URBAN APPLICATIONS OF PRECISION TEACHING TO READING

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Paper presented at

The International Reading Association Convention
May, 1977

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Abstract

A new measurement system, Precision Teaching, is now improving our diagnostic-prescriptive abilities by providing a daily view of student learning. Precision Teaching provides a graphic illustration of student progress, and uses data that is sensitive to changes in the teaching process.. It allows the teacher to estimate a student's future behavior and plan accordingly. This measurement system and its application to reading at the Forest Hill Elementary School are described in this article.

URBAN APPLICATIONS OF PRECISION TEACHING TO READING

It is generally accepted in education that diagnostic-prescriptive teaching is an effective approach. Gagne (1975) states that the ". . . evidence which is most general about effective teaching appears to show that the best way to insure learning is to carry out the sequence: 1) diagnosis, 2) prescription, 3) performance, 4) feedback." This means that the effective teacher first finds out what the student already knows how to do; makes an assignment for learning that represents an advance from this state; requires the student to show (by performing) that he has learned; and then provides "reinforcement" for that accomplishment. Inadequate teaching results when these steps are not followed -- when one or more of them is left out.

Precision Teaching Principles

Precision Teaching is a system of monitoring weekly learning (i.e.,the change in the growth of a particular performance). It is a unique system in that it measures not only performance, but also improvement in performance: learning. The system involves charting daily student performance on a standard chart, evaluating the charted performance in terms of its learning characteristics, and adjusting the learning environment in accordance with information gained from the charts. These data-based decisions to improve teaching are the products of Precision Teaching.

The first requirement of the system is that an academic or social performance be functionally defined. In Precision Teaching, the process of specifying objectives is called "pinpointing" and the objectives

pinpointed are functional "movement cycles." An objective that is defined as a movement cycle will be countable, contain action, and be repeatable. For example, "saying words" is a movement cycle which is the source of an objective that may be stated as: "to accelerate saying words from 10/minute to 90/minute by March 10, 1976."

Movement cycles are measured in terms of their frequency, i.e., occurrence per minute. Frequency is used for many reasons. One reason is that frequency is something all performances have in common and therefore can be used as a universal measure. A second is that frequency is sensitive to changes in the environment. A third is that when frequency is charted properly, both speed (frequency) and accuracy (percent) are retained.

For the purposes of communication and analysis, data are usually recorded on a standard chart (Figure 1). This chart is designed so that frequencies are plotted in terms of their proportional relationships to each other. Since Precision teachers usually use the same chart and similar charting conventions, communication is increased both within and between schools. Most important, however, are the features of the standard chart that allow accurate data analysis in terms of both frequency (performance) and celeration (learning). The design of the chart assures that relative changes in frequencies are displayed such that ". . . you can project the future course of behavior by drawing a straight line through the middle of the daily frequencies you've charted. The direction of this line shows whether the frequency of performance is increasing, decreasing, or remaining the same." (Lindsley, 1971).

Insert Figure 1

Celeration refers to the direction of the line. Acceleration (↗) refers to performances multiplying, and deceleration (↘) to performances dividing. As an example, a learner's performance on "saying ideas" (a comprehension skill) on Monday is 10 correct/minute and a week later, on Monday, the performance is 20 correct/minute. The celeration is described as a times 2 change: 2 times 10/minute is 20/minute. The frequency was multiplied by 2. Individual celerations are measured over a period of one week and can be used as a standard measure to compare different periods of time, different objectives, and cross-cultural performances.

The celeration path is extremely important to the teacher. It provides convenient information for decision-making. The teacher knows a learner's starting performance level, current performance status, and projected learning outcome.

Proficiency Levels

Mager (1962) suggested that instructional objectives contain criterion levels. Table 1 indicates some of the criterion levels suggested for oral and silent reading. These figures differ from those suggested by Precision Teaching, and are included for comparison.

Insert Table 1

Proficiency statements in Precision Teaching include both accuracy and speed. One type of proficiency is the level of a performance standard that results in long-term maintenance without additional practice. A second type, called "fluency," is that level of performance that results in successful accomplishment in real-world situations. In the past four years, proficiency levels have been defined in terms of accuracy and speed but there has not been a clear distinction made between proficiency and fluency (Brent, 1976).

Table 2 summarizes levels used by Precision teachers in the United States and Canada. At Forest Hill, we started with Starlin's (1976) recommendation of 80 per minute for sight words and 120 per minute for words in context. We soon changed these levels to 80 to 100 per minute for sight words and 130 to 200 per minute for words in context on Haughton's (1977) recommendation.

Insert Table 2

Application at Forest Hill

In our project, we desired to take a "new" look at children's acquisition of reading behaviors and the ways teachers could influence this acquisition. The newness of our approach was brought about by looking at learning through Precision Teaching, a measurement system.

In order to start our investigations, we chose to focus on one part of total reading: oral reading. We did not forget the importance

of reading comprehension but simply chose to isolate and study a prerequisite behavior. In addition, we decided that we were mainly interested in the oral reading of words in context: specifically, the context of the basal reader stories available to our classrooms. For all students, our terminal objective was that they read orally from their classroom (basal) reader, at or above their assigned grade level, at a rate of 130 words per minute correct, with 0-2 errors. On sub-objectives, words on Dolch or basal reader vocabulary lists, our aim was 80 per minute.

Our student population was drawn mainly from the lowest reading groups in our classrooms. The rationale was that these children were not learning or learning too slowly and that a change in the teaching process might benefit them.

Case Studies

The following three case studies have been chosen from among thirty. Twenty-nine of the studies showed similar patterns of rapid growth per week in learning. One study showed little learning. The three case studies were selected to represent a spectrum of ages and categories. The first case is a grade 1 child, the second a "perceptually impaired" child, and the third case is a fourth grader.

The terminal objective for the following case studies was the same. It was that the student will read orally from his/her basal reader, at or above grade level, at a minimum rate of 130 words per minute correct, with 0-2 errors.

Procedures used to reach the terminal objective were also similar. Teachers used two techniques for each student. One technique included the use of Dolch or basal sight vocabulary lists. These lists were sequenced according to the Dolch or basal suggestions. The Dolch words were printed on worksheets. Students practiced oral reading from the lists until they achieved a minimum rate of 80 per minute correct, with 0-2 errors. For students who didn't progress, a slice back procedure was used, i.e., a portion of the words were used for initial practice and expanded as more learning occurred.

The second technique was used concurrently with the first. Students orally read stories in which they had been previously instructed until they read their assigned pages at a minimum rate of 130 words per minute correct, with 0-2 errors. If the story was so difficult that the student did not progress, a slice back was made to a portion of the story or to an easier one.

Both techniques assumed that the students were able to read the words but needed drill in order to reach fluency. However, we found that some students had not mastered the most basic word lists and stories even though they had previously been instructed on these items. In these cases, the students had to learn the basic words and drill for fluency.

The charts included with each case study show the acceleration of the student's learning (dots) and the relative absence of errors (x's). For the classroom teacher, the chart can be read quite accurately at a

glance. An accelerating line of dots (correct answers) indicates growth: the steeper the line, the better the learning. A decelerating line of x's (incorrect answers) shows improvement. If more accurate and technical details of student learning are desired, the charted data can easily provide additional information. For example, using the suggestions described by White and Haring (1976), the first phase of Figure 3 may be described as 90, x1.30, 125 (90 refers to his first score, x1.30 to his growth per week, and 125 to his final performance). This technical data, though, is not necessary for classroom use and teachers may simply look at the graphic data to know whether the student is learning.

Student One

C. H. was one of 34 students in a first grade class. The class was divided into three reading groups, each of which was instructed in a different basal reader.

C. H. was receiving instruction in the primer level of the Bank Street Reader, and was the lowest reading group. He had passed the second pre-primer test which had been developed by the first grade teachers. C. H. was reading word by word and finger-pointing. He made several errors per page. He would repeat words to correct his mistakes.

Using the Precision Teaching approach, C. H. was given three consecutive one-minute practice timings on a story of 105 words. Later in the day, he was given a one-minute assessment on the same

story by the teacher. In both practice and timing periods if he completed the entire story within the minute time period, he was instructed to start the story again from the second to last page. (This convention allowed the child to continue his reading without delay until the minute timing was completed.) The same procedure is used to measure C. H.'s growth in reading the Bank Street vocabulary lists.

After three months of Precision Teaching practice, C. H. read with more fluency and usually did not fingerpoint. When he did fingerpoint, he scanned the line completely and swiftly.

The charts (Figures 2 and 3) clearly show that C. H. made progress.

Insert Figure 2

Insert Figure 3

Student Two

D. H., 11 years old, was one of twelve students in a P. I. (Perceptually Impaired), self-contained class. The class was divided into two reading groups. One group was instructed using Precision Teaching methods; the second was instructed in a basal reader approach.

When D. H. previously had been instructed in a basal reader, he was at the primer level in the Read series. He was reading word by word and finger-pointing most of the time. He made few mistakes - hesitating and silently attacking words rather than verbalizing his errors. His comprehension of passages was poor, relating verbatim rather than making interpretations or recalling facts.

Using the P. T. approach, D. H. had daily three-minute practices on the Dolch word list and a one-minute timing on the same list. He also had a three-minute practice and a one-minute timing on a passage in the basal primer text. This passage was longer than he could possibly read in one minute; therefore he did not repeat any portion during the timing.

After Precision Teaching instruction, D. H. read with more fluency. He occasionally used his finger as a guide across a line, rather than pointing to individual words. His comprehension (assessed by his oral summary of silently read passages) appeared to be improved. This, combined with his improvement of word recognition (attaining proficiency at the pre-primer through second grade Dolch word list) has enabled D. H. to participate successfully in additional instruction in a 2.1 grade level Bank Street basal reader. Figures 4 and 5 indicate the progress D. H. has made.

Insert Figure 4

Insert Figure 5

Student Three

D. T. was one of 23 students in a fourth grade class. The class was divided into four reading groups, each of which was instructed in a different basal reader.

D. T. was being instructed on the fourth grade level of American Adventure (American Book Co.). She had passed the 3-1 and 3-2 standardized book tests. D. T. read word by word, finger-pointed and made numerous repetitions in a line. Her oral reading was very halting. She made several errors per page, and she made little attempt to self-correct. She never volunteered to read orally.

Using Precision Teaching techniques, D. T. practiced reading a passage twice from a story on which she had already been instructed. The passages generally had about 225 words per page. When she is finished practicing, a one-minute timing was administered. Since the passage had more words than she could read in a minute, she began at the beginning everyday and read as much of the passage as possible. A similar procedure was used to measure D. T.'s growth in reading the American Book Co. vocabulary list.

After two months of Precision Teaching, D. T. started reading a new story during her Precision Teaching practice at a frequency of about 100 words per minute correct and within a few days reached a level of 200 words per minute. D. T. read with much less hesitation, made few repetitions, finger-pointed less, and had an improved attitude toward reading. She regularly volunteered to read orally. Figures 6 and 7 illustrate her growth.

Insert Figure 6

Insert Figure 7

Discussion

This article has focused on a measurement system called Precision Teaching that clearly shows student learning. Daily assessment and the charting of obtained data are the major requirements of the system. The charts are obviously a concise and graphic way of portraying data.

However, charting is not done just to obtain a clear picture of student performance. The frequency data are sensitive to changes in the teaching/learning situation. Data are recorded daily and therefore readily available to the teacher to act on before student failure occurs. Thus, the chart becomes an invaluable teaching tool that allows data-based decisions to be made by the teacher. These decisions are made often enough to insure that most students learn, and learn quite rapidly.

Precision Teaching measurement creates a host of questions about whatever academic subject it is used with. As Lord Kelvin said,

> Accurate and minute measurement seem to the non-scientific imagination a less lofty and dignified work than looking for something new, yet nearly all the greatest discoveries are made this way.

At Forest Hill, we are asking questions about reading in the areas of curriculum, teaching methods, and criterion levels. For the first time, we have a data-based system to use in attempting to answer these questions. Since Precision Teaching measurement is applied by classroom teachers to their students, the system benefits students while yielding important data on curriculum and methods.

This paper has also indicated that suggested criteria levels for oral reading may be too low. Our minimum level for all grades was 130 words per minute in context. Many students read at 200 or more

words per minute. Guides that suggest lower minimum rates should be questioned in light of the Forest Hill experience and other data obtained by Precision teachers throughout the U. S. and Canada.

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Table 1

Suggested Minimum Speed of Reading in Basal Readers, Grades 1 to 7 and Above

Grade	Oral*	Silent*
1	60	60
2	70	70
3	90	120
4	120	150
5	120	170
6	150	245
7 and above	150	300

Source: McCracken (1967)

*Words per minute.

Table 2

Suggested Minimum Speed of Reading-Precision Teaching

Source	*Oral-Sight	*Oral-In Context
Starlin (1970)		100
Haughton (1972)		100
Alper (1973)	60-80	100-120
Hoeltzel (1973)	60-80	100-120
Willis (1974)	80-100	**120-150
Starlin (1976)	80-100	120-150
Haughton (1977)	100-120	200-300

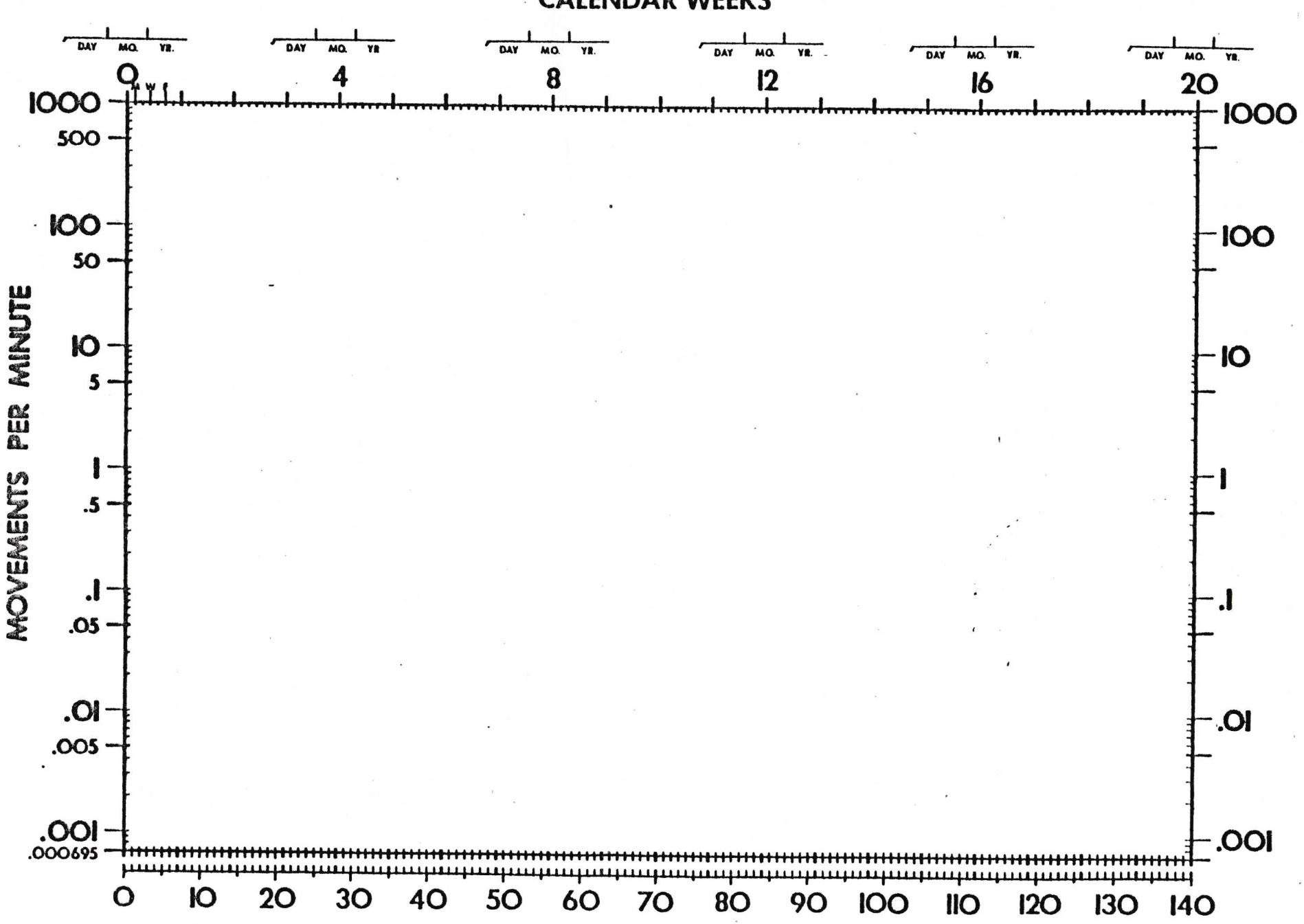
*Words per minute

**Grade 1, 100-120; grade 2, 100-150; grade 3, 120-150.

Figures

Figure 1

Standard Chart



PROJECT TEAM

SUPERVISOR _____ BEHAVER _____

ADVISOR _____ AGE ____ LABEL _____

COUNTER _____ CHARTER _____

MANAGER _____

NOTES _____

MOVEMENT CYCLE

NAME IT _____

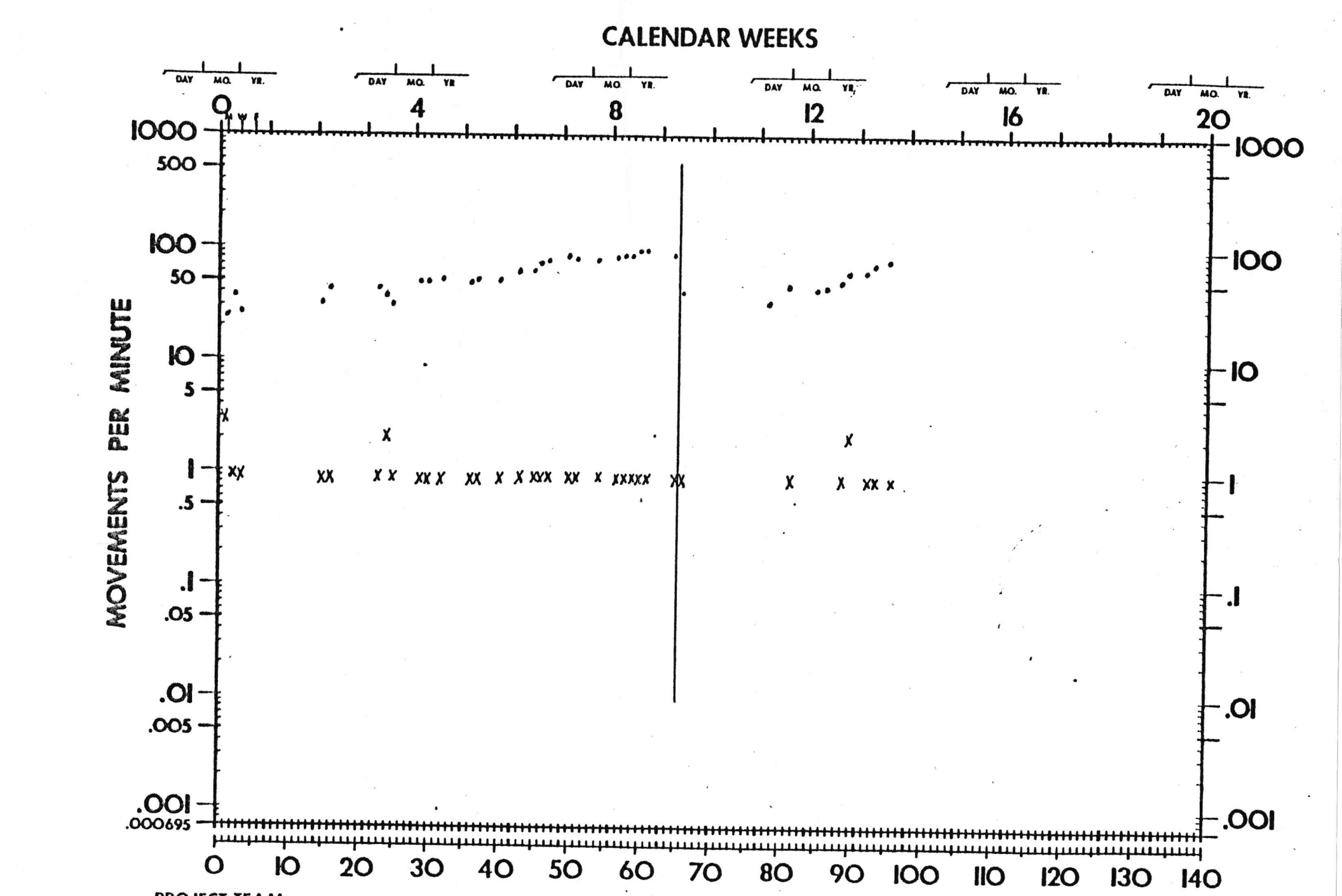
COUNT WHEN _____

_____ OCCURS

Figure 2

C.H. - Sight Words

(x's below the 1 line inicate 0 errors)



PROJECT TEAM

SUPERVISOR Arnold BEHAVER C.H.

ADVISOR Brent AGE LABEL

COUNTER CHARTER

MANAGER DuRoss

NOTES

MOVEMENT CYCLE

NAME IT Sight Words

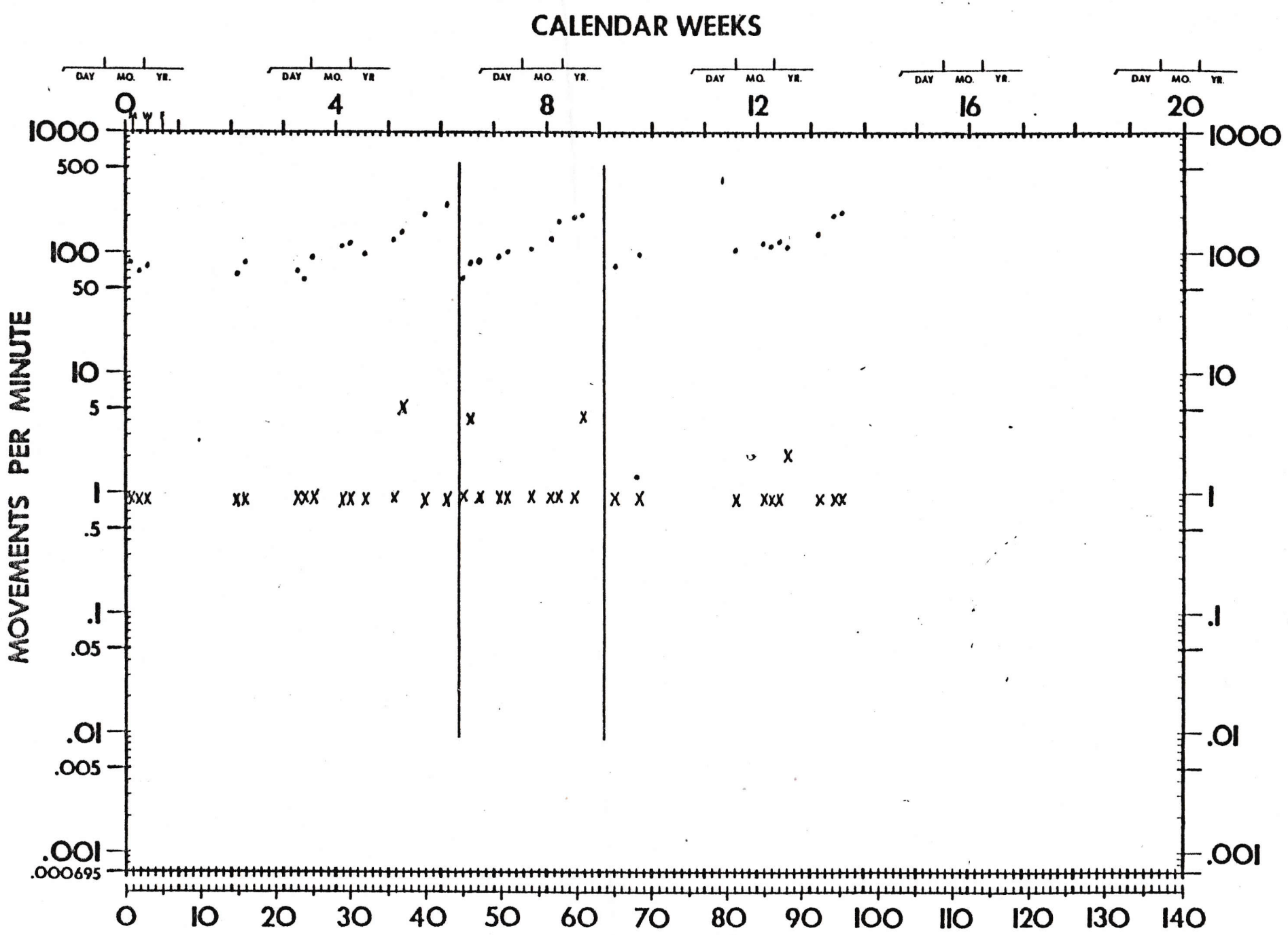
COUNT WHEN

OCCURS

Figure 3

C.H. - Words in Context

(x's below the 1 line indicate 0 errors)



PROJECT TEAM

JPERVISOR Arnold BEHAVER C.H.

DVISOR Brent AGE LABEL

DUNTER CHARTER

MANAGER DuRoss

NOTES

MOVEMENT CYCLE

NAME IT Words in Context

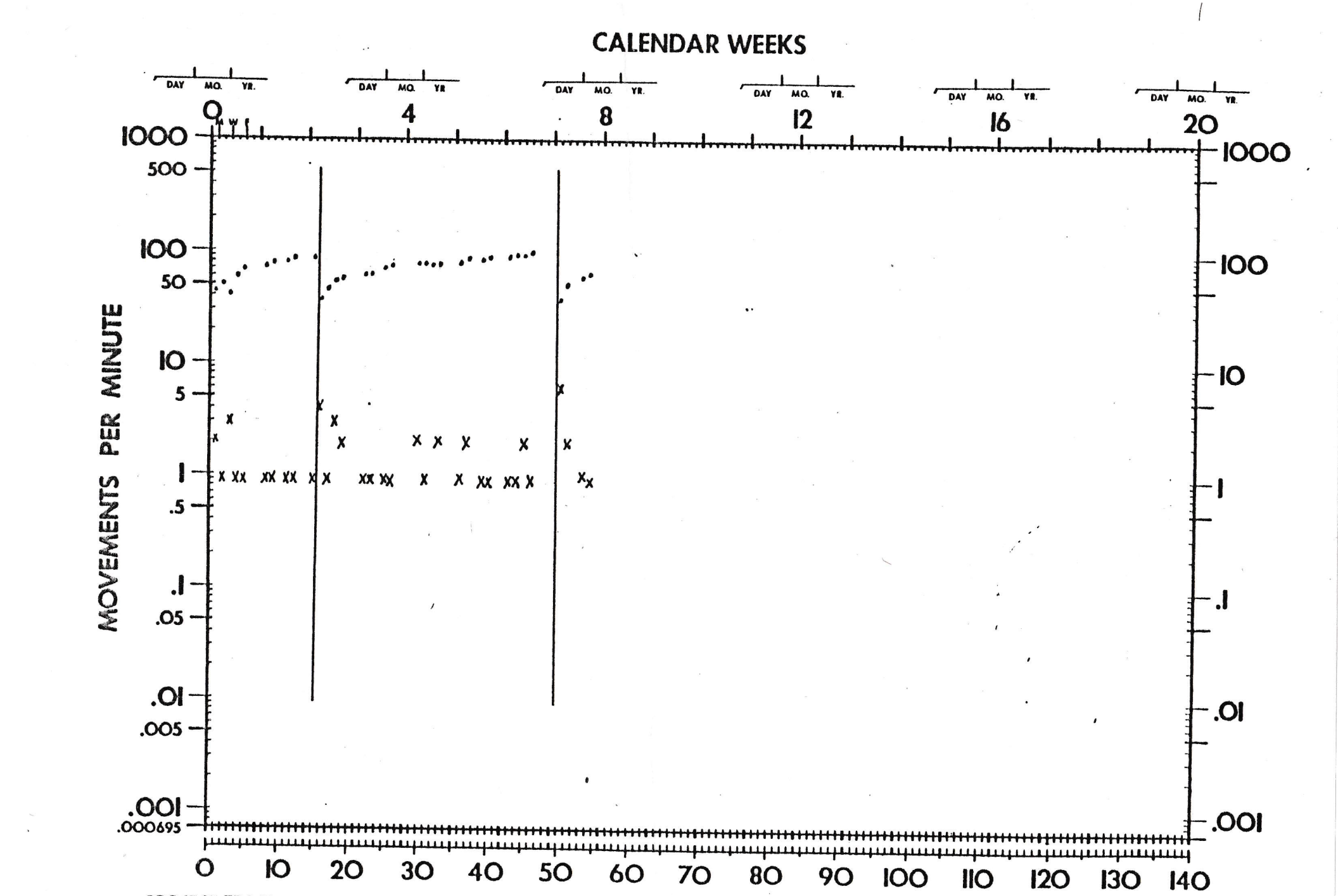
COUNT WHEN

OCCURS

Figure 4

D.H. - Sight Words

(x's below the 1 line indicate 0 errors)



PROJECT TEAM

JPERVISOR Arnold BEHAVER D. H.

DVISOR Brent AGE LABEL

OUNTER CHARTER

MANAGER Slachetka

NOTES

MOVEMENT CYCLE

NAME IT Sight Words

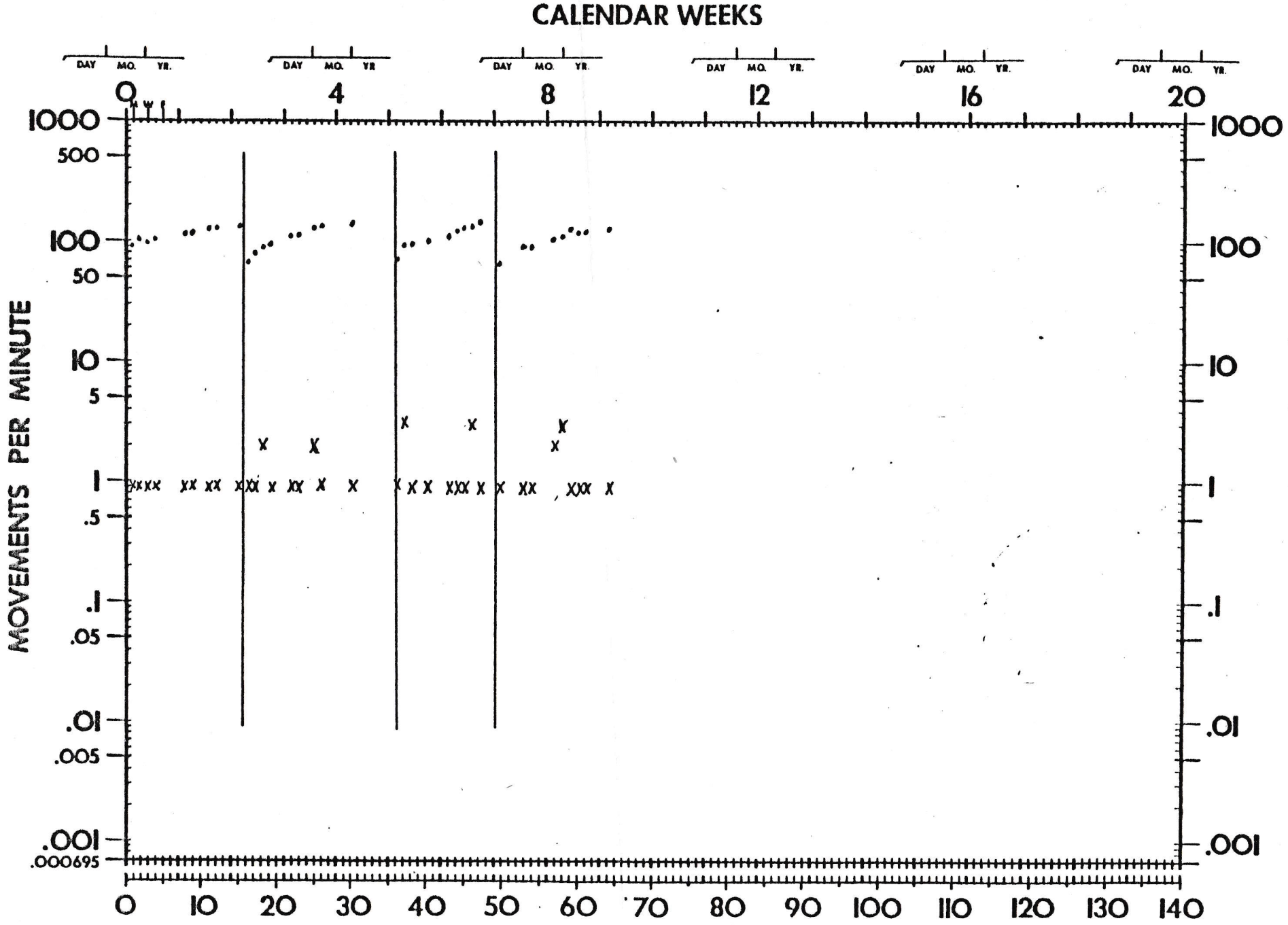
COUNT WHEN

OCCURS

Figure 5

D.H. - Words in Context

(x's below the 1 line indicate 0 errors)



PROJECT TEAM

PERVISOR Arnold BEHAVER D. H.

)VISOR Brent AGE LABEL MANAGER Slachetka

)UNTER CHARTER NOTES

MOVEMENT CYCLE

NAME IT Words in Context

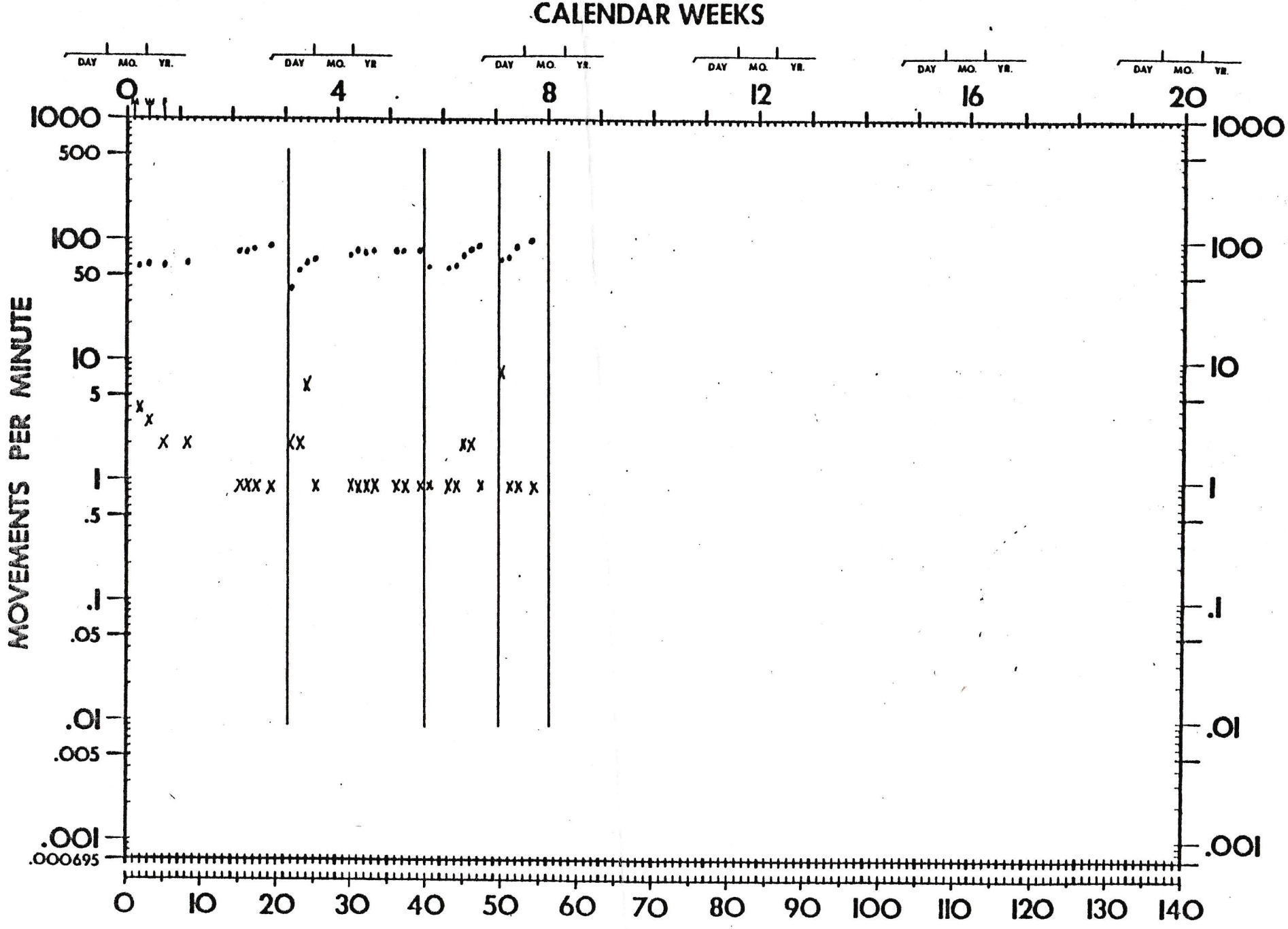
COUNT WHEN

OCCURS

Figure 6

D.T. - Sight Words

(x's below the 1 line indicate 0 errors)



PROJECT TEAM

PERVISOR Arnold BEHAVER D. T.

WISOR Brent AGE LABEL

UNTER CHARTER

MANAGER Griffith

NOTES

MOVEMENT CYCLE

NAME IT Sight Words

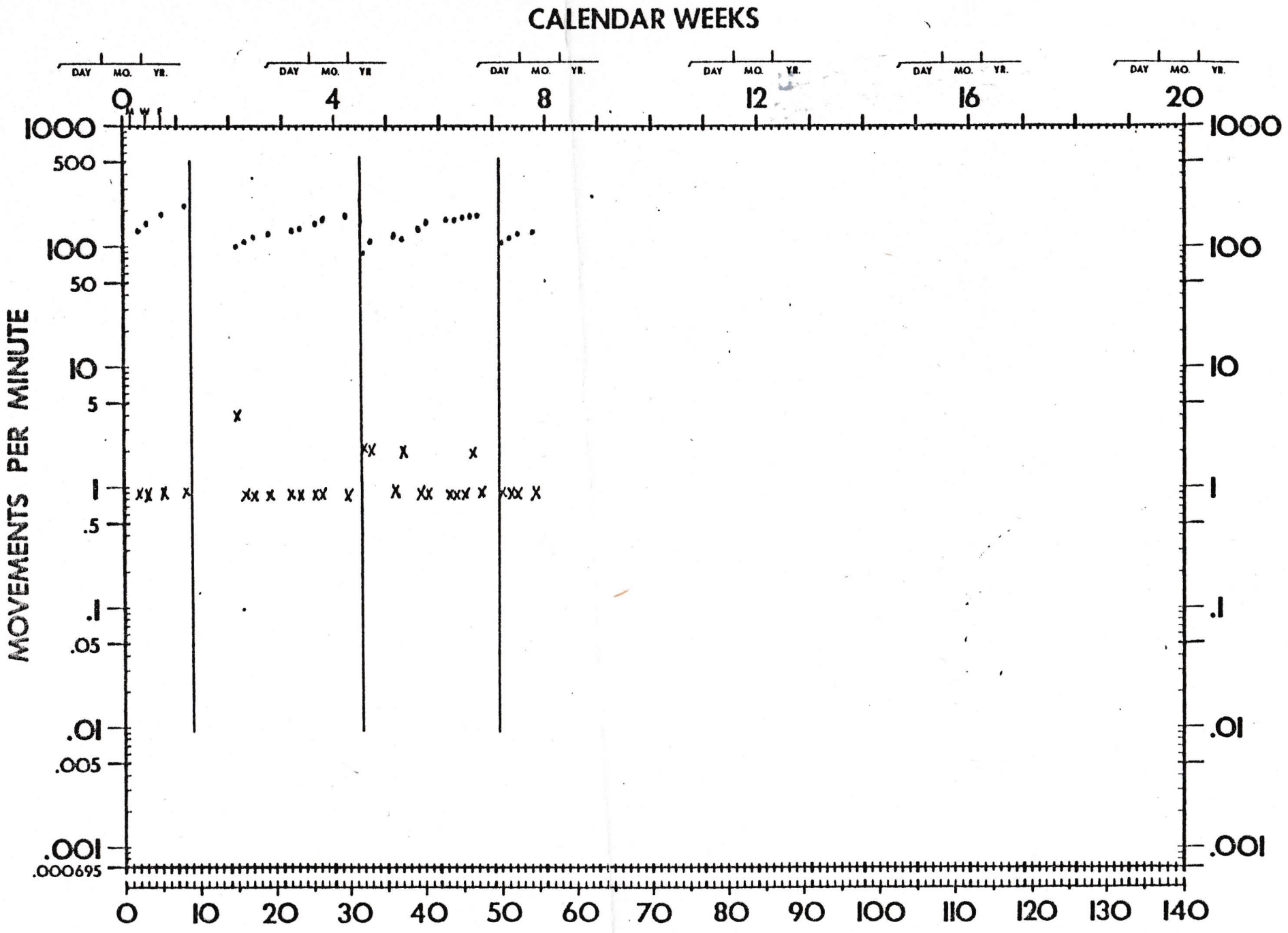
COUNT WHEN

OCCURS

Figure 7

D.T. - Words in Context

(x's below the 1 line indicate 0 errors)



PROJECT TEAM

SUPERVISOR Arnold BEHAVER D. T.

ADVISOR Brent AGE LABEL MANAGER Griffith

COUNTER CHARTER NOTES

MOVEMENT CYCLE

NAME IT Words in Context

COUNT WHEN

OCCURS