
Early Childhood Stuttering I: Persistency and Recovery Rates

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The divergent developmental course of stuttering with its two major paths, persistency and spontaneous (unaided) recovery, has been a focus of scientific attention because of its critical theoretical, research, and clinical perspectives. Issues concerning factors underlying persistency and recovery and their implications for early intervention have stirred considerable controversy among scientists. In light of the intense interest, the scarcity of direct essential epidemiological data concerning the magnitude of the two paths and the timing of recovery is problematic. Most past studies have used retrospective methodologies. The few longitudinal studies have been severely limited in scope or objective data. The purpose of the investigation reported herein is to study the pathognomonic course of stuttering during its first several years in early childhood with special reference to the occurrence of persistent and spontaneously recovered forms of the disorder. Employing longitudinal methodology with thorough, frequent periodic follow-up observations, multiple testing, and recording of extensive speech samples, 147 preschool children who stutter have been closely followed for several years from near the onset of stuttering. In this, the first of three related articles, we present findings regarding the current stuttering status of 84 of these children, who have been followed for a minimum of 4 years after their onset of stuttering. The data indicate continuous diminution in the frequency and severity of stuttering over time as many children progressed toward recovery. Our findings lead to conservative estimates of 74% overall recovery and 26% persistency rates. The process of reaching complete recovery varied in length among the children and was distributed over a period of 4 years after onset. Detailed analyses of phonological and language skills pertaining to differentiation of the developmental paths of children who persist and those who recover are presented in the two other articles in the series (E. P. Paden et al., 1999, and R. V. Watkins et al., 1999).

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Although estimates of the incidence and prevalence of stuttering in the United States and western Europe vary greatly (Bloodstein, 1995), considerations of the central tendencies of the various reports as well as their scientific merit would seem to indicate that about 5% of the population of these parts of the world has stuttered at some time, whereas only 1% stutters at a given time (Andrews & Harris, 1964, Bloodstein, 1995). By inference, the discrepancy between these two figures of incidence and prevalence suggests that the disorder persists in only the minority of all cases involved. Or, conversely, there appears to be a high rate of remission of stuttering. In cases where no clinical intervention has occurred, this phenomenon has been known in the literature as spontaneous recovery.

Other evidence for spontaneous, unaided recovery has been provided by studies designed to assess its occurrence directly. For 60 years since

Bryngelson (1938) made the observation that a substantial number of young children who stutter outgrow the disorder; the clinical and research literature has reported many estimates of spontaneous recovery. Data have varied from a low of 32% (Johnson et al., 1959) to 79% (Andrews & Harris, 1964) and possibly even higher (Yairi & Ambrose, 1992). In a major review of the literature, Wingate (1976) calculated that the overall recovery rate is approximately 43% by age 14. Nevertheless, he suggested several reasons to believe that the recovery rate may be well above that composite value. Such diversity of findings is understandable given that most of the information has been generated through retrospective studies of adults and/or high school students and from reports of parents of young children which depended on long-term memory of presenting symptoms (e.g., Dickson, 1971; Johnson et al., 1959; Sheehan & Martyn, 1970). Furthermore, these investigations lacked tight criteria for recovery, objective speech-based data to substantiate variations in stuttering or claims of remission, and due consideration of epidemiological factors in the composition of their subject samples—all of which may significantly affect the results.

A few longitudinal studies that enabled closer monitoring of recovery in children observed from near the onset of stuttering have provided more reliable data. In these, investigators found recovery of 79% (Andrews & Harris, 1964), 80% (Panelli, McFarlane, & Shipley, 1978), and 65% (Ryan, 1990)—figures that are more consistent with each other. In 1992, Yairi and Ambrose published a pilot longitudinal study reporting, for the first time, systematic, long-term, speech-based data on the development of childhood stuttering. This small-scale study was primarily aimed at developing the mechanism and procedures for longitudinal investigations of stuttering; the study was not intentionally planned to study recovery. Nevertheless, the data indicated a large reduction in disfluencies during the first 14–16 months post-onset, with 65% complete recovery during the first 2 years after onset and additional recovery at a later time. That pilot study included only 27 preschool-age children who stuttered, of whom 18 were exposed to minimal intervention and 9 were not. No differences in recovery trends were found between these two subgroups.

Of particular interest is a recent longitudinal study reported by Mansson (1997). This investigator had the unique opportunity of having access to the birth records of all children, approximately 500, born annually on the Danish island of Bornholm, which has a very stable, low-mobility population of 45,000. Within a month or two following their third birthday, Mansson and a team of four other clinicians conducted individual face-to-face speech, language, and hearing screening of the entire population of 1,040 children born during a 2-year period (98% of the recorded births). The investigator reported

that 4.9% of the children exhibited stuttering, a figure identical to that found by Andrews and Harris (1964) in a Scottish population of a similar size. Mansson also reported that a follow-up evaluation 2 years later revealed a recovery rate of 71.6%. The likelihood of intervention, however, was not clear. A recent update of the data places the observed incidence at 5.09%. Reported recovery 5 to 6 years after initial identification was 85% (Mansson, in press).

Although all of the longitudinal studies mentioned above were either limited in scope and/or had a variety of other limitations, it is worth pointing out that their findings indicated persistency and remission levels commensurate with those inferred from the incidence-prevalence discrepancy data. Nevertheless, the likelihood of sampling errors in limited samples should be kept in mind.

Determining with reasonable accuracy the proportion of children who persist in stuttering and those who indeed recover of their own accord and isolating factors that govern or influence persistency and remission are key objectives in the overall research effort concerning the nature of stuttering. These objectives have immense theoretical, clinical, financial, and ethical consequences (Curlee & Yairi, 1997; Ratner, 1997; Zebrowski, 1997). This issue, however, has been the subject of considerable debate. Several investigators (Ingham, 1983; Martin & Lindamood, 1986; Ramig, 1993; Young, 1975), citing concerns about past research, have concluded that the level of spontaneous remission is considerably lower than 50% or even 40%. On the other hand, Yairi (1997) and Curlee and Yairi (1997, 1998) have argued that such low estimates overlook essential epidemiologic factors that influence persistency and remission—particularly age, sex, and time elapsed from onset of stuttering. For example, because recovery can take place at a very early age and within a short period after onset, an appreciable number of stuttering incidence and recovery cases go unreported (Yairi, Ambrose, & Cox, 1996). Similarly, samples that consist primarily of school-age children (e.g., Ramig, 1993) have a late starting point, making it impossible to capture much of the phenomenon of unaided recovery. Therefore, for precise estimate of the true level of persistent and recovered stuttering, longitudinal studies must begin from close to the onset of the disorder.

From a clinical standpoint, reasonably reliable estimates of the probability and timing of spontaneous recovery, or risk of developing persistent stuttering, should significantly affect overall intervention strategies. Individual prognosis for each child regarding the risk for chronic stuttering and choosing between a waiting period or immediate treatment can become scientifically based. Treatment-efficacy studies for early childhood stuttering would be expected to become

considerably more accurate by better isolating the true treatment effects from spontaneous recovery. Theoretically, information about percentages and timing of recovery gives rise to important questions pertaining to the nature of the differences between persistent and recovered stuttering. Although arguments in favor of environmental factors, such as parental intervention, have been entertained (e.g., Ingham, 1983; Wingate, 1976; Zebrowski, 1997), a recent study by Ambrose, Cox, and Yairi (1997) has provided evidence suggesting that the two subsets of children who stutter, those who persist and those who recover, have different genetic liabilities for stuttering. Such unrecognized heterogeneity may explain many previous ambiguous or contradictory results regarding characteristics of speech, physiology, home environment, and other parameters of young children who stutter. Separating those children who will eventually persist in from those who will recover from stuttering will increase precision in experiments with various aspects of the disorder in childhood and provide data-based grounds for modifying the traditional viewing of stuttering as a unitary disorder (St. Onge, 1963) toward recognition of subgroups.

Given that both theoretical foundations and solid research in early childhood stuttering must derive from a strong database of the epidemiology of the disorder (Yairi, 1999), more and better data are needed about the natural course of the disorder and true magnitude of persistency and spontaneous recovery. Furthermore, because common clinical experience and research reports (Andrews & Harris, 1964; Yairi, Ambrose, & Niermann, 1993) have indicated that rapid changes, including substantial reduction in stuttering, occur during the first year or two of the disorder, greater attention should be given to the delineation of the timing of recovery from stuttering. Questions concerning who persists and who recovers, as well as what characteristics distinguish the two subgroups, can then follow.

The present longitudinal investigation was initiated under the sponsorship of the National Institute on Deafness and Other Communication Disorders to study the development of stuttering. With the traditional developmental models (e.g., Bloodstein, 1960) in mind, our original motivation was to describe and quantify changes in various characteristics of stuttering over time. Using (a) a large, new subject sample, (b) observations from close to the onset of stuttering, (c) a longer time-span for the study, and (d) a reasonably frequent recording schedule of speech samples, considerable methodological improvements have been achieved over past longitudinal studies of stuttering (Andrews & Harris, 1964; Fritzell, 1976; Ohashi, 1973; Panelli et al., 1978; Ryan, 1990; Van Riper, 1971) as well as our own pilot study (Yairi & Ambrose, 1992). Concurrent with the study of the development of stuttering, additional parameters

such as language and phonology were investigated.

In a series of three articles we present updated findings of this investigation pertaining to the two developmental paths in early childhood stuttering based on the accumulated data for 84 children. The present article details the criteria that we have settled upon after several years of study as optimal for determining persistency and recovery; the article also focuses on the main issue—the relative incidence of these paths in this large group of participants. Information concerning several parameters of these groups is also reported. The companion articles (Paden, Yairi, & Ambrose, 1999, and Watkins, Yairi, & Ambrose, 1999) investigate in detail the phonological and language abilities exhibited by these groups of participants as they entered the project. These developmental areas have been the focus of theory and research in recent years, and often they are considered to be linked with stuttering (Paden & Yairi, 1996; Watkins & Yairi, 1997).

Method

Recruitment and Screening of Candidates for the Study

Participants in the longitudinal stuttering research project at the University of Illinois were preschool-age children and their parents recruited from the Champaign-Urbana, Illinois, area and from other communities located in an approximately 90-mile radius. The data to be presented were obtained for a substantial subset of a larger database of children who were included in the long-term project. This subset consists of all children who have met the criteria listed below. No overlap exists between the current sample and that employed in the Yairi and Ambrose 1992 study, which presented data from an earlier pilot project. Some portions of the data for some children reported here have been reported in various previous publications of this project; 19 participants are new.

Because the present investigation was publicized for several years to promote recruitment of subjects, the children were identified through a wide network of referral sources, including self-referral and referral from speech-language clinicians, other health professionals, daycare centers, and via newspaper advertisements. There are reasonable grounds, therefore, to view the sample of this project as more representative of the population of young children who begin stuttering than typical clinical samples that may run the risk of bias for several reasons. Additionally, from the outset, an important objective that guided selection of the subject pool was that it be epidemiologically sound. That is, the sample had to be inclusive in its representation of

children who stutter, from the earliest possible stage of stuttering, to provide the fullest range of the developmental paths of stuttering with the passage of time. Any case of stuttering, identified as such by parents according to criteria described below and confirmed by the investigators according to these criteria, was deemed important to include. To this end, we set out to recruit young children who were as close as possible to the onset of stuttering. Any sample of older children and/or those further removed in time from the onset of the disorder would bypass important developmental changes and, most likely, be weighted in favor of persistency.¹ Therefore, children who were within 12 months of stuttering onset were targeted. A few children, however, were referred who exceeded this guideline. They were admitted into the study and investigated as a separate group. Members of this group have been excluded from some studies and included in others, such as this.

Criteria

These and other considerations yielded the following initial multiple-criteria protocol for admitting children who stutter into the Stuttering Research Project database: (a) age 6 years or younger, (b) regarded by their parents as having a stuttering problem, (c) regarded by two investigators (EY and NA) as having a stuttering problem, (d) stuttering severity rated by parents or the two experimenters as 2 or higher on an 8-point severity scale (0 = normal to 7 = very severe) to be described below, (e) exhibiting at least three Stuttering-Like Disfluencies (SLD include part-word repetition, monosyllabic word repetition, and disrhythmic phonation²) per 100 syllables of spontaneous speech, (f) no obvious neurologic disorders or abnormalities. Given these multiple objective and subjective criteria, there was no doubt in the mind of parties involved that every child admitted into the study exhibited stuttering of clinical significance.

Because of the extensive duration of the investigation, 10 years at present (and considerably longer when the pilot study is included), we have been in a position to evaluate procedures in light of experience and the gradually accumulating results. As we have assessed a growing number of potential subjects, some adjustments to the initial criteria and procedures published in previous reports (Paden & Yairi, 1996; Watkins & Yairi, 1997;

Yairi, Ambrose, Paden, & Throneburg, 1996) were deemed warranted. More detailed information concerning procedures, such as severity rating scales described in previous related publications, is provided in the present report.

Stuttering Severity Scales

Severity of stuttering for each child was rated independently by parents and by clinicians at each visit. The Parent Severity Scale requested ratings of overall recent stuttering severity ranging from 0 to 7. If ratings were reported to vary during the time between visits, these were also recorded. Parents were allowed to choose points halfway between intervals. Zero was defined as "normally fluent," 1 was defined as "borderline," and 2 as "mild." The interval between 1 and 2 referred to definite, but quite mild, stuttering. Point 3 was defined as "mild-to-moderate," 4 as "moderate," 5 as "moderate to severe," 6 as "severe," and 7 as "very severe."

Clinician severity ratings, on the other hand, were based on overall impressions of the child's speech throughout the evaluation. The scale we devised was based on published scales (Darley & Spriestersbach, 1978; Riley, 1981). Scoring was broken down into 4 components: frequency, duration, tension, and accessory characteristics. The first three were rated from 0 to 6, and their mean was calculated. Again, 0 was described as normally fluent speech, 1 as "borderline," and 6 as "severe" stuttering. Accessory characteristics were rated from 0 to 1, and this number was added to the mean of the first three items. A maximum score of 7 ("very severe" stuttering) could thus be obtained if frequency, duration, and tension were rated as 6 and accessory characteristics as 1. The Clinician Severity Scale is shown in the Appendix. Severity was judged by the two investigators independently. Ratings that differed by up to half a point were set at the higher of the two estimates. In rare cases where greater differences occurred or when uncertain, the videotaped sample was viewed to arrive at a mutually agreed-upon rating. Interjudge agreement between the two investigators was established by independently rating 10 videotaped samples. The mean difference in rating was 0.17.

Procedures: Initial Evaluation

Parent Interview

Each child received a comprehensive initial evaluation over two sessions approximately one week apart, totaling 3 to 4 hours. In a few cases, a third session was necessary. The evaluation included a parent interview, with the mother usually serving as the primary informant. Supplementary information was solicited from

¹Data on early onset and recovery were reported by Andrews & Harris (1964). Data on major developments during the early months of stuttering and observation on early recovery were reported in Yairi, Ambrose, & Niermann (1993). Comprehensive discussions of epidemiological factors can be found in Yairi (in press) and Yairi, Ambrose, & Cox (1996).

²The category of disrhythmic phonation includes sound prolongations, silent blocks, and also broken words and other within-word interruptions (but not repetitions) that disturb the continuity of words.

fathers and grandparents. Interviews were conducted using a standard coded questionnaire pertaining to family background, health and developmental history, detailed information concerning circumstances of onset of stuttering, and characteristics of the very early stuttering. Interviews lasted 1 to 1.5 hours over the two visits and were supplemented by additional sessions according to need. Special care was taken during the interview in narrowing down the date, manner, and circumstances of the onset. To help identify the time and situation of onset, parents were encouraged to consult their child's records, recall concurrent events, or proximity to other dates. The interview questioning followed a systematically reduced bracketing pattern that led to a limited time-range for the possible time of onset. In a number of cases, time of onset was pinned down to a specific date with what appeared to be a high level of confidence, confirmed independently by both parents. (An example of such procedures is provided in Yairi & Ambrose, 1992.) Parents also described or imitated the child's stuttering at onset and rated its severity using the 8-point scale described above. After information was obtained regarding onset, the interview continued with standard questions concerning the development of stuttering from time of onset to present. Parents were asked to rate the current severity of the child's stuttering.

At the conclusion of the evaluation, parents were provided with a general assessment of the child's status that was later supplemented with a written summary of results and impressions. They were also given brief, standard information about stuttering and its development, advised that the child might or might not recover, and given a brief unbiased review of several factors frequently cited as possibly beneficial for children who stutter, such as slow speech, not interrupting, and avoiding negative corrections of the child's speech. Parents were told about the objectives of this research project and that it was not geared toward providing regular clinical services. They were informed about availability of clinical services in the area; parents decided if and when their child received treatment for stuttering.

Speech Samples

Recording. The children's spontaneous speech was observed in several locations in the clinic that provided many opportunities during the two sessions to take notice of stuttering in various informal situations, including conditions of excitement. Of particular importance, conversational speech samples were audio- and videotaped during about 40 minutes of interaction between both the child and a parent and between the child and one investigator in two sessions approximately one week apart. The general protocol for speech-language sample collection was conversation while the child played with

clay. Several standard, open-ended questions were posed to the child (e.g., questions about favorite toys, TV shows, movies, siblings, and school or day care experiences, as well as talk about ongoing play). Speech samples ranged from 1,000 to 1,500 syllables with the exception of six samples that ranged from 500 to 1,000 syllables. In samples that were longer than 1,500 syllables, portions from the beginning or the end were excluded from analyses.

Given that many of the measures of interest to this investigation were derived from the spontaneous language samples of each subject, the quality of those samples was of considerable importance. Several steps were taken to ensure collection of a representative and high-quality sample. First, a portion of the sample was collected with the child's parent, a comfortable and familiar conversational partner for the child. Second, adults interacting with the children during sampling were encouraged to limit questions that invite yes/no or one-word answers. Instead, open-ended comments and questions were suggested (e.g., "Tell me more about what you're making" or "What happened in that movie?" rather than "Who are your friends?" or "Do you like to watch TV?"). Third, in addition to standard questions, parents, but particularly the experimenters, included topics that were identified by parents to be especially exciting to the child, such as recent minor mishaps, pets, special toys, and so on. Fourth, the size of the speech sample was significantly larger than typical 300-syllable samples often reported in disfluency studies (Conture & Kelly, 1991; Meyers, 1986; Yaruss, 1997) or the 100-utterance length used in many past investigations involving language analyses. Several scholars have suggested that reliability and validity are significantly enhanced through use of longer samples (Lahey, 1988; Lund & Duchan, 1993). Fifth, the sample was obtained over two different days to minimize the effects of a specific mood or conversational topic and fluctuations in the frequency of stuttering.

Analysis. Several project staff, each having several hundred hours of experience with disfluency analysis, transcribed the tapes orthographically and identified disfluencies. The Systematic Analysis of Language Transcripts (SALT; Miller & Chapman, 1996) program was used for transcript entry. Coding was used to identify six disfluency types. Three types were grouped as Stuttering-Like Disfluencies or SLD (part-word repetition, monosyllabic word repetition, disrhythmic phonation), and three were grouped as Other Disfluencies (interjection, revision-incomplete phrase, and multisyllabic word repetition plus phrase repetition). In addition, repetition units were tallied for part- and single-syllable word repetitions. Previous studies (Yairi et al., 1993) showed the SLD measure to be the most sensitive indicator of variations in stuttering over time, whereas the number

of other disfluencies remained relatively invariable. Measures of repetition units were shown to provide the best differentiation between children who stutter and normally speaking children (Ambrose & Yairi, 1995). Thus, there is a special interest in looking at this parameter when some children change from the diagnosis of stuttering to normally fluent.

Reliability. The second author listened again to approximately 80% of the samples in their entirety. Differences were resolved by repeated listening and the final judgment of the second author. The average point-by-point interjudge agreement between the transcribers and the second author for 50 samples representing early and later visits was .86 for SLD (part-word repetition, single-syllable word repetition, and disrhythmic phonation). For repetition units, 98% of repetitions were in agreement for the number of units. Additionally, interjudge agreement between transcribers and the second author for syllable counts of 50 utterances each of 24 samples was calculated. The mean difference in syllable count was .48%, or 1.50 syllables per sample, with a range from 1.33 to 1.83 syllables.

Additional Testing

A battery of speech, language, hearing, motor, psychological, and other tests was administered, including the Assessment of Phonological Processes—Revised (APP-R; Hodson, 1986), the Preschool Language Scale (Zimmerman, Steiner, & Pond, 1979), and the Arthur adaptation of the Leiter International Performance Scale (Arthur, 1952)—all of which were administered at entry into the study. Additional measures of language—for example, mean length of utterance and morphological saturation, to be described in the article by Watkins et al. (1999)—were obtained from the recorded spontaneous speech samples.

Procedures: Follow-Up

Data Collected

Follow-up direct observations, recording, and testing have been conducted every 6 months for all participants. Several speech and language tests were re-administered on a yearly basis. Similar to the procedures for the initial evaluation, follow-up visits were conducted over two sessions, approximately one week apart. Again, the two experimenters had several opportunities during these visits to observe the child in various speaking situations in and outside the clinic and the recording/testing room. The investigators noted whether or not the child stuttered, observable changes in stuttering, and the overall stuttering severity using the clinician's rating scale. Also noted were indications of the child's awareness of stuttering and any behavioral problems. Approximately 40-min

speech samples of at least 1,000 syllables were audio- and videorecorded over the two days.

Between visits, parents were advised to keep notes about the child's stuttering and to call the investigators whenever they noted that a significant change occurred in the stuttering. In each follow-up visit, parents responded to a standard progress report that included items concerning general trends of stuttering during the past 6-month period; the presence and overall frequency of each of several types of disfluencies; as well as secondary head, neck, and respiratory characteristics; situational variations in stuttering; the child's awareness of stuttering; indications of emotional reactions such as avoidance or word-substitutions; comments by relatives, friends, and neighbors about the child's stuttering; other behavioral concerns; and health history. Additionally, they were asked to rate the severity of the child's stuttering on the parent rating scale mentioned above.

A system of scheduling and follow-up reminders by phone and mail and considerable flexibility in scheduling and rescheduling visits, including weekends and holidays to suit each family's needs, proved effective in keeping families in the study. A few children who moved before the completion of the study were recorded in their new locale by local speech pathologists and/or parents. Families received \$30 in compensation for the two sessions of each visit. The overall rate of subject loss—those who completed less than 1 or 2 years of the study and thus were not used for longitudinal information—was approximately 5%.

Criteria for Persistency

Criteria for classifying a child's stuttering as persistent bore similarity to the admission criteria: (a) parental description of stuttering and/or investigators' observation of stuttering, (b) parental or investigator severity rating of stuttering >1 (on the scale described above), and (c) stuttering present for 48 months or longer. Any single indication of continuing stuttering had an overriding effect in imposing persistency classification, even when little supporting evidence was available and/or when other indications suggested recovery. For example, a child might exhibit normally fluent speech during any examination based on SLD count and investigator rating, and parents might state that their child had "normal speech," giving it a rating lower than 1. Yet, the parents might also say that at times ("once a month or so") the child stutters when very excited. If their description or imitation represented probable stuttering behavior (multiple unit sound or syllable repetitions or blocks or prolongations), their child was classified as persistent. In other words, even if a child appeared to be "clinically normal" for all practical purposes on the basis of formal criteria for parent and investigator

judgment, but occasional stuttering was *suspected*, the child was classified as persistent.

Criteria for Recovery

To be considered recovered, *all* of the following criteria had to be met: (a) clinician's general judgment that the child did not exhibit stuttering, (b) parent's general judgment that the child did not exhibit stuttering, (c) parent rating of stuttering severity as less than 1, (d) clinician rating of stuttering severity as less than 1, (e) SLD observed and reported as fewer than 3 per 100 syllables,³ (f) no stuttering present for a minimum of 12 months as judged both by parent report and clinician observation (in most cases this limit was exceeded considerably). A policy was maintained in which suspicion of possible stuttering precluded classification of recovery. In a few cases, at any given visit, no overt stuttering was reported or observed, but parents and/or investigators rated a child's fluency as borderline (1.00) because the child's speech appeared somewhat "choppy" or "hesitant." Such cases continued to be observed until positive classification could be made. Contrary to the opinion expressed by Onslow and Packman (1999) that the Illinois studies used "very liberal" criteria that inflated the number of recovered children, our criteria do the reverse, using strict multiple criteria to unambiguously identify recovery but using any indication of even mild occasional stuttering for classification of persistence.

Description of Final Participants

A total of 147 children, 102 boys and 45 girls suspected of stuttering, have been evaluated by the project's staff at the time this report was originally submitted. The children represent 129 of Caucasian, 14 of African American, 2 of Hispanic, and 2 of Asian origin. Socio-economic status as assessed by parents' education, profession, and income extended over a substantial range. Only a few parents did not complete high school; the remainder ranged from high school graduates to those with higher degrees. Occupation and income also ranged widely, from those on public assistance to unskilled and

skilled workers and higher-income professionals. The families lived in a medium-size community (approximate population: 100,000) in the Midwest or in smaller nearby communities.

Of the original pool of 147 children, 15 were excluded because stuttering could not be confirmed or medical or other problems existed that did not comply with the established criteria, and 6 dropped out of the study early on. Of the remaining 126 stuttering children who have participated in the longitudinal study, 84 have been observed to date for at least 48 months following their onset of stuttering. These 84 children have been classified according to pre-set criteria as either persistent or recovered. This article and its companions (Paden et al., 1999, and Watkins et al., 1999) are based upon these 84 children.

At the time of entrance into the study the age range of the 84 children was between 25 and 59 months, with a mean of 39.81 months ($SD = 8.50$). There were 58 males, with a mean age of 40.02 months ($SD = 7.75$), and 26 females, with a mean age of 39.35 months ($SD = 10.13$). Table 1 shows the number of males and females by 6-month age intervals. As can be seen, the largest group of males represented the 36–41 months age category, whereas the largest group of females came from the 30–35 months category.

As already indicated, an extensive effort was made to recruit children as close as possible to the onset of stuttering. The mean age at onset for the group was 32.98 months ($SD = 7.27$); the mean number of months elapsed between onset and the evaluation was 6.79 ($SD = 6.34$). Table 2 presents the distribution of the 84 children according to the interval from onset to when they first entered the study. As can be seen, a majority were evaluated within the first 6 months of their stuttering.

Upon entrance into the study, the participants exhibited a range of stuttering severity reflecting the admission criteria. Severity of stuttering can be evaluated in several ways. First, the mean initial frequency of stuttering-like disfluencies (SLD, or part-word repetitions, single-syllable word repetitions, and disrhythmic phonation) was 10.39 per 100 syllables ($SD = 5.76$); for all disfluencies it

³A common diagnostic criterion of stuttering (also applied as a criterion for admitting a child into this study) is exhibiting *at least 3 SLD per 100 syllables*. That is, a child cannot be classified as a "stutterer" without having a minimal amount of observed stuttering. But, this is not necessarily the threshold above which one *must* be considered a stutterer. Available data (Johnson et al., 1959; Yairi, 1997) have reported that a few young, normally fluent children, especially 2- to 3-year-olds, may exhibit up to 5 SLD. Adhering to these data in principle, several previous studies (e.g., Watkins & Yairi, 1997) stated that one recovery criterion was exhibiting less than 4 SLD. In all those cases, however, children classified as recovered fell well below this number. Because the difference between the minimal criterion for stuttering and the maximum criterion for normal fluency appears to have caused some misunderstanding, it was decided to use here 3 SLD as a single demarcation line. Very rarely, however, did recovered children exhibit more than 2 SLD.

Table 1. Distribution of stuttering children in 6-month age groups at entrance into study.

Age in months	Males	Females	Total
24–29	6	2	8
30–35	11	11	22
36–41	19	5	24
42–47	11	1	12
48–53	8	3	11
54–59	3	4	7

Table 2. Distribution of children who stutter according to months post-onset of stuttering at entry into the study.

Post-onset interval (months)	Number of participants	Cumulative percentage
0-3	34	40
4-6	21	65
7-9	9	76
10-12	11	89
> 12	9	100

was 16.16 ($SD = 6.91$). This appears to be within definitions of moderate or even moderate-severe stuttering according to several scales (e.g., Darley & Spriestersbach, 1978; Van Riper, 1971). Second, the mean number of repetition units (number of extra iterations in repetitions) was 1.49 per repetition ($SD = 0.36$)—clearly well in the range of stuttering (Ambrose & Yairi, 1995). Third, the mean stuttering severity rating judged by parents was 3.72 ($SD = 1.35$); the mean clinician severity rating was 3.96 ($SD = 1.36$). On the 8-point scale employed (0-7), these means are above the midpoint of 3.50. Mild stuttering was exhibited by 26% of the participants; moderate, by 48%; and severe, by 26%.

As mentioned earlier, the PLS, APP-R, and the Leiter—which assess language development and phonological and nonverbal skills—were administered to all children when they entered the study, at a time when their eventual classification outcome was still unknown. Overall, the test scores were within expected levels for phonological development and above age-expectation for language comprehension and expression and for nonverbal cognitive skills. Detailed findings about phonological and language skills will be reported in Paden et al. (1999) and Watkins et al. (1999).

The large body of data collected during the longitudinal periodic test and recording sessions lends itself to several types of analyses and produces findings on a number of different measures. This first report in the series will present general findings pertaining to the percentage, timing, and distribution of persistency and spontaneous recovery.

Results

Incidence of Recovery and Persistency

The main results of this study pertain to the percentages of children who persisted in stuttering for at least 4 years and the percentage of those who exhibited spontaneous recovery (i.e., they outgrew the disorder without formal clinical intervention). Twenty-two children were classified as persistent, with a mean age of

43.52 months ($SD = 8.33$) at entry into the study, and 62 were classified as recovered, with a mean age of 38.80 months ($SD = 8.16$). The distribution of the 84 children, according to gender, into the two developmental categories, Persistent and Recovered, is presented in Table 3. As can be seen, 26% persisted and almost 74% exhibited recovery. The difference was statistically significant ($\chi^2 = 19.05, p < .001$), simply corroborating the obvious observation that more children recover than persist. There was also an apparent gender factor in that of those who recovered, 35% were female, but of those who persisted, only 18% were female, yielding a male-to-female ratio of 4.50:1 for the persistent group and 1.82:1 for the recovered group. The difference was not statistically significant ($\chi^2 = 2.28, df 1, p = .18$); however, with the low number of females ($n = 4$) in the persistent group, power was insufficient (.36) to detect possible significant differences. The very nature of the distribution—that there are few persistent females—makes it difficult to test the significance of that infrequency.

Duration of Stuttering and Timing of Recovery

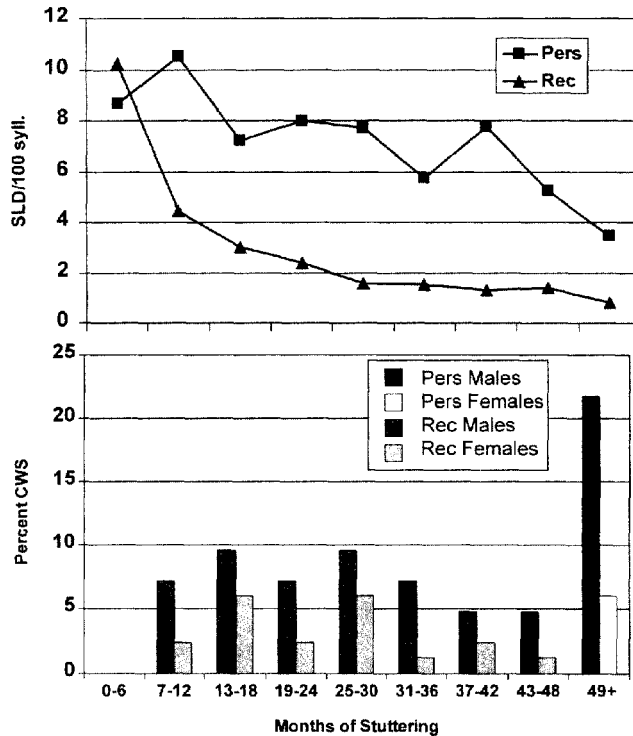
Frequency of recovery is but one important issue. The timing of recovery must also be examined. The data presented in the bottom half of Figure 1 show that for children who recover, duration of stuttering tends to run from 6 to 35 months for most, with some children stuttering as long as 3 to 4 years before recovery. Inspection of the graph reveals that, in addition to the previous finding that females tend to recover in greater proportions than males, females also tend to recover at earlier ages. Recovery for females peaks between 12 and 30 months following onset, whereas recovery for males is highest between 24 and 36 months after onset.

Although minimum criteria were set for group classification, a majority of children vastly exceeded these limits. For the persistent group, children had been stuttering for a range of 49 to 131 months, with a mean of 72.05 months ($SD = 22.71$), considerably longer than the 48-month minimum. Classification criteria also specify that children were followed for a minimum of 12 months following their complete recovery. In fact, this

Table 3. The number and percentage of stuttering children who persisted in and recovered from stuttering, and the male-to-female (M/F) ratio.

Group	Persistent	Recovered	Total
Males	18 (31.0%)	40 (69.0%)	58
Females	4 (15.4%)	22 (84.6%)	26
Total	22 (26.2%)	62 (73.8%)	84
M/F Ratio	4.50	1.82	2.61

Figure 1. SLDs and duration of stuttering in 6-month intervals for persistent and recovered children.



post-recovery observation period was exceeded for a majority of children, as shown in Table 4. Over 75% of the group were followed for at least 2 years following identification of recovery.

Disfluency Profiles

Analyses of conversational speech samples recorded at each visit during the longitudinal study were performed. Data on the mean number of stuttering-like disfluencies per 100 syllables spoken, the parameter used in this study as the objective indicator of stuttering, are displayed in the top half of Figure 1 for the persistent and recovered groups at 6-month intervals. Because children entered the study at varying times following onset of their stuttering, their 6-month follow-ups occurred at different times. Not all children were seen within 6 months of onset; therefore, data points for the interval 0–6 months post-onset do *not* represent *all* children's initial visit. Thus, the number of children for whom data are presented at each point in time along the curves is different. Because of this variation and

because of the descriptive nature of this study, formal statistics were not derived. For the persistent group, standard deviations remained large through all visits, whereas in the recovered group much less variation was present. Intervals of ± 1 standard deviation from the mean result in some overlap. The greater variability in the persistent group reflects the inclusion of cases with very mild stuttering, which were, by our definition, excluded from the recovered group. For both groups, the greatest variation is between subjects, rather than

Table 4. Post-recovery observation period for recovered participants.

Time (months)	Number of children	Percentage of recovered children
12-17	5	8.1
18-23	9	14.5
24-29	10	12.2
30-35	11	17.7
36-41	12	19.4
42-47	4	6.5
>48	11	17.7

within subjects. It is clear, however, that the initial level of disfluency does not distinguish between the two groups. In fact, the children who later recovered exhibited slightly more disfluencies on initial evaluation. Significantly, although in many cases complete recovery occurs a year or two later, the sharp reduction in SLD for the recovered group, as opposed to the relative stability of SLD for the persistent group, creates a large gap as soon as 12 months post-onset. The departure of the curves at that point may serve as an important prognostic feature. The lining up of the top and bottom sections of Figure 1 emphasize this point.

It is also worth noticing that the SLD for the Recovered group dips below the established criterion of 3 and is well into the "normal zone" for the group as a whole sometime between 2.5 and 3 years post-onset. Similarly interesting is the fact that for the persistent group, the level of SLD remains somewhat stable for the 2nd and 3rd years, and eventually dips, reaching very close to the minimal criterion point established for admitting children into the study as stuttering. Because a vast majority of persistent children should have received and did receive treatment, it is not possible to examine to what extent treatment affected these levels.

The data on the frequency of occurrence of stuttering-like disfluency are complemented by data on the mean number of repetition units—that is, the number of extra times that part-word or single-syllable words were uttered per instance. This measure reflects the extent or length of disfluent events (Ambrose & Yairi, 1995). The results of this analysis are depicted in Figure 2. As can be seen, the lines for the two groups almost mirror their respective lines in Figure 1. In other words, for both groups as the frequency of SLD decreases, so does the average length of the instances of such disfluency, eventually approaching the normal level of fluency.

Severity Ratings

Mean clinician and parent severity ratings for persistent and recovered children are shown in Figure 3. Intervals are based on time post-onset of stuttering, not on whether the visit was initial, 6 months later, and so forth.

Parents were not informed of clinician ratings before making their own ratings, and clinician ratings were performed independently of parent ratings. Clinician severity scores were based on 4 subscales, whereas parent ratings allowed for only a single global score. Close to the onset of stuttering, during its first 6 months, clinician ratings indicated that 33% of participants exhibited mild stuttering; 45%, moderate; and 22%, severe. Ratings ranged from 1.16 to 5.33 for the persistent group and from 1.17 to 6.32 for the recovered group. Parent ratings placed 24% in the mild category; 47%, moderate; and 29%, severe. Ratings ranged from 1.0 to 5.0 for the persistent group and 1.0 to 6.0 for the recovered group. Either parents rated children as >1 before the evaluation or clinician ratings exceeded 1.

Over the course of stuttering, for children whose stuttering persisted, mean clinician ratings are consistently slightly higher than parent ratings but generally follow the same path, whereas mean ratings by clinicians and parents for recovered children are virtually identical. For both clinician and parent ratings, variability was quite stable, with standard deviations of about 1.5 for each visit.

Discussion

In evaluating the results of the first 10 years of this intensive longitudinal investigation, several of its

Figure 2. Repetition units over time for persistent and recovered groups.

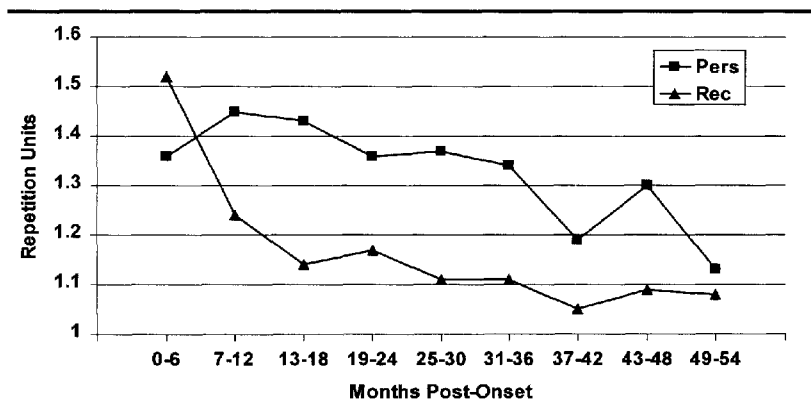
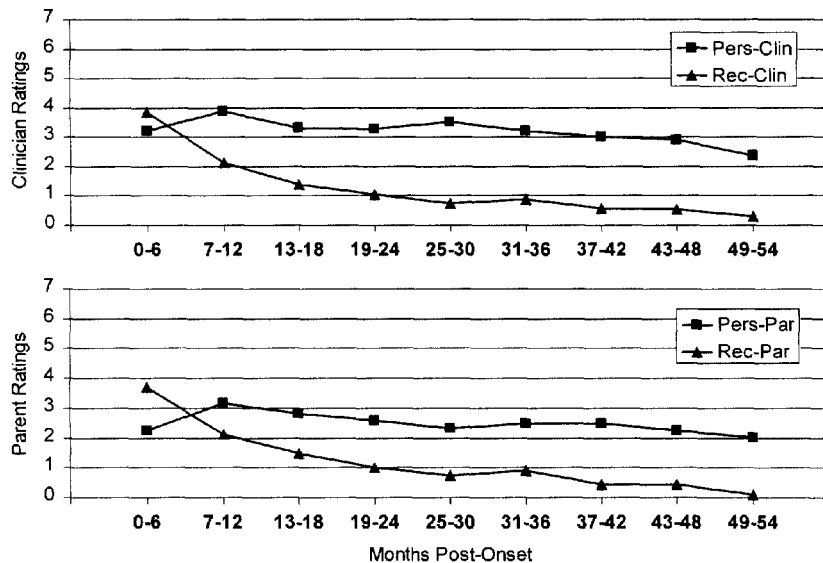


Figure 3. Mean severity ratings of clinicians and parents over time for persistent and recovered groups.



strengths should be kept in mind: (a) The study is large in scope—84 children compared with 43 in the Andrews and Harris (1964) study. (b) The sample is epidemiologically sound in an attempt to provide reasonable representation of the population that ever expressed stuttering from as close as possible to its onset. (c) The central body of the results is anchored in evidence from “hard” speech-based data, not retrospective reports. (d) The 1,000- to 1,500-syllable speech samples provide reliable examples of the child’s speech and language. (e) Multiple speech samples recorded on different days for each visit with different conversational partners add to the validity of the data. (f) Repeated samples are obtained to observe the children several times per year over a period of at least 4 years after onset. (g) Multiple classification criteria increase confidence in the effort to determine persistency and recovery.

Magnitude of Persistence and Recovery

The finding that 26% of the participants persisted in stuttering whereas 74% stopped provides strong support to previous high-end estimates of recovery. This figure falls in the middle of the high-end estimates—including 65% by Ryan (1992), 79% by Andrews and Harris (1964), 80% by Panelli et al. (1978)—all of which were based on longitudinal studies. The recovery figure is clearly supported by the data on the consistently

diminishing SLD levels and severity ratings.

The repeated parent reports, over several years, regarding the presence or absence of stuttering at home, accompanied by the parent severity ratings along with the experimenters’ impressions and independent severity rating (before becoming familiar with the objective disfluency counts) greatly reduce the possibility of a child’s being misclassified as recovered on the basis of disfluency counts from speech samples alone. Recently, Onslow and Packman (1999) stated that home speech samples must be used to establish recovery.⁴ Although it is quite possible for some variations in frequency/severity of stuttering to occur from situation to situation (Silverman, 1972; Yaruss, 1997), it appears less than likely that the presence of a stuttering problem, once diagnosed at home and confirmed in the clinical environment, will be completely missed by all concerned during formal and informal observations in several environments over a period of several years. The very similar, sometimes identical, severity ratings by parents and clinicians for both groups would bear out this conclusion.

Furthermore, in our opinion the present 26% persistence rate is an overestimate. As explained, children who gave even a slight suspicion of (rarely) exhibiting

⁴Home samples have their own problems. For example, the timing and situation chosen by parents for home sampling can be quite selective in terms of the level of emotionality of the situation, questions asked, parents’ reactions, length of the sample, etc. These issues have not been addressed in current research.

characteristics of stuttering were kept in the persistent group. For all practical-clinical purposes, however, these children would be considered recovered. To drive the point further, these "persistent" children would never have met the minimal criteria for stuttering had they been referred by their parents at that point as candidates for entry into the study. If such cases continue to accumulate as the investigation progresses, a third category of "unclassified" or "clinically recovered with traces of stuttering" should be considered, which would further reduce the persistent group.

Another significant factor that strengthens our conclusion that 26% persistency is an overestimate and 74% recovery is a guarded estimate for the population at large relates to incompleteness of counts. One example is reported but unverified cases of stuttering and recovery. The present investigators have had several experiences with parents concerned about either their child's sudden stuttering onset or a significant surge in his/her stuttering. Although the parents provided very vivid descriptions of stuttering during the initial telephone contact, less than 2 weeks later, they canceled scheduled diagnostic evaluations because, reportedly, the child stopped or drastically reduced stuttering. Another example is that of unreported cases. Because recovery can take place at a very early age and within a short period (a few months) after onset, it is highly probable that many cases go unreported. These children are often unaware of their stuttering history, even if it was severe. Evidence for this scenario was detected in families of participating children where we belatedly discovered cases of unreported stuttering among the child's siblings. In summary, there are good reasons to believe that the true incidence of recovery reaches and exceeds 80% of all cases, confirming Andrews and Harris' (1964) findings. Conclusions that placed the mean recovery at a lower level (e.g., 42% according to Wingate, 1976) were based on samples that included teens and adults, where persistent stuttering is identified but cases of recovery in early childhood may easily be missed. Such samples are biased towards persistency (Yairi et al., 1996), a point that was not fully considered by Wingate.

Another issue is the representativeness of the children in terms of initial stuttering severity and the possible effects of severity on either persistency or recovery. As reported in the section on description of subjects, the initial severity status of the present sample, based on ratings, resembles a normal distribution centered on what would be considered moderate stuttering. Furthermore, in terms of SLD in the children's speech, the stuttering severity of the present subject sample appears greater than most previous accounts of early childhood would have predicted (Bloodstein, 1960; Bluemel, 1932; Froeschels, 1964; Johnson et al., 1959), portraying it as typically mild in nature. Interestingly, the frequencies of total disfluency

and of SLD for children in the present sample are comparable to data reported by Johnson et al. (1959) for a large group of children. In addition, in the present study, children with mild stuttering were in the minority, whereas Bloodstein noted that typically "The distribution of stutterers with respect to frequency of stuttering is skewed....That is, there are more 'mild' than there are 'severe' stutterers..." (Bloodstein, 1995, p. 3).

There is no indication whatsoever that children who recovered had initially milder stuttering. To the contrary, the data show a slight tendency toward more severe stuttering initially in the recovered group. We agree with Wingate (1976) "that level of severity does not necessarily limit the expectation of recovery in any particular case" (p. 114). Most certainly, there are no grounds to suspect that children who recovered early did not exhibit "real" stuttering. They, like any other child in the study, were properly identified by several observers according to well-established criteria and included some of the most severe cases in the sample. There is no justification for the notion that children who stutter less for than 6 months should not be considered as "real stutterers" and hence should be excluded from the count. The purpose of epidemiological studies is to account for all cases identified under any disorder to better understand all of its characteristics. In fact, the duration of stuttering was one of the main independent variables in this investigation.

Dynamics of Stuttering and Timing of Recovery

The graphs of the data presented earlier confirm previous reports on smaller numbers of subjects (Yairi & Ambrose, 1992; Yairi et al., 1993) which demonstrate that, in general, stuttering frequency and severity reach their peak during the early stage of the disorder. (Parent reports indicated that frequency and severity increased during the first few weeks or months.) After the disorder reaches its peak, within a few weeks or months after onset, there is a strong tendency for a substantial alleviation in the frequency and severity of stuttering. This tendency is seen in all measures employed. Although substantial reduction during the first year appears to be a reasonably good predictor of eventual recovery, it should not be confused with the actual occurrence of complete, confirmed recovery. Some children do indeed exhibit recovery within a few months or a year post-onset. In the majority of cases, however, recovery is a slow, gradual process that may begin during or after the first year and reach completion at various later points in time up to approximately 3 years after onset—occasionally up to 4 years. It is clear, however, that a longer observation period, as has been suggested by Onslow and Packman (1999), would have resulted in a higher recovery rate. Although it is possible

to conclude that spontaneous recovery, like onset, is primarily a phenomenon of early childhood, the beginning and end of the disorder are not symmetric—the declining phase lasts considerably longer than the ascending phase—giving rise to the possibility of maturational processes (Wingate, 1976). On the other hand, a stable disfluency level during the first year may be an indication of persistency. Although the tendency for eventual decline in severity for the persistent group may have been influenced by treatment, it is intriguing that complete recovery did not occur during the course of the study, whereas in the recovered group, complete recovery occurred in the absence of formal treatment.

The Gender Factor

Although the data continue to indicate that the percentage of boys who persist is larger than that of girls, this trend was not statistically significant in the present study. The same proportions with a sample twice as large would be significant. Seider, Gladstien, and Kidd (1983), however, did find statistical significance ($p = .005$) with a much larger sample of 259 individuals, but their sample consisted primarily of adults with persistent stuttering. Although there were more males who persisted than males who recovered, the pattern for females was similar to the sample presented here, and the male-to-female ratios in the Seider et al. study are almost identical to those reported here. Thus, it appears that even with radically different sampling techniques, females evidence a higher recovery rate than do males. Furthermore, the influence of gender is also seen in the tendency for females to recover at an earlier age. The sex-modified expression of not just stuttering, but of persistence versus recovery, reflected in the smaller proportion and shorter duration of stuttering in females provides a provocative clue as to the genetic involvement in these two pathways (Ambrose et al., 1997; Cox & Kidd, 1983; Seider et al. 1983).

Interpretations and Implications

A massive effort over a decade aimed at conducting an inclusive epidemiological investigation of early childhood stuttering has allowed for observations that are often impossible to make in clinical samples prone to biases in subject selection—especially the problem of missing substantial proportions of all cases that express the disorder. This appears to be the most solid explanation for discrepancies between the present findings and some previous findings (e.g., Ramig, 1993) or between the conclusion of the present study and previous estimates of overall lower recovery and higher persistency rates (e.g., Wingate, 1976; Young, 1975). As data that comply with epidemiological research principles solidify, it becomes

increasingly evident that only a minority persists in stuttering, whereas in the majority of cases stuttering is a temporary, often short-lived disorder that disappears without formal intervention and apparently on its own. Improvement and recovery predominate during the early stages of early childhood stuttering. The data reinforce Yairi and Ambrose's (1992) as well as Wingate's (1976) previous conclusions that traditional concepts of stuttering as a disorder that becomes progressively more complex and severe with time (e.g., Bloodstein, 1960), although true for some, do not hold for the group at large.

Related to the above, continuous observations and close monitoring of the children lead us to conclude that although early stuttering often undergoes up-and-down cycles, once recovery has been achieved and maintained for *several months*, chances are very high that it will be permanently sustained. There is no support in the present data, nor in Andrews and Harris's (1964) data, for the belief that reversal of recovery that has been maintained for a substantial period is common at these ages (Bloodstein, 1995). This is quite different from recovery in adults who report residual stuttering (Wingate, 1976) and from the frequent relapses observed in many older children or adults who undergo treatment for their stuttering. Furthermore, recovery at this age appears to be complete in terms of normal speech fluency. A child classified as recovered did not exhibit stuttering in his/her speech. In a perceptual study of the speech of several of these recovered children, listeners were unable to differentiate better than chance between speech of recovered children and speech of normally speaking control children (Finn, Ingham, Ambrose, & Yairi, 1997). In this respect, it is interesting to cite Wingate (1976), who stated that residual tendency for stuttering "does not qualify the matter of recovery in the sense of raising the question as to whether these individuals have 'really' recovered" (p. 115).

The question of why some children recover whereas others persist cannot be answered positively with any new information obtained in this study. In a previous familial aggregation study (Ambrose et al., 1997), however, which used many of the same subjects, there were strong indications that these two developmental paths are influenced by factors that appeared to be of a genetic nature. They suggested that genetic factors suspected to exist in the persistent group may be associated with other deficits that may complicate stuttering and prevent or slow down the recovery process. Research along these lines, as well as biological analyses, are currently in progress. As discussed in Paden et al. (1999) and Watkins et al. (1999), phonological and language skills may have a role in persistency and recovery, but this is far from clear. Although considerations that environmental factors—such as brief parent counseling or parents' informal correction of the child's stuttering—contribute

to recovery cannot be ruled out and should stimulate additional research, convincing evidence for this possibility does not presently exist. There is no credible scientific evidence to support arguments that brief parent counseling, such as provided in this study, can be so effective as to actually result in complete recovery. A recent study has indicated that such indirect intervention was not effective (Fortier-Blanc, Labonte, Beauchemin, & Jutras, 1997). The fact that some children do persist and the obvious gender differences in persistency and recovery also call into question the strength of such arguments. One of the most important implications of the present results pertains to clinical efficacy research in early childhood stuttering. The findings make it amply clear that any claim of successful therapeutic regimen and/or any clinical efficacy study must recognize the strong factor of unaided, spontaneous recovery—an argument recently articulated and expanded by Curlee and Yairi (1997, 1998). An acceptable experimental design should not only include a nontreatment (by parent choice) control group, when possible, but also especially strive to include unbiased subject samples. Clinical investigators claiming that every child who begins stuttering should receive immediate intervention should include in their experimental and control samples children in close proximity to the onset of their stuttering to assess with greater validity the effect of unaided as compared to aided recovery. Studies that include children with a longer stuttering history (say one year) and use adequate controls can certainly contribute to the understanding of the relative merit of different treatment techniques, but will not be capable of isolating the full effect of spontaneous recovery.

Finally, epidemiological information such as that reported here should be considered in theoretical models of stuttering that attempt to explain its cause and mechanism. It may also be useful in planning clinical services, establishing service policies, and counseling parents of young children who exhibit stuttering. Most importantly, although considerable attention has been given to the high level of spontaneous recovery, it is hoped that this study may create intense focus on identification of the subgroup of children who are at higher risk for chronic stuttering. These are the children who should be identified early and have priority as the recipients of available clinical resources.

Future Research

In spite of the large size and other advantages of the present longitudinal project, more and larger-in-scope research on the course of stuttering and the rate of persistency and recovery is needed. Better understanding of spontaneous recovery would improve our insight about

factors that might contribute to successful treatment, and understanding of persistency may improve means for containment of the problem. Follow-up of children born into families with a high risk for stuttering would appear to be particularly profitable (see also Kloth, Janssen, Kraaimaat, & Brutten, 1998). Also, the development of stuttering should be studied in conjunction with other developmental aspects, such as emotional reactions, motor factors, hemispheric lateralization, and linguistic skills. Such research is likely to further understanding of differences between the persistent and recovered subtypes of stuttering. Of course, more precise methods are always desirable. For example, although the present study included a good number of children who were followed from very close to onset, future studies should strive to include larger numbers and proportions of such participants within 3 months of onset. More frequent follow-ups and the inclusion of more children from various racial and ethnic backgrounds should also be considered. It should be understood, however, that the purpose of large-scale, long-term epidemiological research is to obtain *estimates* of the population trends and, as in the present case, to attempt to study the effects of time. This is quite different from questions asked in clinical research studies, where the effect of specific intervention must be isolated. Epidemiological studies have their strength in the large scope and the opportunities to conduct multiple observations over a long period of time. A major question in such research is the definition of recovery and persistency. There is no simple answer to this question because, so far, there is no simple answer to the question of how to define stuttering.

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Appendix. University of Illinois Stuttering Research Project.

Stuttering Severity

Name _____ Date _____

Session # _____ Rater _____

Points	SLD	Duration (3 longest)	R.U. or Length	Tension
0	< 2			none
1	2-3	1	very brief	none-slight
2	3-5	1.5	<.5 s	slight
3	5-7	2	<1 s	slight-moderate
4	7-10	3	<1.5 s	moderate
5	10-15	4	<2 s	moderate-excessive
6	> 15	>4	2-3 s	excessive

Secondary Characteristics

.25 _____ mild, very few, infrequent, minimal; not noticeable unless looking for it

.33 _____ mild, few, & occasional; barely noticeable

.50 _____ moderate, few, & sometimes; noticeable

.66 _____ moderate, some, &/or often; obvious

.75 _____ severe, many, &/or frequent; distracting

1.00 _____ severe, many, & frequent; severe and painful looking

SLD points + duration points + tension points divided by 3 =
 (_____ + _____ + _____) = _____ / 3 = _____

Additional points for secondary characteristics _____

TOTAL SEVERITY SCORE _____

Comments: _____
