Characteristics of Mother-Infant Interactions in Nonorganic Failure to Thrive

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Nonorganic failure to thrive (NOFTT) is characterized by physical and developmental retardation and a disturbed mother-infant relationship. This study sought to quantify differences in interactions between mother-NOFTT infant pairs and control mother-thriving infant pairs. Eleven mother-NOFTT infant dyads and 11 control mother-infant dyads were videotaped for 30 minutes through a one-way mirror. Mother and infant behaviors were evaluated for 21 behavioral categories: 12 maternal, 7 infant, and 2 mutual. Statistically significant differences were noted in five (24 percent) categories. The quantity of maternal and infant vocalizations and the responsiveness of the mother to the infant's vocal cues were strikingly reduced in the NOFTT dyads.

Nonorganic failure to thrive (NOFTT) is a well-recognized clinical entity characterized by retardation of physical growth, cognitive, and psychomotor development, behavioral disturbances, alteration of affect, and an abnormal mother-infant relationship.[1–4] In the past the diagnosis was considered after exclusion of organic conditions by extensive diagnostic and laboratory evaluations, a process subjecting the patient to unnecessary testing and expense.[5] More recent studies have emphasized the characteristics of behavior and affect in these infants.[6–8] Evaluations of maternal characteristics and family dynamics have also revealed abnormalities.[9–11]

This study was undertaken to evaluate the interactions between mothers and their NOFTT infants and to determine whether quantifiable differences exist between mother-NOFTT infant dyads and mother-thriving infant dyads.

METHODS

Mother-infant dyads were evaluated in the pediatric outpatient department at Harbor–UCLA Medical Center, a county-funded teaching hospital serving a low to low-middle socioeconomic class, with approximately 40,000 pediatric outpatient visits a year. A convenience sample of patients being seen in the Pediatric Continuing Care Clinic (PCC Clinic) for routine well-child care or in the Failure to Thrive Clinic (FTT Clinic) for an evaluation by a multidisciplinary team was used. Referrals to the FTT Clinic are made from the emergency department, other hospital clinics, community health clinics, and by private physicians. Criteria for referral are height or weight below the 5th percentile or an observed decrease in either of these measurements by two major percentiles. Patients in the FTT Clinic undergo an extensive medical, nutritional, and psychosocial assessment by a team that includes a pediatrician, pediatric nurse practitioner, dietitian, clinical social worker, clinical psychologist, occupational therapist, and home nurse. None of the infants in the FTT Clinic had been previously diagnosed as NOFTT, and their parents were advised that the clinic evaluates children who are not growing at the expected rate.

The study group comprised qualifying infants in the FTT Clinic, and the control group, PCC Clinic patients. No control subject had a NOFTT diagnosis. To qualify for the study group, mother-infant pairs had to meet the following criteria: (1) this visit was their first to the FTT Clinic, (2) an ultimate diagnosis of NOFTT was required for inclusion in the study group, (3) the infant was aged between 1 to 18 months, and (4) the infant presented to the clinic with its natural mother.

Parents were told that the purpose of the study was to

Submitted, revised, April 23, 1987.

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TABLE 1. COMPARISON OF CONTROL (n = 11) AND STUDY (n = 11) MATERNAL BEHAVIORS IN 12 BEHAVIORAL CATEGORIES

Variable	Median Score		Range		P Value (Wilcoxon)
	Control	Study	Control	Study	
Makes positive vocalizations: laugh, praise, approval	23.5	1.0	0–92.5	0–27.5	.02
Makes negative vocalizations: criticism, threat	0	0	0–9.5	0–4.0	.56
Responds to infant's distress vocalizations	4.50	0	0–46.0	0–8.0	.04
Responds to infant's nondistress vocalizations	6.50	0	0–89.0	0–14.0	.03
Attempts social interaction	6.50	5.00	3.0–46.5	0–18.0	.09
Ignores infant	1.00	6.00	0–8.00	0–100	.16
Offers object	4.50	2.00	0–9.50	0–13.0	.32
Looks at infant	7.50	16.00	2.50–65.50	1.50–56.00	.27
Holds infant	22.00	8.80	0–120.00	0–21.00	.50
Performs caretaking duties: feeding, changing	1.0	1.5	0–4.00	0–20.50	.20
Touches infant	8.00	8.00	0–14.50	0–15.00	.77
Performs vestibular stimulation: rocking, bouncing, lifting	7.00	4.500	0–32.00	0–21.00	.92

TABLE 2. COMPARISON OF CONTROL (n = 11) AND STUDY (n = 11) INFANT BEHAVIORS IN SEVEN BEHAVIORAL CATEGORIES

Variable	Median Score		Range		P Value (Wilcoxon)
	Control	Study	Control	Study	
Distress vocalizations: fussing, crying	4.50	0.5	0–45.00	0–13.00	.02
Vocalizations	8.5	0.0	0–72.00	0–25.50	.02
Initiates social interaction: touching, smiling, gesturing	2.5	0.0	0–10.00	0–14.00	.22
Self-play	8.5	0.0	0–41.00	0–120.00	.13
Looks at mother	2.5	2.0	0–10.00	0–16.00	.77
Asleep	0.0	0.0	0–3.00	0–2.50	.72
Awake	6.0	6.0	3.00–6.00	3.50–6.00	.72

evaluate the interactions between mothers and infants. A signed informed consent was obtained, and mother-infant pairs were placed in an examining room stocked with developmentally appropriate toys and caretaking items. This clinical setting was designed to simulate a home environment, although certain environmental stresses (eg, telephones, siblings, etc) were eliminated. A video camera was present on the other side of a one-way mirror so as to be less intrusive. Videotaping was carried out for 30 minutes.

Each tape was subsequently reviewed by two independent observers who were blinded to patient diagnosis and uninvolved in patient care. A modification of the Infant Caretaker Interaction Scale[12] was used to assign a quantitative score for specific mother-infant interactions, maternal behaviors, and infant behaviors. To facilitate scoring, individual test items were grouped together, and the 46-item behavior scale was condensed into 21 behavioral categories: 12 maternal behaviors, 7 infant behaviors, and 2 mutual categories (Tables 1 through 3). Behaviors were scored as being present (1) or absent (0) for each 15-second interval. Scores were summed for each five-minute segment (maximum score 20) and for the 30-minute period (maximum score 120).

Correlation between interrator scores was assessed by using a ratio of total scores assigned by each examiner for each item. Overall correlation was .98. Scores were averaged for the two raters, and the statistical significance of differences in the study group and control group scores for each category was evaluated using the Wilcoxon rank sum test. A nonparametric test was used because of wide variance (F test) of score values.[13]

RESULTS

Data were analyzed for 11 mother-NOFTT infants pairs and 11 mother-thriving infants pairs. The diagnosis of

TABLE 3. COMPARISON OF MUTUAL BEHAVIORS IN CONTROL (n = 11) AND STUDY (n = 11) GROUPS

Variable	Median Score		Range		P Value (Wilcoxon)
	Control	Study	Control	Study	
Mutual interactions	6.50	2.00	0–49.50	0–8.00	.06
Mutual gazing	6.00	1.0	0.50–42.50	0–19.50	.08

NOFTT was made after comprehensive medical assessment failed to uncover organic disease and psychosocial assessment provided corroborative data supporting a nonorganic diagnosis. A total of 40 pairs were videotaped. Eighteen were eliminated because they did not meet the study criteria. The most frequent reason for exclusion from the study group was the diagnosis of a condition other than NOFTT. Familial short stature, constitutional delay (short stature with delayed bone age), and cow milk protein allergy were the major excluding diagnoses. The control group subjects were selected to match study group subjects for variables including infant age, ethnic background, birth order, and age of mother (Table 4).

All the categories analyzed and the statistical results are listed in Tables 1 through 3. Statistically significant differences in scores ($P < .05$) between the study and control groups could be demonstrated in five (24 percent) categories, all related to vocal interactions. These included 3 out of 12 maternal behaviors (positive vocalizations, behavior contingent on infant's distress vocalizations, behavior contingent on infant's nondistress vocalizations), and 2 out of 7 infant behaviors (distress vocalizations, vocalizations). In the following three other categories, differences approached but did not achieve statistical significance ($.05 < P < .10$): attempts social interaction, mutual interaction, and mutual gazing.

Anecdotal notations by the raters indicated less reciprocity between mothers and NOFTT infants than between mothers and thriving infants. Five control mothers were judged to exhibit appropriate mutual interaction with their youngsters, compared with only one study mother. Similarly, eight control mothers compared with three study mothers exhibited turn-taking strategies (infant does something and mother responds appropriately).

TABLE 4. CHARACTERISTICS OF STUDY AND CONTROL GROUPS

Characteristic	Control (n = 11)	Study (n = 11)
Mother's age (years)		
18–25	7	7
26–30	3	3
31–35	1	1
Marital status		
Single	6	9
Married	5	2
Race/ethnic group		
Latino	8	5
White	1	1
Black	2	4
Infant age (months)		
0–6	3	4
7–12	4	5
13–18	4	2
Infant sex		
Male	6	6
Female	5	5
Birth order		
Youngest	7	8
Firstborn	3	3
Other	1	0

DISCUSSION

This study focused on mother-infant interaction in a simulated home environment. By assessing and comparing the overall frequency of selected specific behaviors in mother-NOFTT infant and mother-thriving infant pairs, it was possible to demonstrate significant differences between these two groups.

The striking area of statistically significant differences was in the diminished degree of verbalization noted in mothers and their NOFTT infant when compared with the control group. It is not known whether these mothers exhibited reduced vocalizations in all their interpersonal interactions or only in those involving their infants. Sociologic factors such as ethnic background and educational level influence the degree of vocalization; however, these factors were similar in both study and control groups. Decreased speech and vocalization are also characteristic of depression.[14] The incidence of depression in the mothers in this study was not evaluated. A previous study carried out in the FTT clinic with a different group of mothers of NOFTT infants revealed a high incidence (47 percent) of depression.[15] Evans et al[10] found maternal depression a key factor in families where nonorganic failure to thrive occurred.

TABLE 5. CHARACTERISTICS OF INFANTS WITH NONORGANIC FAILURE TO THRIVE

Physiological Traits	Social Traits
Cachectic appearance	Withdrawal behavior
Poor feeding, difficult to feed	Apathy
Excessive sleep	Wary
Motor Skills	Watchful
Scissoring	Radar gaze
Hypertonicity	Self-stimulatory play
"Strap hangers'" position—arms up, elbows bent, fists clenched	Preference for objects over people
Lack of spontaneous movement	Affective Development
Listlessness	Poor eye contact
	Gaze avoidance
	Back arching
	Irritability
	Sadness

In addition to maternal depression, other maternal characteristics have been associated with nonorganic failure to thrive in the infant.[9] These characteristics include maternal anger or hostility to the child,[10] a reluctance to praise or caress the child,[2] feelings of inadequacy in their own mothering role,[4,16] inability to deal with stress,[17] failure to initiate interactions, and lack of knowledge of the infant's needs.[4,16,18]

NOFTT infants display less vocalization such as babbling and cooing, and less distress vocalization, such as fussing and crying. Recognizing that infants learn by mirroring the behaviors they observe, it is not surprising that vocalization was also reduced in the offspring of nonvocalizing mothers.[19] These infants spend more time in self-play and prefer inanimate over animate objects.[8]

Infant interactional difficulties have been noted by many investigators.[6,8,19–23] Table 5 contains a summary of behaviors reported in infants with nonorganic failure to thrive. Rosenn et al,[6] in a prospective study employing an approach–withdrawal scale, was able to quantitate behavioral differences in interactions with an investigator in organic and nonorganic failure to thrive infants. Powell and Low[8] reviewed and compiled existing information on behavior in NOFTT infants. They prospectively evaluated 21 infants and found inactivity, irritability, flattened affect, rumination, infrequent vocalization, thumb sucking and hand and finger activity, lack of cuddling, poor eye contact, and lack of response to human stimulus. Interpersonal behavior was more adversely affected than noninterpersonal behavior.

The cause of these behavioral disturbances and reduced interaction between mother and NOFTT infant is uncertain. Disturbed interaction could result from a nonresponsive infant, a depressed, overwhelmed mother, or a mismatched mother-infant pair. The purpose of this study was not to determine who was at fault in the relationship, but to better define the behavioral characteristics of this relationship and therein facilitate the diagnosis of nonorganic failure to thrive.

Certain limitations exist in the design of the present study. Infants ranged in age from 1 month to 18 months. Because of the small number of subjects, groups could not be subdivided by age. A wide range of patient age would present a number of problems. Patients of different ages would have suffered nonorganic failure to thrive for differing periods of time. Certain infant behaviors such as social interaction or self-play are influenced by patient age, which would introduce an added variable. Infants were, however, age-matched to controls so that the validity of the study was maintained. Infants with organic failure to thrive were not evaluated, and the possibility of interactional disturbances in mother-organic FTT infant dyads is not addressed. Additionally, interactions between the infant and father or the infant and the investigator were not evaluated. The role of the father in nonorganic FTT has not been extensively explored. Previous studies suggest that if infant-investigator rather than infant-mother interactions were evaluated, these interpersonal interactions would have been equally abnormal.[6,8]

Despite these limitations, this study contributes information about mother-infant interactions that will assist in the diagnosis of nonorganic failure to thrive. The diagnosis of nonorganic failure to thrive is often a difficult one to make. Although behavioral interactions were scored for the purpose of this study, the clinical applicability of the data presented lies in the descriptive differences found. By delineating the behavioral characteristics of the mother-NOFTT infant dyad, the diagnosis of nonorganic failure to thrive can be entertained early in the clinical course. The recognition of these characteristics should obviate the need for extensive laboratory tests. Intervention strategies should be aimed at correcting interactional dysfunction. Reassessment of mother-infant interactions after intervention would provide a means for determining the success of the intervention and the degree to which abnormal mother-NOFTT infant interactions are reversible.

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