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Contents

EDITORIAL POLICY

The **Journal of Precision Teaching** is a multidisciplinary journal dedicated to a science of human behavior which includes direct, continuous and standard measurement. This measurement includes standard units of behavior, **frequency, latency,** and **duration,** a standard scale on which successive units are displayed, the **Standard Celeration Chart,** a standard measure of behavior change between two units, **frequency multiplier,** and a standard, straight-line measure of behavior change across seven or more units, **celeration.** Frequencies, latencies, durations, frequency multipliers, and celerations displayed on the Standard Celeration Chart form the basis for Chart-based decision-making and for evaluating the effects of independent variables.

The purpose of the **Journal of Precision Teaching** is to accelerate the sharing of scientific and practical information among its readers. To this end, both formal manuscripts and informal, Chart-sharing articles are considered for publication. Charts produced by behavers are exact reproductions.

Materials submitted for publication should meet the following criteria: (1) be written in plain English, (2) contain a narrative that is brief, to the point and easy to read, (3) use the **Journal of Precision Teaching Standard Glossary and Charting Conventions,** (4) contain data displayed on the Standard Celeration Chart that justify conclusions made, (5) be submitted in quadruplicate to the editor, and (6) include one set of original charts or hand-drawn copies. Each formal manuscript will be reviewed by one consulting editor and two reviewers, two of whom must approve it prior to publication.

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TECHNOLOGICAL ADVANCES IN PRECISION TEACHING: A COMPARISON BETWEEN COMPUTER-TESTING AND SAFMEDS

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A look at the programs for the annual meeting of the Association for Behavior Analysis and the National Precision Teaching Conference for the past several years indicates that precision teachers are relying more frequently on computer-assisted instruction. The Center for Individualized Instruction at Jacksonville State University offers a program of "precision courses", some of which use a computer-generated, frequency-based testing program (Merbitz & Olander, 1980b; Olander, Yaracs, & Merbitz, 1980). Modifications to the program have been empirically based since its inception in 1979 (Merbitz & Olander, 1980a; McDade & Olander, 1984; Olander, McDade, Caine, & Merbitz, 1981; Olander, McDade, Grimsley, Yaracs, & Merbitz, 1981). One major question which was addressed in an earlier study (McDade, Olander, & Lea, 1983) but not fully answered is whether computer-based precision teaching is preferable over SAFMEDS.

SAFMEDS refers to a frequency-oriented learning system where a deck of cards is made with a question on one side and the answer on the other side of each card. The student's task is to proceed through the deck giving verbal responses to the questions as rapidly as possible, while a tester checks answers and "keeps track of the recording interval". Lindsley (1984) coined the term SAFMEDS to stand for "Say All Fast A Minute Each Day Shuffled."

The Center for Individualized Instruction offered two precision undergraduate psychology courses during the 1984-85 academic year. A study was undertaken in these courses to compare two frequency-based test formats. The first was the precision teaching technique of SAFMEDS, a card deck of at least one hundred free recall questions per unit. SAFMEDS were given to the student with unlimited sort time before the student was required to answer the questions verbally. The second testing format was computer-generated in a frequency based testing program which selects items and their alternatives at random from a test item pool of at least one hundred items per unit. Questions were taken from identical material in both testing formats. Students were given free access to both testing formats whenever a microcomputer or the instructor/psychology advisors were available.

METHOD

Fifteen undergraduate students successfully completing PSY 410: History and Theories in Psychology in fall semester-1984 and eighteen undergraduate students successfully completing PSY 335: Theories of Personality in spring semester-1985 served as subjects. All volunteered to participate in this study.

Course policies were exactly the same for both classes. Students were assigned units of material(i.e., 15 units in PSY 410; 14 in PSY 335) to master at their own pace, with the semester's ending date as the only limit on their progress. Optional discussion groups led by the instructor were held twice weekly with no external contingency on student attendance. Course requirements were described to students in the following section of the syllabus:

> Unit quizzes: Short answer identification
>
> All unit quizzes are mastery-based, allowing the student to retake any quiz without penalty until mastery is reached, or until the student is satisfied with his/her beyond mastery performance. Mastery is defined as at least 15 correct responses per minute. The student may take a unit quiz in the Center for Individualized Instruction with the instructor or a psychology advisor.
>
> Although all questions are taken from a large test item pool, they are presented in two formats-- concealed multiple choice format on a microcomputer or recall format on file cards. Using the Findley forced-choice procedure (Lockhart, Sexton, & Lea, 1975), tests will be given to all students in both formats. The Daily Progress Chart indicates to the student the testing format for the first unit. The student is then required to test in the other format on the second unit. Thereafter, the student may choose to test in either format. If, however, the student chooses the same format for three successive units, s/he **must change** to the other format on the following unit. While this procedure allows the student to maintain some control over his/her performance conditions, it also requires the student to use both test formats to

determine if one is preferable for the individual.

Unit quizzes are ten points each. Performance on each quiz is based on an accuracy score which counts only after the minimum of 15 correct responses per minute is reached. For example, the student may choose a score of 70% at 15 correct per minute to count toward his/her grade or the student may elect to continue working toward a higher grade, for instance, 92% correct at 35 correct per minute. In the first case, the student would receive 7 out of 10 points on the quiz; in the second, 9.2 out of 10 points.

Midterm and final exams: Essay

The student may take the midterm exam when s/he has mastered the first seven units and the final exam when s/he has mastered the last seven units.

All computer-generated tests were provided on Apple II microcomputers using a one-minute testing program designed within the Center for Individualized Instruction (McDade, 1985; Olander & Merbitz, 1980). All questions were designed by the instructor in the concealed multiple-choice format (Bowles, 1978). SAFMEDS were designed by the instructor with questions on one side and answers on the other in a free recall format. Students were given ten cards drawn at random from the card deck and tested verbally for one minute, with the answers checked by the instructor or a psychology advisor. A student evaluation of the course, the IDEA System (1981) was used. Additional instructor-made items were used to assess specific aspects of the courses.

RESULTS

The data were analyzed in two ways. From the statistical analysis perspective, each class was treated as a separate study using non-parametric comparisons for dependent samples, since sample sizes were small. Then the classes were combined into one group, using parametric comparisons for dependent samples. From the experimental (behavioral) analysis perspective, separate standard celeration charts for each testing format were plotted for each student.

Statistical Analysis of Results: The hypothesis that the highest best performances were no different in either testing format was rejected both with the Wilcoxon Matched-Pairs Test for individual classes and the t test for dependent samples for the combined classes (i.e., T[PSY 335]= 34 with n= 18 and T[PSY 410]= 9.5 with n= 15, $p<.01$; t= -4.88 with 32 df, $p<.01$). Higher best performances, evaluated by frequency of correct responses, tended to occur on SAFMEDS.

The hypothesis that the number of trials on the computer was no different from the number of trials on SAFMEDS was rejected at the .001 level (i.e.,T[PSY 335]= 1 with n= 18; T[PSY 410]= 2.5 with n= 15; t= 9.48 with 32 df). The mean total number of trials was more than three times greater using computer-generated tests (i.e., Mean = 34.0) than SAFMEDS (i.e., Mean = 10.1).

The hypothesis that the mean number of attempts to mastery was no different in either testing format was accepted (i.e., T[PSY 335]= 40 with n= 18; T[PSY 410]= 64 with n= 15; t= 0.67 with 32 df). The hypothesis that the mean number of attempts after mastery was no different in either testing format was rejected at the .02 level in the individual classes and at the .001 level with combined classes (i.e., T[PSY 335]= 18.5 with n= 18; T[PSY 410]= 0 with n= 15; t= 6.52 with 32 df). Students tended to test past mastery more frequently on the computer.

Experimental Analysis of Results: Charts 1 and 2 display data for one student in PSY 410. In PSY 335 fourteen of eighteen students and in PSY 410 thirteen of fifteen students showed higher best performances on SAFMEDS.

Only one student in each class used more trials on SAFMEDS than on computers. Fourteen of fifteen students in PSY 410 used the computer past mastery while only ten used SAFMEDS past mastery. In PSY 335 all eighteen students used the computer past mastery, while only eight used SAFMEDS past mastery.

DISCUSSION

Both SAFMEDS and computer-generated tests resulted in relatively high fluencies for both classes. Best performances were typically double the minimum fluency criterion for mastery. Since the number of attempts to mastery does not vary in either testing format, teachers can expect high levels of student performance using either SAFMEDS or computer-generated tests.

When higher fluencies, especially verbal ones, are desired, SAFMEDS should be preferable to computer-generated tests.

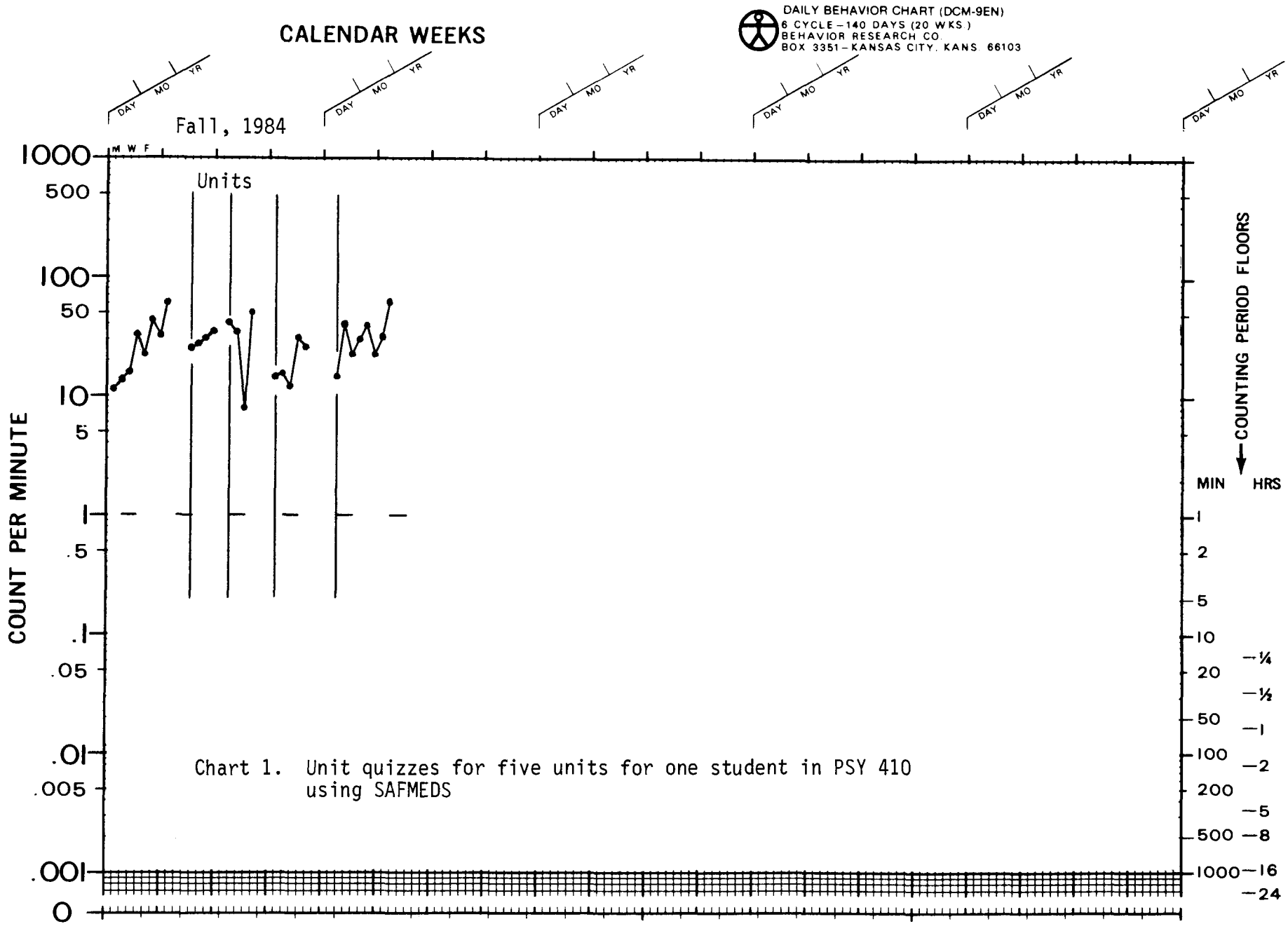

Chart 1. Unit quizzes for five units for one student in PSY 410 using SAFMEDS

CALENDAR DAYS

McDade	Wigley			S.S.			see-say answers
SUPERVISOR	ADVISER	MANAGER		BEHAVER	AGE	LABEL	COUNTED

Center for Individualized Instruction Jacksonville State University Jacksonville, AL

AGENCY

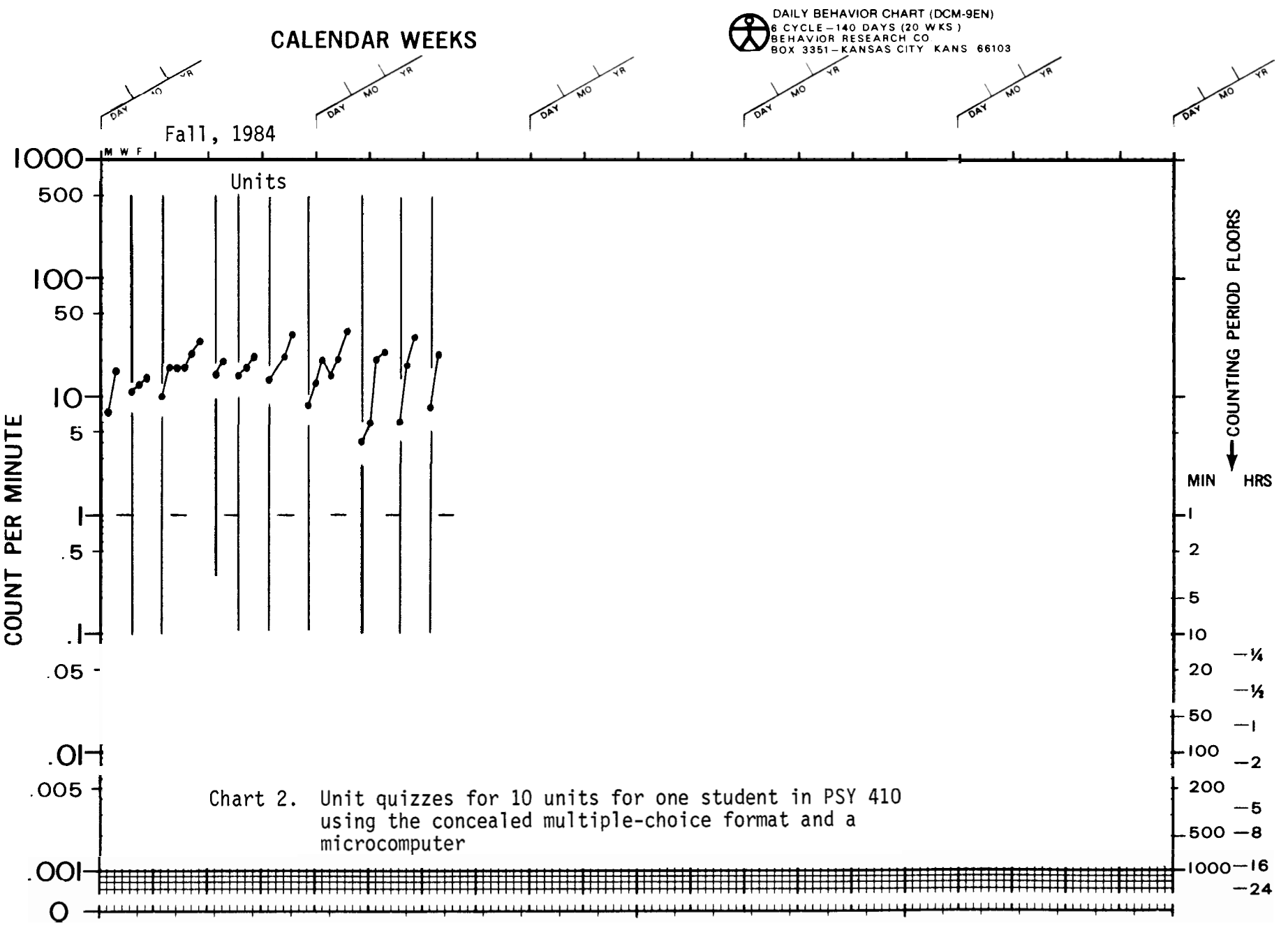

Chart 2. Unit quizzes for 10 units for one student in PSY 410 using the concealed multiple-choice format and a microcomputer

Limits to student performance on computer-generated tests may exist as an artifact of the particular program used. Further research with the testing program used in the Center for Individualized Instruction will attempt to determine whether such limits exist.

The findings that students are more likely to use the computer-generated tests than SAFMEDS and are more likely to test past mastery on the computer are consistent with the feedback students give to Center staff about the differences between the two testing formats. Computers are available from 8 a.m. to 7:30 p.m., while the instructor/psychology advisors are available for SAFMEDS testing fewer hours daily. Student evaluations of the courses indicated that they studied more for SAFMEDS than for computer-generated tests, because they viewed SAFMEDS as more "anxiety-producing". Students reported that the computer did not evaluate them "personally" for poor performances, the computer was never moody, and the computer was more accurate than a person. They said that they could learn more from the computer, they liked the immediate feedback given by the computer, and they found the computer tests equivalent to an enjoyable game. Teachers can encourage students to use the computer as a teaching device for just these reasons.

The best news is that effective precision teaching does not require expensive equipment. These data indicate that computer-based precision teaching is not preferable over SAFMEDS. Student learning can be managed quite well with SAFMEDS. However, precision teaching with computers can also be effective, especially for students to learn, study, and practice until high proficiency levels are reached.

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IMPROVEMENT PICTURES WITH LOW CELERATIONS: AN EARLY FORAY INTO THE USE OF SAFMEDS

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Ogden Lindsley coined the neologism "SAFMEDS" to stand for "Say All Fast a Minute Each Day Shuffled" (e.g. Lindsley, 1983). SAFMEDS is a functional substitute for the word "flashcards", for SAFMEDS specifies a procedure. Above and beyond this specification, SAFMEDS implies a particular instructional system. This system is relatively simple. First, one creates a set of SAFMED cards. These are usually 3 x 5 inch cards, with a problem, question, or premise written on the front and an answer written on the back of each card. Next, one "does" daily timings with the cards every day for several weeks. Prior to the timings, the cards are shuffled, so that one doesn't learn responses by the order of occurrence. During these timings, which are usually one minute in duration, one goes through as much of the deck as possible, looking at the front of a card, and attempting to say aloud what's on the back. After an answer is attempted, the card may be turned over, the answer checked, and the card put into either a "corrects" or "misses" pile. Provided a countdown timer is available, a timing can be done alone or with a friend. After the timing the number of cards in each pile is counted and the respective frequencies are plotted on standard celeration charts.

One of the distinct advantages of a SAFMEDS instructional system is that costs remain very low; a pack of 3 x 5 cards costs much less than a microcomputer. At the same time the system of SAFMEDS packs an educational "wallop". Moreover, it serves as a convenient way to study human operant behavior, specifically that category of verbal behavior that Skinner (1957) identified as "intraverbal". In addition, SAFMEDS can be used with any subject and educational level.

College students are perhaps the most difficult group to have as subjects in a SAFMEDS study. They already have an education history of at least 15 years. They may be quite "set in their ways", insofar as their learning and studying repertoires. After all, in 15 years, one is going to find the "right" way to succeed in school, and the "best" way to study. So, instead of going through the entire deck at once, one might decide to peel off the top 10 and learn them well, and then the next 10 and so on (Lindsley, 1980, 1983). Some might decide to study the cards for a half-hour once a week, going through them slowly, while "flashing" back and forth between front and back (Lindsley, 1980, 1983). Plus, given a choice, college students will probably create SAFMEDS on a topic that they already know something about, rather than on an alien subject. These are only some of the reasons why they seem to be the most difficult subjects.

Procedure

Keeping the preceding precautions in mind, I conducted a SAFMEDS study where seven undergraduate education majors served as subjects. All were enrolled in one section of a large introductory behavior analysis course. Students had a choice of participating in several projects for credit, and these seven chose the "Precision Teaching Project". They received course credit for both participating and for improving their performance.

I met weekly with them. We did an in-class timing at each meeting, students pairing up with each other, with one the behaver and the other the recorder, and then switching roles. Frequencies were charted immediately after the timings. During the remainder of the meeting we covered some aspect of charting, decided upon interventions, and set aims. For the intervening days they were instructed to do the timings in the SAFMEDS style and chart their responses. To encourage honesty, they were allowed to choose the topic or subject matter of their SAFMEDS. Not too surprisingly, all chose topics relevant to courses they were taking. Also, they were instructed not to put a data point on their chart on days they missed--the same convention as "no-chance days." (q.v., Pennypacker, Koenig, & Lindsley, 1972). The weekly meetings and periodic timings with me as recorder calibrated honest charting, at least to the point where "faking it" would make little difference.

The range of topics for the SAFMEDS included: (1) atomic element symbols, (2) French vocabulary, (3) physics formulae, (4) physical education training terms, (5) voice concepts, (6) agricultural mechanics terms, and (7) herbicide names. The latter two topics were selected by two foreign students from central Africa who planned to go back to

their respective nations and teach agriculture.

Results

Most of the students reached their aims. Correct frequencies reached a high of 70/minute (see Chart 3), though most ended in the 40-60/minute range. Errors generally reached "below floor" (less than one/minute for the one minute). Overall celerations were low for both corrects and errors, with X1.1 or X1.3 common for the former, and /1.3 and /1.0 common for errors. In a couple of cases there were exceptional initial celerations: Texan (see Chart 1) produced a X3 for corrects over the first 9 days; Lee (see Chart 6) had X10 for errors over the first 5 timings. The data are displayed in Charts 1 through 7.

Event-following celerations are not drawn on the charts, even though events were changed during the course. There is no significant effect from drawing prediction lines or studying the cards before the timings. Furthermore, with the exception of Lee (see Chart 6), there are no major trend-following celerations worthy of display. Bounce is very low in all cases as well. Notably, for most students, bounce is greater for error responding than for correct responding. The resultant learning pictures are those of improvement, however: jaws, takeoff, and climb.

Follow-up

I was able to do a two-week follow-up with one of the students, Musa, after the semester had ended. We used a set of cards about behavior analysis, did two minute timings every day, and I served as timer. The second phase of Chart 7 shows his learning picture during the follow-up. He managed to achieve an overall crossover jaws, though his frequencies would be classified as low--no more than 13 correct per minute. A most-recent celeration indicates his errors, which never did reach the record floor, were increasing over the last four days.

These one-on-one daily timings (we even met on weekends) provided me a closer picture of some of the subtle events that must be considered part of the milieu of doing SAFMEDS. For example, if Musa came to a card for which he couldn't say an answer, or got it wrong, he tended to verbally punish himself, or say "I don't know this one." These self put-downs visibly slowed the frequency of responding. In another example, at a later time, he revealed that he was beginning to attend to one or two key words on the front of the cards, or just the "form" or pattern of the words on the front.

Discussion

The data in Charts 1 through 7 illustrate a successful application of SAFMEDS technology. The figures help highlight several further considerations as well. First, ease of learning is colored by existing familiarity with the subject matter: all students selected topics with which they were already familiar. This was especially true in the case of Jackie (see Figure 3) who started out at 35/minute correct, and who never made more than two errors. Second, changing certain variables during the course--mid-course "corrections", as it were--had little, if any, apparent effect. Studying the cards before doing the timing, setting aims, or drawing prediction lines on standard behavior charts failed to result in either celeration turn-ups (multipliers) or frequency jump-ups (multipliers).

Perhaps the main benefit of this type of study are the questions it raises--questions I would not have entertained previously. For example, are bounce and celeration low for particular classes of behavior, for example see--says with SAFMEDS as opposed to other classes of verbal behavior? Are low bounce and celeration typical of college students doing SAFMEDS? In what ways does prior familiarity with a subject matter affect learning; that is, if prior familiarity does result in takeoff, climb, and jaws learning pictures, then how much prior familiarity is necessary to do so? This issue concerns the contributions to learning played by one's behavioral history, something often quoted as a "cause" of behavior, but rarely clarified and quantified. How does responding come under the control of the "form" or the pattern of the words on the front of a card, and what would happen if efforts were made to circumvent such control? These are only some of the questions suggested by the use of SAFMEDS.

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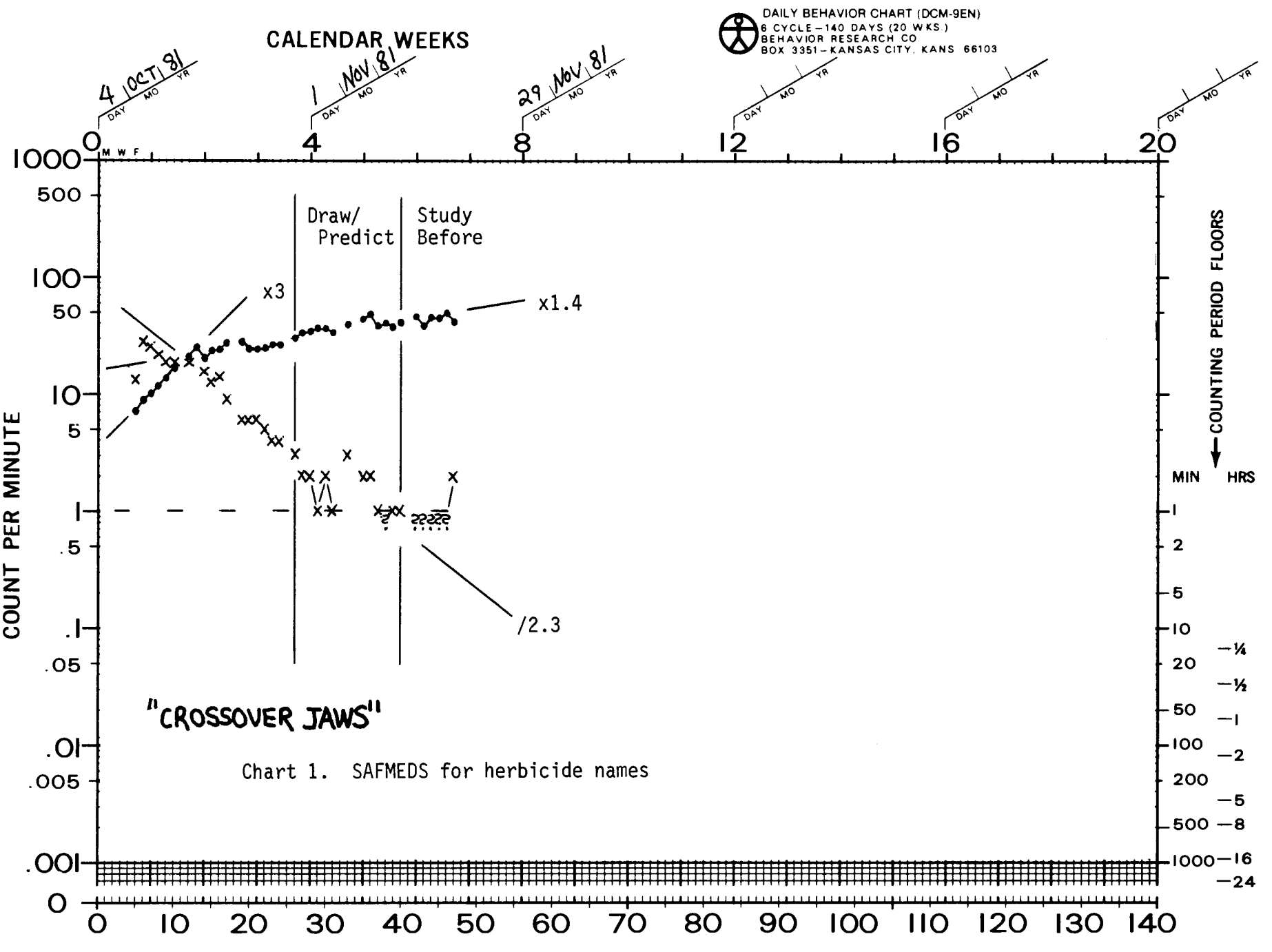

Chart 1. SAFMEDS for herbicide names

SUPERVISOR	ADVISER	MANAGER		BEHAVER	COUNTED
		J. Eshleman		Texan R.	see-say herbicide names
DEPOSITOR	AGENCY	TIMER	COUNTER	CHARTER	

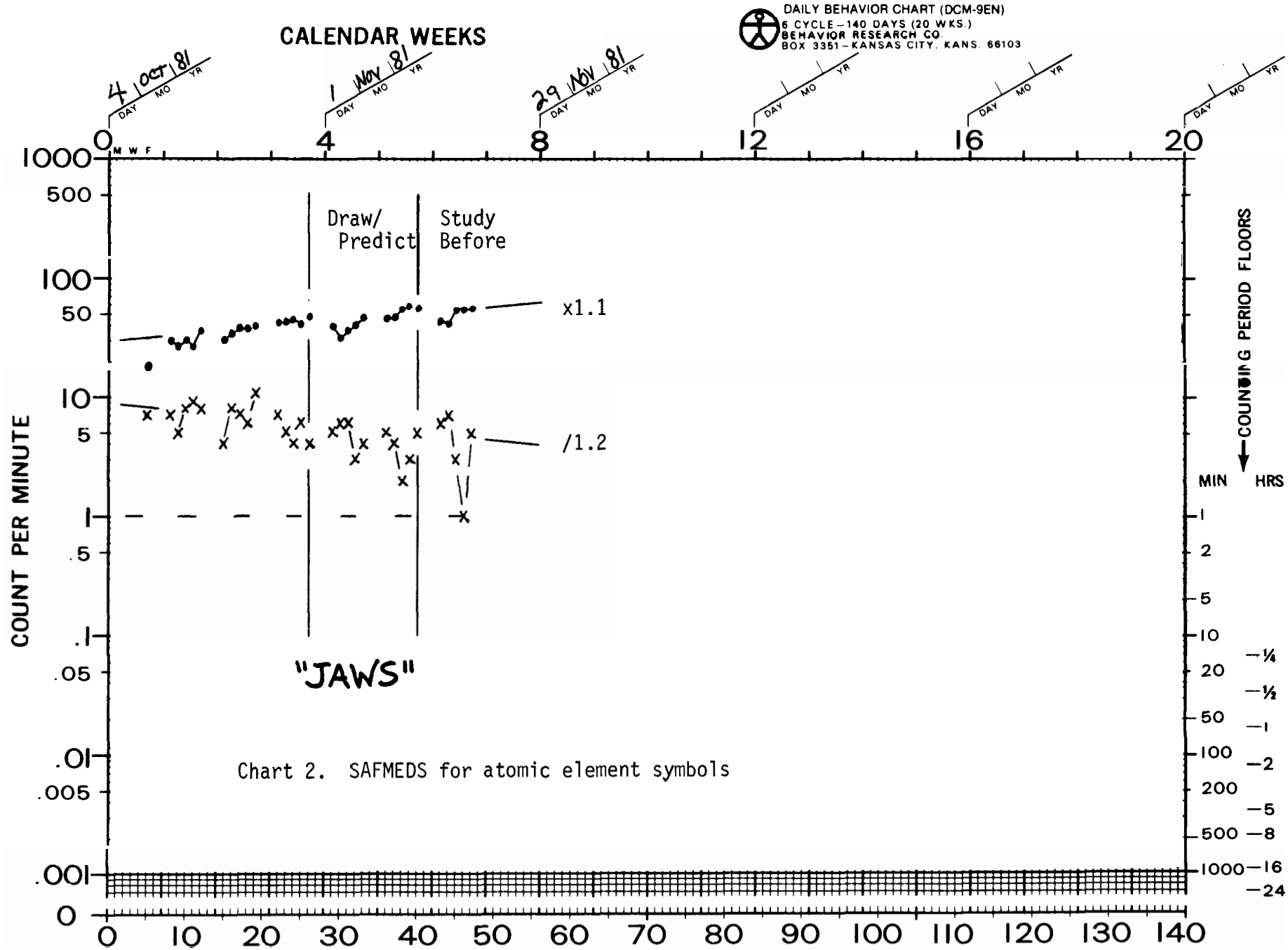

Chart 2. SAFMEDS for atomic element symbols

SUPERVISOR	ADVISER	MANAGER		BEHAVER	COUNTED
		J. Eshleman		Odi O.	see-say atomic element symbol
DEPOSITOR	AGENCY		TIMER	COUNTER	CHARTER

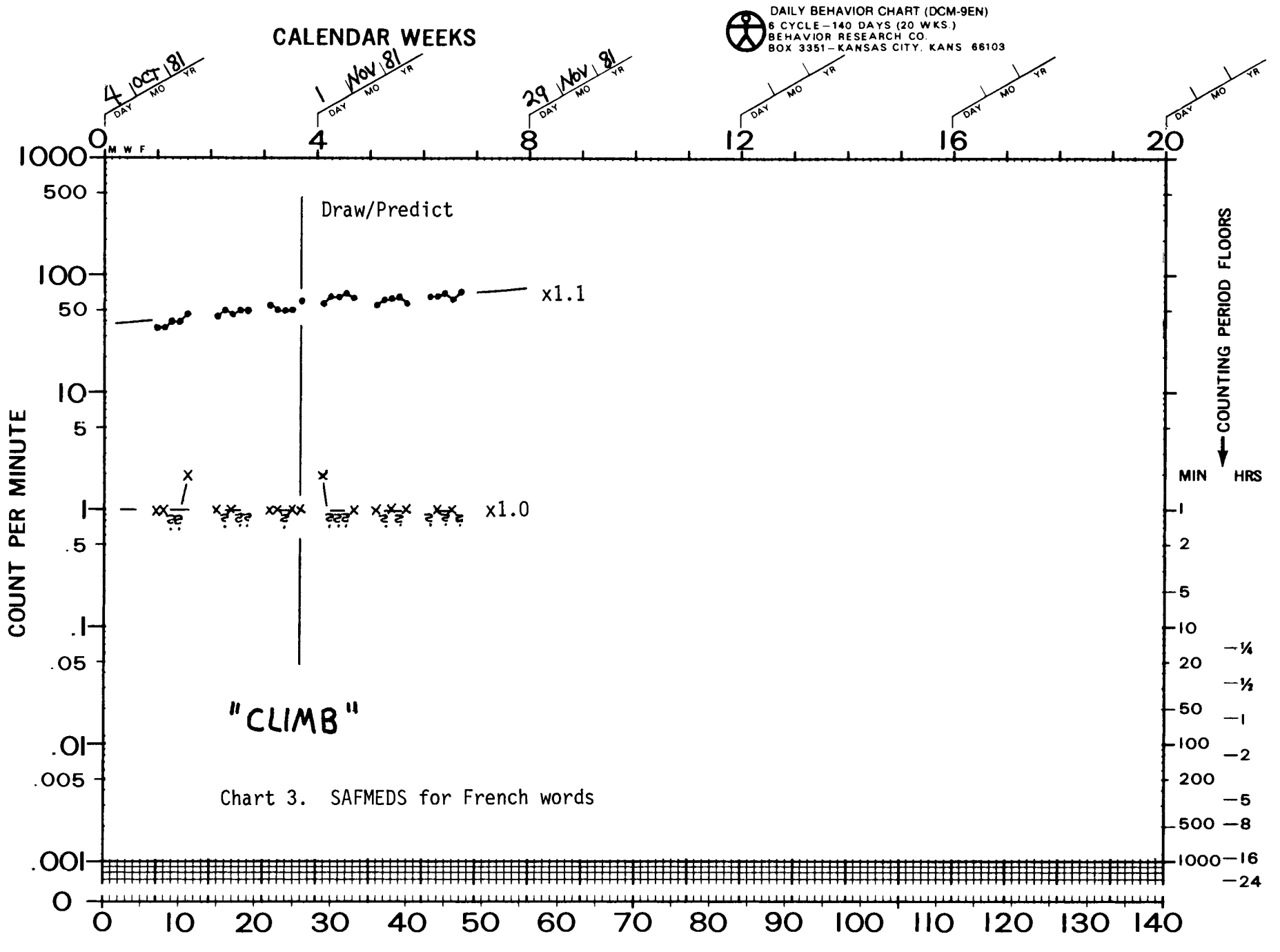

Chart 3. SAFMEDS for French words

SUPERVISOR	ADVISER	MANAGER		BEHAVER	COUNTED
		J. Eshleman		Jackie S.	see-say French words
DEPOSITOR	AGENCY	TIMER	COUNTER	CHARTER	

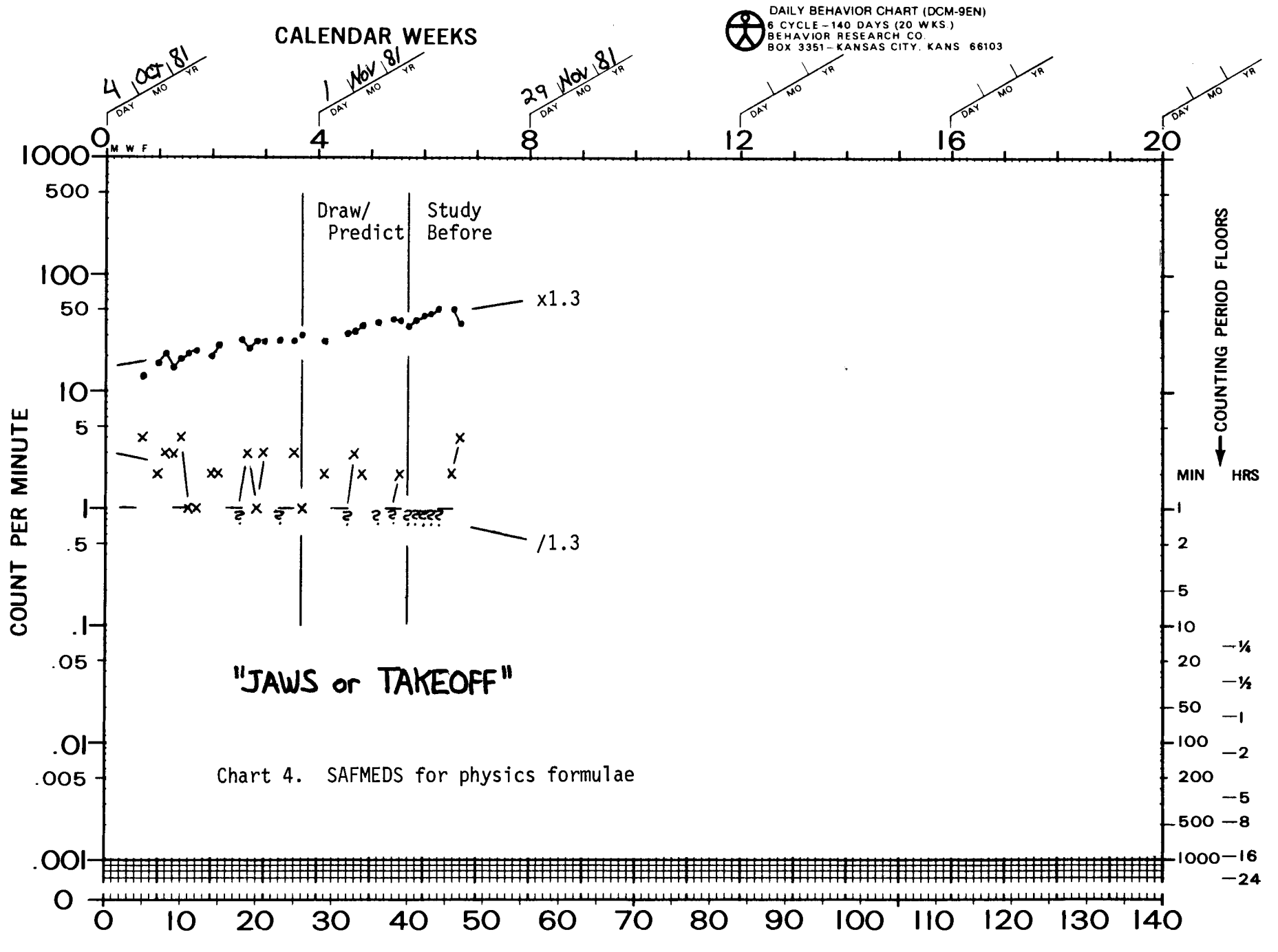

Chart 4. SAFMEDS for physics formulae

SUPERVISOR	ADVISER	MANAGER		BEHAVER	COUNTED
		J. Eshleman		Don W.	see-say physics formulae
DEPOSITOR	AGENCY	TIMER	COUNTER	CHARTER	

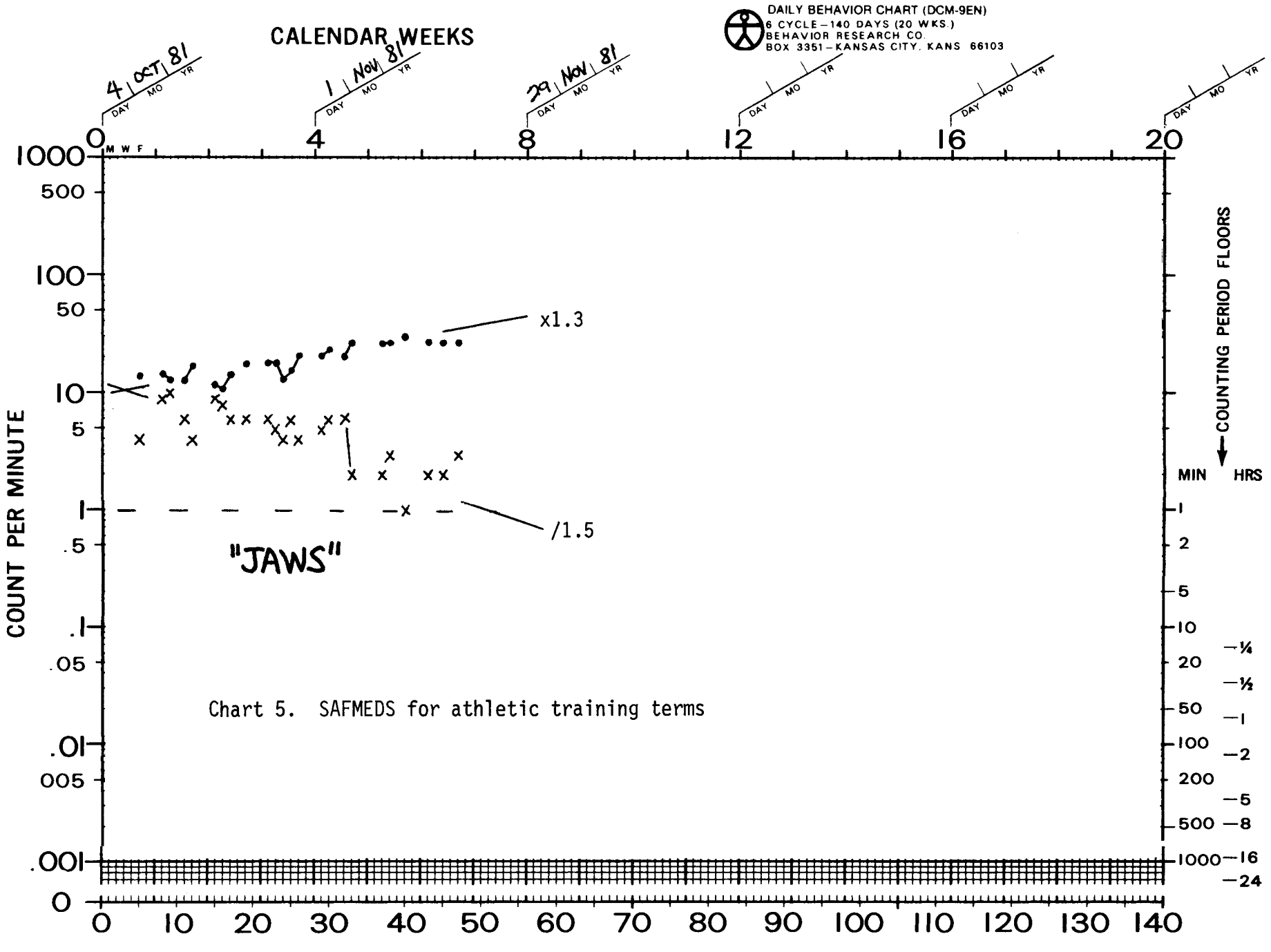

Chart 5. SAFMEDS for athletic training terms

SUPERVISOR	ADVISER	J. Eshleman MANAGER		Lois M. BEHAVER	see-say athletic training terms COUNTED
DEPOSITOR	AGENCY	TIMER	COUNTER	CHARTER	

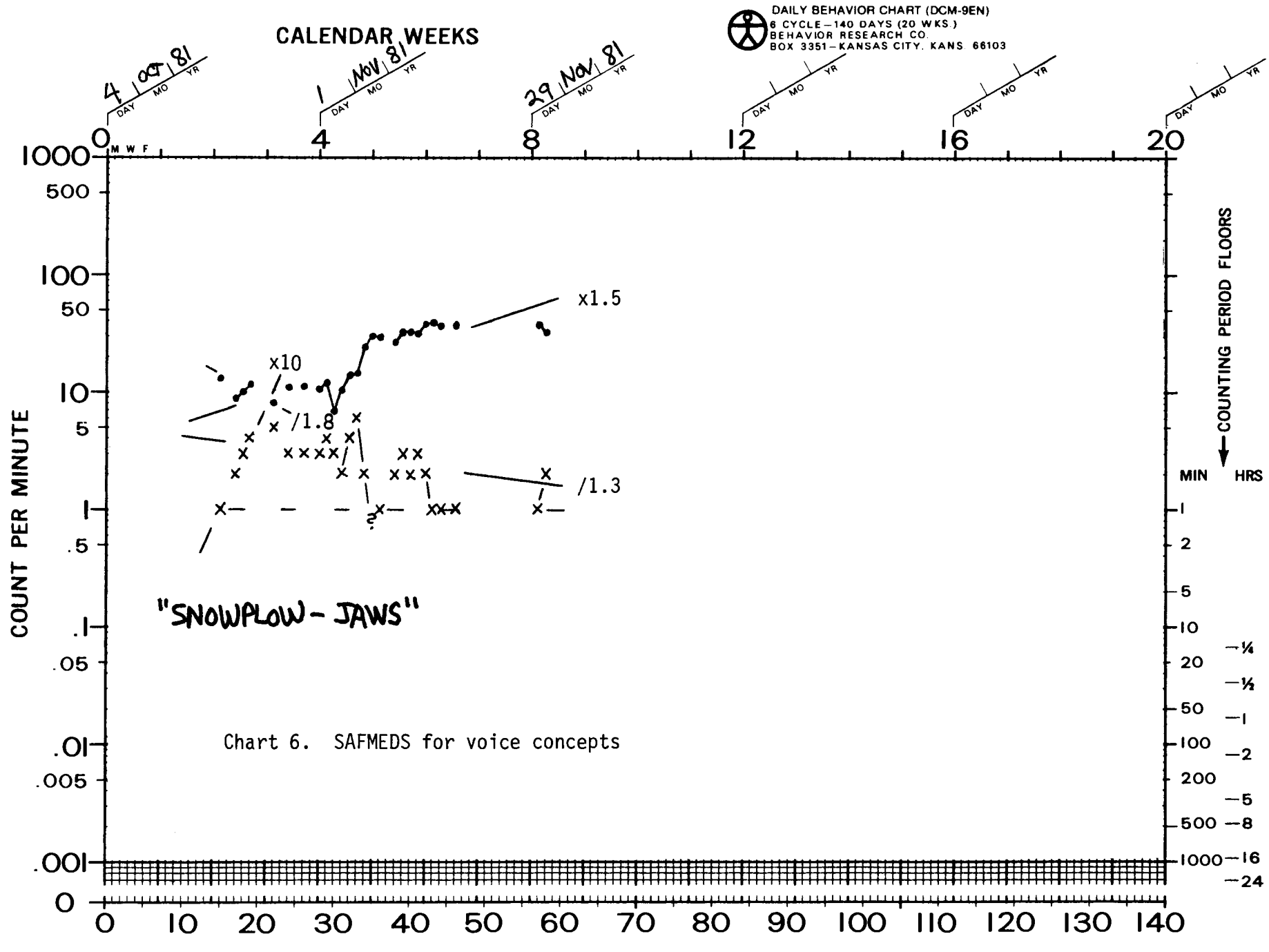

Chart 6. SAFMEDS for voice concepts

SUPERVISOR	ADVISER	J. Eshleman MANAGER		Lee S. BEHAVER	see-say voice concepts COUNTED
DEPOSITOR	AGENCY	TIMER	COUNTER	CHARTER	

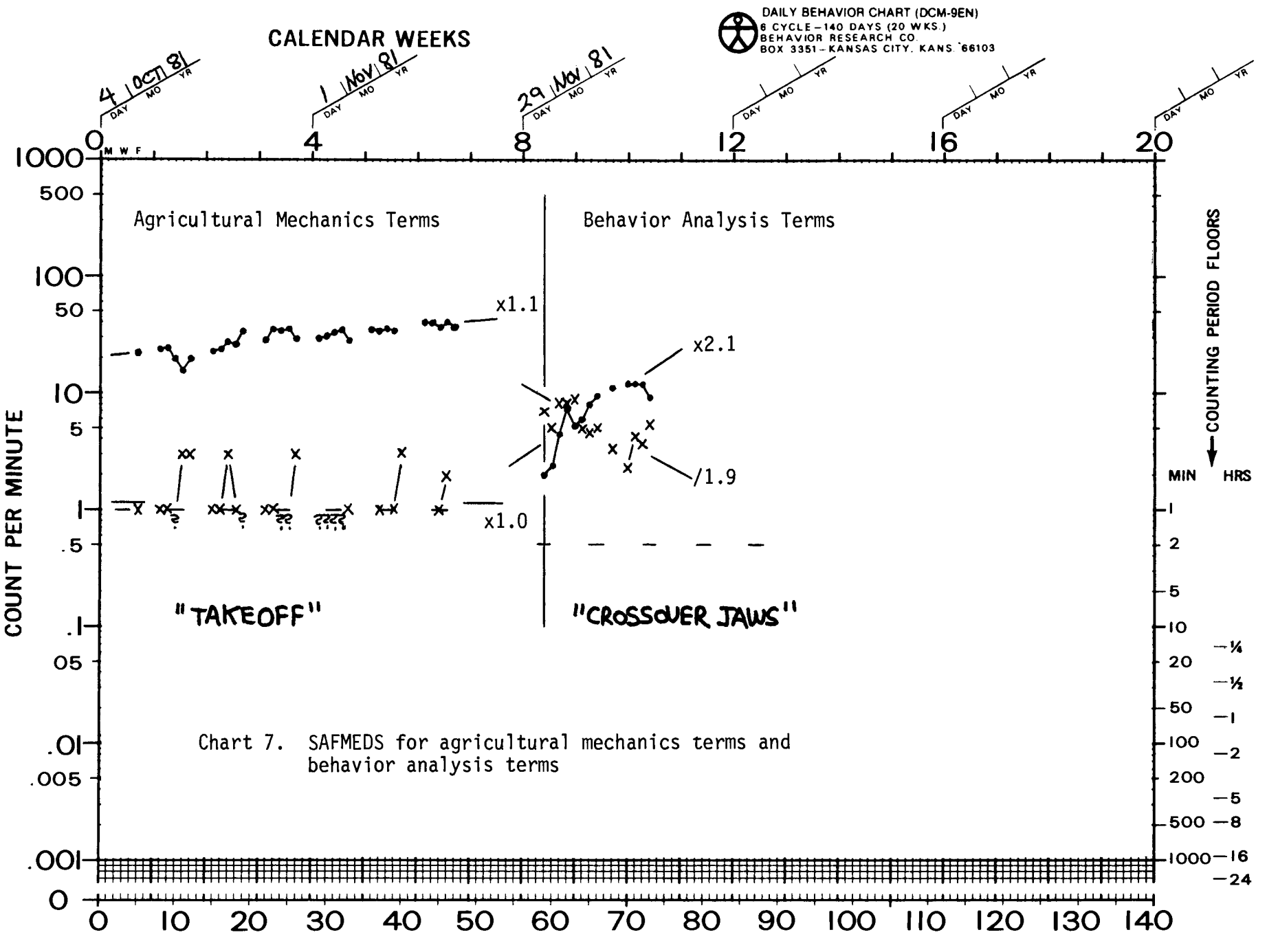

Chart 7. SAFMEDS for agricultural mechanics terms and behavior analysis terms

at the third annual Precision Teaching Winter Conference, Orlando, FL.

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Chart - sharing

THE EFFECTS OF PRECISION TEACHING ON CHILDREN WITH ACADEMIC DIFFICULTIES

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Precision Teaching, developed by Ogden Lindsley in 1967, has become widely known as an effective mode of remediation for underachieving students (Diviaio & Hefferan, 1983; Lovitt & Fantasia, 1983; McGreevy, 1982; Brandstetter & Merz, 1978). Precision Teaching may be described as a system which utilizes direct and continuous measurement in order to improve a student's performance in certain academic and social skills.

The primary aim of the present study was to increase performance in specific academic skills of 4 underachieving students. These students had previously received numerous forms of academic intervention, all of which had proved to be ineffective.

A precision teaching program was devised in which semi-logarithmic charts were utilized to record the daily one minute timings for each pinpointed skill. Each skill was recorded on a different chart by this author. The charts were shared and discussed with the students so that they would see a daily picture of their progress. The correct responses were marked with dots and connected daily. The incorrect responses were marked with x's and were also connected daily.

The modes of assessment used to measure each skill were probes on which the student's daily performance was measured and timed for one minute, and subsequently recorded on the semi-logarithmic chart. These probes were administered after the students had received direct instruction in the particular skill to be tested.

Charts 1-4 indicate that the implementation of this program proved beneficial to all of the students. Although few students achieved mastery of all the pinpointed skills, their learning pictures indicate considerable improvement during the eight week period.

Some conclusions which may be extracted from the results of this study, are as follows: (1) precision teaching was effective for improving performance in the pinpointed academic skills of the 4 students; (2) the student's learning pictures indicated that performance in the pinpointed academic skills will probably continue to increase, providing a similar type of program continues to be implemented in the student's educational setting; (3) improvement in the students' self concepts, "on task", and appropriate behavior, were also noted (though not charted), and believed to be due to the implementation of the program.

The results of this study provide numerous implications for educators involved in the teaching of underachieving students. First, in order for effective learning to take place, it is essential that each child be taught as an individual. Precision teaching offers educators a way of systematically monitoring each child's progress, so that when instruction is not effective, this will be illustrated on the student's chart immediately. Hence, rather than discovering (after a number of months) that the student is behind in a certain skill, the educator will see this instantly, and will hopefully be able to remedy the situation by providing a different type of instruction.

Second, it is important to note that the students in this study enjoyed observing their daily progress (as seen on the charts), and were constantly attempting to improve their performance from the previous day. Consequently, precision teaching may be viewed as a possible motivator for underachieving students, which can in turn lead to increased academic achievement. It is especially important for underachieving students to be able to actually see their academic progress, as they often tend to become discouraged due to frequent failure in the educational system. If they have the

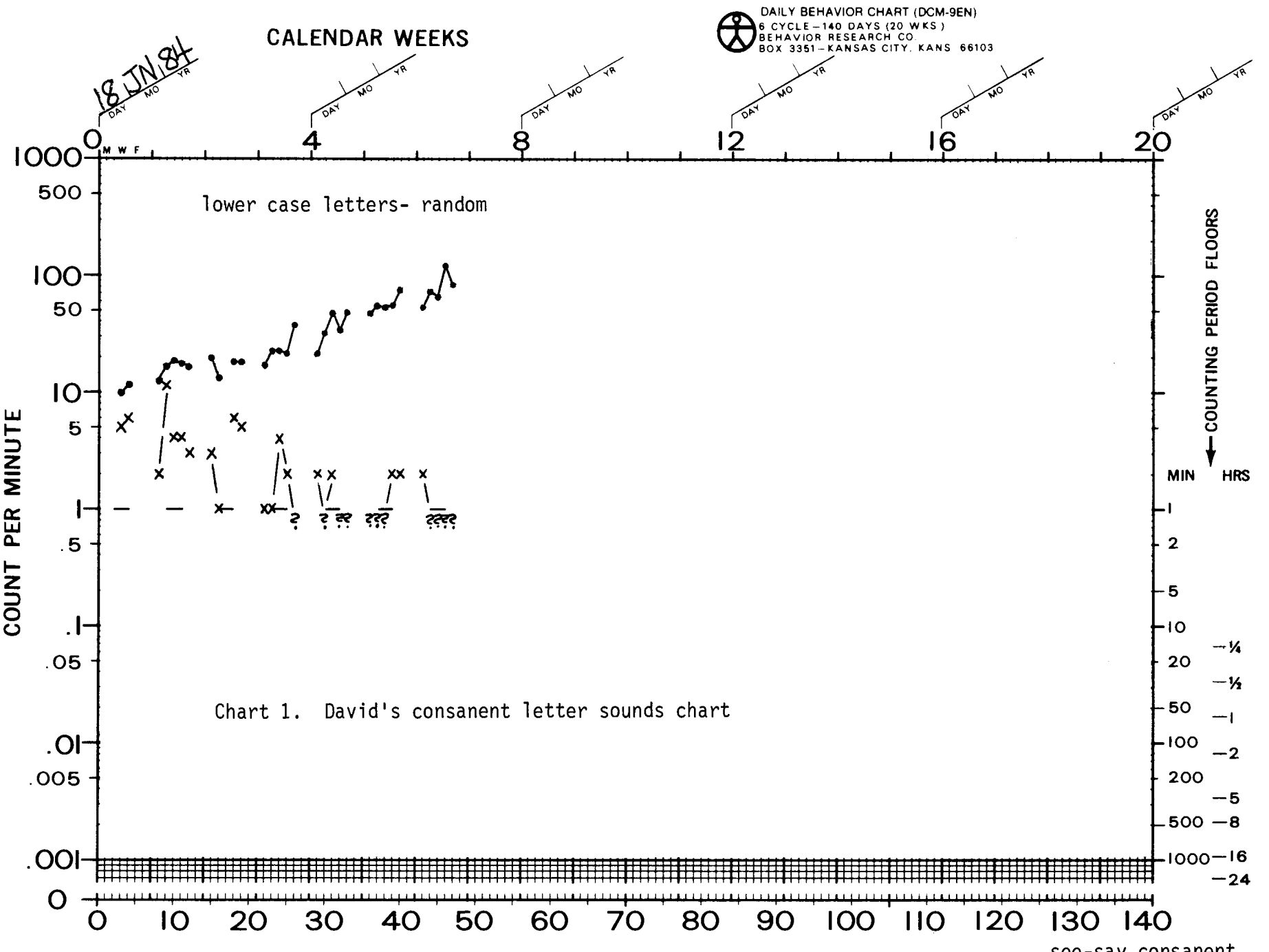

Chart 1. David's consanent letter sounds chart

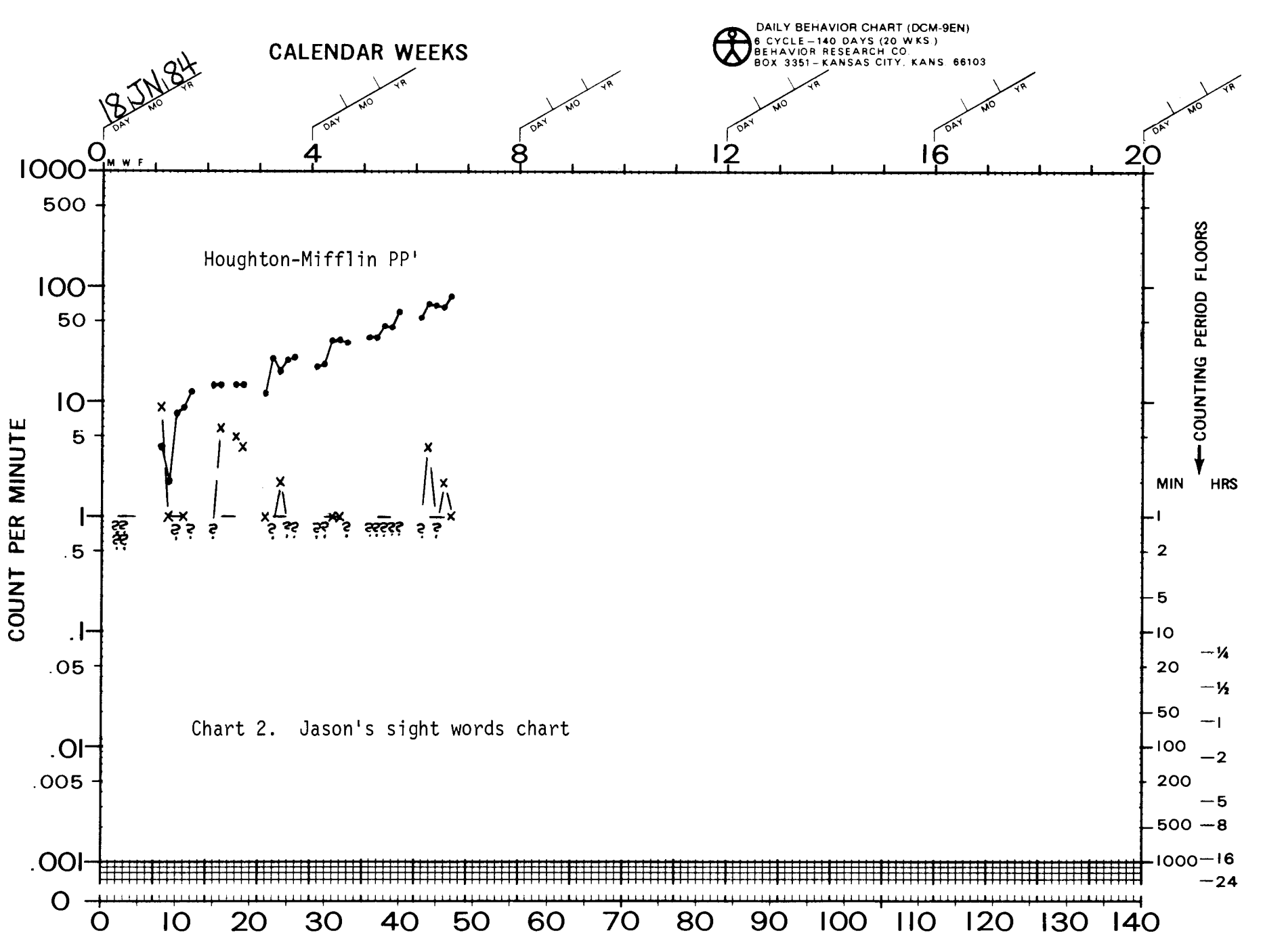

Chart 2. Jason's sight words chart

SUPERVISOR	ADVISER	MANAGER		BEHAVER	AGE	COUNTED
				Jason	6	see-say sight words

DEPOSITOR	AGENCY	TIMER	COUNTER	CHARTER

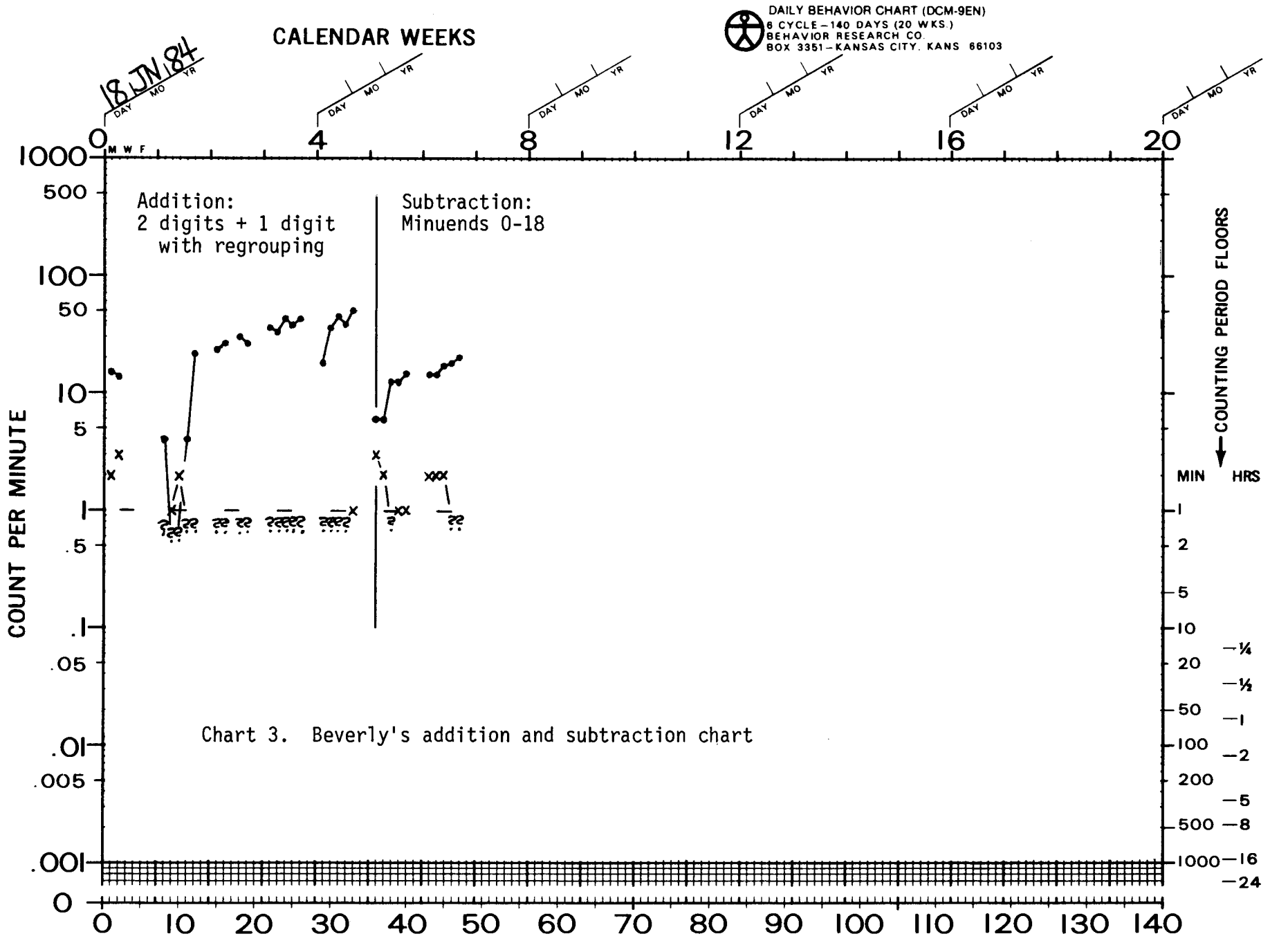

Chart 3. Beverly's addition and subtraction chart

SUPERVISOR	ADVISER	MANAGER		Beverly	6	see-write answers
				BEHAVER	AGE	COUNTED
DEPOSITOR	AGENCY	TIMER	COUNTER	CHARTER		

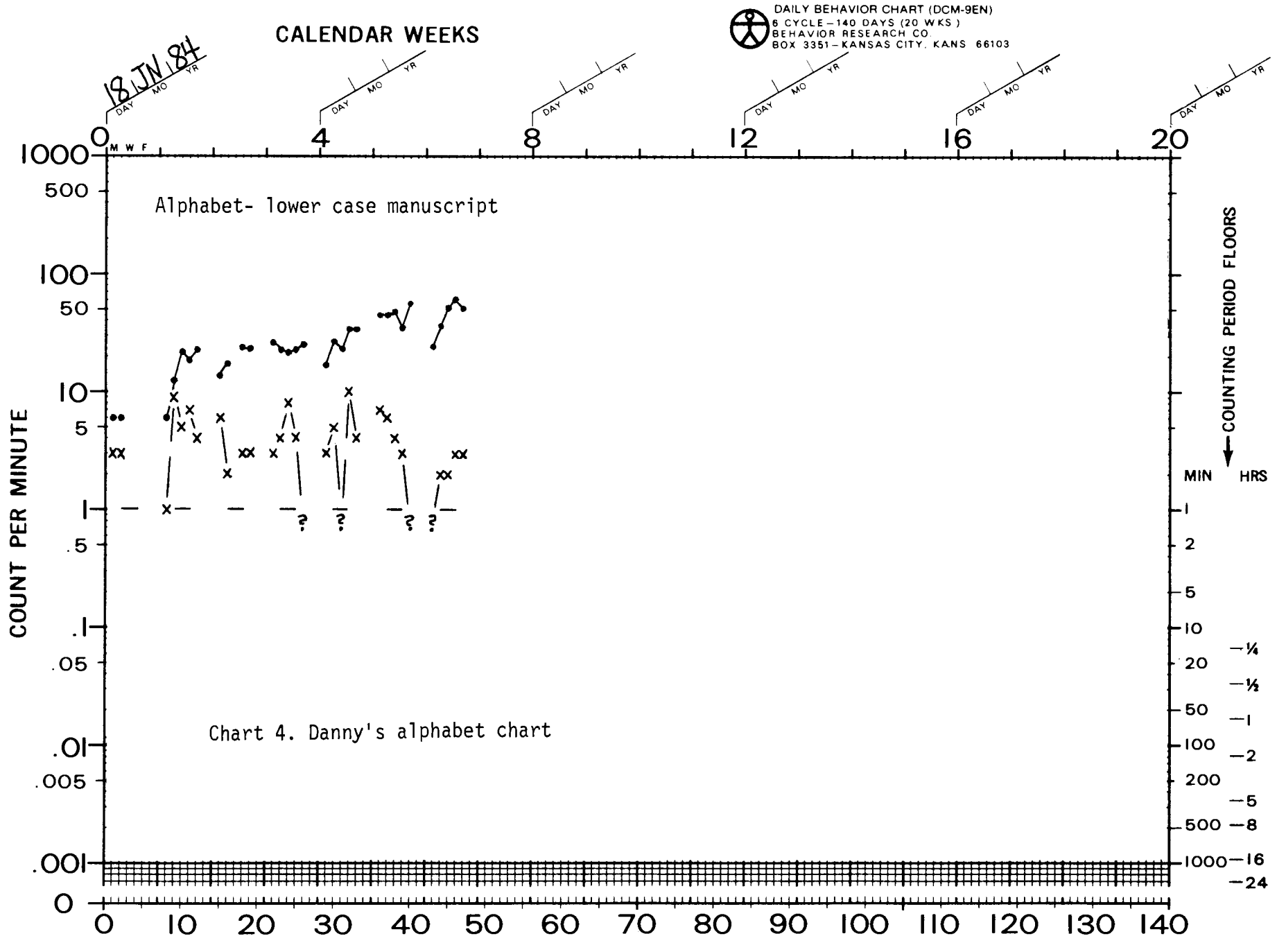

Chart 4. Danny's alphabet chart

SUPERVISOR	ADVISER	MANAGER		BEHAVER	AGE	COUNTED
				Danny	7	think-write letters

DEPOSITOR	AGENCY	TIMER	COUNTER	CHARTER

opportunity to observe the ascent of their academic performance, maybe their degree of discouragement would be lessened, which in turn might encourage them to try harder to improve their performance.

Finally, an important point to consider is that the underachieving students in this study had previously received a multitude of interventions in an attempt to increase their academic performance, all of which proved to be ineffective. Educators are constantly searching for a mode of teaching that "works" with this type of student. The fact that precision teaching proved effective in increasing academic performance when nothing else "worked", is of considerable importance in and of itself. Educators should keep this in mind when they are devising programs of instruction for underachieving students.

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About PT

NOTES FROM THE EDITOR

Patrick McGreevy

Some of you may have thought that your last two issues of Volume VI were "consumed" by the U.S. Postal Service sorting machines, or that, perhaps, the Journal had decided to fold its tent and fade into the sunset. Neither is the case. A number of problems contributed to the delay. One of them was the lack of good manuscripts and chart-shares. WE NEED BOTH! I decided that a delay was better than issues of lesser quality. This issue, Volume VI, Number 3, was mailed at about the same time as Volume VI, Number 4, which you should receive in a few days (if you haven't already).

Volume VII, Number 1, the first issue of the next volume, will be ready for mailing shortly. To renew your subscription, simply return the pink subscription form attached to Volume VI, Number 4. I would appreciate it if you would encourage a friend or colleague to subscribe. If you return a new subscription with your renewal before 1 June 86, you can deduct $2.00 from each subscription. If your university library or school media center subscribes, you can deduct $4.00 from your subscription.

SOCIAL SKILLS

Christine Y. Mason

With this issue of the Journal of Precision Teaching a new Social Skills column is introduced. The introduction of this column represents an opportunity to encourage data-sharing regarding overt and covert behaviors, verbal and motoric responses, and social skills curricula and change in social behaviors.

The high incidence of sexual, emotional, and physical child abuse and its correlations with handicapping conditions provides even further rationale for focusing some attention on social skills development. Reports suggesting a high relationship between levels of social skills and job performance of mentally retarded persons and other reports of correlations- between social skills and

survival in mainstreamed classrooms for mildly handicapped students provide additional impetus for such a focus.

You are invited to send charts and brief narratives, or short summary reports of changes in behavior specific techniques. The first column will be devoted to providing a common framework for understanding the current literature on social skills, and possible areas for Precision Teaching exploration.

Precision Teaching and Social Skills Training: Some Possible Directions

Christine Y. Mason
Eastern Montana College

Foster and Ritchey (1979) have defined social competence as "the ability to maximize the probability of producing, maintaining, or enhancing positive effects for the interactor" (p. 632). Van Houten (1979), Arkowitz (1981) and others have developed similar definitions for social skills. According to these definitions, an individual who is socially skilled has a repertoire of behaviors which increase the likelihood of the individual being positively reinforced for his/her behaviors and decrease the likelihood of the individual being punished for social interactions. Implicit in such definitions is the need to examine the effect of the individual's behavior on the individual according to some measure of the environmental reaction.

When measuring social skills, then, the investigator can decide to measure specific behaviors or to measure interactions. In the past, many studies have measured isolated social behaviors and the influence of specific interventions on isolated skills. These studies have measured the effects of specific techniques on eye contact, talking out, verbal imitation and other behaviors. These studies have added to the general body of knowledge concerning the effectiveness of specific techniques for increasing or decreasing specific behaviors. However, as Barrett (1980) has suggested, a danger of such an approach is that we teach splinter skills and do not ultimately not assist our students, but rather spending precious hours to obtain mediocre and perhaps even nonfunctional results.

The issue which is of foremost consideration is that of social validity. Foster and Ritchey (1979) discussed social validity in terms of whether or not a behavior is critical to adaptive social functioning. Wolf (1978) is often quoted for his definition of social validity, which refers to the acceptability of treatment techniques and the magnitude of treatment effects, often measured through consumer satisfaction. Van Houten (1979) described two procedures for determining the social validity of the change in behaviors: (1) comparing the behavior to peers who did not receive treatment or need treatment or (2) comparing the treatment behavior of the individual to an optimal level of performance. Van Houten advocated the selection of appropriate target behaviors along with competency aims expressed in terms of optimal frequency, duration, and latency of response.

If Precision Teaching is to be utilized with a renewed effort to better understand how to define and measure social skills, then it appears that the social validity of our measurement should be a major concern. Whereas a monadic approach (Strain & Shores, 1977) can lead to supposition concerning the efficacy of a specific intervention, as in the case of a decrease in drooling, measurement of other events or surrounding variables is needed before definitive conclusions concerning the effects of the decrease in drooling can be made. Measurement of the approach of others, duration of contact with the subject, or inclusion in social activities may be important variables, if, in fact, the intent of the intervention was to increase social acceptability. Such measurement of concomitant variables may be one approach to insure the social validity of the intervention or even selection of a targeted behavior. Strain, Shores and Kerr (1976) suggested that one important aspect of such measurement may be the reciprocity of behaviors, whereby negative interactions are typically paired with negative interactions and positive interactions are followed by positive interactions.

A more traditional approach to the assessment of social/behavioral skills has included the use of behavioral checklists such as the Walker Behavior Problem checklist, the Behavior Problem checklist, and the A.A.M.D. Adaptive Behavior Scale. Self-concept inventories such as the Valette Self Concept Inventory also could be included in this category of approaches to assessment. Problems with the reliability and validity of these checklists (Irvin, Cromwell, and Bellamy, 1970) include the ambiguity of the items, leniency of ratings and errors of central tendency making it more likely to rate close to the mean. Despite these problems, these checklists are frequently

used to determine special education placement and IEP goals. Measurement of social skills deficits, strengths, gains, and regressions could likely be enhanced through application of precision teaching techniques and frequency recording of targeted behaviors from the checklists, with measurement of surrounding environmental events as appropriate.

Thus far three possible ways of using precision teaching have been described: (1) the traditional measurement of isolated behaviors, (2) measurement which included some focus on the outcomes of the behavior for the individual, and (3) use of frequency measures with traditional testing. In regard to the efficacy of measurement, social validity of both the selection of the targeted behavior and treatment effects, was also discussed. In consideration of the applicability of precision teaching to the measurement of social skills and directions for future exploration, three other issues are central: (1) the measurement unit selected, (2) curriculum development and effects, and (3) counting and recording procedures.

Measurement Unit

Frequency, for many valid reasons, has been the primary measurement unit used with precision teaching. However, as Arkowitz (1981) has identified, a serious problem in using frequency to evaluate social skills is that "implicit in such an approach is that it is better to have more of a 'good behavior' (e.g., eye contact) and less of a 'bad behavior' (e.g., speech disruptions). Perhaps there can be too much of a good thing and too little of a bad one" (p. 303). A logical way of handling this dilemma is to obtain ecological baselines through measuring behaviors of skill proficient peers and establishing desired rates with upper and lower boundaries.

Much of the psychological literature is based upon reports of percentages of intervals during which behaviors were displayed. A major difficulty with the interval approach is that behavior is defined according to artificial units of behavior which in and of themselves are meaningless. For example, stating that Susie cried during 30% of the 5 minute intervals provides some general information on the level of the behavior. Measure- ment of the frequency, duration, or latency of crying provide additional details which are lost in interval measurement. An advantage of using interval measures is that it is easier to obtain high rates of interobserver reliability, particularly when counting multiple classes of behavior such as positive interactions, negative interactions, and neutral interactions. However, much data are lost in such a process and of interpretation of the behavior can change with changes in the artificial units.

When measuring such behaviors as interactions with others or interaction with objects in the environment, duration as well as frequency may be needed. Generally it is preferable to use both of these units rather than interval measure- ment. Some of my preliminary work with the analysis of videotapes using frequency counts, no measurement, and interval systems (Mason, 1984), suggests that it may be useful to begin a social analysis using an interval recording system and switch to frequency as a second level of analysis in order to obtain more detailed information on targeted behaviors identified through interval measurement.

Curriculum

Precision teaching can easily be used to measure the effects of social skills curriculum, either the published curriculum such as the **Walker Accepts Curriculum** or Goldstein's **Skillstreaming the Adolescent** or **Skillstreaming the Elementary Child** or teacher developed curriculum. Using a precision teaching approach, counting an "inner" could be developed into a sequence of "inners" that may lead to social competence. Similarly, using task analysis, students could verbalize the association of emotions with events (I feel happy when ...) as well as problem solving statements (When ... wants to fight, I will ...). Correlations- between saying or writing these statements and overt behaviors or reactions from others in the environment could also be measured.

Counting and Recording

Of course many of the traditional precision teaching procedures such as self-monitoring, peer monitoring (especially of curriculum activities), and teacher monitoring are applicable. Additionally, new technology adds additional options such as videotaping or computer coding. The Epson computer with a program designed by Repp, Harman, and Felce (undated) is particularly useful in that real life event recording of up to 43 variables is possible with computerized tallies of both the frequency and duration of events.

With such a program, it is possible to code about twenty variables simultaneously- with

high reliability. The addition of an expansion unit allows for a time lag series analysis as well. Interobserver reliability of 90%+ has been obtained with this unit, and the program is ideal for measuring teacher-pupil or staff-client interactions.

Summary

With current emphasis on social skills development, and the current need for preparing children to function in socially acceptable ways in an every changing world, now is the time for precision teaching practitioners to focus energy on better understanding how social competence can be facilitated. Issues such as which measurement units to use, how to best measure interactive effects, the effectiveness of different curricula, and the advantages of technology can and need to be addressed. Just as reading and math have been taught through the systematic application of precision teaching, sets of social skills may be able to be taught. By sharing information, data, and resources we may be able to accelerate this process.

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