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The Variable Nature of Stuttering: A Clinical Case Study

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The purpose of this study was to describe the variability of a preschool boy's speech/stuttering behaviors throughout a 4-month period. Various clinical measures were used to analyze the speech of both the subject and his communication partner. The analysis included *direct* measures of stuttering (e.g., stuttering frequency and sound prolongation index) and *related* measures of stuttering (e.g., speech rate and response length). Results indicated a marked variability in the subject's speech and stuttering behavior across six data acquisition sessions. Implications for clinicians regarding diagnosing and treating children with fluency problems are discussed.

One frustration cited frequently by parents of children who stutter relates to the variable nature of childhood disfluency. Both *direct* (e.g., stuttering frequency) and *related* (e.g., speech rate) measures have been reported to be highly variable throughout various periods of time (e.g., days, weeks, and months) in young children who stutter (Conture, 1990; Peters & Guitar, 1991). Unfortunately, although frequently mentioned in clinical textbooks (e.g., Bloodstein, 1987; Conture, 1990; Wall & Myers, 1984), there have been few published reports on the variable nature of childhood disfluency. For example, literature geared toward helping parents understand the nature of *disfluency* often makes mention of "episodic variation" in the frequency of nonfluency that children who are *normally fluent* experience as they develop speech and language (Gottwald, Goldbach, & Isack, 1985). Pamphlets written for parents of children who stutter often note the apparent capricious nature of stuttering as highlighted by variations in stuttering frequency (e.g., Cooper, 1979). Regrettably, there is little or no objective study of the variations in the nonfluent behavior of either children who stutter or children who are fluent.

Stuttering is widely considered to be a disorder of childhood (Conture, 1991; Conture & Caruso, 1987; Weiss & Zebrowski, 1992; Yairi & Ambrose, 1992a; Yairi & Ambrose, 1992b; Yairi, Ambrose, & Nierman, 1993) and, in recent years, there has been an increased emphasis by researchers and clinicians on investigating the speech behaviors of young children at or near its onset (e.g., Adams, 1987; Caruso, Conture, & Colton, 1988; Conture, Rothenberg, & Molitor, 1986; Schwartz & Conture, 1988). Most of these studies have been *cross-sectional* in design. In other words, most researchers have restricted their studies of young children who stutter to include only one data collection period. Conture's (1991) review of 17 studies of the speech production of young children who stutter reveals that the majority, if not all, of these studies were cross-sectional in nature. Although cross-sectional studies of the speech behavior of young children who stutter have provided numerous theoretical and clinical insights, they are nonetheless limited because they do not permit the examination of changes in stuttering throughout its course of development. *Longitudinal* studies, on the other hand, allow for a more precise description of the subsequent development of stuttering after its onset. In essence, longitudinal studies require the researcher to obtain multiple data collections from the same subject over a specified time period.

One recent study by Yairi and Ambrose (1992b) reflects an emerging trend toward incorporating longitudinal studies in childhood disfluency research. Findings of Yairi and Ambrose's study provide a clearer picture of the nature of childhood stuttering. These researchers studied 27 preschool children for a minimum of 2 years shortly after they began stuttering. Yairi and Ambrose's study is important because it documents marked variability in the longitudinal course of disfluency in several children who stutter. Specifically, Yairi and Ambrose note a wide range of individual variation in the frequency of stuttering across several data acquisition sessions. Some of the subjects exhibited sharp declines in stuttering frequency between the first and second data acquisition sessions, whereas others exhibited an "alternating up and down course" (p. 758). Unfortunately, it is unclear from this study how much time elapsed between these two data acquisition sessions. The only information provided by Yairi and Ambrose is that the subjects were taped "several months apart over a two-year period" (p. 756).

The contributions of Yairi and Ambrose's (1992b) study are noteworthy; nonetheless, their findings are restricted for

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several reasons. First, precise information regarding the amount of time between recording sessions was not specified. Second, the data were obtained in a clinical setting only. Previous studies of children's language behavior indicate differences in findings depending on whether data were collected in the home or clinic (Kramer, James, & Saxman, 1979). It seems reasonable to speculate that childhood disfluency data also would vary depending on the data acquisition setting. Finally, Yairi and Ambrose reported speech data from the stuttering subject only. A common assumption in the clinical stuttering literature is that stuttering behavior may vary with different communication partners (Conture, 1990; Peters & Guitar 1991; Wall & Myers, 1984). Thus, the present writers believe it is important to describe the speech behavior of the communication partner in addition to the subject's behavior when measuring changes in the frequency of childhood disfluency. The importance of including measures of the communication partner's speech when talking to a child who stutters, and utilizing that information in evaluations of childhood fluency disorders, has been discussed previously (Conture & Caruso, 1987).

The purpose of the present study was to describe the degree or magnitude of speech/stuttering changes in a preschool boy diagnosed with a fluency disorder. Although it was planned that data acquisition sessions would occur once a week, unexpected events prevented this parent from regularly recording a sample of her son's speech. The present study spanned 4 months, with recording sessions ranging from 1 to 47 days apart. All speech samples were recorded in the home during mother–child interactions. The recording sessions took place in the home based on the present writers' assumption that this would provide a more representative sample of the subject's "everyday" speaking/stuttering behavior.

METHODS

Subject

The subject used for the present study was a young boy aged 3:8 (years:months) at the time of the first recording session (6/30). He was diagnosed by the Kent State University Speech and Hearing Clinic as having a fluency disorder. All other aspects of speech, language, and voice were within normal limits. The subject received no direct fluency therapy during the course of this study; it should be noted, however, that the subject's parents received a training program conducted by the second author involving indirect fluency techniques, including alterations in speech rate, pause times, and question types. This indirect fluency treatment continued during this study.

Procedure

Six audiotape recordings were made by the subject's mother during informal play sessions that took place in their home. These mother–child conversational interactions were subsequently transcribed orthographically (both the subject's and mother's utterances) and the subject's first 300 words of each session were included in this analysis. The mother's utterances associated with the subject's 300-word sample also were analyzed.

Measures of child's speech/stuttering. The following measures of the child's stuttering were made: (a) overall stuttering frequency per 300 words; (b) sound prolongation index (i.e., the percent of total disfluencies that were sound prolongations) (Sander, 1961); and (c) stuttering duration. Several additional speech behavior measures also were calculated. *Overall speech rate* was computed by timing each of the subject's conversational turns with pauses and stuttering durations included. The value for each turn was then converted into words per minute (wpm). The wpm values were then summed and divided by the total number of turns. *Mean number of words per turn* was computed by dividing the 300 words spoken by the subject by the total number of turns he used. *Mean length of utterance* (MLU) was calculated by counting the total number of morphemes used in each turn, summing them, and dividing by the total number of turns for each session. Brown's (1973) *grammatical morphemes stages* were calculated and a developmental stage was assigned for each sample. *Type token ratio* (TTR) was computed by summing the number of different words spoken in a 50-word sample and dividing that sum by the total number of words spoken (Miller 1981; Templin, 1957). A TTR score was assigned to each sample.

Measures of mother's speech. Several measures of the mother's speech behavior were computed. Overall speech rate was calculated the same way as for the subject. Mean number of words per turn, number of one word utterances, MLU, and TTR were all calculated in the same way as for the subject. *Question types* used by the mother during the dialogue with her son were measured according to the complexity of the response needed. The questions were categorized according to their similarity to the questions used in the *Stocker Probe Technique* (Stocker, 1976).

RESULTS

Child's Speech Behavior

Measures of stuttering frequency, speech rate, response length, and sound prolongation index are displayed in Figure 1. All data displayed in the figures were obtained from six recording sessions over a 4-month period (see figure for actual recording dates). Analyses were based on 300-word samples from each session. As shown in Figure 1a, the subject's stuttering frequency varied considerably across the six sessions. Overall stuttering frequency varied from as little as 4% on 7/1 to as much as 14.3% on 9/10. Strikingly, within one 24-hour period, the subject's stuttering frequency dropped by 50% (from 8% on 6/30 to 4% on 7/1). Furthermore, the subject's stuttering frequency began an upward trend approaching an almost 4-fold increase from 7/1 to 9/10. Finally, on 10/27, stuttering frequency dropped to about 8%.

The subject's sound prolongation index (SPI) is displayed in Figure 1b. The SPI is a measure that indicates the

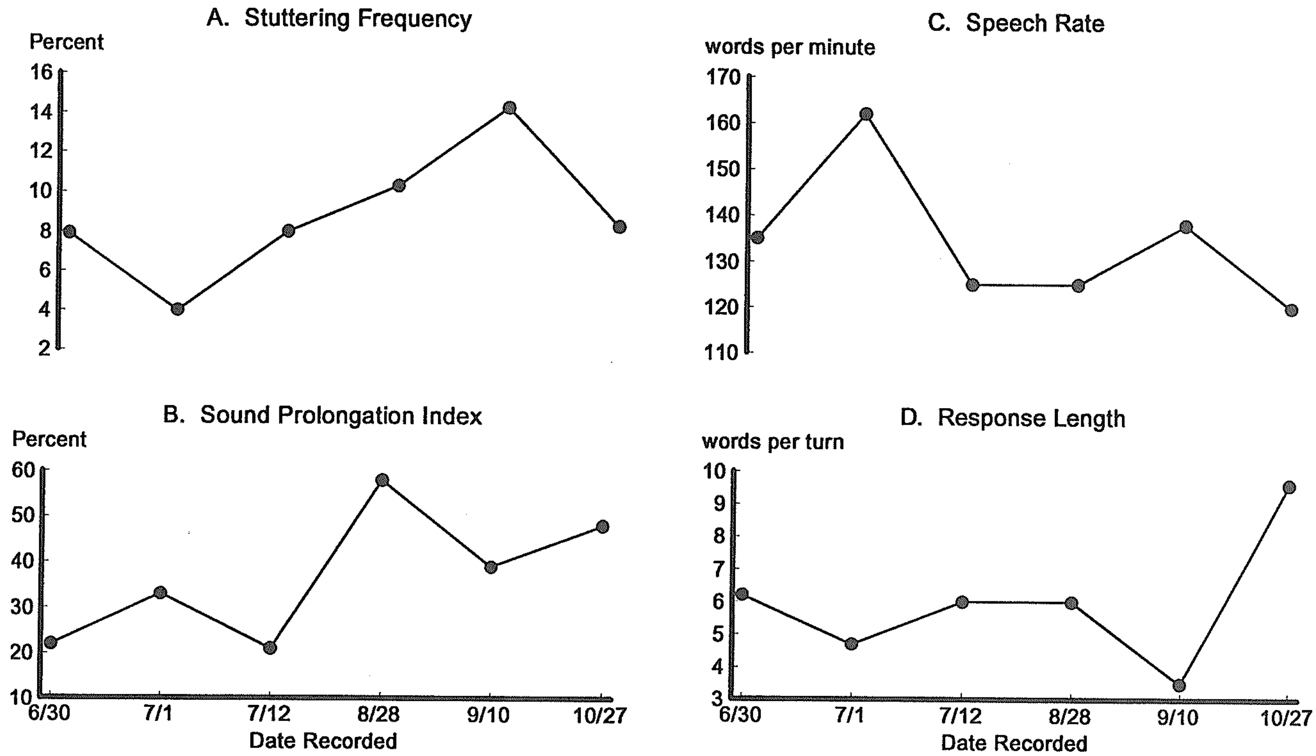

FIGURE 1. Measures of the subject's stuttering frequency (percent of the 300 words spoken during each recording session that were disfluent), sound prolongation index (percent of total disfluent words that were sound prolongations during each session), speech rate (overall words per minute during each 300-word sample), and response length (average number of words per turn spoken by the subject during each session).

percentage of the total number of stutterings that were sound prolongations. Overall, the SPI varied markedly throughout the six recording sessions. The sharpest increase in the SPI was approximately 40% (see recording sessions 7/12 and 8/28). With the noted exception, the SPI varied from 10% to 20% across the six sessions. In essence, these data indicate that the frequency of sound prolongations varied considerably for this child.

Figure 1c displays the subject's rate of speech during each of the six recording sessions with his mother. The degree of variability for his speech rate is similar to the variability of his stuttering frequency (Figure 1a). For example, within a 24-hour period (6/30–7/1), his speech rate changed from about 135 wpm to about 160 wpm. The subject's speech rate remained relatively constant through the next two sessions (7/12, 8/28), with a minimal increase (from 124 wpm to 139 wpm) on 9/10, and then a decrease to 121 wpm on 10/27. Overall, the subject showed variability with regard to speech rate.

Figure 1d displays the subject's response length during conversations with his mother. Recall that response length is measured in the average number of words per turn. Unlike the other measures of the child's speaking/stuttering behavior, the variability in response length was not as dramatic as for the first four data acquisition sessions as the variability found in the other stuttering measures. However, on the last 2 days, the subject exhibited variability in response length that was more similar to the variability associated with the previously reported measures. The subject's words per turn dropped sharply on 9/10 to approximately 3 words per turn; however, on 10/27, there was a threefold increase (10 words per turn) from the previous session.

Mother's Speech Behavior

Figure 2 shows the mother's speech behavior during each of the six conversational interactions with the subject. Figure 2a shows the mother's speech rate across the six sessions. With the exception of the 8/28 session, the mother's rate of speech ranged between 160–180 words per minute (wpm), a range often cited as typical of conversational speech (see Conture, 1990). However, on 8/28, her speech rate increased to almost 210 wpm. This rate of speech is considered by clinicians to be somewhat fast when talking with a child with fluency concerns (Conture & Caruso, 1987; Peters & Guitar, 1991).

The mother's response length is displayed in Figure 2b. The mother ranged from 5 to 7.75 words per turn. This change of approximately 3 words per turn is rather narrow, and may be due in part to the indirect fluency training the mother received. It is interesting to note that on the last 2 days, the mother's and the subject's response length were inversely related to each other. That is, on 9/10, the mother's words per turn was approximately 6.75, whereas the subject's was approximately 3 words per turn (see also Figure 1d). Conversely, on 10/27, the subject's words per turn was high (10 words per turn) whereas the mother's was low (5 words per turn).

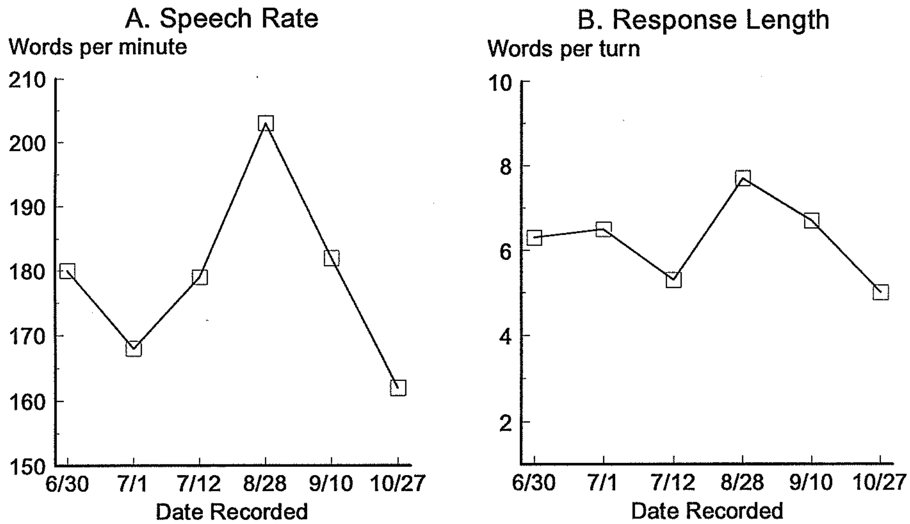

FIGURE 2. Measures of the mother's speech rate in words per minute and response length in words per turn during each of the six conversational interactions with the subject.

Mother-Child Conversational Interaction

Figure 3 depicts the mother's and subject's turn-taking behaviors during their conversational interactions. As shown, each conversational partner was gracious in allowing the other to take a turn; the values are essentially congruous. Interestingly, the decrease in number of turns by both speakers on 10/27 reflects the fact that the number of words per turn was higher on that day for the subject (see Figure 1d). In essence, this interplay between words per turn and number of turns taken by both the subject and his mother indicates that the subject maintained his conversational turn for longer periods of time. Conversely, on that same day (10/27), the mother's words per turn was the lowest of the six sessions. It appears, then, that the mother allowed the subject to maintain his topic for longer periods of time.

Table 1 shows the subject's overall stuttering frequency during each recording session and the percent of Stocker probe-like questions used by the mother. Level I questions are those questions that require one-word responses (e.g., "Is this a dog or a cat?"). Level II questions are those that require the subject to produce a two-word response (e.g., "What is this a picture of?"). Level III questions require about a three-word response (e.g., "What do you use a telephone for?"). Level IV questions require the subject to produce longer responses than Level III (e.g., "Can you describe everything about this object?"), whereas Level V questions require the subject to produce complete phrases and sentences ("Can you make up a story about this animal"). For all six of the recording sessions, the majority of questions produced on each day were Level III-type questions or lower. As can be seen in Table 1, there is no consistent pattern between the subject's stuttering frequency and the mother's question types.

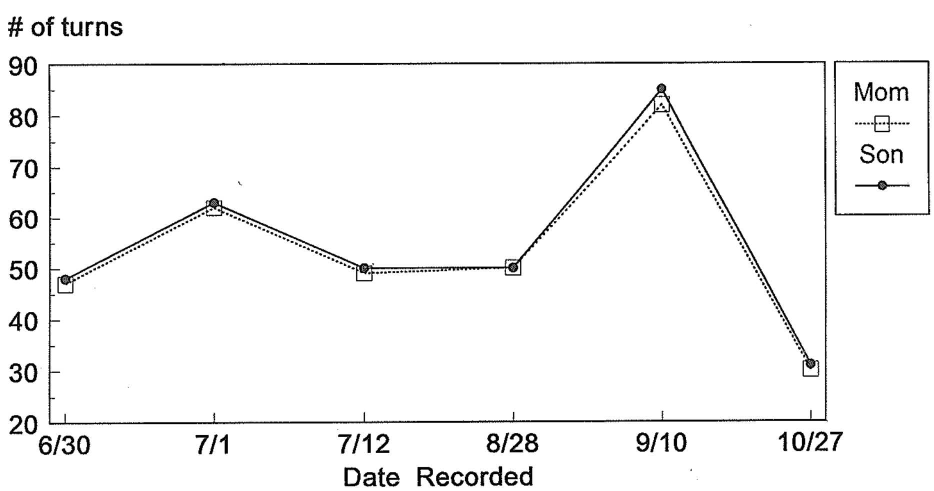

FIGURE 3. The number of turns taken by the subject and his mother during each recording session.

TABLE 1. The subject's percent stuttering frequency for the six sessions (percent of the 300 words spoken during each session that were disfluent) and the percent of Stocker probe-like questions produced by the mother during each session.

Date	*Subject's stuttering frequency (%)*	*Mother's question types (%)* I	II	III	IV	V
6/30	7.9	80	0	5	15	0
7/1	4.0	76	4	16	4	0
7/12	8.0	30	5	25	10	30
8/28	10.3	60	15	0	5	20
9/10	14.3	44	6	26	6	18
10/27	8.3	44	0	22	33	0

Table 2 shows the subject's percent stuttering frequency across the six sessions, and both the subject's and mother's TTR and MLU values for each recording session. It should be noted that the average percent stuttering frequency across the six sessions was 8.8%. Note that when the subject's stuttering frequency was near or above the average, his TTR ranged from .31 to .39. Conversely, when the subject's stuttering frequency was below his average for the six sessions (4% disfluent on 7/1), his TTR was notably high (.85). Additionally, the mother's TTR and MLU values were roughly the same as the subject's, and may reflect the training the mother received in the indirect fluency treatment program.

DISCUSSION

An overall finding of this study indicates that both direct (e.g. stuttering frequency, sound prolongation index) as well as related measures (e.g. speech rate, response length) of the child's stuttering varied considerably during this 4-month period. It is interesting to note that in just a 24-hour period, overall stuttering frequency decreased by 50% (see Figure 1a dates 6/30–7/1). Furthermore, during the same 24-hour period, the frequency of sound prolongations increased considerably. This finding provides support for the suggestion that clinicians base judgements of both the frequency and nature of stuttering on multiple data acquisition sessions (see Conture, 1990).

The present findings indicate that stuttering frequency is one important measure to consider when developing an "individual profile" (IP) for a disfluent child. An IP would show how much variability in stuttering frequency is typical or characteristic for that child. To calculate an IP for stuttering frequency on the subject used in this study, we calculated the overall stuttering frequency for each session, summed these values, and divided that sum by the number of sessions. This method of calculation yields a mean stuttering frequency for this child throughout this period of time. In addition, this method was used to calculate the standard deviation.

TABLE 2. The subject's percent stuttering frequency (% SF), type token ratio (TTR), and mean length of utterance (MLU) per day in addition to the mother's TTR and MLU for each of the six sessions.

Date	*% SF*	*Subject* *TTR*	*MLU*	*Mother* *TTR*	*MLU*
6/30	7.9	.35	7.6	.34	7.2
7/1	4.0	.85	5.4	.39	6.9
7/12	8.0	.31	6.8	.40	6.0
8/28	10.3	.39	6.6	.36	11.3
9/10	14.3	.39	3.8	.44	7.3
10/27	8.3	.35	10.5	.57	5.7

Figure 4 displays the stuttering frequency for each data acquisition session as previously displayed in Figure 1a. The mean stuttering frequency (8.8%) across the six sessions is displayed by the horizontal solid black line. The dashed lines shown above and below the grand mean represent the mean +/-1.0 *SD* (*SD* = 3). This was chosen because the majority of variability around the mean is contained within one *SD* above or below the mean (Kerlinger, 1986). Thus, changes in stuttering frequency that occur within this range might be considered "tolerable" because these values would not be statistically different from the mean. Future research done on large groups of children would document whether or not these IPs would be similarly informative.

The IP, albeit preliminary in development, is likely to yield important insights for both parents of children who stutter and fluency clinicians. Parents often question fluency clinicians about observed increases in their child's stuttering frequency. Use of an IP may ultimately provide parents a more objective guideline as to when to be concerned regarding increases in stuttering frequency. Increases in the child's stuttering frequency above the baseline but within +1.0 *SD* may be of less concern to parents than those increases that are above +1.0 *SD* of the mean. Similarly, the IP may help the fluency clinician to discern whether *changes* in stuttering frequency are greater than the day-to-day variability that is typical for that child. Moreover, an IP also may provide additional objective information that may be helpful in determining when adjustments in the course of treatment are warranted.

The present writers wish to emphasize that because the IP is preliminary, there are several questions that need to be addressed. First, how many data acquisition sessions should be included to develop a representative profile for an individual child? Second, how long does each session have to be? Third, should the data acquisition sessions take place daily, weekly, monthly, or varied? Finally, are there other measures of stuttering that should be utilized in the development of the IP (e.g., stuttering duration)? In spite of the many unanswered questions, developing an IP for a particular child reflects the continuing trend toward not limiting clinical decisions regarding the evaluation and treatment of stuttering to a single diagnostic session (Conture, 1990).

Another interesting finding of the present study pertains to TTR (see Table 2). On 7/1, the subject's TTR was uncharacteristically high. On that particular day, the recording was made while the subject and his mother were conversing during lunch. This situation could have provided an unrestricted environment for conversation, which could have accounted for the high TTR. In other words, their conversation was not limited by objects with which they were playing or pictures they were viewing.

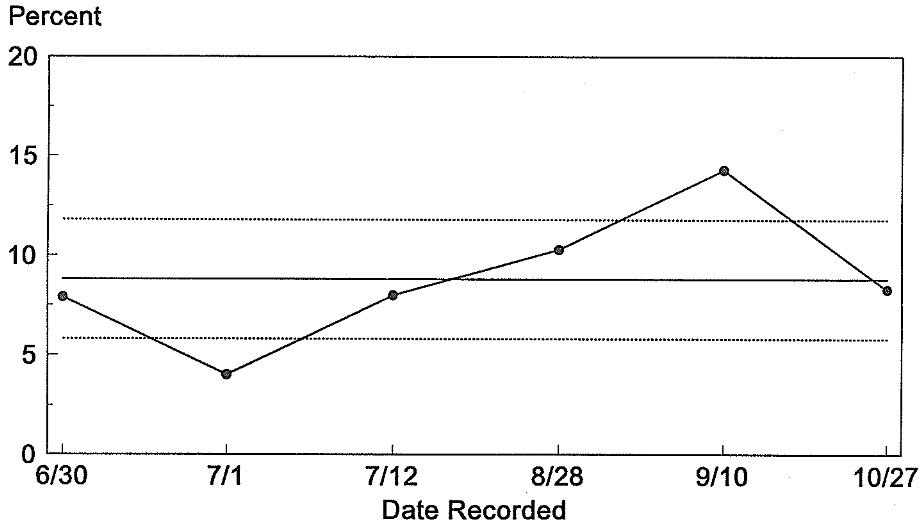

FIGURE 4. An "individual profile" of the subject. Stuttering frequency for each of the six sessions is depicted. The mean stuttering frequency (8.8%) across all six sessions is displayed by the horizontal solid black line. The dashed lines represent one *SD* (*SD* = 3) above and below the mean.

Additionally, the subject's overall stuttering frequency was at its lowest of the six sessions on 7/1 (4%). It also is possible that the minimal amount of disfluencies produced by the subject positively affected his TTR on that day. Although the observation is limited to only one data acquisition session, the present writers believe that further investigation of the possible relationship between TTR, disfluency, and the situation in which the speech sample was obtained is warranted.

The mother's speech behavior during this study also is worth noting. Her TTR for each session also was in a restricted range (see Table 2), suggesting that she adjusted her language content to her son's developmental level. These data suggest that the mother provided a "good" communication model for fluency development. Clinical observation indicates that continued use of fluency-facilitating techniques by a parent is likely to have a positive effect on the child's fluency development.

Another interesting relationship between the subject's and his mother's speech behavior deals with the subject's stuttering frequency on each data acquisition session and the types of questions used by the mother during those same sessions. (see Table 1). As previously mentioned, there was no consistent pattern between the two measures. What is clear, however, is that the mother adjusted her question types in an attempt to facilitate her son's fluency development. Clinical observations suggest that continued use of this technique of altering question types has been an important component in childhood fluency development (see Weiss & Zebrowski, 1992).

It is important to note that the present study's findings support those of Nippold's (1990), who found that children who stutter are no more likely to have a language problem than their fluent peers. On the days that this subject had the highest overall stuttering frequency, he still did not go below normal limits for the language measures used in this study (TTR and MLU) (see Table 2).

FUTURE RESEARCH

Based on the results of the present study, we offer some suggestions for future research in this area. We wish to encourage others to consider longitudinal studies when researching childhood stuttering. Although this study only followed one child, future research would benefit from large groups of children who are studied longitudinally. Additionally, samples of children's speech/stuttering behavior could be obtained both in the home and in the clinic to determine differences in the nature or variability of stuttering in each of these settings.

Finally, a more descriptive language analysis regarding the lexical diversity of a child's vocabulary should be used. The data from the present study seem to warrant further investigation regarding lexical diversity and fluency development in children. It is not clear what variables might influence the measure of lexical diversity that was employed in the present study (TTR). Perhaps alternative measures of lexical diversity would provide additional and more refined insights (Bennett, 1989).

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