January 1993

# The Early Months of Stuttering: A Developmental Study

Rebecca Throneburg
*Eastern Illinois University*, rmthroneburg@eiu.edu

Ehud Yairi
*University of Illinois at Urbana-Champaign*

Nicoline Grinager Ambrose
*University of Illinois at Urbana-Champaign*

# THE EARLY MONTHS OF STUTTERING: A DEVELOPMENTAL STUDY

Ehud Yairi, Nicoline Grinager Ambrose, and Rebecca Niermann

Objective data on the development of stuttering during its first several months are sparse. Such a deficit is due to parents' tendency to postpone professional consultation regarding early stuttering until later in the course of the disorder and to a lack of longitudinal studies beginning close to onset. This report presents information on a rare group of 16 preschool subjects who were evaluated within several weeks after stuttering onset and followed for 6 months using multiple measures. The findings show that often early stuttering takes on a moderate-to-severe form. Substantial changes occurred, however, during the 6 months of the study, with a strong tendency for reduction in stuttering-like disfluencies, number of head/face movements, clinician severity ratings of stuttering, and parent ratings of stuttering. Several subjects, including severe cases, exhibited complete recovery. The large changes that occur during the early stage of stuttering suggest that relatively small differences in the length of post-onset interval (stuttering history) can greatly influence all research data of early childhood stuttering. The high, as well as fast, improvement rate suggests that the precise timing of early intervention should be conscientiously evaluated in carefully controlled studies.

KEY WORDS: stuttering, preschool children, early stuttering, development

Recent years have seen an increased interest in a wide range of aspects of early childhood stuttering. Information has been published concerning the onset of stuttering (Yairi & Ambrose, 1992b), characteristics of disfluencies (Hubbard & Yairi, 1988; Onslow, Gardner, Bryant, Stuckings, & Knight, 1992; Zebrowski, 1991), and nonspeech behaviors (Conture & Kelly, 1991; Schwartz & Conture, 1988). Research has also focused on physiologic characteristics and acoustic properties (Conture, Rothenberg, & Molitor, 1986; Hall & Yairi, 1992; Healey & Bernstein, 1991), as well as phonologic features, language development, and concomitant disorders (Louko, Edwards, & Conture, 1990; Nippold, 1990; Ratner & Sih, 1987; Ryan, 1992). A few have investigated the effects of treatment (Onslow, Costa, & Rue, 1990).

Such an increase in research activity reflects an attempt to correct past imbalances, that is, the fact that the majority of studies were conducted on adults who stutter (Adams, 1986) although stuttering typically begins in early childhood (Andrews & Harris, 1964). In view of the vast changes in overt and covert stuttering symptomatology that occur over time (Bloodstein, 1960; Van Riper, 1971), inferences about the nature of stuttering in children based on data from adults could be erroneous (Conture, 1991; Yairi, 1990). This realization has only recently begun to have a serious impact on research priorities. Indeed, recent findings regarding the early presence of secondary physical characteristics (Conture & Kelly, 1991) and awareness of disfluencies (Ambrose & Yairi, 1990) have highlighted the deficiencies in traditional concepts that depicted early childhood stuttering as consisting of

simple repetitions devoid of tension, secondary physical behaviors, affective reactions, or awareness (Bluemel, 1932; Froeschels, 1921; Johnson et al., 1959). Moreover, early stuttering presents experimenters with a disorder that is less contaminated by time-related adjustments to internal and external responses.

A key element in the effort to increase precision of early childhood stuttering research is a strong database of the epidemiology and pathognomonic development of the disorder. There is a good reason to suspect that much of the conflicting data about stuttering reflects insufficient consideration of significant factors in the selection and grouping of subjects rather than, or in addition to, the data collecting procedures (St. Onge & Calvert, 1964; Yairi, 1990). Obviously, the definition of "early" stuttering is crucial. This term involves two elements: age and length of stuttering history. One criticism directed toward past investigations (e.g., Johnson et al., 1959) is that they lumped together subjects between 2 and 9 years of age with a mean stuttering history of 18 months. This tendency is also found in more recent research. A review of several studies (Conture & Kelly, 1991; Hall & Yairi, 1992; Schwartz & Conture, 1988; Schwartz, Zebrowski, & Conture, 1990; and Zebrowski, 1991) reveals that the ages of subjects ranged from 2:10 (years:months) to 94, and the length of the post-onset interval (stuttering history) was up to 12 months or unspecified. Thus, conflicting reports on the number of repetition units (Yairi & Lewis, 1984; Zebrowski, 1991) may be due to differences in the post-onset interval used by the investigators in selecting subjects (M = 6 weeks and 8.5 months respectively).

Because common clinical experience and the research reports referred to above have indicated that substantial changes in stuttering occur during the first few years of the disorder, greater attention should be given to the delineation of the timing and rate of these developmental processes. Such data should provide not only essential information concerning criteria for subject differentiation in research studies, but a data-based rationale for clinical strategies concerned with timing of clinical intervention. Until recently, however, the few developmental studies of stuttering, whether cross-sectional (Bloodstein, 1960) or longitudinal (Andrews & Harris, 1964), were not based on objective, reliable speech data. A preliminary longitudinal investigation of stuttering in 27 preschool children (Yairi & Ambrose, 1992a) was the first published study to report systematic, long-term, speech-based developmental data on the disorder. The results indicated a large reduction in disfluencies during the first 14 to 16 months post-onset, with a high rate of recovery during the first 2 years. Additional cases of recovery occurred even later. Many developmental details, however, have remained unresearched, necessitating additional extensive longitudinal investigations. For example, in the Yairi and Ambrose (1992a) study, subjects were between 2 and 5 years of age, had stuttered for a period of up to 1 year when they entered the study, and their speech samples were recorded at intervals of 6 months or longer. Unfortunately, late referral of subjects has hampered research of developmental processes during the first few months of stuttering. Data from this early period previously have not been available.

Within the longitudinal stuttering research project currently in progress at the University of Illinois we were able, over a period of several years, to identify 16 cases in close temporal proximity to the reported stuttering onset. These 16 cases were followed more frequently than other subjects. Thus, the principal objective of the present study was to use this unique subject sample to provide the missing information on changes that occur during the earliest stage of stuttering. Another long-term objective of the project has been to experiment with measures sensitive to developmental changes of stuttering. In our previous longitudinal study (Yairi & Ambrose, 1992a), disfluency counts were the only variable reported. To increase validity of variations in the complexity of stuttering over time, it was deemed important to employ multiple measures. The present study includes the additional factor of nonspeech physical behaviors as well as two perceptual evaluations of stuttering severity, one by parents and one by clinicians. In presenting both individual and group data our objective is to emphasize that the strong trends observed in the results are shared by the majority of the subjects and are not the mere reflection of potentially obscuring group means. The individual data also serve to highlight the diversity in developmental dynamics.

## Method Subjects

The subjects, children suspected of exhibiting stuttering, were referred for initial speech evaluation on the initiative of their parents, physicians or speech pathologists in various settings, and by staff members of daycare centers. One referral was in response to a newspaper ad. The general criteria for subject selection were similar to those reported by Yairi & Ambrose (1992b). All of the following criteria were met: (a) subjects were under 6 years of age, (b) subjects were regarded by both parents and the first two authors as having a stuttering problem, (c) stuttering severity was rated by one parent as at least 2 on an 8-point scale (0 = normal speech; 1 = very mild stuttering; 2 = mild; ... 7 = very severe), (d) a severity rating of 2 or higher was assigned by the first two authors, (e) subjects' speech contained at least 3 Stuttering-Like Disfluencies (SLD) per 100 syllables (Schwartz & Conture, 1988; Zebrowski, 1991), (f) stuttering histories were no longer than 12 weeks.

The 16 subjects presented in this report included 10 males and 6 females. The subjects ranged in age from 25 to 39 months, with a mean of 32.63 months (SD = 3.96). The post-onset interval ranged from 1 to 12 weeks (M = 6.88; SD = 3.84). Detailed descriptions of procedures used to determine onset date can be found in Yairi & Ambrose (1992b). All subjects exhibited at least 4.50 SLD per 100 syllables. None received any form of direct clinical intervention before or during the period covered by this report.

At the initial contact parents were told the objectives of the research and that this project was not an agency for providing regular clinical services. At the conclusion of the initial evaluation session, the parents received general assessment of the child's speech, language, hearing, and other skills. A written summary of results was

mailed to them. Parents were also given basic information about stuttering and were informed about current estimates of spontaneous recovery (65% to 75%). They were advised that their child might or might not recover and were informed about availability of treatment and the locations of clinical services, including the University of Illinois Speech and Hearing Clinic. Reflecting our current clinical philosophy about very early cases of stuttering, parents were told that they might either wait for a while or seek treatment. A 3-month follow-up evaluation was scheduled, and parents were encouraged to contact the investigators or other clinical facilities at any time if they had questions or concerns. They were advised to reduce their speaking rate when talking to the child. Subjects included in the current group were not paid and did not, by their parents' choice, receive treatment.

Speech Samples

Conversational speech was audio- and videotape-recorded in a sound-treated room during the initial evaluation, a 3-month follow-up and a 6-month follow-up visit. One subject missed her 3-month follow-up. Each visit consisted of two sessions separated by 1 week. At each session a speech sample was obtained, thus increasing the representativeness of the subject's speaking behavior. The total duration of the two samples was 30 to 45 minutes. Speech was recorded during verbal interaction with one parent and also included several minutes of interaction with one investigator. Standard toys (Playdoh) and questions were used to elicit conversation. A Crown PCC-Cardioid microphone was connected to a Yamaha KM608 preamplifier (mixer). The audio signal was directed to a high quality Tascam 122 MKII stereo cassette recorder and a Sony SLV-353UC video recorder with frame-by-frame display capability. A Panasonic WV-BD400 camera was used to obtain the video images. Because of the close-up angle, only the head and neck of the subject were in view.

Approximately 1,000 words, 500 from each of the two recordings per visit, constituted each sample used for analysis. Seven disfluency types were counted: (a) Part-Word Repetition, (b) Single-Syllable Word Repetition, (c) Disrhythmic Phonation, (d) Polysyllable Word Repetition, (e) Phrase Repetition, (f) Interjection, (9) Revision-Incomplete Phrase. The first three types were labeled Stuttering-Like Disfluencies and their counts combined. The last four were labeled Other Disfluencies and their counts were combined as well.

Five staff members of the project, including the three authors, served as listeners for the task of identifying and classifying disfluencies. All listeners had several hundred hours of experience with the task. Each tape-recorded sample was independently scrutinized by two listeners, one of whom was always the second author (NA). Instances of disagreement between the two listeners were resolved through repeated listening. For sake of consistency, however, the final count was always determined by NA, whose self-reliability was .93.

Point-by-point (location and type) interjudge reliability was calculated for the two listeners for each (entire) sample of each subject, using the Sander (1961) agreement index. Reliability values were derived by totaling the number of agreements and disagreements for each of the seven disfluency types for each sample. For the three SLD types, totals were obtained for agreements and disagreements, yielding composite scores. Total agreements were divided by total agreements plus disagreements, with a resulting reliability of .84 (SD = .07). The same procedure was used for the four Other Disfluency types, with a reliability of .90 (SD = .07). The present reliability is close to those obtained in other studies that analyzed disfluency types (e.g., Wexler, 1982, who employed a similar number of listeners; Zebrowski, 1991).

## Facial and Head Movement

The Facial Action Coding System, FACS (Ekman & Friesen, 1978), was used to identify the number of facial and head movements exhibited during 10 instances of Stuttering-Like-Disfluencies for each subject. FACS is a descriptive system that distinguishes between 58 different head and facial actions on the basis of anatomical and structural movements. (More detailed descriptions of FACS can be found in Ekman & Friesen, 1978, and Conture & Kelly, 1991.)

For each of a subject's three speech samples, 10 instances of SLD (that is, part-word repetition, single-syllable word repetition, and disrhythmic phonation) were analyzed for corresponding movements using a frame-by-frame video analysis at the rate of 30 frames per second. These instances of disfluency were selected by dividing the sample into 10 approximately equal segments and choosing the perceptually longest SLD instance in each segment. The longest instance was selected to highlight dynamics at this preliminary stage of research.

Preliminary observation revealed that many facial movements occurred during fluent speech. To minimize confounding of the data by these apparently normal movements, each disfluent instance was matched by a fluent production of the same word in which it occurred according to sentence position and grammatical structure. The total number of facial and head actions identified during production of the control word was subtracted from the total number of actions identified for the matched disfluent word. The mean of the differences was calculated for the 10 utterances selected from the speech sample of each visit. For the purpose of this study, no differentiation was made between head and face movement. The facial analysis was performed by one author (RN). Another staff member performed the reliability check on 30 samples. The Pearson Product Moment correlation coefficient for interjudge reliability was .80.

## Results

Group means and standard deviations for the five measures used in this study (the number of Stuttering-Like Disfluencies and Other Disfluencies per 100 syllables,

Parent and Clinician severity ratings, and the number of Facial-Head Movements) are presented in Table 1. All of these data are reported for the initial visit, the 3-month follow-up, and the 6-month follow-up. As can be seen, there is a parallelism of trends in the means of all measures except for Other Disfluencies.

Number of Disfluencies

The table shows that the group's mean SLD declined from 11.99 to 6.34 to 4.46 per 100 syllables for the first through the third visit, respectively. The mean Improvement Index(n1) was 3.06. A one-way analysis of variance for repeated measures revealed the decrease in SLD over time was significant with $F(2,30) = 20.17$ and $p < 0.01$. Using the Tukey procedure, significant differences were observed between the first and second visit and between the first and third visit ($p < .01$), but not between the second and third visits.

In contrast to SLD, Other Disfluencies showed no overall time-trend. The means for the three visits remained relatively stable at 5.42, 6.45, and 5.03 per 100 syllables. The analysis of variance indicated no significant differences, with $F(2,30) = 1.45$, $p = .25$.

| Measure | Initial session | 3-month follow-up | 6-month follow-up |
|---|---|---|---|
| SLD | 11.99 (6.83) | 6.34 (3.35) | 4.46 (2.88) |
| OD | 5.42 (2.82) | 6.45 (3.91) | 5.03 (2.23) |
| Parent Rating | 4.16 (1.03) | 2.55 (1.33) | 1.78 (1.14) |
| Clinician Rating | 4.43 (1.20) | 2.97 (1.04) | 1.99 (1.10) |
| Facial-Head Movement | 3.18 (1.50) | 2.36 (1.05) | 1.91 (1.16) |

TABLE 1. Means and standard deviations (in parentheses) for Stuttering-Like Disfluences (SLD), Other Disfluencies (OD), Parent Rating, Clinician Rating, and Facial-Head Movement for the initial evaluation, 3-month follow-up, and 6-month follow-up sessions.

Number of Facial-Head Movements

The number of head and facial movements followed the trend of SLD but showed a more moderate declining slope. These two types of data, however, are not directly comparable as SLD are actual numbers of disfluencies per 100 syllables, whereas facial behaviors are the mean number per disfluency. An analysis of variance yielded

a significant $F(2,30) = 7.08$ ($p = .003$) across visits. Only the difference between the first and the third visit was statistically significant ($P < .01$).

## Severity Ratings

The means of the Clinician and Parent Rating (CR and PR) of stuttering severity maintained a declining trend from the initial visit to the 3-month and the 6-month follow-ups. Moreover, the means of the two measures were similar for all three testing periods. They indicated an above-moderate stuttering severity at the initial visit and mild stuttering at the 6-month follow-up. Interestingly, the standard deviations of both ratings, about one scale interval, remained almost unchanged in spite of the decline in the mean rating. Analysis of variance indicated significant differences over time for both measures (CR, $F(2,30) = 27.78$, $p < .001$; for PR, $F(2,30) = 27.20$, $p < .001$). Means for both measures were significantly different at the .01 level for the first and second, and first and third visits. For the Clinician Rating, the difference between the 3- and 6-month visits was also significant ($p < .05$).

## Correlations Among Measures

The relations among the various measures reported above were examined by means of Pearson Product Moment correlations. SLD and Clinician Rating produced moderate-to-high correlations for each visit with $r = .76$, .72, and .89, respectively ($p < .005$). The relation between SLD and Parent Rating, however, was not consistent. A moderate coefficient value of .71 ($p < .005$) resulted only for the 3-month visit. The r values for the other two visits were below .40.

SLD also was correlated significantly with Facial-Head Movement for the initial and 6-month visits ($r = .54$ and .64 respectively, $p < .05$). The correlation was less than .20 for the 3-month visit.

Parent Rating and Clinician Rating were significantly correlated for the 3- and 6-month visits ($r = .85$ and .46, $p < .05$). For the initial visit, the correlation was less than .40. In contrast, measurements of Other Disfluencies did not correlate significantly with any other variable.

## Individual Data

Individual subject data for all measures for the three testing periods are displayed in Table 2. These data show that the group means reflect tendencies that are common to many subjects. The first interesting observation is that a majority of the subjects initially exhibited moderate-to-severe stuttering. On the initial visit, 11 of the 16 subjects had more than 8 SLD per 100 syllables (excluding other disfluencies), with clinician severity ratings varying from 3.16 to 6.25. Such a concentration of moderate-to-severe cases at the very early stages of stuttering is one of the most intriguing findings of this study.

| Subject | Sex | Measure | Initial | 3-Months | 6-Months |
|---|---|---|---|---|---|
| 01 | F | SLD[a] | 4.71 | 4.11 | 2.56 |
| | | OD[b] | 2.46 | 6.57 | 5.40 |
| | | Parent Severity Rating | 3.00 | 1.00 | 2.00 |
| | | Clinician Severity Rating | 2.67 | 2.25 | 0.66 |
| | | Facial-Head Movements[c] | 3.7 | 2.9 | 1.8 |
| 02 | F | SLD | 12.72 | 4.09 | 2.18 |
| | | OD | 7.20 | 18.14 | 6.55 |
| | | Parent Severity Rating | 3.00 | 1.50 | 0.00 |
| | | Clinician Severity Rating | 5.58 | 2.57 | 1.16 |
| | | Facial-Head Movements | 5.9 | 3.0 | 1.6 |
| 03 | F | SLD | 10.63 | 8.77 | 1.70 |
| | | OD | 2.50 | 1.05 | 2.92 |
| | | Parent Severity Rating | 5.00 | 4.50 | 3.00 |
| | | Clinician Severity Rating | 5.33 | 4.58 | 1.50 |
| | | Facial-Head Movements | 1.5 | 3.0 | 2.1 |
| 04 | F | SLD | 16.07 | 3.86 | 3.23 |
| | | OD | 5.03 | 4.53 | 3.42 |
| | | Parent Severity Rating | 6.00 | 1.00 | 1.00 |
| | | Clinician Severity Rating | 5.33 | 1.56 | 1.00 |
| | | Facial-Head Movements | 4.1 | 1.4 | 3.0 |
| 05 | F | SLD | 5.08 | — | 1.35 |
| | | OD | 3.42 | — | 4.96 |
| | | Parent Severity Rating | 4.50 | — | 0.00 |
| | | Clinician Severity Rating | 4.67 | — | 0.83 |
| | | Facial-Head Movements | 1.3 | — | 1.2 |
| 06 | M | SLD | 27.73 | 7.23 | 11.97 |
| | | OD | 3.54 | 3.40 | 2.04 |
| | | Parent Severity Rating | 4.00 | 2.00 | 1.50 |
| | | Clinician Severity Rating | 6.25 | 2.83 | 4.33 |
| | | Facial-Head Movements | 5.1 | 3.5 | 3.6 |
| 07 | M | SLD | 13.33 | 12.00 | 6.87 |
| | | OD | 7.08 | 8.85 | 7.46 |
| | | Parent Severity Rating | 3.50 | 2.50 | 1.50 |
| | | Clinician Severity Rating | 4.16 | 4.08 | 2.99 |
| | | Facial-Head Movements | 3.9 | 4.2 | 3.0 |
| 08 | M | SLD | 9.76 | 4.34 | 3.64 |
| | | OD | 0.79 | 9.58 | 3.25 |
| | | Parent Severity Rating | 3.00 | 1.00 | 1.00 |
| | | Clinician Severity Rating | 4.41 | 0.66 | 2.00 |
| | | Facial-Head Movements | 0.8 | 0.6 | 0.0 |
| 09 | M | SLD | 8.19 | 4.57 | 2.73 |
| | | OD | 10.30 | 5.28 | 7.18 |
| | | Parent Severity Rating | 5.00 | 1.50 | 1.00 |
| | | Clinician Severity Rating | 4.00 | 2.33 | 1.16 |
| | | Facial-Head Movements | 1.6 | 1.1 | 0.8 |
| 10 | M | SLD | 23.32 | 4.65 | 5.97 |
| | | OD | 8.81 | 4.52 | 8.46 |
| | | Parent Severity Rating | 6.00 | 3.00 | 2.00 |
| | | Clinician Severity Rating | 5.99 | 3.50 | 1.66 |
| | | Facial-Head Movements | 4.7 | 1.8 | 2.0 |
| 11 | M | SLD | 4.91 | 3.92 | 4.26 |
| | | OD | 4.15 | 3.36 | 4.10 |
| | | Parent Severity Rating | 4.50 | 2.00 | 2.00 |
| | | Clinician Severity Rating | 3.00 | 2.50 | 2.33 |
| | | Facial-Head Movements | 3.5 | 3.6 | 1.4 |

(cont'd on next page)

| Subject | Sex | Measure | Initial | 3-Months | 6-Months |
|---|---|---|---|---|---|
| 12 | M | SLD[a] | 3.98 | 3.91 | 2.60 |
| | | OD[b] | 3.22 | 5.40 | 2.49 |
| | | Parent Severity Rating | 4.00 | 2.00 | 2.00 |
| | | Clinician Severity Rating | 3.33 | 2.92 | 2.33 |
| | | Facial-Head Movements[c] | 1.6 | 2.4 | 1.1 |
| 13 | M | SLD | 10.79 | 5.44 | 3.54 |
| | | OD | 7.63 | 6.39 | 4.09 |
| | | Parent Severity Rating | 4.50 | 3.00 | 2.50 |
| | | Clinician Severity Rating | 3.16 | 3.50 | 2.00 |
| | | Facial-Head Movements | 4.2 | 3.1 | 0.9 |
| 14 | F | SLD | 14.43 | 12.80 | 8.71 |
| | | OD | 4.53 | 4.95 | 2.88 |
| | | Parent Severity Rating | 4.00 | 4.50 | 3.00 |
| | | Clinician Severity Rating | 5.83 | 4.45 | 3.92 |
| | | Facial-Head Movements | 2.4 | 1.9 | 4.5 |
| 15 | M | SLD | 7.69 | 6.00 | 3.36 |
| | | OD | 9.77 | 9.74 | 6.23 |
| | | Parent Severity Rating | 2.50 | 3.00 | 1.50 |
| | | Clinician Severity Rating | 2.83 | 3.25 | 1.00 |
| | | Facial-Head Movements | 3.4 | 3.1 | 2.3 |
| 16 | M | SLD | 18.54 | 12.57 | 6.62 |
| | | OD | 6.27 | 7.17 | 9.11 |
| | | Parent Severity Rating | 4.00 | 5.00 | 4.50 |
| | | Clinician Severity Rating | 4.40 | 3.83 | 3.00 |
| | | Facial-Head Movements | 3.2 | 1.3 | 1.2 |

[a]SLD = Stuttering-Like Disfluencies. [b]OD = Other Disfluencies. [c]Per instance of stuttering.

TABLE 2. Ratings for individual subjects on various measures during the initial visit, 3-month follow-up, and 6-month follow-up.

Second, the breadth and magnitude of the decline in the Stuttering-Like Disfluencies are more salient in the individual data. At the 3-month follow-up, although all subjects still exhibited the minimum three SLD per 100 syllables required to be defined as a stutterer, only four of them had more than eight SLD. Six subjects (numbers 2, 4, 6, 8, 10, 13) exhibited 50 to 80% decline in SLD between the initial visit and the 3-month follow-up. An additional two subjects (numbers 9 and 16) decreased their SLD by 45 and 33% respectively.

At the 6-month follow-up, six subjects (38% of the group) had fewer than the minimum three SLD. Five subjects exhibited three to five SLD; another five subjects had between six and seven SLD, and only two continued to exhibit more than eight SLD. As can be seen, 10 subjects (numbers 1, 2, 3, 7, 9, 12, 13, 14, 15, 16) demonstrated between 32 and 81% reductions in SLD between the second and the third visits. Four subjects (3,7,15,16) exhibited sharp reductions only between the second and third visits. Subject 5, who missed the second visit, demonstrated a large decline in SLD from the first to the third visit. In only three subjects, all males (numbers 6, 10, 11), the initial decline was followed by a moderate or small rise in

SLD from the second to the third visit. This upward shift may partially explain the relatively small change in the group mean over this period.

Other Disfluencies varied considerably from subject to subject, as well as within subjects, but without showing a consistent pattern. In a few instances (e.g., at the 3-month follow-up of subjects 1, 2, and 8) the number of Other Disfluencies rose at the time when the number of SLD declined.

The individual severity rating data strengthen the finding that a sharp declining course of stuttering is a frequent phenomenon during the early stages of the disorder. At the 6-month follow-up, three subjects (numbers 2, 5, 9) were regarded as "recovered" on the basis of SLD counts lower than 3 and both severity ratings lower than 2. When only two of the three criteria were applied, an additional four subjects (numbers 1, 3, 4, 15) could have been regarded as "possibly recovered." Of the remaining subjects, five (numbers 8, 10, 11, 12, 13) presented mild stuttering; that is, 3 to 6 SLD and severity ratings lower than 3. Four subjects (numbers 6, 7, 14, 16) presented moderate stuttering--more than 6 SLD and at least one severity rating of 3 or higher. The latter subjects were all males who initially exhibited moderate-to-severe stuttering.

The individual data also reveal that although the correlation between the clinician and parent severity ratings was rather low for the first and third visits, the actual differences were smaller than one scale-interval for 10 subjects in each visit. In other words, parents and clinicians agree more often than not on the severity of the child's stuttering. The data, however, also demonstrate several large inconsistencies between the two ratings or between parent rating and the number of SLD (e.g., subject 6, initial visit and 6-month follow-up). This quite likely is due to a lack of a frame of reference for parents' judgments.

## Discussion

The multiple measures employed in this study lead us to conclude that early stuttering is often more severe than has commonly been portrayed in the literature (Bloodstein, 1987; Bluemel, 1932; Froeschels, 1955; Van Riper, 1971). The finding that all subjects had head and facial movements during disfluent speech in excess of their matched fluent speech serves to emphasize that early stuttering is also more complex than the traditional notion of easy, effortless repetitions, depicted in the abovementioned as well as many other sources. Moreover, stuttering can reach advanced forms soon after onset. Our conclusion supports Yairi and Lewis' data (1984) obtained from a different group of subjects near the onset of stuttering indicating relatively high levels of disfluency. It also confirms retrospective parental reports that described the onset of the disorder as characterized by moderate-to-severe stuttering in nearly 30% of the cases (Yairi, 1983; Yairi & Ambrose, 1992b). One explanation of the high concentration of moderate-to-severe stuttering in the present sample of early referrals is that these parents are more apt to make early referrals. We wish to point out, however, that the remaining 58 subjects currently in

our longitudinal investigation, who were not presented here because of their later referrals, also include children with moderate-to-severe stuttering.

The most obvious revelation of the present investigation is the large-magnitude decline in frequency and severity of stuttering that occurs during the early stages of the disorder in the absence of formal clinical intervention. This conclusion is supported by the overall similar longitudinal trend of multiple measures. These results strongly support our previous findings for a different group of 27 preschool age children who stuttered (Yairi & Ambrose, 1992a). Subsequent follow-ups of up to 2 years of these subjects have indicated that not even a single case of recovery had experienced relapse and that most subjects who stuttered at the 6-month visit continued the downward course. Thus, our accumulating evidence suggests that early improvement and recovery are a dominant factor in early childhood stuttering.

The many past clinical or retrospective reports of spontaneous recovery in preschool children (see Wingate, 1976), longitudinal data (e.g., Andrews & Harris, 1964; Ryan, 1990), and our own present as well as recent (Yairi & Ambrose, 1992a) objective data lead to several conclusions. First and foremost, these findings make a compelling case that researchers and clinical observers of treatment efficacy for early childhood stuttering must employ extraordinary caution in designing studies and interpreting results. The requirement to control for spontaneous recovery by employing groups of children who did not receive treatment is crucial. The younger the children, and the shorter the stuttering history, the more crucial is the control. A similar conclusion was recently reached by Onslow, Costa, and Rue (1990) concerning the results of their treatment study. A related issue is the timing of direct clinical intervention. Our cumulative longitudinal findings seem to raise questions about the advisability of advocating immediate intervention (Onslow, 1992; Prins, 1983), especially in cases of early referrals. Alternative strategies, such as a waiting period, immediate direct intervention, or indirect intervention, should be the focus of careful research. Post-onset intervals and other subgroup differentiating factors should be considered. Hopefully, more definite conclusions on this question can be reached through additional longitudinal investigations. Such questions regarding timing of early intervention do not negate the need for all children suspected of stuttering to receive speech-language-hearing evaluation. The fact that some children do persist in their stuttering--in this sample mostly males with moderate-to-severe problems--certainly keeps clinical intervention a viable option. Early referral and diagnosis remain critical for both research and treatment purposes.

Another important implication of the study concerns the rapidly changing symptoms of early stuttering. Considering the time interval between the stuttering onset and the initial interview (about 6 weeks on the average) and the large decline at the 3-month follow-up, it would appear that for many subjects the peak of stuttering was reached during the first 2-3 months of the disorder, just before its sharp decline. It is possible then, that differences between children who stutter and their nonstuttering peers can be better detected closer to the onset of the disorder.

While we concur with Conture's (1991) view that children's stuttering must be differentiated from adults' stuttering, the present findings demonstrate that there must also be differentiation of subgroups of children who stutter. The rapid changes during the early stages of stuttering oblige researchers to give serious consideration to the timing of their investigations. In particular, small differences in post-onset interval should be viewed as an important factor in subject selection. Grouping together young stutterers who are within 1 year of onset may result in a rather heterogeneous sample, leading to erroneous interpretations of the nature of early stuttering.

Finally, the results of this study should also be discussed in regard to measures of stuttering. Onslow et al. (1992) expressed reservations about the reliability and validity of traditional disfluency measurement systems in research on early stuttering. Our data, however, show good interjudge reliability that is in line with several other investigators (Wexler, 1992; Zebrowski, 1991; Yairi & Ambrose, 1992b). Also, the large speech samples that were obtained over two different days for each subject provide an important dimension of representativeness to the behaviors under investigation. The general agreement of the perceptual measures, particularly the Clinician Rating, and the Facial/Head Movement with the Stuttering-Like Disfluencies across three testing periods also lends validity to the SLD as a measure of behaviors perceived as stuttering. Thus, the relation between the frequency of disfluencies and the perception of stuttering and variations in its severity established many years ago (e.g., Young, 1961) is supported by the present data. Extensive experience, opportunities to listen as many times as needed, and the use of long speech samples are important factors in achieving high reliability.

We agree, however, that traditional disfluencies systems should be carefully reevaluated for their specific usefulness. Certain combinations, such as SLD, appear to be more sensitive, whereas Other Disfluencies are not particularly useful measures of early stuttering. Further research on the unique contribution of each of the three SLD components in differentiating stutterers from control subjects or among subgroups of stutterers as they emerge developmentally is recommended.

In summary, then, examination of the dynamics of very early stuttering reveals that stuttering may manifest complex and severe symptoms at onset and then show substantial remission within the first 6 months. These factors are important to consider in the evaluation and treatment of childhood stuttering as well as in research design.

Acknowledgments

This study was supported by grant #R01-DC00459 from the National Institute of Deafness and Communication Disorders. The editorial advice of Elaine Paden is greatly appreciated.

References

Adams, M. (1986). Stuttering, disfluency and fluency: A perspective overview. A paper presented at the convention of the American Speech-Language-Hearing Association. Abstract published in Asha, 28, 71.

Ambrose, N., & Yairi, E. (1990). Development of awareness in young stutterers. A paper presented at the convention of the American Speech-Language-Hearing Association. Abstract published in Asha, 32, 144.

Andrews, G., & Harris, M. (1964). The syndrome of stuttering. London: Heinemann.

Bloodstein, O. (1960). The development of stuttering: II. Developmental phases. Journal of Speech and Hearing Disorders, 26, 67-82.

Bloodstein, O. (1987). A handbook on stuttering (4th ed.). Chicago: National Easter Seal Society.

Bluemel, C. (1932). Primary and secondary stuttering. Quarterly Journal of Speech, 18, 178-200.

Conture, E. (1991). Young stutterers' speech production: A critical review. In H. Peters, W. Hulstijn, & W. Starkweather (Eds.), Speech motor control and stuttering (pp. 365-384). New York: Elsevier Science Publishing Co.

Conture, E., & Kelly, E. (1991). Young stutterers nonspeech behavior during stuttering. Journal of Speech and Hearing Research, 34, 1041-1056.

Conture, E., Rothenberg, M., & Molitor, R. (1986). Electroglottographic observations of young stutterers' fluency. Journal of Speech and Hearing Research, 29, 384-393.

Ekman, P., & Friesen, W. (1978). Facial action coding system (manual). Palo Alto, CA: Consulting Psychologists Press.

Froeschels, E. (1921). Beitrage zur symptomatolgie des stotterns. Nervous Child, 2, 148-161.

Froeschels, E. (1955). Core of stuttering. Acta Otolarygologica, 45, 115-119.

Hall, K., & Yairi, E. (1992). Fundamental frequency, jitter, and shimmer in preschool stutterers and nonstutterers. Journal of Speech and Hearing Research, 35, 1002-1008.

Healey, C., & Bernstein, B. (1991). Acoustic analysis of young stutterers and nonstutterers disfluencies. In H. Peters, W. Hulstijn, & W. Starkweather (Eds.), Speech motor control and stuttering (pp. 401-407). New York: Elsevier Science Publishing Co.

Hubbard, C., & Yairi, E. (1988). Clustering of disfluencies in the speech of stuttering and normal speaking preschool children. Journal of Speech and Hearing Research, 31, 228-233.

Johnson, W., & Associates (1959). The onset of stuttering. Minneapolis: University of Minnesota Press.

Louko, L., Edwards, M., & Conture, E. (1990). Phonological characteristics of young stutterers and their normally fluent peers: Preliminary observations. Journal of Fluency Disorders, 15, 191-211.

Nippold, M. (1990). Concomitant speech and language disorders in stuttering children: A critique of the literature. Journal of Speech and Hearing Disorders, 55, 51-60.

Onslow, M., Costa, L., & Rue, S. (1990). Direct early intervention with stuttering: Some preliminary data. Journal of Speech and Hearing Disorders, 55, 405-416.

Onslow, M. (1992). Identification of early stuttering: Issues and suggested strategies. American Journal of Speech-Language Pathology, 1, 21-28.

Onslow, M., Gardner, K., Bryant, K., Stuckings, C., & Knight, T. (1992). Stuttered and normal speech events in early childhood: The validity of a behavioral data language. Journal of Speech and Hearing Research, 35, 79-87.

Prins, D. (1983). Continuity, fragmentation, and tension: Hypotheses applied to evaluation and intervention with preschool disfluent children. In D. Prins & R. Ingham (Eds.), Treatment of stuttering in early childhood. San Diego: College Hill.

Ratner, N. B., & Sih, C. S. (1987). Effects of gradual increases in sentence length and complexity on children's disfluency. Journal of Speech and Hearing Disorders, 52, 278-287.

Ryan, B. (1990). Development of stuttering, a longitudinal study, report 4. A paper presented at the convention of the American Speech-Language-Hearing Association, Seattle. Abstract published in Asha, 32, 144.

Ryan, B. (1992). Articulation, language, rate, and fluency characteristics of stuttering and nonstuttering preschool children. Journal of Speech and Hearing Science, 35, 333-342.

St. Onge, K., & Calvert, J. (1964). Stuttering research. Quarterly Journal of Speech, 50, 159-165.

Sander, Eric K. (1961). Reliability of the Iowa Speech Disfluency Test. Journal of Speech and Hearing Disorders, Monograph Supplement, VII, 21-30.

Schwartz, H., & Conture, E. (1988). Subgrouping young stutterers: Preliminary behavioral observations. Journal of Speech and Hearing Research, 31, 62-71.

Schwartz, H., Zebrowski, P., & Conture, E. (1990). Behaviors at the onset of stuttering. Journal of Fluency Disorders, 15, 77-86.

Van Riper, C. (1971). The nature of stuttering. Englewood Cliffs, NJ: Prentice Hall.

Wexler, K. (1982). Developmental disfluency in 2-, 4-, and 6-year-old boys on neutral and stress situations. Journal of Speech and Hearing Research, 25, 229-234.

Wingate, M. (1976). Stuttering theory and treatment. New York: Irvington.

Yairi, E. (1983). The onset of stuttering in two-year-old children. Journal of Speech and Hearing Disorders, 48, 171-177.

Yairi, E. (1990). Subtyping child stutterers for research purposes. ASHA Reports, 18, 50-57.

Yairi, E., & Ambrose, N. (1992a). A longitudinal study of stuttering in children: A preliminary report. Journal of Speech and Hearing Research, 35, 755-760.

Yairi, E., & Ambrose, N. (1992b). Onset of stuttering in preschool children: Selected factors. Journal of Speech and Hearing Research, 35, 782-788.

Yairi, E., & Lewis, B. (1984). Disfluencies near the onset of stuttering. Journal of Speech and Hearing Research, 27, 154-159.

Young, M. (1961). Predicting ratings of severity of stuttering. Journal of Speech and Hearing Disorders (Monograph Supplement), 7, 31-54.

Zebrowski, P. (1991). Duration of speech disfluencies of beginning stutterers. Journal of Speech and Hearing Research, 34, 483-491.