A COMPARISON OF METHODS FOR THE MEASUREMENT OF RATES OF DISFLUENT BEHAVIOR OF STUTTERERS

by

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INTRODUCTION

Stuttering theory and the associated technology of stuttering treatment has not reflected the kind of progressive change and refinement which might be expected from a developing science (Beech and Fransella, 1968). Could it be that the observed absence of progressive change is due to benign neglect? On the contrary, Carroll (1964) indicated surprise at the lack of definitive findings concerning stuttering in view of the considerable quantity of research devoted to the topic. Bloodstein in his 1975 Handbook on Stuttering needed to resort to a classification system to treat the multitude of theoretical postures which have been advanced to explain the phenomenon of stuttering.

Stuttering research is confounded by a lack of solid and reliable evidence, and an abundance of contradictory and conflicting experimental findings. The supply of theoretical postures appears to reflect the disarray of the experimental literature.

A hallmark of a developing science, applied or theoretical, includes agreement among its advocates on a number of factors. It appears to be necessary to have reasonably good agreement on definition of terms, specification of the dependent variables, methods for the measurement of these variables, statements of the several conditions under which the variables need to be studied, selection of useful exploratory designs and procedures for the analysis of data. These factors taken as a set are a prerequisite for a science to exhibit its unique property of showing a cumulative progress.

One could recite a litany of the points of disagreement in the literature over the definition of terms, the specification of appropriate dependent variables, the shortcomings of the various measurement methods, the specification of relevant independent variables, and the adequacy of a broad spectrum of experimental designs. With regard to data analysis, it appears that statistically conceived chance is the devil (Sidman, 1960). An alternative to statistical comparison appears to be the narrative or case study report. In attempting to cope with the milieu of the stuttering literature it is conceivable to adopt the posture of the Universal Man and attempt to deal with all data which comes forward. However, to adopt an eclectic position fails to make the life of the serious student of stuttering more parsimonious. Data are found in the literature which utilize a variety of definitions of terms, different measurement systems and several analysis procedures. Unless one is content to limit his studies to the "conclusion level," he is condemned to be buffeted about by data. As Bachrach (1958) has noted, "To be eclectic may . . . mean that he has his feet firmly planted in mid-air." One should have some convictions as to what kinds of data are most needed by his area of scientific interest. This will give direction to the student's research and clinical activities and will provide his work with an over-all unity that will permit him to make a sounder contribution. The cumulative development of a science provides the only final answer as to the importance of any particular data.

Two decades ago a line of investigation was reported which explored the feasibility of application of the methodology of operant

conditioning to the problem of stuttering (Flanagan, Goldiamond and Azrin, 1958 and 1959). The methods of operant conditioning, referred to today as behavior analysis, were proving of value in providing a degree of prediction and control in the larger arena of behavior as scientific data. A major distinction between behavior analysis and other approaches to the science of behavior is in the methods employed to study the phenomenon in question. Methodologically, behavior analysis uses single subject designs, repeated measurement, direct observation and graphical analysis (Hayes, 1978). A more common methodological approach in the behavioral sciences might include group designs, pre-post measurement, inferential statistics and comparative analysis. While the ramifications of the use of different methodologies are many, the major difference seems to boil down to different methods yield different results. A strong argument for the use of the methods of behavior analysis is that single subject designs produce data which have generality for individuals whereas the essential characteristic of a statistical study is that it deals with a group of individuals. The generality of group statistical studies appears to be limited to making predictive statements about groups of individuals. When one desires to make a predictive statement about a given individual, the use of a scientific law based on the generality of an observation among individuals appears to be a firmer ground than a law based on the generality of observations based on groups. Sidman (1960) treated this point in depth in his discussion of intrinsic versus imposed variability.

The basic measurement of the dependent variables in behavior analysis is rate of behavior. To assess the rate of occurrence of any

behavior, it is only necessary to know that a specific behavior is controllable, repeatable and contains movement. To illustrate, if a child says a word, at its completion he is free to say another word. If he does not say a word, his emission of words would be zero. However, if he says five to eight words in a given amount of time, information is available about his rate of emitting words.

Rate, as a way of viewing behavior has been suggested by a number of authors (Bijou, et al., 1968; Ferester and Perrott, 1968; and Skinner, 1938, 1953, 1966, 1968). Skinner, however, has made the most dramatic case in favor of rate in applied and basic research. He gives the following seven characteristics of rate.

First, frequency of response is an extremely orderly datum. The curves which represent relation to many types of independent variables are encouragingly simple and smooth. (The assumption here is that if human behavior is a lawful one, it needs a measure which reflects the orderliness of the individual.)

Second, the results of a study in which rate is used, are easily reproduced. Skinner suggested that it is seldom necessary to resort to groups of subjects at this stage. The use of rate permits a direct view of the behavior process which up to this time has only been inferred. He goes on to suggest that if an experiment is reproduced and the results differ from the initial experiment, averaging or other statistical modification should not be resorted to. Rather, the results should be taken as a warning that some relevant condition has still to be discovered and controlled.

Third, since rate provides results that are easily reproduced, the concepts or laws that emerge from this type of study have an

immediate reference to the behavior of the individual which is lacking in concepts or laws which are products of statistical operations. Skinner suggests that when behavior analysis is extended to human affairs in general, it is a great advantage to have a conceptual system which refers to the single individual without comparison to a group. As was suggested earlier, in this way a more direct application to the prediction and control of the individual is achieved.

Fourth, rate of response provides continuous data of many basic processes. Rate allows one to follow a performance for extended periods of time. Rate being a continuous measure is in marked contrast to methods which may observe the learning process on a pre-post basis where the continuity of the process must be inferred.

Fifth, rate of response in many instances lends itself easily to automatic experimentation. This characteristic may or may not be crucial in the stuttering treatment situations. To the behavioral scientist it is sometimes necessary to measure processes in behavior which cover extended periods of time. Personal observation of such material is unthinkable, so that when rate is used it is convenient to automatically record the results. Several studies have been directed toward the development of devices which would have the capabilities of automatically recording disfluent and fluent speech (Flanagan, 1960 and 1966). However, functional apparatus have yet to be developed. A recent development (Sololove, 1973) suggests the feasibility of the use of self-observation in situations which require extended observation of response rate of an individual.

Sixth, and perhaps most important of all according to Skinner, rate provides a substantial basis for a concept of probability of behavior. Probability is a concept toward which the science of behavior has been groping for years. As mathematicians have pointed out, probability is simply a way of representing a frequency of occurrence. Probability of behavior can be dealt with by attending to the repeated appearance of the specified behavior during an appreciable interval of time. Rate then provides a good physical reference for such a concept. Every clinician wants a client to learn more effective and efficient communication skills. The clinician needs to make probability statements about the client. Any time the clinician sets up conditions in the clinic, such as presenting the child with a series of pictures to talk about or instructing him to repeat sentences, the clinician is predicting on the basis of past experiences that the child will be able to perform the required task.

The concept of probability also applies to treatment objectives. A treatment task is one of arranging clinic conditions as best one can to assure the client's success in reaching the treatment goals, using the defined response class as a unit of measurement and rate of response as a means of viewing performance. These are tools the clinician can use to predict the enhancement or development of the client's communicative ability.

Finally, Skinner declares that rate is most sensitive to the manipulation of independent variables. Although the previous six characteristics are important, this characteristic may be seen as having the most immediate relevance to the behavior analysis of stuttering or disfluency.

Williams (1978) indicates that appropriate examination of the stuttering problem needs to reveal significant aspects of (1) the attitudes and reactions of listeners to the speaker and his speech, (2) the attitudes and reactions of the speaker to those of his listener and to himself and his own speech, and (3) the speech behavior of the speaker. Williams' position is reflective of the opinion in the stuttering literature that stuttering is something more than excessive disfluent speech. However, there does not appear to be good agreement on what the 'something more' is or how to observe it. While a behavior analysis must limit itself to the study of observable behavior, i.e. the disfluent and fluent speech of stutterers, it can not deny the existence of phenomenon which is presently beyond the scope of the methodology. Perhaps the scientific understanding and treatment of stuttering could be advanced by study of the data which are available. The rates of disfluent and fluent words are data which are available whenever an individual who stutters attempts oral communication.

Percentage has been the primary measure in the disfluency or stuttering literature. It clearly shows the ratio between fluent and disfluent words. If a stutterer emits 1000 words and 100 of them were spoken disfluently, he obviously had 900 fluent words. A ratio relationship exists between the fluent and disfluent words. The client had nine times as many fluent words as he had disfluent words.

Rate can give the same information plus valuable additional knowledge about the vocal behavior of the speaker. If the same stutterer had taken ten minutes to complete the 1000 words, he would have had a fluent word rate of 90 words per minute ($900 \div 10$). His

disfluent word rate would be ten words per minute (100/10). The relationship between the fluent and disfluent word rate is still nine. His fluent word rate is nine times faster than his disfluent word rate. A measure of the quality of the speaking performance is maintained with rate as the measure.

Typical disfluency measures utilizing only frequency, not time, are not sensitive to whether an individual is speaking slowly or rapidly; only the amount is revealed. Referring back to the original example, the ten percent disfluent word statement gave the clinician no idea of how long the stutterer took to complete the communication. Since rate by definition includes the time dimension, the clinician has a built-in reference to proficiency. The individual who communicated for ten minutes and spoke 900 words fluently with a fluency rate of 90 words per minute is much more proficient than the individual who took twenty minutes, also spoke 900 fluent words, but had a fluent rate of 45 words a minute.

Percentage has an arbitrary ceiling of 100. However, there is a need to distinguish between the individual who takes ten minutes to speak 1000 words fluently, i.e. 100 percent fluency score, and the individual who takes twenty minutes to get the same percentage score. Rate, by taking this into account, allows the clinician to see that difference.

Percentage also implies a reciprocal relationship between the fluent words and disfluent words. For example, a score of five percent disfluent words when compared to a previous score of ten percent implies that fluent word rate has increased and disfluent word rate has decreased.

Suppose that the individual mentioned earlier, who had a fluent rate of 90 words per minute spoke another 1000 words. This time he took five minutes instead of ten minutes and still spoke 100 words disfluently. His fluent rate would be 180 words per minute and his disfluent word rate would be twenty per minute. In this example as fluent words increased, so did disfluent words. Proficiency could also have decreased proportionately in rate and yield the identical reciprocal relationship.

Purpose

The focus of this study was to explore different procedures for the measurement of the rates of disfluent words, fluent words and clinician words emitted during conditions of conversational speech. The conversational speech task was selected since it may be considered most representative of the stutterer's communicative experiences. In support of this posture, Ayllon and Azrin (1968) indicated that only those behaviors that will continue to be reinforced after training should be selected for training. A conversational speaking task as opposed to a monologue or oral reading, appear to have a greater probability of being maintained in social settings.

Given that automatic apparatus for the recording of disfluent or fluent words is not available, the prospectus for tape recording the conversational probe and then counting the number of words spoken by categories is at best extremely time consuming. Van Loenen (1975) recognized many of these practical problems and investigated how many randomly selected fifteen second segments for the eight minute recording were necessary to predict the frequency of fluent words, disfluent words and clinician words. Her results of the coefficients

of correlation appear to indicate that for the three variables under study, the eight randomly selected fifteen second segments or one fourth of the total conversational speech recording are the minimum which can be sampled and maintain an acceptable predictive level ($r = .90$). These findings were based on the study of the recordings of conversations with fourteen stutterers.

After a period of using Van Loenen's sampling procedures to short cut the copious amount of time required to collect the rate data from the total eight minute conversational sample, questions arose concerning alternative and perhaps more convenient sampling procedures. For example, would sequentially selecting the first, second, third or fourth fifteen second segment for each of the eight minutes of recording produce different predictive power than the selection of eight fifteen second segment samples on a random basis? If predictive power of the sampling procedures proved to be equivalent, the sequential sampling would be more convenient and faster. Also, since Van Loenen's sampling procedure has been used to some extent, perhaps the study should be replicated with a larger number of conversational recordings than the fourteen originally used. That is, could the predictive power of eight randomly selected fifteen second segments be reproduced?

The specific purpose of this investigation was to compare by correlation procedures the predictive power of four sampling procedures. The sampling procedures are as follows: (1) a one-fourth sample consisting of eight fifteen second segments selected on a random basis, (2) a one-half sample consisting of sixteen fifteen second segments selected on a random basis, (3) a one-fourth sample consisting of eight

fifteen second segments selected on a serial basis, (4) a one-half sample consisting of sixteen fifteen second segments selected on a serial basis.

The specific serial samples studied were selected on a chance basis. For example, the total eight minute conversational speech sample may be viewed as a series of thirty-two fifteen second segments; one series was comprised of the odd numbered segments and the other of the even numbered segments. The determination of whether to observe the odd or even numbered sample was left to a table of random numbers. Rates per minute of fluent words, disfluent words and clinician words for the four sampling procedures were then correlated with the corresponding rates for the total eight minute conversational recording.

METHODS

Subjects

A total of twenty subjects from the Kansas State University Speech and Hearing Center, the University of Kansas Speech Clinic and the surrounding community participated in this study. The subjects included sixteen males and four females, ranging in age from 3 to 42 years, who at one time had received or were presently receiving treatment for stuttering.

Recording Procedure

The subjects were each seated at a table next to the experimenter in a quiet room. A tape recorder was placed out of the sight of the subject with the microphone placed in front of him. The experimenter conversed briefly with each subject to familiarize him to the experimental situation and to adjust the recorder.

Eight minute conversational speech samples were recorded with the experimenter serving as the interviewer. Questions were asked to elicit conversation for each speech sample. These questions inquired about the subject's special interests, hobbies and places he has visited or would like to visit. The early childhood subjects were asked to tell a familiar story and talk about their families or events that happened at pre-school. The clinician responded as she would in typical two party communication. Verbal prompts adopted from those employed by Hammond (1973) were provided when needed during the conversation. The experimenter timed each conversation with a stopwatch to secure eight minutes of recorded conversation.

Data Analysis

A verbatim transcript was compiled from each recorded speech sample in order to obtain a word count and to divide the sample into 15 second segments. A stopwatch was used to measure each 15 second interval on the tape and slash marks (/) corresponding with 15 seconds of tape were recorded appropriately on the verbatim transcripts. Each speech sample was thus divided into thirty-two 15 second segments on the transcripts.

The following word counts were tallied: the number of disfluent words spoken by the stutterer; the number of fluent words spoken by the stutterer; and the nunber of words spoken by the clinician.

The following categories were used as criteria for counting words: expressions of affirmation, of negation or of exclamation counted as one word; hyphenated words and compound nouns which appeared to function as single words were counted as one word each. Contractions and combinations such as "gonna" and "wanna" were counted as one word rather than as two words because of the judged difficulty of counting such expressions in conversational speech. Other words repeated singly or in a phrase were counted only once.

In order to count disfluent words, a definition of disfluency is required. For this study, a modification of Johnson's (1961) definition of disfluency was employed to analyze the conversational speech samples. Included from this definition were the following categories: an interjection of sounds, syllables, words and phrases; part word repetitions; word repetitions; phrase repetitions; broken words and prolonged sounds. Excessive pauses (Love and Jeffress,

1971) were also counted as disfluencies. Because of the suggested difficulty in judging utterance revisions and incomplete phrases, these were not included in the disfluent word count.

The number of disfluent words spoken by the stutterer, the number of fluent words spoken by the stutterer and the number of words spoken by the clinician were converted into words per minute by dividing the total number of words in each category by eight (total number of minutes).

Four types of sampling procedures were examined to determine the efficiency of measuring segments of speech. The first two procedures involved randomly selected 15 second segments while the last two procedures involved sequentially selected 15 second segments. Specifically, the four procedures consisted of the following segmentations: Procedure 1 - sixteen randomly selected 15 second segments; Procedure 2 - eight randomly selected 15 second segments; Procedure 3 - sixteen sequentially selected 15 second segments; Procedure 4 - eight sequentially selected 15 second segments.

Selection of random segments for Procedures 1 and 2, consisted of numbering thirty-two 3 x 5 note cards corresponding to each of the 15 second segments. The cards were shuffled five times and then the deck was cut for each subject. The experimenter then counted off the appropriate number of cards from the top of the deck corresponding to the segments to be examined in each procedure (i.e., sixteen cards for Procedure 1 and eight cards for Procedure 2).

Procedure 3 called for two sequential orders of 15 second segments. One was composed of the odd numbered segments, i.e., segments

1, 3, 4, 7....31. The other sequential order was made up of the even numbered segments, 2, 4, 6, 8....32. Subjects were individually assigned to the odd or even sequence according to a table of random numbers.

Procedure 4 involved four sequential orders. The first 15 second segment of each of the eight minutes was selected as one sequential order. The other sequential orders were respectively made up of the second, third and fourth 15 second segment of each of the eight minutes. Subjects were individually assigned to one of the four sequential orders by a random selection process.

For each sample selected a count was recorded for the number of disfluent words spoken by the stutterer, the number of fluent words spoken by the stutterer and the number of clinician words. These were then converted into words per minute by dividing the total number of words by the total minutes included in the sample.

Scorer Reliability

Pearson's product-moment correlation procedure was used to measure scorer reliability between the experimenter and another listener, both graduate students in Speech Pathology. Four randomly selected 15 second segments were examined to determine whether the number of disfluent words spoken by the stutterer, number of fluent words spoken by the stutterer and number of words spoken by the clinician were similarly recorded. The observer did not obtain the word counts for the word categories from a verbatim transcript. She was instructed to record word counts by making slash marks on a sheet of paper for each word of each category. The observer was allowed to replay each 15 second segment as often as necessary to insure accuracy of her counts. A total

word count for each word category was then derived for each subject by totaling the number of words recorded by the observer during the four 15 second segments.

Results indicated the inter-observer coefficients of correlation to be .99 for the number of fluent words spoken by the stutterers, .98 for the number of disfluent words spoken by the stutterers, and .99 for the clinician words. These data would suggest adequate reliability to permit further analysis of the data.

RESULTS AND DISCUSSION

The results of this research are presented in reference to 1) a t-test analysis for significance of the differences between means of the rates of fluent words, disfluent words and clinician words of the total conversational recording and the four sampling procedures and 2) the coefficients of correlation obtained when comparing the respective word rates for the four sampling procedures with the rates obtained by analysis of the total conversational recording.

If the means of a sampling procedure and the mean of the parent population do not differ significantly from each other and a high correlation between the two is observed, the most convenient method of predicting the real value of the population from the sample is to substitute y for x. If this condition can be met it is not necessary to go through the additional task of computing x by the regression equation. Table I lists the means and standard deviations of the rates per minute of stutterers fluent words, disfluent words, and clinician words from the four sampling procedures and similar rate data obtained from analysis of the total conversational recording. The means for the four sampling procedures were compared to the mean for the total conversational recording by word category, using t-test for related measures. The observed difference between all the means failed to be significant at .10 level of confidence. This finding is not surprising since each sampling procedure's mean fell within one standard error unit of the means for the data from the total conversation recordings. On the basis of this analysis it may be concluded that the observed mean differences between data analysis procedures may be attributed to

TABLE I

Means and Standard Deviations of Rates Per Minute of Stutterers' Fluent Words, Disfluent Words and Clinician Words Obtained From Four Sampling Procedures and Analysis of the Total Conversation Recording

Sampling Procedure	Category of Word Rate					
	Disfluent Words		Fluent Words		Clinician Words	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
1/4 Random Sample	7.3	4.1	59.4	26.9	57.5	25.0
1/2 Random Sample	6.9	3.3	62.9	27.5	59.7	21.5
1/4 Serial Sample	7.2	3.5	62.0	32.4	61.5	26.6
1/2 Serial Sample	7.3	3.9	64.7	31.1	57.5	22.4
Total Conversation Recording	6.8	3.3	61.6	27.4	60.9	23.0

variability intrinsic to the measurement systems in question. Given a high correlation between measurement systems a real value derived by one of these systems could be substituted for the other.

Table II presents the product-moment correlations of word rates for the eight minute conversational recording with four sampling procedures for rates of disfluent words, fluent words and clinician words. The sampling procedures were 1) a one-fourth randomly selected sample of fifteen second segments of the total recording, 2) a one-half randomly selected sample of fifteen second segments of the total recording, 3) a one-fourth serially selected sample of fifteen second segments of the recording, and 4) a one-half serially selected sample of fifteen second segments of the total recording.

For disfluent word rate correlation coefficients ranged between .97 for the one-half randomly selected sample to .85 for the one-fourth serially selected sample. The coefficient of correlation for the one-fourth randomly selected sample was .92 and for the one-half serially selected sample was .90.

With respect to fluent word rate, the correlation coefficients ranged between .97 for the one-half randomly selected sample to .91 for the one-fourth serially selected sample. For the one-half serial sample the correlation coefficient was .96 and for the one-fourth random sample the correlation was .94.

The correlations for clinician word rates ranged from .98 for the one-half randomly selected sample to .81 for the one-fourth randomly selected sample. The intermediate correlations were .94 for the one-half serial sample and .85 for the one-fourth serial sample.

TABLE II

Product-Moment Correlations of Word Rates for an Eight Minute Conversational Recording with Four Sampling Procedures for Rates of Stutterers' Disfluent Words, Fluent Words and Clinician Words

Sampling Procedure	Category of Word Rate		
	Disfluent Words	Fluent Words	Clinician Words
1/4 Random Sample	.92	.94	.81
1/2 Random Sample	.97	.97	.98
1/4 Serial Sample	.85	.91	.85
1/2 Serial Sample	.90	.96	.94

Van Loenen reported coefficient correlations for a one-fourth and a one-half randomly sampled fifteen second segments to be above .90 for disfluent words, fluent words and clinician words. This study confirms Van Loenen's results with the exception of the one-fourth randomly selected rate for clinician words where a correlation of .81 was obtained.

To reach a general conclusion about the four sampling procedures the data were pooled several ways: 1) by median correlation by specific sample procedure, 2) by median correlation for random versus serial sampling procedures, and 3) by one-fourth sampling versus one-half sampling procedures. In each analysis the one-half random sampling procedure yields the highest median correlation and the one-fourth serial sampling procedure the lowest. The one-half serial sampling procedure appears more powerful than the one-fourth random sampling procedure. A side observation perhaps needs to be made. That is, the most time consuming sampling procedure yielded the best correlations, and the least time consuming procedure yielded the lowest correlations.

Of the twelve coefficients of correlation, nine were at or above .90 coefficient which is generally accepted as a level sufficient for prediction of results for individual subjects and the other three correlations were close to the magical .90 level. To predict the margin of the true word rate at 95 percent confidence limits, the formula is $2S\sqrt{1-r}$ where S stands for an estimate of the standard deviation for the population, r stands for the reliability coefficient and 2 and 1 are constants. Using this formula, a plus-minus confidence

limits would be the standard deviation times 0.63 for an r of .90, for an r of .85 would be the standard deviation times 0.77.

It is difficult to recommend one sampling procedure over the other without knowing the confidence band which is acceptable or the amount of time which is available for data analysis. For example, given a disfluent word rate of ten per minute and a target disfluent word rate of one per minute and an estimated standard deviation of 3.5, how important is it to be working with a confidence band of $\pm$ 2.2 (r +.90) versus a confidence band of $\pm$ 2.7 (r +.85)? In either case there is no overlay of the confidence bands between baseline disfluent word rate and target disfluent word rate. Further, a one-fourth serial sampling procedure requires approximately ten minutes of data processing time and the one-half random sampling procedure requires approximately twenty-five minutes.

In conclusion, the four sampling procedures appear to be within acceptable limits for use in the data collection of rate of disfluent words, fluent words and clinician words. The precision required by the individual situation and the time available for data processing should determine which sampling procedure should be utilized.

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The point of view was taken that the stuttering literature has not reflected the cumulative progress which is generally associated with a developing science. Data in the literature utilize a variety of definitions of terms, different measurement systems and several data analysis procedures. It was suggested that cumulative progress might be exhibited if the students of the phenomenon limit these analyses to observable data collected within a common methodological approach. The methods of behavior analysis which uses single subject designs, repeated measurement, direct observation and graphic analysis were suggested as an appropriate choice. A defense of this choice was presented.

The case was then made for rate of behavior as the appropriate dependent variable.

The focus of this investigation was to explore the efficiency of four methods of measurement of rate of disfluent words and fluent words of stutterers along with clinician word rates which were emitted during conditions of conversational speech. It was pointed out that analysis of tape recording of conversational speech probes required copious quantities of time for data processing, hence, a sampling procedure appeared necessary. The specific purpose of the research was to compare four sampling procedures 1) a one-fourth sample consisting of fifteen second segments selected on a random basis, 2) a one-half sample consisting of fifteen second segments selected on a random basis, 3) a one-fourth sample consisting of fifteen second segments selected on a serial basis, and 4) a one-half sample consisting of fifteen second segments selected on a serial basis.

Tape recorded conversational speech samples were obtained with twenty stutterers. The entire conversational recording was analyzed for stutterers' disfluent and fluent words and for clinician words. The recordings were also analyzed by the four sampling procedures. All word counts were then converted to rate measures expressed in words per minute. Scorer reliability was determined to be .98 for stutterers' disfluent words, .99 for stutterers' fluent words and .99 for clinicians' words.

The mean word rates for disfluent words, fluent words and clinician words were respectively compared by t-test procedures. The analysis failed to find significant differences between total rate measures and the four sampling procedures.

Product-moment correlation procedures were used to compare each of the sampling procedures with the total count measures. All of the obtained correlations were highly significant. The one-half randomly selected sampling procedure yielded the highest correlation, and the one-fourth serially selected sampling procedure yielded the lowest correlations.

It was concluded that the four sampling procedures appeared to be within acceptable limits for use in the collection of rate measures for disfluent words, fluent words and clinician words. The precision required by the individual situation and the time available for data processing should determine which sampling procedure should be utilized.