum cortisol levels.
3. There is no relationship between maternal anxiety scores and infant satiety levels.

The exact relationships to be tested included: scores on both the first and second administrations of the STAI X-1 Questionnaire and the STAI X-2 Questionnaire with both infant prefeed and postfeed serum glucose levels and the amount of formula consumed by the infant.

4. There is no relationship between maternal perception scores and infant satiety levels.

The exact relationships to be tested included: scores on the MPITB Questionnaire with both infant prefeed and postfeed serum glucose levels and the amount of formula consumed by the infant.

5. There is no relationship between maternal perception scores and infant anxiety levels.

The exact relationships to be tested included: scores on the MPITB Questionnaire with both infant prefeed and postfeed serum cortisol levels.

6. Maternal perception and anxiety scores are not statistically significant predictors of infant satiety and anxiety levels. $H_0: R_{FM}^2 = R_{RM}^2$, $H_a: R_{FM}^2 \neq R_{RM}^2$.

To test the predictive, multivariate relationships that may have existed between the variable set of maternal perception and anxiety scores with the variable set of infant satiety and anxiety levels, several restricted models (RM) were to be examined. As such, the RM of scores on the MPITB Questionnaire and the three STAI Questionnaires were to be tested for their predictive effect on: (1) the amount of formula consumed by the infant, when infant postfeed serum glucose
and/or cortisol levels acted as the covariates; (2) infant postfeed serum glucose levels, when infant postfeed serum cortisol levels acted as the covariate; (3) infant prefeed serum cortisol levels, when infant postfeed glucose levels acted as the covariate; and finally, (4) infant postfeed serum cortisol levels, when infant postfeed serum glucose levels acted as the covariate.

The significance level for rejection of the statistical hypotheses was determined prior to implementation of the study. The significance level was set at $\alpha = 0.05$.

Limitations

1. Given that the nature of the mother-infant interaction depends to a certain degree upon the developmental level of the infant, the context in which the tenderness process can be examined in the early days of infancy is limited. For example, much of the interaction between mother and infant during this early period is associated predominantly with meeting physiochemical needs.

2. The fact that the investigator is of the White middle class can act as an intervening variable when studying Black and White mothers of the lower socioeconomic level.

3. A study consisting predominantly of Black mothers from the lower socioeconomic level also limits the generalizability of the study.
Population and Sample

The unit for analysis in the study was the mother-infant couple. The sampling frame included hospital charts of mother-infant deliveries from the University of Alabama in Birmingham's Medical Center hospital. The study was a one-time, cross-sectional investigation of mother-infant couples during the first 72-hour postpartum period. This upper time limit ensured that the data were collected prior to the mother's discharge from the hospital.

Original Criteria

Primiparous mothers between 18 and 25 years of age giving birth to infants between 38 and 42 weeks of gestation by vaginal delivery were considered for inclusion in the study. Only essentially healthy mother-infant pairs without any major physical or psychological complications as determined by the investigator were asked to participate. For example, mothers with diagnosed diabetes, major metabolic conditions associated with glucose and cortisol metabolism or psychiatric problems were not included in the study. Infants with a five-minute Apgar score of 7 or above (Apgar, 1953; Drage & Berendes, 1966; Feldman, Sell, Gray & Lazzara, 1973) and without any current, major physiological problems other than physiologic jaundice were included in the study. Subjects were limited to those pairs where the infant was bottle-fed and rooming-in with the mother. Finally, both black
and White mothers from the lower socioeconomic group using Green's socioeconomic scoring index (1970) were included in the study.

Materials

Instruments

Maternal Anxiety. Both STAI Questionnaires from the State-Trait Anxiety Inventory (Spielberger et al., 1970) were used to measure maternal anxiety (see Appendices B & C). Two STAI X-1 Questionnaires were used to measure state anxiety or the subjective, consciously perceived feelings of maternal anxiety taking place immediately prior to and during the infant feeding period. One STAI X-2 Questionnaire was used to measure trait anxiety or the relatively stable individual differences in maternal anxiety proneness.

Normative data for the STAI Questionnaires were derived from a variety of subjects including high school students, college students, psychiatric patients, medical and surgical patients, and young prisoners. However, the data were not based on representative or stratified groups. In addition, testing was usually done under low threat situations, such as during relaxation and movies. The total range of scores for both STAI Questionnaires was from 20 to 80 (Spielberger et al., 1970). A score of 20 represented low anxiety while a score of 80 represented high anxiety.

Mean scores on the STAI X-1 Questionnaire were reported as follows: female freshman college students - 39.39; female undergraduate
Mean scores for the STAI X-2 Questionnaire were reported as follows: female freshman college students - 38.25; female undergraduate college students - 38.22; and female high school students - 41.61 (Spielberger et al., 1970).

Test-retest reliabilities in a sample of female undergraduate college students for the STAI X-1 Questionnaire ranged from 0.16 to 0.31; the scores for the STAI X-2 Questionnaire ranged from 0.76 to 0.77. Alpha coefficient scores for the STAI X-1 Questionnaire ranged from 0.86 to 0.92 in the female freshman, undergraduate, and high school students; scores for the STAI X-2 Questionnaire ranged from 0.86 to 0.92 (Spielberger et al., 1970).

Evidence for construct validity of the STAI X-1 Questionnaire was based on a sample of 645 female undergraduate college students from Florida State University. The critical ranges for 18 of the 20 items measured from 19.99 to 42.13, with two items indicating scores of 12.60 and 17.46. Point-biserial correlations for the same 18 items ranged from 0.42 to 0.73, with two items scoring 0.31 and 0.39. Finally, concurrent validity was established for 120 female college students by comparing the STAI X-2 Questionnaire to the following scales: (1) IPAT Anxiety Scale (Cattell & Scheier, 1963) - 0.75; (2) Taylor Manifest Anxiety Scale (1953) - 0.80, and (3) Zuckerman Affect Adjective Checklist (1960) - 0.52 (Spielberger et al., 1970).

Maternal Perception. A multidimensional scaling instrument, the MPITB Questionnaire, was developed for the study by the investigator...
(see Appendix A). The purpose of the questionnaire was to measure maternal perception of infant behavior. The items in the instrument were derived from Carty's (1978) list of infant tender behaviors. The total range of scores was from 36 to 252. A score of 36 represented minimum discrimination while a score of 252 represented maximum discrimination. As such, a score of 1 was given for "very similar" while a score of 7 was given for "very different."

**Procedure**

Subjects meeting the sample criteria were asked to give their verbal permission to participate in the study. Demographic data were collected from the mothers' charts with any missing information being obtained verbally from the mothers (see Appendix D). While the mothers' hospital room was the major environment for collection of the data, a treatment room also was used to collect the bloods from the infants.

During the initial phase of the study and prior to the 48-hour postpartum period, the mothers completed the MPITB Questionnaire (see Appendix A). The time required to complete this phase of the study was approximately 15 minutes. Early collection of data from this noninvasive aspect helped ensure that all information was collected prior to the mothers' discharge. In addition, the interaction with the mothers provided them with the opportunity, if needed, to ask further questions.
In the next phase, the mothers participated in a single feeding session with their infants. This phase took place between 48 and 72 hours postpartum. The time period was necessary to lessen the impact of delivery on the feeding session. For the specified session, the mothers were asked to notify the investigator just prior to feeding the infants. The mothers then completed the STAI X-1 Questionnaire indicating how they felt at that moment (see Appendix B). At the same time, the investigator took the infants to a treatment room to obtain the prefeed heel prick. This aspect of the data collection provided information as to how the mothers felt at present, as well as baseline information on the infants' serum glucose and cortisol levels. In addition, separating the mothers and infants at this time helped to ensure a conducive atmosphere for mothers completing the questionnaire. This portion of the study required eight to ten minutes for both mothers and infants; then the couple was reunited for a private feeding session of up to 30 minutes. At the end of the feeding session the mothers were asked to refrain from feeding their infants for the remainder of the study. The investigator then noted the amount of formula consumed by the infant.

Ninety minutes after the start of the feeding, the mothers completed the STAI X-2 Questionnaire indicating how they generally felt (see Appendix C). The investigator again took the infants to the treatment room for the postfeed heel prick. Postfeed serum glucose and cortisol levels provided information regarding the infants' physiologic response to the feeding interaction. This final portion of the
study required eight to ten minutes for both mothers and infants, after which time the couple was reunited.

It should be noted that the investigator handled the infants minimally. For example, the investigator used the infants' cribs to transfer the infants between the mothers' hospital rooms and treatment room. The head of the crib was elevated approximately 35° for one minute prior to blood collection. Only the infants' feet were handled during the heel pricks. Finally, a pacifier was used where necessary to quiet the infants during blood collection.

Pilot Study

Ethical Review

The hospital's Internal Review Board for Human Use at the University of Alabama in Birmingham assessed the protocol prior to implementation of the research study. The Board determined that the subjects were not at risk; therefore, only verbal permission from the mothers was required for participation in the study.

Subjects

Eleven Black mother-infant pairs participated in the pilot study. The mothers ranged in age from 17 to 26 years. Five of the infants were males, while six of the infants were females. The pilot study was carried out from December 1981 to January 1982.
Findings

Reliability. Cronbach's measure of internal consistency was used to determine the reliabilities for the three instruments used in the pilot study. The alpha coefficients were as follows: (1) STAI Questionnaire - 0.69; (2) STAI X-2 Questionnaire - 0.83; and (3) MPITB Questionnaire - 0.84.

Validity. The MPITB Questionnaire also was examined for construct validity. Factor analysis of the instrument through both varimax and oblique rotations indicated a two factor solution. The two factors related to the need for physiochemical nutrients and the need for contact.

Correlation. Pearson correlations for the preliminary data resulted in the following significant findings: (1) STAI X-1 Questionnaire and STAI X-2 Questionnaire - r = 0.63, p < 0.01; and (2) STAI X-1 Questionnaire and infant postfeed serum glucose level -r = 0.60, p < 0.04.

Changes Made in Study as a Result of the Pilot Study

Subjects. Due to a relatively low census available for collection of data, the following changes were made in the sample criteria. First, the maternal age limit was expanded to include mothers between
15 and 32 years of age. Second, the infant gestational age was expanded to include infants between 36 and 44 weeks. Third, multiparous mothers as well as primiparous mothers were included. Finally, mothers with caesarean sections as well as with vaginal deliveries were included. These changes were necessary to ensure collection of the data over a reasonable period of time.

**Procedure.** A second administration of the STAI X-1 Questionnaire was to be given to try to improve the reliability of the instrument. The second administration of the instrument was to be given following the feeding session. The purpose was to have the mothers indicate how they felt while actually feeding their infants. According to Spielberger et al. (1970), the alpha coefficients were usually higher for this questionnaire when given under conditions of psychological stress. Thus, the investigator conjectured that measurements taken during the actual feeding period would be more meaningful than the immediate period prior to feeding the infant. Finally, infant states were to be noted prior to each heel prick (Brazelton, 1973).

**Hormone Assay Precision**

**Cortisol.** Serum cortisol levels were measured using the cortisol RIA kit (Immophase) manufactured by Corning Medical and Scientific (1981). Fifteen μl from each serum sample were assayed in duplicate. The sensitivity of the assay was 11.2 ± 1.1 ng/ml (x ± S.D.) over three runs. The linear range (defined as B/B₀ equals 0.80 to 0.20) of
the assay averaged between 11.0 ± 1.1 ng/ml (x ± S.D.) for B/B₀ = 0.80 and 598.0 ± 19.5 ng/ml (x ± S.D.) for B/B₀ = 0.20. The between-assay coefficients of variation were 3.7 and 4.5% for the two control sera which had values of 41 and 333 ng/ml, respectively.

**Glucose.** Serum glucose levels were measured by a spectrophotometric procedure using the Glucose (Hexokinase) method by Beckman Instruments (1981). Twenty µl from each serum sample were assayed in duplicate. The absorbance curve generated by various concentrations of glucose was linear over a dose range between 10 and 500 mg glucose/dL. This included optical densities between 0.025 and 1.13. However, no sample had an optical density lower than 0.11 (14 mg glucose/dL) or greater than 0.43 (161 mg glucose/dL).

**Summary**

A detailed description of the methodology used in the study was presented. The research design, limitations, population, and sample were identified. The materials and procedures also were presented. In addition, the pilot study was reviewed briefly with regard to ethical considerations, description of subjects, procedures, findings, and changes made as a result of implementing the pilot study.
CHAPTER IV
PRESENTATION AND ANALYSIS OF DATA

Purpose

The purpose of the study was to identify what impact, if any, maternal perception and anxiety had on an infant at the time of feeding.

Descriptive Data

Subjects

Mothers. The study sample was composed of 65 mother-infant couples. This included 59 Black mother-infant couples, as well as six White mother-infant couples. The mothers ranged in age from 15 to 32 years with a mean of 21.6 years (S.D. = ± 4.21). There were 30 primiparous mothers and 35 multiparous mothers, including 20 second-time mothers, 11 third-time mothers, three fourth-time mothers, and one fifth-time mother. Fifty-six mothers had vaginal deliveries, while nine mothers had caesarean sections. Green's (1970) socioeconomic scoring index for the mothers ranged from 40 to 67 points with a mean of 54.1 points (S.D. = ± 6.8).
Infants. There were 25 males and 40 females in the sample. Gestational age for the infants ranged from 36 to 43 weeks with a mean of 40 weeks (S.D. = ± 2.0). Birth weight ranged from 2400 to 4460 g with a mean of 3310 g (S.D. = ± 440.5). Twenty-five infants were fed Similac (20 calories/ounce), 29 infants were fed Enfamil (20 calories/ounce), and 11 infants were fed SMA (20 calories/ounce). The time of day of the prefeed infant heel pricks ranged from 0823 to 2132 hours with a mean of 1573 hours. The time of day of the postfeed infant heel pricks ranged from 0953 to 2302 hours with a mean of 1721 hours. Infant states according to Brazelton's (1973) scoring method were noted prior to and after feeding (see Table 1). Apgar scores ranged from 8 to 10 points with a mean of 9.2 points (S.D. = ± 0.5). Infant age at the time of the prefeed heel prick ranged from 4116 to 7612 hours with a mean of 5406 hours. Finally, the amount of formula consumed by the infants during the study feeding ranged from 15 to 110 ml with a mean of 60.0 ml (S.D. = ± 24.5).

Questionnaire Data

Table 2 summarizes the findings for the three STAI Questionnaires and the MPITB Questionnaire. In addition, a Pearson correlation indicated a statistically significant relationship between the STAI X-2 Questionnaire and both the first administration ($r = 0.28$, $p < 0.01$) and the second administration ($r = 0.26$, $p < 0.01$) of the STAI X-1 Questionnaire.
Table 1: Infant States Prior to and After Feeding

<table>
<thead>
<tr>
<th>Time</th>
<th>State</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Mean</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prefeed</td>
<td></td>
<td>13</td>
<td>13</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>24</td>
<td>3.8</td>
<td>±2.1</td>
</tr>
<tr>
<td>n = 65</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postfeed</td>
<td></td>
<td>29</td>
<td>24</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>2.1*</td>
<td>±1.5</td>
</tr>
<tr>
<td>n = 65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ t = 5.52; p < 0.001^* \]

Note: States: 1 = deep sleep; 2 = light sleep; 3 = drowsy or semi-dozing; 4 = alert/minimum motor activity; 5 = eyes open/considerable motor activity; and 6 = crying.

* Significance as compared with the prefeed state by paired t-test.

Table 2: Mothers' STAI and MPITB Scores

<table>
<thead>
<tr>
<th></th>
<th>STAI X-1 (1st administration n = 65)</th>
<th>STAI X-1 (2nd administration n = 65)</th>
<th>STAI X-2 n = 65</th>
<th>MPITB n = 65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>20-53</td>
<td>20-62</td>
<td>23-52</td>
<td>36-223</td>
</tr>
<tr>
<td>Mean</td>
<td>35.6</td>
<td>32.5*</td>
<td>40.5</td>
<td>160.7</td>
</tr>
<tr>
<td>S.D.</td>
<td>±7.5</td>
<td>±9.1</td>
<td>±7.5</td>
<td>±31.2</td>
</tr>
</tbody>
</table>

\[ t = 3.10; p < 0.003^* \]

* Significance as compared with the 1st administration of the STAI X-1 by paired t-test.
Reliability. Cronbach's measure of internal consistency was used to assess reliability for the four questionnaires. Cronbach alpha coefficients were as follows: (1) the first administration of the STAI X-1 Questionnaire - $\alpha = 0.70$; (2) the second administration of the STAI X-1 Questionnaire - $\alpha = 0.81$; (3) the STAI X-2 Questionnaire - $\alpha = 0.75$; and (4) the MPITB Questionnaire - $\alpha = 0.88$.

Validity. The MPITB Questionnaire also was examined for construct validity. The instrument was factor analyzed first for extraction of the initial factors, and also for both varimax and oblique rotations. Results from initial factor loading scores (see Table 3), as well as Scree tests on the principal factors and both varimax and oblique rotations, supported a two factor solution. Specifically, the variables in abbreviated form as seen in Table 3 consisted of each of the paired combinations of behavior on the MPITB Questionnaire (see Appendix A). As such, the results of Table 3 suggested that only the first two factors were to be retained with Factor 1 reflecting the need for contact and Factor 2 reflecting the need for physiochemical nutrients. This finding was expected since the general need for tenderness during very early infancy according to Sullivan (1953) encompassed both the specific need for physiochemical nutrients, as well as the need for contact. In addition, the instrument was factor analyzed by initially specifying a two factor solution. Applying the exact factor retaining criteria as specified in Table 3, the same variables in Table 3 were retained again on the same factors.
Table 3: Factor Matrix Using Principal Factor with Iterations and Criteria for Retaining Factors

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>FACTORS</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>CUDC 1</td>
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<td>CUDRO 1</td>
<td>0.58053</td>
<td>-0.13508</td>
<td>-0.28220</td>
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<td>CUDSM 1</td>
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<td>-0.10179</td>
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<tr>
<td>CUDMSN 1</td>
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<td>0.18331</td>
<td>-0.18509</td>
<td></td>
</tr>
<tr>
<td>CUDST 1</td>
<td>0.53445</td>
<td>0.15832</td>
<td>-0.14426</td>
<td></td>
</tr>
<tr>
<td>CUDF 1</td>
<td>0.30644</td>
<td>0.54955</td>
<td>-0.05880</td>
<td></td>
</tr>
<tr>
<td>CUDE 1</td>
<td>0.60757</td>
<td>-0.22927</td>
<td>-0.05586</td>
<td></td>
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<tr>
<td>CUDMSVS 1</td>
<td>0.45512</td>
<td>-0.45111</td>
<td>-0.14493</td>
<td></td>
</tr>
<tr>
<td>CRO 2</td>
<td>0.31024</td>
<td>-0.44538</td>
<td>-0.04827</td>
<td></td>
</tr>
<tr>
<td>CSM 2</td>
<td>0.33634</td>
<td>0.32732</td>
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<td>CMSN 2</td>
<td>0.36052</td>
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<td>0.39880</td>
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<tr>
<td>CST 2</td>
<td>0.03413</td>
<td>0.30451</td>
<td>0.66929</td>
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<tr>
<td>CF 2</td>
<td>0.23776</td>
<td>-0.34215</td>
<td>0.27964</td>
<td></td>
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<tr>
<td>CE 2</td>
<td>0.42321</td>
<td>0.38397</td>
<td>0.23986</td>
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<td>CSMVS 2</td>
<td>0.09060</td>
<td>0.31615</td>
<td>-0.27465</td>
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<tr>
<td>RSM 3</td>
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<td>-0.14895</td>
<td></td>
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<tr>
<td>ROMSN 3</td>
<td>0.59508</td>
<td>-0.17859</td>
<td>0.24488</td>
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<tr>
<td>ROST 3</td>
<td>0.42636</td>
<td>0.15041</td>
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<td>ROF 3</td>
<td>0.40841</td>
<td>-0.00292</td>
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<tr>
<td>ROE 3</td>
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<td>-0.02950</td>
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<tr>
<td>RMSVS 3</td>
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<tr>
<td>SMMSN 4</td>
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<tr>
<td>SMMSVS 4</td>
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<td>0.24316</td>
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<tr>
<td>MSNST 5</td>
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<td>0.26535</td>
<td>0.13830</td>
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<tr>
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<td>-0.13460</td>
<td>0.52156</td>
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<tr>
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<td>0.14199</td>
<td>0.08302</td>
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<tr>
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<td>0.02420</td>
<td>-0.12770</td>
<td></td>
</tr>
<tr>
<td>STF 6</td>
<td>0.29293</td>
<td>0.08205</td>
<td>0.41762</td>
<td></td>
</tr>
<tr>
<td>STE 6</td>
<td>0.27137</td>
<td>0.14324</td>
<td>-0.19214</td>
<td></td>
</tr>
<tr>
<td>STMSVS 6</td>
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<td>0.17548</td>
<td>-0.14134</td>
<td></td>
</tr>
<tr>
<td>FE 7</td>
<td>0.32846</td>
<td>0.47975</td>
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<tr>
<td>FMSVS 7</td>
<td>0.06719</td>
<td>0.57869</td>
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<tr>
<td>EMSVS 8</td>
<td>0.59048</td>
<td>-0.26050</td>
<td>0.08452</td>
<td></td>
</tr>
</tbody>
</table>

Eigenvalues          7.66524 2.93418 2.17796
Percentage Explained  34.5 13.2 9.8

Factor Retaining Criteria: Three or more variables with a factor loading of 0.50 or greater is necessary to retain the factors.
Infant Serum Blood Levels

**Cortisol.** Prefeed serum cortisol levels ranged from 17 to 342 ng/ml with a mean of 97.2 ng/ml (S.E. = ± 7.9). Postfeed serum cortisol levels ranged from 22 to 252 ng/ml with a mean of 89.9 ng/ml (S.E. = ± 6.2). A paired t-test revealed no significant difference between prefeed and postfeed infant serum cortisol levels (see Figure 3).

**Glucose.** Prefeed serum glucose levels ranged from 61 to 128 mg/dL with a mean of 87.9 mg/dL (S.E. = ± 2.1). Postfeed serum glucose levels ranged from 67 to 161 mg/dL with a mean of 107.0 mg/dL (S.E. = ± 2.5). A paired t-test revealed a significant difference between prefeed and postfeed infant serum glucose levels (see Figure 4).

**Background Analyses**

Independent sample t-tests indicated a statistically significant difference in maternal perception based on parity, when group 1 consisted of 30 primiparous mothers and group 2 consisted of 35 multiparous mothers (t = 2.68, p < 0.01). Specifically, multiparous mothers scored a mean of 169.1 points (S.E. = ± 6.7) on the MPITB Questionnaire, while primiparous mothers scored a mean of 141.5 points (S.E. = ± 7.1). Given the sample criteria changes made as a result of implementing the pilot, only inclusion of both primiparous and multiparous mothers had a significant impact upon the study. At the same
Figure 3. Neonatal serum cortisol values
(mean ± S.E.)

(t = 7.53; p < 0.001*)
Figure 4. Neonatal serum glucose values
(mean ± S.E.)

(t = 0.80; p < 0.42)
time, infant gender and type of feeding had no statistically significant effect on maternal perception. Finally, parity had no significant effect on maternal anxiety scores.

There were no statistically significant differences in infant serum glucose and cortisol levels based on infant sex. For prefeed cortisol levels, the 25 males had a mean cortisol level of 110.2 ng/ml (± 14.3) while the 40 females had a mean cortisol level of 89.1 ng/ml (± 9.2) (t = 1.30, p < 0.19). For postfeed cortisol levels, the 25 males had a mean cortisol level of 90.3 ng/ml (± 9.1) while the 40 females had a mean cortisol level of 89.6 ng/ml (± 8.3) (t = 0.05, p < 0.96). With regard to prefeed glucose levels, the 25 males had a mean glucose level of 90.5 mg/dL (± 3.0) while the 40 females had a mean glucose level of 86.3 mg/dL (± 2.8) (t = 1.01, p < 0.31). Finally, postfeed glucose levels for the 25 males included a mean glucose level of 106.0 mg/dL (± 3.2) while the 40 females included a mean glucose level of 107.6 mg/dL (± 3.5) (t = 0.30, p < 0.76).

Pearson correlations did not reveal any statistically significant relationships between the following: (1) infant prefeed serum cortisol levels and infant behavioral states prior to the prefeed heel prick (r = 0.15, p < 0.11); (2) infant postfeed serum cortisol levels and infant behavioral states prior to the postfeed heel prick (r = -0.01, p < 0.46); (3) infant prefeed serum glucose levels and infant behavioral states prior to the prefeed heel prick (r = 0.05, p < 0.32); and (4) infant postfeed serum glucose levels and infant behavioral states prior to the postfeed heel prick (r = 0.01, p < 0.48).
Independent sample t-tests did not reveal any statistically significant differences among mothers based on age. Variables considered included the first administration of the STAI X-1 Questionnaire (t = 0.17, p < 0.98), the second administration of the STAI X-1 Questionnaire (t = 0.12, p < 0.87), the STAI X-2 Questionnaire (t = 0.44, p < 0.71), and the MPITB Questionnaire (t = 1.74, p < 0.08). In addition, there were no statistically significant differences in infants' prefeed serum cortisol levels (t = 1.84, p < 0.07), postfeed serum cortisol levels (t = 0.25, p < 0.80), prefeed serum glucose levels (t = 0.73, p < 0.46), or postfeed serum glucose levels (t = 0.90, p < 0.37) based on time of day of heel prick.

Finally, Pearson correlations disclosed a statistically significant relationship between infant prefeed cortisol levels and postfeed glucose levels (r = 0.22, p < 0.03). However, a similar relationship was not found between infant prefeed cortisol levels and amount of formula consumed by the infant (r = 0.08, p < 0.25).

**Examination of Statistical Hypotheses and Findings**

1. There is no relationship between maternal perception scores and maternal anxiety scores.

Pearson correlations were used to evaluate the first hypothesis. The analysis revealed no statistically significant relationship between scores on the MPITB Questionnaire and the STAI X-2 Questionnaire (r = 0.23, p < 0.09). However, a statistically significant relationship was found between the following: (1) scores on the MPITB
Questionnaire and the first administration of the STAI X-1 Questionnaire \( (r = 0.28, \ p < 0.01) \); and (2) scores on the MPITB Questionnaire and the second administration of the STAT X-1 Questionnaire \( (r = 0.23, \ p < 0.02) \). In addition, a statistically significant relationship was realized for the second administration of the STAI X-1 Questionnaire and the scores on Factor 2, after factor analysis of the MPITB Questionnaire \( (r = 0.23, \ p < 0.03) \). Thus, the first hypothesis was rejected, with a statistically significant relationship existing between maternal perception scores and maternal anxiety scores.

2. There is no relationship between maternal anxiety scores and infant anxiety levels.

Pearson correlations were used to evaluate the second hypothesis. The analysis disclosed a statistically significant relationship between scores on the first administration of the STAI X-1 Questionnaire and infant prefeed serum cortisol levels \( (r = 0.19, \ p < 0.05) \). No statistically significant relationships were found between the following: (1) scores on the first administration of the STAI X-1 Questionnaire and infant postfeed serum cortisol levels \( (r = 0.02, \ p < 0.40) \); (2) scores on the second administration of the STAI X-1 Questionnaire and infant prefeed serum cortisol levels \( (r = 0.10, \ p < 0.21) \) or infant postfeed serum cortisol levels \( (r = 0.02, \ p < 0.41) \); and (3) scores on the STAI X-2 Questionnaire and infant prefeed serum cortisol levels \( (r = 0.18, \ p < 0.06) \) or infant postfeed serum cortisol levels \( (r = 0.06, \ p < 0.30) \). The second hypothesis was rejected, with a statistically significant relationship existing between maternal anxiety scores and infant anxiety levels.
3. There is no relationship between maternal anxiety scores and infant satiety levels.

Pearson correlations were used to evaluate the third hypothesis. The analysis did not uncover any statistically significant relationships between the following: (1) scores on the first administration of the STAI X-1 Questionnaire and infant prefeed serum glucose levels \( (r = 0.06, p < 0.30) \) or infant postfeed serum glucose levels \( (r = 0.19, p < 0.06) \); (2) scores on the second administration of the STAI X-1 Questionnaire and infant prefeed serum glucose levels \( (r = 0.01, p < 0.45) \) or infant postfeed serum glucose levels \( (r = 0.07, p < 0.26) \); (3) scores on the STAI X-2 Questionnaire and infant prefeed serum glucose levels \( (r = 0.004, p < 0.48) \) or infant postfeed serum glucose levels \( (r = 0.09, p < 0.22) \); and (4) the amount of infant formula consumed and scores on the first administration of the STAI X-1 Questionnaire \( (r = 0.05, p < 0.33) \), the second administration of the STAI X-1 Questionnaire \( (r = 0.07, p < 0.28) \), or the STAI X-2 Questionnaire \( (r = 0.13, p < 0.45) \). The third hypothesis was retained, with no relationship existing between maternal anxiety scores and infant satiety levels.

4. There is no relationship between maternal perception scores and infant satiety levels.

Pearson correlations were used to evaluate the fourth hypothesis. The results indicated a statistically significant relationship between scores on the MPITB Questionnaire and the infant postfeed serum glucose levels \( (r = 0.19, p < 0.05) \). Further analysis revealed no significant relationship between scores on the MPITB Questionnaire and
the amount of formula consumed by the infant ($r = 0.01, p < 0.45$). In addition, the analysis revealed no significant relationship between scores on the MPITB Questionnaire and the infant prefeed serum glucose levels ($r = 0.12, p < 0.15$). The fourth hypothesis was rejected, with a statistically significant relationship existing between maternal perception scores and infant satiety levels.

5. There is no relationship between maternal perception scores and infant anxiety levels.

Pearson correlations were used to evaluate the fifth hypothesis. The results disclosed no significant relationships between the following: (1) scores on the MPITB Questionnaire and infant prefeed serum cortisol levels ($r = 0.15, p < 0.10$); and (2) scores on the MPITB Questionnaire and infant postfeed serum cortisol levels ($r = 0.15, p < 0.10$). The fifth hypothesis was retained, with no statistically significant relationship existing between maternal perception scores and infant anxiety levels.

6. Maternal perception and anxiety scores are not statistically significant predictors of infant satiety and anxiety levels. $H_0: R^2_{FM} = R^2_{RM}$, $H_A: R^2_{FM} \neq R^2_{RM}$.

Multivariate analysis of variance (MANOVA) was used to evaluate the sixth hypothesis. The following models were analyzed by computer. First, the RM of scores on the MPITB Questionnaire and the three STAI Questionnaires were tested for their predictive effect on the amount of formula consumed by the infant; both infant postfeed glucose and cortisol levels and only infant postfeed cortisol levels were held as covariates on separate computer runs. Results indicated that the
scores on both the second administration of the STAI X-1 Questionnaire and the STAI X-2 Questionnaire were significant predictors of the amount of formula consumed by the infant. The significance was evident when both the postfeed glucose and cortisol levels were considered as covariates ($t = 2.30, p < 0.02$), as well as when only the postfeed cortisol levels were considered as the covariate ($t = 2.35, p < 0.02$).

Second, the RM of scores on the MPITB Questionnaire and the three STAI Questionnaires were tested for their predictive effect on infant postfeed glucose levels when infant postfeed cortisol levels were held as the covariate. Results indicated that the scores on both the MPITB Questionnaire and the STAI X-2 Questionnaire were significant predictors of infant postfeed glucose levels when infant postfeed cortisol levels were considered as the covariate ($t = 2.29, p < 0.02$).

Third, the RM of scores on the MPITB Questionnaire and the three STAI Questionnaires were tested for their predictive effect on infant prefeed cortisol levels when infant postfeed glucose levels were considered as the covariate. Results indicated that the scores on both the MPITB Questionnaire and the first administration of the STAI X-1 Questionnaire were significant predictors of infant prefeed cortisol levels when the infant postfeed glucose levels were considered as the covariate ($t = 2.18, p < 0.03$).

Finally, the RM of scores on the MPITB Questionnaire and the three STAI Questionnaires were tested for their predictive effect on infant postfeed cortisol levels when infant postfeed glucose levels were considered as the covariate. No significant contributions were evident for any of the many combinations present. The sixth
hypothesis was rejected, with maternal perception and anxiety scores being significant predictors of infant satiety and anxiety levels.

Summary

The purpose of the study was reviewed. A detailed description of the data was presented with regard to the characteristics of both the mothers and infants who participated in the study. The questionnaire data were described, including reliability and validity testing of the questionnaires. In addition, infant blood values were offered and demographic variables were analyzed. Finally, specific findings were presented for each statistical hypothesis.
CHAPTER V
SUMMARY, CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS

Summary

Purpose

The purpose of the study was to identify what impact, if any, maternal perception and anxiety had on an infant at the time of feeding.

Problem

According to Sullivan (1953), an interruption in the tenderness process within mother-infant couples manifested itself by malevolence. In the mothering one, malevolence resulted in the inability to meet an infant's needs for contact and physiochemical requirements necessary to sustain life. Malevolence at its worst resulted in psychological, physiological, or physical harm to the infant.

From Sullivan's (1953) perspective, the foremost cause of an interruption in the human tenderness process during the very early stages of the mother-infant relationship was attributed mainly to anxiety in the mothering one. As such, maternal anxiety exerted two major effects on the mother-infant relationship. First, maternal
anxiety penetrated the mother's actions (Sullivan, 1953). In particular, anxiety inhibited awareness. That is, a mother became less alert or perceptive to relevant cues in an interpersonal situation. As a result, it might be said that maternal anxiety limited the refinement and precision of a mother's actions relative to the satisfaction of her infant's needs (Mullahy, 1970). Second, maternal anxiety also induced anxiety in the infant through an emotional linkage known as empathy. This anxious state in effect prohibited the infant from directing bodily energy appropriately for meeting essential life sustaining needs.

Subjects

Mothers. Except for six pairs, all the mother-infant pairs were Black. The mothers were relatively young at 21.6 years of age, with approximately half of the group being first-time mothers. The majority of mothers had vaginal deliveries with only a few having caesarean sections. The mothers were from the low socioeconomic group.

Infants. Approximately two-thirds of the sample were females and one-third were males. On the average, the infants were full-term with regard to maternal gestation and weight. Approximately 1/2 of the infants were fed with Enfamil, 1/3 were fed with Similac, and the remaining 1/6 were fed with SMA. The average time of the first heel prick was 3:00 p.m., with the second heel prick at 5:30 p.m. With regard to infant state prior to feeding, the largest group of infants
was found to be crying. At the same time, the infant state 90 minutes after feeding for the largest group was that of a deep sleep. Apgar scores were very high at 9+ for the mean score. All infants at the time of the first heel prick were over 41 hours of age. Finally, the infants on the average consumed 2 ounces of milk during the feeding session, a fairly substantial amount for this age.

Conclusions

Questionnaire Data

As reflected by the three STAI Questionnaires, the mothers represented a fairly low-anxious group. At the same time, mean scores on the MPITB Questionnaire indicated a relatively perceptive group. Parity had a significant effect on maternal perception scores with multiparous mothers being more perceptive than primiparous mothers. Infant gender and type of feeding did not affect maternal perception score nor did parity affect maternal anxiety scores. Finally, analysis of the STAI Questionnaire data also confirmed the positive relationship that would be expected by Spielberger et al. (1970) between state anxiety scores and trait anxiety scores. That is, mothers who were generally high-anxious were also high-anxious under the specific stress-producing circumstances surrounding infant feeding.

Reliability/Validity. All four questionnaires had high reliabilities of 0.70 or greater. The second administration of the STAI
X-1 Questionnaire resulted in a much higher reliability than the first administration of the same questionnaire ($\alpha = 0.81$ versus $\alpha = 0.70$). Finally, validity testing of the MPITB Questionnaire revealed that mothers perceived two distinct categories of infant behavior, as revealed by a two factor solution. The factors reflected two distinct tenderness needs: (1) the need for physiochemical nutrients; and (2) the need for contact.

**Infant Serum Blood Levels**

While cortisol levels varied widely among the infants, a comparison of the prefeed and postfeed mean cortisol levels revealed no significant change as a result of the feeding. Although glucose levels did not vary as greatly, a comparison of the prefeed and postfeed mean glucose levels disclosed a significant increase as a result of the feeding. Infant sex did not significantly effect glucose or cortisol levels.

**Background Variables**

There was no significant relationship between the infants' behavioral states and serum cortisol levels. Furthermore, no circadian rhythm was evident in either infant serum glucose or cortisol levels. However, infant prefeed cortisol levels were directly related to postfeed glucose levels, but not the amount of formula consumed by the infant.
Statistical Hypotheses

1. There is no relationship between maternal perception scores and maternal anxiety scores.

The hypothesis was rejected. There was a significant relationship between maternal perception scores and maternal state anxiety scores prior to and during the feeding. The relationship was positive with greater maternal perception scores being associated with greater state anxiety scores. There was no significant relationship, however, between maternal perception scores and maternal trait anxiety scores.

2. There is no relationship between maternal anxiety scores and infant anxiety levels.

The hypothesis was rejected. There was a significant relationship between maternal state anxiety scores present prior to feeding and their infants' prefeed cortisol levels, but not postfeed cortisol levels. The relationship was positive with greater maternal state anxiety scores being associated with greater infant prefeed cortisol levels. There was no significant relationship between maternal state anxiety scores during feeding and their infants' prefeed or postfeed cortisol levels. Finally, there was no connection between maternal trait anxiety scores and their infants' prefeed or postfeed cortisol levels.

3. There is no relationship between maternal anxiety scores and infant satiety levels.

The hypothesis was retained. There was no significant relationship between either maternal state anxiety scores or trait anxiety
scores, and their infants' prefeed glucose levels, postfeed glucose levels, or amount of formula consumed.

4. There is no relationship between maternal perception scores and infant satiety levels.

The hypothesis was rejected. There was a significant positive relationship between maternal perception scores and their infants' postfeed glucose levels. There was no relationship between maternal perception scores and either infant prefeed glucose levels or amount of formula consumed.

5. There is no relationship between maternal perception scores and infant anxiety levels.

The hypothesis was retained. There was no relationship between maternal perception scores and either their infants' prefeed or postfeed cortisol levels.

6. Maternal perception and anxiety scores are not statistically significant predictors of infant satiety and anxiety levels.

The hypothesis was rejected. First, both maternal state anxiety scores prior to feeding and trait anxiety scores were significant predictors of the amount of formula consumed by the infant, when both glucose and cortisol levels or just cortisol levels were used as covariates. Second, both maternal perception scores and trait anxiety scores were significant predictors of infant postfeed glucose levels when infant postfeed cortisol levels were used as the covariate. Third, both maternal perception scores and state anxiety scores prior to feeding were significant predictors of infant prefeed cortisol
levels, when infant postfeed glucose levels were used as the covariate. Finally, maternal perception scores and anxiety scores were not significant predictors of infant postfeed cortisol levels, when infant postfeed glucose levels were used as the covariate.

Discussion

Interrelationship of Maternal Perception and Anxiety

Maternal perception scores were associated with maternal state anxiety scores present prior to and during feeding. In effect the greater the mothers' ability to discriminate among infant behavior, the greater was the mothers' state anxiety prior to and during feedings. The positive relationship between the two variables appeared to be in direct opposition to Sullivan's (1953) theory. That is, maternal anxiety according to Sullivan should have inhibited awareness. However, further delineation of an anxiety gradient by Sullivan suggested that low levels of anxiety resulted in positive outcomes (Mullahy, 1970). Thus, a possible explanation for the positive relationship between maternal perception and state anxiety might rest with the fact that the mothers represented a relatively low-anxious group. Perhaps a greater or critical level of maternal anxiety was required to inhibit maternal perception of infant behavior. In addition, parity was found to effect maternal perception. As such, multiparous mothers were more discriminating than primiparous mothers with regard to infant behavior. This was consistent with Sullivan's belief that
previous experience with prior children had an effect on how mothers currently perceived and related to their infants. With 35 multiparous mothers participating in the study, over 1/2 the group of mothers had prior personal experience in differentiating between infant behaviors. However, this past experience did not seem to have any impact on maternal anxiety levels.

**Nursing Implications.** While nurses need to be aware of the relatively high perceptive capacity of young, new mothers (especially as pertains to the Black culture), nurses also must be cognizant of the fact that within the study primiparous mothers are not as perceptive as multiparous mothers. Given that parity only affects perception and not anxiety, it would be beneficial for nurses to help mothers in discriminating among infant behaviors and needs rather than try to decrease their anxiety. In fact, anxiety when present in small amounts appears to enhance rather than detract from the mothers' perceptive capabilities. Primiparous mothers, in particular, would appear to benefit greatly from an emphasis on discrimination of infant behavior and needs.

**The Finding of Low Anxiety in the Mothers**

Since the criteria for the study stipulated essentially healthy mother-infant couples, this may have enhanced further the low-anxious phenomenon reflected by the study. That is, the early postpartum period represented a somewhat low-anxious period for the healthy mother-infant couple in the study. Moreover, the majority of the
mother-infant couples were Black which presupposes a specific cultural response to the interaction during this period. The finding of low anxiety levels in a predominantly Black sample supported the literature by Jackson (1973) which inferred that Blacks were not highly anxious with regard to child-rearing.

**Nursing Implications.** While the early postpartum period is essentially a time of adjustment for both infant and mother, maternal anxiety at least from the perspective of the Black culture and lower socioeconomic group may not be the major presenting problem in early disruptive mother-infant relationships. Nurses need to investigate additional contributing factors within the Black culture and lower socioeconomic group which may contribute to a successful dyadic interaction.

**Prefeed Maternal State Anxiety and Infant Cortisol**

The significant positive relationship between maternal state anxiety scores prior to feeding and infant prefeed cortisol levels presumed that infants of more anxious mothers were under greater stress than infants of low-anxious mothers prior to feeding. Possibly, a more powerful cue was needed from the infants to stimulate the mothers to respond to the need for milk. This aspect of the study supported Sullivan's (1953) theory that maternal anxiety inhibited maternal awareness. That is, maternal anxiety appeared to have a direct physiological impact on the infant at the time when an unmet physiochemical need was present in the infant.
Glucose Values

The glucose levels found in the study essentially reflected normal values found in infants at this age (Creery & Parkinson, 1953; Farquhar, 1954; Norval et al., 1949). In addition, the significant change in glucose levels resulting from feeding (an increase of approximately 13 mg%) further supported the literature by Zamboni et al. (1979). That is, feeding during the early postpartum period constituted a physiologic stimulus for the pancreas of the newborn. Thus, glucose appeared to be a satisfactory measure of satiety in newborns. Finally, the fact that there were no differences in glucose levels with regard to infant sex also supported previous literature (Creery & Parkinson, 1953; National Institute of Mental Health, 1970).

Cortisol Values

The cortisol levels found in the study also reflected normal values found in infants at this age (Vermes et al., 1980). The fact that there was no significant change in cortisol levels in response to feeding also supported the literature by Zurbrugg (1976). Possible explanations for this finding were: (1) The actual time spent by the mother in feeding the infant was brief (10 to 15 minutes). Thus, the mother-infant interaction may not have been adequate for the infant to respond to any other stress in addition to the physiochemical need. (2) The mechanism of empathy may not have been operational in the
newborn, at least in terms of the interaction experienced during actual feeding. (3) Serum cortisol response to emotional stress may have been delayed in the newborn, as was recently demonstrated in rhesus monkeys by Blank, Wilson, and Gordon (in press). At the same time, a positive correlation between state anxiety scores and infant prefeed cortisol levels supported cortisol as a suitable measure of infant anxiety.

The additional finding that cortisol levels were not affected by infant behavioral states at the time of heel prick or by maternal anxiety during feeding suggested a highly discriminating response by cortisol to specific stressors. Further, the finding that maternal anxiety contributed greatly to infant satiation and that there was a significant positive relationship between infant prefeed cortisol and postfeed glucose levels, and no such relationship between postfeed glucose levels and the amount of formula consumed by the infant, implied that cortisol played a greater role in physiologic rather than psychologic stress in the newborn. Likewise, if the infant depended solely on external sources of glucose, one would expect a relationship between postfeed glucose levels and the amount of formula consumed by the infant. The presence of these findings suggested that in the presence of physiologic stress in the newborn, cortisol acted as a protective mechanism to ensure adequate nutrition in the infant by converting protein and fat into carbohydrates. This appeared to support previous literature by Boddy (1978), Guyton (1968), and Massip (1980). This may explain further why no significant differences were found between infant prefeed and postfeed cortisol levels. As such,
cortisol's role in ensuring adequate nutrition in the infant may have necessitated a continued maintenance level of cortisol for a relatively long period of time.

**Nursing Implications.** Supplemental feedings may be necessary in situations wherein there is exposure to repeated emotional stress during feeding. This would appear necessary to keep the infant from depleting his internal store of protein and fat so necessary to regulating growth and development in the infant. In addition, the infants who are exposed to repeated emotional stress during feeding may need to be observed for additional physiologic problems (i.e., excessive bilirubin levels) resulting from increased catabolism.

The fact that a multivariate analysis of variance procedure was required to demonstrate a predictive relationship between maternal perception and anxiety scores with infant satiety and anxiety levels indicated that the mother-infant tenderness process was a complex phenomenon. Although a relatively small degree of relationship appeared to exist between some of the variables, the relatively homogeneous sample concealed the substantially greater relationship that would have been expected in a heterogeneous group. Thus, maternal perception and anxiety might be thought to have an important impact on infant satiety and anxiety in the general population.

**Recommendations**

1. More highly anxious mothers should be included in a study to assess whether or not a critical level of maternal anxiety is
necessary to trigger a response to infant postfeed cortisol levels. According to Sullivan's (1953) anxiety gradient, severe anxiety when present during feeding should have a dramatic negative effect on the infant. If empathy is operational under severe maternal anxiety states, the result should be increased postfeed cortisol levels.

2. A comparison should be made between breast- versus bottle-feeding infants with regard to glucose and cortisol levels. In regard to the breast-feeding infant, the added variables of the physical passage of a relatively transitional amount of glucose and cortisol in human milk, as well as the potential for greater body contact during feeding, may intensify the negative effect that maternal anxiety has on the satiety and anxiety of an infant.

3. Additional variables contributing to the mother-infant tenderness process should be investigated. The relatively low correlations obtained in the study suggest that there may be additional important factors which contribute to this complex mother-infant interaction. Examples might include degree of touch, mother's voice, or number of times infant is exposed to stress.

4. The tenderness process should be studied using a more heterogeneous group, i.e., inclusion of additional cultures and different socioeconomic levels. This would allow for examination of how the mother-infant tenderness process differs from or is similar to a predominantly Black group of mother-infant couples.

5. The length of time spent in mother-infant interaction during feeding should be increased to assess its impact on infant postfeed cortisol levels. The relatively short period of time spent in feeding
for the study may not have been enough to elicit a physiologic response.

6. Older infants and/or children should be included in the study to assess if there is a difference in the physiologic cortisol response. Although Sullivan (1953) admits that he is unsure as to when anxiety is exhibited in infants, he recognizes that infant anxiety is observable more so in the infant after 6 months of age.

7. The relationship should be assessed from the perspective of a different physiochemical need. Perhaps the nature, rather than degree, of the stressor contributes more to the infant's satiety and anxiety during the newborn period.

8. A less invasive technique should be tried for measuring cortisol in infants and compared with existing venipuncture techniques. For example, recent studies on the feasibility of using salivary cortisol as a measure of pituitary-adrenal function offers a less painful method for measuring anxiety in infants. Results from these studies indicate that salivary cortisol, rather than serum cortisol, is more prominent in its response to stimulation. This finding suggests that monitoring of salivary cortisol may be more superior to that of serum cortisol in certain clinical situations (Hiramatsu, 1981; Umeda, Hiramatsu, Iwaoka, Shimada, Miura, & Sato, 1981).
REFERENCE NOTES


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APPENDICES
**APPENDIX A: Maternal Perception of Infant Tender Behavior (MPIB) Questionnaire**

New mothers often spend a great deal of time observing their babies. Listed below are some of the behaviors noted frequently by mothers during a baby's first year of life. For a mother to satisfy her baby's needs, it is important that she understand what her baby wants. For each pair of babies listed below, I would like you to check off (x) how similar or different you think the babies' needs are based on their behavior.

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<td>1. Baby A is cuddling. Baby B is crying.</td>
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<td>4. Baby A is cuddling. Baby B is making sucking noises.</td>
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<td>5. Baby A is cuddling. Baby B is staring.</td>
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<td>6. Baby A is cuddling. Baby B is fussing.</td>
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<td>Baby A is cuddling. Baby B is exploring.</td>
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<td>Baby A is cuddling. Baby B is making soft vocal sounds.</td>
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<td>Baby A is crying. Baby B is reaching out.</td>
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<td>Baby A is crying. Baby B is smiling.</td>
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<td>Baby A is crying. Baby B is making sucking noises.</td>
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<td>Baby A is crying. Baby B is staring.</td>
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<td>13</td>
<td>Baby A is crying. Baby B is fussing.</td>
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<td>14</td>
<td>Baby A is crying. Baby B is exploring.</td>
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<td>15. Baby A is crying. Baby B is making soft vocal sounds.</td>
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<td>16. Baby A is reaching out. Baby B is smiling.</td>
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<td>17. Baby A is reaching out. Baby B is making sucking noises.</td>
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<td>18. Baby A is reaching out. Baby B is staring.</td>
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<td>19. Baby A is reaching out. Baby B is fussing.</td>
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<td>20. Baby A is reaching out. Baby B is exploring.</td>
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<td>21. Baby A is reaching out. Baby B is making soft vocal sounds.</td>
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<tr>
<td>22. Baby A is smiling. Baby B is making sucking noises.</td>
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<td>very different</td>
<td>somewhat different</td>
<td>slightly different</td>
<td>neither similar nor different</td>
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<tr>
<td>23.</td>
<td>Baby A is smiling. Baby B is staring.</td>
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<tr>
<td>24.</td>
<td>Baby A is smiling. Baby B is fussing.</td>
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<tr>
<td>26.</td>
<td>Baby A is smiling. Baby B is making soft vocal sounds.</td>
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<tr>
<td>27.</td>
<td>Baby A is making sucking noises. Baby B is staring.</td>
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<td>28.</td>
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<td>29.</td>
<td>Baby A is making sucking noises. Baby B is exploring.</td>
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<tr>
<td>30.</td>
<td>Baby A is making sucking noises. Baby B is making soft vocal sounds.</td>
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<tr>
<td>31.</td>
<td>Baby A is staring. Baby B is fussing.</td>
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<td>32.</td>
<td>Baby A is staring. Baby B is exploring.</td>
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<td>33.</td>
<td>Baby A is staring. Baby B is making soft vocal sounds.</td>
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<tr>
<td>34.</td>
<td>Baby A is fussing. Baby B is exploring.</td>
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<td>35.</td>
<td>Baby A is fussing. Baby B is making soft vocal sounds.</td>
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<tr>
<td>36.</td>
<td>Baby A is exploring. Baby B is making soft vocal sounds.</td>
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</tbody>
</table>
APPENDIX B

SELF-EVALUATION QUESTIONNAIRE
Developed by C. D. Spielberger, R. L. Gorsuch and R. Lushene

STAI FORM X-1

NAME _____________________________ DATE ________________

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

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<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1. I feel calm</td>
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<tr>
<td>2. I feel secure</td>
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<td>3. I am tense</td>
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<td>4. I am regretful</td>
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<td>5. I feel at ease</td>
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<td>6. I feel upset</td>
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<td>7. I am presently worrying over possible misfortunes</td>
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<td>8. I feel rested</td>
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<td>9. I feel anxious</td>
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<td>10. I feel comfortable</td>
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<td>11. I feel self-confident</td>
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<td>12. I feel nervous</td>
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<td>13. I am jittery</td>
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<td>14. I feel “high strung”</td>
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<td>15. I am relaxed</td>
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<td>16. I feel content</td>
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<td>17. I am worried</td>
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<tr>
<td>18. I feel over-excited and “rattled”</td>
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<td>19. I feel joyful</td>
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<tr>
<td>20. I feel pleasant</td>
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677 College Avenue, Palo Alto, California 94306

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APPENDIX C

SELF-EVALUATION QUESTIONNAIRE
STAI FORM X-2

NAME ___________________________ DATE ___________________________

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

21. I feel pleasant ...........................................

22. I tire quickly ...........................................

23. I feel like crying ........................................

24. I wish I could be as happy as others seem to be ........................................

25. I am losing out on things because I can't make up my mind soon enough ....

26. I feel rested ............................................

27. I am “calm, cool, and collected” ........................................

28. I feel that difficulties are piling up so that I cannot overcome them ....

29. I worry too much over something that really doesn't matter ..........

30. I am happy ............................................

31. I am inclined to take things hard ........................................

32. I lack self-confidence ...................................

33. I feel secure ...........................................

34. I try to avoid facing a crisis or difficulty ...................................

35. I feel blue ...........................................

36. I am content ...........................................

37. Some unimportant thought runs through my mind and bothers me ........

38. I take disappointments so keenly that I can't put them out of my mind ....

39. I am a steady person ...................................

40. I get in a state of tension or turmoil as I think over my recent concerns and interests ........................................
# APPENDIX D: Demographic Data and Results

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<td>Ethnicity (Black 1, White 2)</td>
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<td>Mother's Age</td>
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<td>Mother's Education</td>
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<td>Occupation/Gross Family Income</td>
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<td>Infant State: Prefeed</td>
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<tr>
<td>Postfeed</td>
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<td>AGE AT TIME OF FEED</td>
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GRADUATE SCHOOL
UNIVERSITY OF ALABAMA IN BIRMINGHAM
DISSERTATION APPROVAL FORM

Name of Candidate  Deidre Marion Blank
Major Subject       Maternal Child Health Nursing
Title of Dissertation The Tenderness Process in Mother-Infant Couples: The Relationship of Maternal Culture, Anxiety, and Perception to Infant Satiety and Anxiety

Dissertation Committee:
Chairman
Director of Graduate Program
Dean, UAB Graduate School

Date 12/3/82