

BRIEF REPORT

Content-Free Voice Analysis of Mothers Talking About Their Failure-to-Thrive Children

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Tape recordings of mothers of 13 normal and 15 nonorganic failure-to-thrive (NOFTT) infants talking about their infants were filtered to remove voice content and rated by female students, who scored them on 19 affect-related categories. Control mothers scored significantly higher on a composite variable termed "positive affect" compared to NOFTT mothers, suggesting content-free voice analysis may be a useful tool in measuring aspects of the mother-infant relationship and in understanding NOFTT.

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Nonorganic failure-to-thrive (NOFTT) is defined as failure of growth in infancy without any diagnosable medical cause. Clinicians working with NOFTT children often comment on apparent deficiencies in the mother-infant relationship or in the ability of mothers to respond appropriately and consistently to their offspring's concerns and needs. Several investigators have described evidence of a relational or attachment disorder in NOFTT dyads (Call, 1984; Dietrich, Starr, & Weisfeld, 1983), and Berkowitz and Senter (1987) found that the quality of maternal and infant vocalizations and the responsiveness of the mother to infant's vocal cues were strikingly reduced in NOFTT dyads.

The work of Rosenthal and collaborators (Blanck, Rosenthal, & Cordell, 1985; Milmoie, Rosenthal, Blane, Chafetz, & Wolf, 1967; Rosenthal, Blanck, & Vanicelli, 1984) demonstrated that feeling state is communicated by the voice independent of specific vocal content, suggesting information is contained within the spoken voice independent of content, which can be useful

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when assessing emotional communication, including that between individuals in various types of relationships.

This experiment was designed to determine whether the technique of content-free voice analysis might be useful in comparing mothers of NOFTT children to mothers of normal children and to provide additional information about a possible communicative disorder in the dyad.

We studied 15 mothers of NOFTT children and 13 mothers of normal children (controls) from the clinics of the University of Colorado Health Sciences Center. Mothers did not differ significantly in age, SES, educational level, or ages of target children. Mothers with significant medical or psychiatric problems were not included. Mothers of the control group were screened to exclude any history of abuse or neglect toward their children. The children were classified NOFTT by one of the following criteria for abnormal growth: (a) height or weight below the 3rd percentile for age, (b) weight for height below the 5th percentile, or (c) a drop of 2 or more major percentiles on the growth curve. Control children were all above the 5th percentile for height and weight, and in good general health with no chronic medical disorders.

Mothers agreeing to participate signed informed consent and were then asked to respond to the following three questions while sitting in the examining room with the research assistant (an audiotape recorder was turned on and in view):

1. Describe some of the things you and your child do together on a typical day.
2. Tell me about your child. Tell me about his or her personality and how he or she expresses emotion.
3. As with all parents, there are things that our children do that please and irritate us. Describe some of these things for your child.

Three 10-s clips were extracted from the first 10 s of uninterrupted speech by the mother in response to each question. These were assembled and rerecorded, with order of NOFTT and control mothers randomized in a Latin squarelike design, onto one audiotape. This master tape was content-filtered, a process that removes high frequencies on which word-recognition depends, but preserves the sequence and rhythm of the speech (Rogers, Scherer, & Rosenthal, 1971; Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979).

Eight female undergraduate students who had signed up for the experiment were paid to rate the samples of mother speech individually. They were told that they would hear short segments of mothers talking about their children with the content removed. Judges were instructed to stop the tape recorder after each segment and to rate each segment on 19 dimensions of affective behavior, on a scale running from *not at all* (1) to *very* (9). The dimensions rated were not-anxious-anxious, not-attentive-attentive, not-

cheerful-cheerful, not-competent-competent, not-confident-confident, not-dogmatic-dogmatic, not-dominant-dominant, not-emotional-emotional, not-enthusiastic-enthusiastic, not-happy-happy, not-hostile-hostile, not-interested-interested, not-likable-likable, not-loving-loving, not-optimistic-optimistic, not-relaxed-relaxed, not-supportive-supportive, not-stable-stable, and not-warm-warm. Previous research has indicated that people are able to do this task quite reliably, without any formal training (Milmoie et al., 1967; Rosenthal et al., 1984).

The reliabilities of the judges' ratings were computed by means of intra-class correlations (Rosenthal, 1987). The effective reliability of the mean of eight judges ranged from .34 to .83 ($M = .68$). These reliabilities are well within the range of reliabilities normally reported for these types of ratings (Rosenthal, 1987).

The mean of the judges' ratings of each of the 19 affective dimensions for each mother was computed across all samples, and these means were correlated with the type of mother (NOFTT or control), with the mother as the unit of analysis. Scores for two of the dimensions, not-anxious-anxious and not-stable-stable, were reversed. Eight of the 19 affective dimensions were significantly predictive of the type of mother. Control mothers were judged to be significantly more supportive, loving, likable, cheerful, optimistic, happy, relaxed, and interested than NOFTT mothers based on their tone of voice.

The means of ratings on the affective dimensions were also intercorrelated in a 20×20 correlation matrix, which was subjected to a principal components analysis with varimax rotation. Based on this procedure, three composite variables were created. Dimensions loading on the first composite variable, positive affect, were cheerfulness, likability, optimism, happiness, lovingness, interestedness, supportiveness, enthusiasm, warmth, attentiveness, emotionality, and relaxedness. The loadings ranged from .95 to .63. Dimensions loading on the second composite variable, aggression, were hostility, dogmatism, and dominance, with loadings ranging from .93 to .90. The third composite variable, emotional stability, was comprised of the dimensions of stability and lack of anxiety, with loadings of .90 and .87, respectively. The intercorrelations of variables comprising each of the three composite variables were low, suggesting that each composite was internally consistent and that the three composite variables did not overlap appreciably (Rosenthal, 1987). The dimensions of competence and confidence did not load onto any one of the three principal components very highly. Because they were highly correlated ($r = .84$), these dimensions were considered together in the next analysis.

The three composite variables, and the combined variables of competence and confidence were then correlated with the criterion variable (type of mother). The results are presented in Table 1 (p. 510).

The composite variable of positive affect was significantly related to the

TABLE 1
Correlations of Composite Variables With Type of Mother

Variable	r
Positive Affect	.45**
Aggression	-.01
Emotional Stability	.24
Competence and Confidence	.33**

Note. NOFTT = 1; Control = 2.

* $p = .09$. ** $p = .05$.

type of mother. Control mothers were rated significantly higher on positive affect, $r(26) = .45, p < .02$, and higher (at a level approaching significance) in confidence and competence, $r(26) = .33, p = .09$.

Our results demonstrate apparent differences in the affective content of speech of mothers of NOFTT children and control mothers when talking about their children. These results complement those of Berkowitz and Senter (1987), who found that the quality of maternal and infant vocalizations and the responsiveness of the mother to the infant's vocal cues were strikingly reduced in NOFTT dyads. Caron, Caron, and Maclean (1988) suggested that infants as young as 5 months might be more sensitive to emotional expression in the voice than to facial expression, suggesting verbal communication may be a most salient portion of the mother-infant interaction. These findings are also consonant with evidence that maternal warmth is associated with positive infant outcomes (Clarke-Stewart, 1973; Diskin & Heinicke, 1986).

Our findings are clearly preliminary. No claim can be made as to direction of causality. It is not certain, for example, that mothers of NOFTT infants in this study may have been concerned about their infants, who were not growing, with this reflected in voice-pattern changes. Appropriate control groups could be selected to test this hypothesis. Our purpose, however, is to suggest that the strategy of content-free voice analysis might be a useful tool in examining aspects of the NOFTT syndrome.

In contrast to traditional methods, such as self-report measures used to gather such data, this method is relatively unobtrusive and less subject to self-protective processes on the part of the subject: People are generally not aware of their nonverbal behavior. Therefore, we believe this method may be of considerable use in evaluating aspects of nonverbal behavior.

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