Teaching Throwing: Precision Teaching in Physical Education

Phillip Ward, Marie C. Cull, William J. Sweeney, and Gregg E. Drevno

This investigation examined effects of physical education preservice teachers' correct discrimination of pupil throws. The subjects in this study were six female 8-year-old children. The teachers were taught to discriminate between correct and incorrect pupil throws. Pupils were videotaped and systematically observed to identify correct and incorrect throws. Teacher behavior was also recorded to provide an assessment of the fidelity of the treatment. Results indicate that after intervention, correct pupil throws increased in frequency, and incorrect throws decreased in frequency. Implications for physical education instruction are discussed.

Pupil performance in physical education classes is frequently measured in terms of how pupils spend their time (Siedentop, 1991). Inductively derived systematic observation systems are used to categorize pupil behavior into broad response classes. For example, a typical profile of a pupil in a physical education class might be described as: Susie spent 50% of the available time on task, 20% of the time listening to instructions, 10% of the time off task and 20% of the time involved in non-instructional activity such as waiting to get her name marked off on a roll, moving from place to place and gathering equipment. Time on task and its many variations are posited as proxy variables for pupil achievement (Siedentop, Tousignant, & Parker, 1982). Such information is used to define the effectiveness of the teacher in both research and undergraduate teacher assessment.

Another ubiquitous performance measure in physical education is an assessment of outcome, (e.g. did the ball go through the hoop, how fast did the child run). Though a valid and important measure, focusing on outcome alone and not technique is a counterproductive strategy. For example, a child might perform a forward roll to his feet, but have rolled on his head and not on his shoulders. In Precision Teaching, technique is more commonly referred to as tool movement. Tool movements are usually derived from a component analysis of a skill. There are several component analyses of sports skills in physical education (Vickers, 1990).

This investigation examined the effect that preservice teachers had when they discriminated between the correct and the incorrect tool movements of pupils learning to throw. The results of a pilot study found that teachers could be taught to discriminate pupil behavior with little effort and with high accuracy, but the question remained, "What effect did this discrimination have upon pupil throwing?" This investigation sought to examine the effect of teacher discrimination in terms of pupil throwing performance using the Standard Celeration Chart as the measurement tactic and diagnostic tool.

Method

Subjects

The subjects were six female eight-year-old children. The children were enrolled in the The Ohio State University's Developmental Movement Education Program where instruction is provided in aquatics, basic gymnastics (e.g., balances and rolls), and fundamental motor skills (e.g., running, striking, throwing, and catching). The program is supervised by faculty and graduate students specializing in teacher education and movement development and staffed by undergraduates majoring in physical education. The subjects were paired and each pair was taught by an undergraduate student. The instruction occurred over seven successive Saturdays of a school quarter.

Materials
Archery-like targets and several buckets of tennis, nerf and rubber balls were used.

Procedures
One day of traditional teaching was conducted before the teachers began using the intervention. The instruction involved teachers providing feedback in the form of prompts, praise, and corrections to students. For the most part, this feedback was poorly provided. It tended to be a "hit or miss" affair with little differentiation noticeable in either teacher or pupil performance with reference to the previous throw by the pupil. After the day of traditional teaching, the teachers were taught to discriminate correct pupil throws. When the pupil performed the skill correctly, the teacher praised and, in some cases, gave the students stickers as reinforcers using a simple token economy. When the pupil performed the skill incorrectly, the teacher was required to remain silent and to reduce any physical movement (e.g., gestures etc.). The teacher could model and ask the child to practice the correct response only after three consecutive incorrect performances were observed.

Precision Teaching Procedures
The teachers and pupils were video and audiotaped during the study. Researchers viewing these tapes coded first the pupil's tool skill (a component of the throw) as either correct or incorrect, and then coded the teacher's response. Standard Celeration Charts were used to display the number of correct and incorrect pupil tool movements over a constant 10 minute counting period for each of the seven Saturdays of the study. The 10 minute counting period was selected because this was the time allocated by the program coordinator for each teacher to instruct at any one activity station during the Saturday class.

Accuracy and Procedural Reliability
Both pupil and teacher performance were assessed. The video-camera was placed, so that the pupil's behavior could be observed at all times. While almost always in view of the lens, the teacher wore a wireless microphone, so that her verbal behavior("Say"/"No Say") could at all times be recorded.

Dependent Measures
The pupils were videotaped throughout the study. Videotapes were examined in slow motion by two researchers using the component analysis provided by the teachers. Each pupil's throw was coded as a correct or incorrect tool movement. The correct/incorrect correspondence was 100%. The component analysis that the teacher used was a modified version of the Developmental Movement Education Program handbook (Herkowitz, 1991).

Independent Measures
Procedural integrity defined as the correct discrimination by the teacher indicated by the "Say" (correct tool movement), or "No Say" (incorrect tool movement) movement cycle, and is reported below for one pupil from each pair. Procedural integrity ranged from 73% to 100% across all subjects.

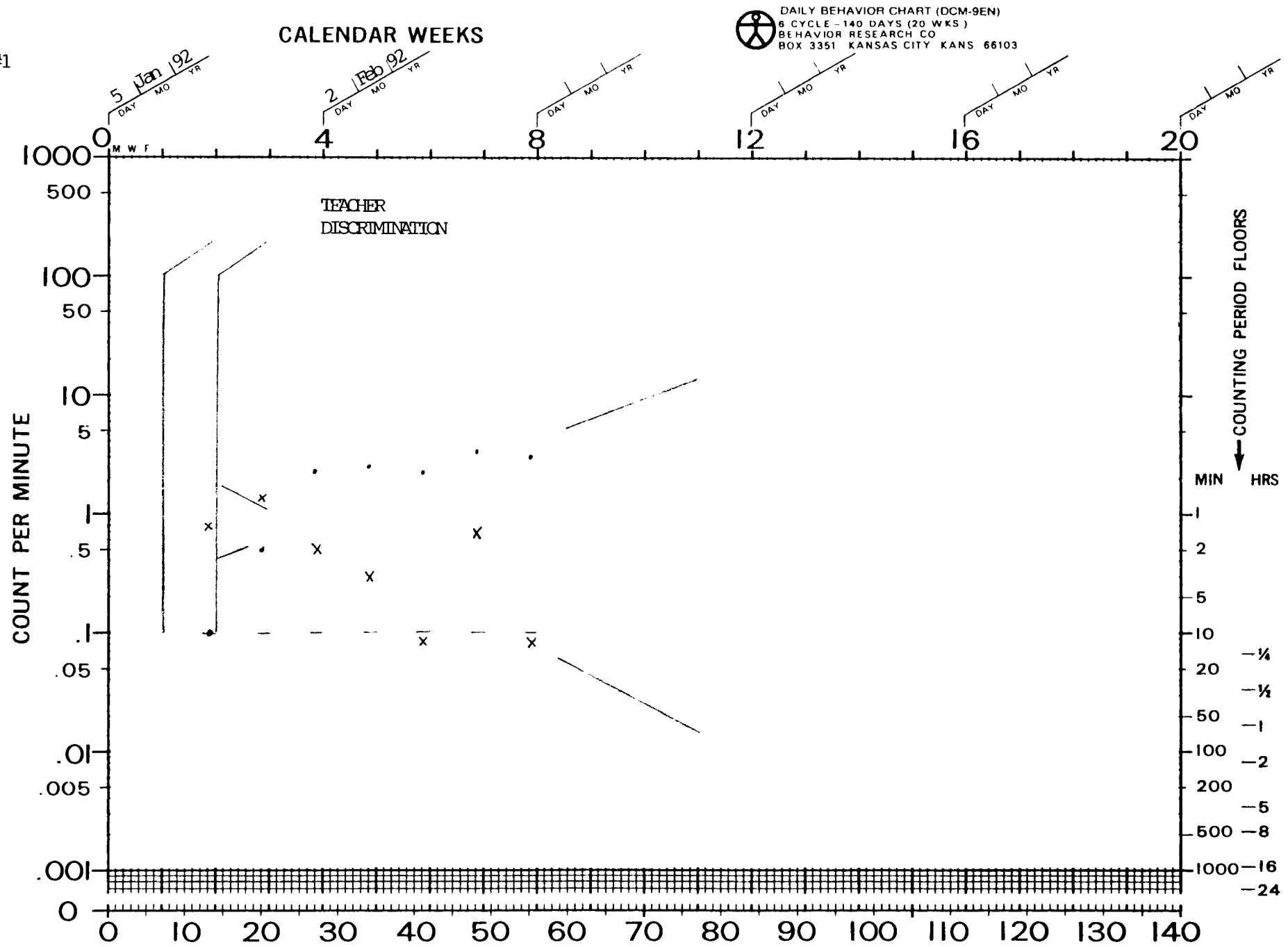
Results

Standard Celeration Charts
Data presented on Charts 1 through 3 represent one pupil from each pair of pupils who served as subjects in this study. The data represent the number of correct and incorrect tool movements per minute during the 10 minute counting period.

Chart 1
Results on Chart 1 indicate a dramatic "jump up" in Sally's throwing behavior after the discrimination training intervention when compared to the previous baseline (change from baseline to intervention indicated by the phase line). Sally's scores for correct throwing at the target ranged from 5 to 33 with a median of 24 during the intervention condition. This was an impressive improvement from just one correct throw during baseline. During intervention, the celeration of correct throwing behavior per 10 minute counting period was x1.5, while the learning opportunities (i.e., errors) was ÷1.8. The data on her throwing performance reveals a "Cross-over Jaws" learning picture. This cross-over occurs when the initial number of learning opportunities is greater than the number of correct responses in contrast to later responses where the number corrects are greater than the number of learning opportunities. Her overall performance change from baseline through intervention was x35.0

CHART #1

DAILY BEHAVIOR CHART (DCM-9EN)
6 CYCLE - 140 DAYS (20 WKS)
BEHAVIOR RESEARCH CO
BOX 3351 KANSAS CITY KANS 66103



SUPERVISOR	ADVISER	MANAGER		BEHAVER	AGE	LABEL	COUNTED
Ward	The Ohio State University	Drevno	Ward/Cull	Sweeney			
DEPOSITOR	AGENCY	TIMER	COUNTER	CHARTER			

Sweeney

Sally | 8 | DME | Balls Thrown

while the learning opportunities was ÷18.0.

Chart 2

Debbie's results on Chart 2 indicate a "jump up" in throwing behavior after the introduction of the intervention when compared to the baseline. Debbie's scores for correctly throwing at the target ranged from 10 to 29, with a median of 18.5 during the intervention condition. The celeration of correct throwing behavior per 10 minute counting period was x1.25, while the learning opportunities was ÷1.7 during intervention. Debbie's data on her throwing performance reveals a "Cross-over Jaws" learning picture. Her overall performance change from baseline through intervention was a x9.0, while the learning opportunities was ÷15.0.

Chart 3

Ann's results indicate a "jump up" in the number of correct throws and a "dive" in the number of throwing learning opportunities after the introduction of the intervention. Ann's scores for correctly throwing at the target ranged from 5 to 28, with a median of 16 during the intervention condition. Her celeration of correct throwing behavior was x1.5 during intervention, while learning opportunities was ÷1.5 per 10 minute counting period. Ann's throwing performance reveals a "Cross-over Jaws" learning picture. Her overall performance change from baseline through intervention was x9.0, while the learning opportunities was ÷18.0.

Discussion

The results indicate that correct tool movements of ball throwing in physical education are easily observable, measurable, and changeable. Initial measures obtained during traditional teaching indicated a high number of incorrect tool movements for each subject and a low number of correct tool movements. All three pupils were able to make rapid celerations of correct tool movements after intervention and a reduction in the frequency per session of incorrect tool movements. The relevance of this statement becomes more significant because each of the subjects in this study had been a part of the developmental motor program for at least three quarters. That is, they had been instructed on how to throw correctly by past teachers in the program, and it appeared that they had achieved little mastery of the tool movements required for the throw.

A common argument in favor of using non-tool movement measures in physical education is that such observations are difficult because of a lack of permanent products either in the form of the performance (i.e., the throw) or the product (e.g., hitting the target). The results of this study suggest that teachers who correctly discriminate correct and incorrect tool movements and provide their pupils with appropriate feedback can affect changes in acquisition of tool movements by their pupils. This finding suggests that proxy measures of pupil performance such as time on task need not be the method of choice in assessing pupil performance in physical education. Correct identification of pupil performance when combined with outcomes is likely to produce the most accurate measure of pupil skill and the most valid measure of teacher effectiveness.

This study used Standard Celeration Charts to display behavior. Future studies might do well to use some of the other Precision Teaching practices. For example, what would be the effect on pupil performance if sprints were used (i.e., the child encouraged to throw as many as possible during a one-minute timing), or if the child charted his/her own progress using a peer tutor to provide feedback?

References

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Siedentop, D., Tousignant, M., & Parker, M. (1982). *Academic learning time-physical education.* Revision Coding Manual. Columbus: The Ohio State University, College of Education.

Vickers, J. N. (1990). *Instructional design for teaching physical activities.* Champaign, IL: Human Kinetics Publishers.

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CHART #2

DAILY BEHAVIOR CHART (DCM-9EN)
6 CYCLE - 140 DAYS (20 WKS)
BEHAVIOR RESEARCH CO
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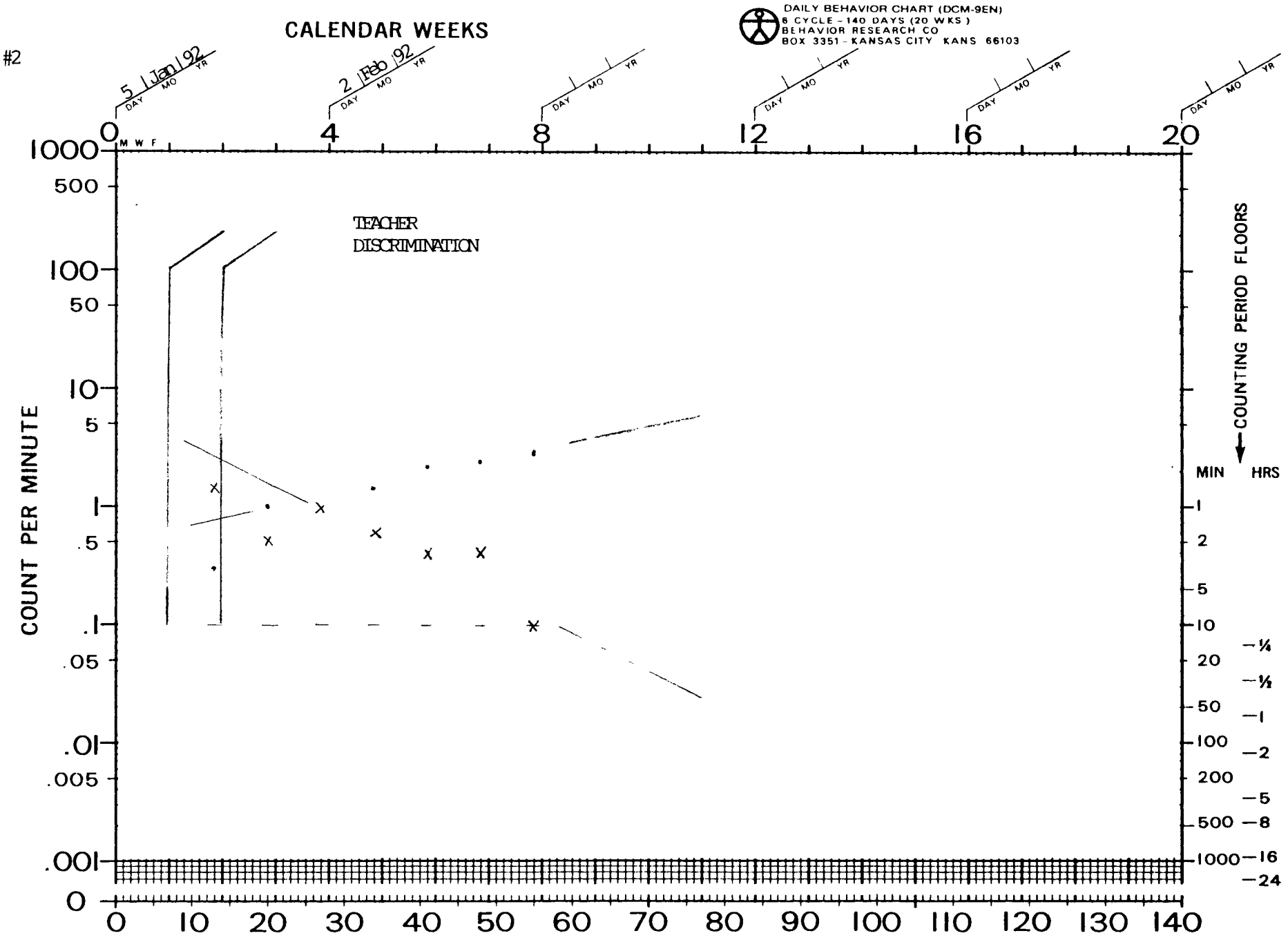

SUPERVISOR	ADVISER	Sweeney MANAGER		Debbie BEHAVER	8 AGE	DME LABEL	Balls Thrown COUNTED
Ward DEPOSITOR	The Ohio State University AGENCY		Drevno TIMER	Ward/Cull COUNTER	Sweeney CHARTER		

CHART #3

DAILY BEHAVIOR CHART (DCM-9EN)
6 CYCLE - 140 DAYS (20 WKS)
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CALENDAR WEEKS

5 | Jan | 92 (DAY | MO | YR)
2 | Feb | 92 (DAY | MO | YR)

0 (M W F) 4 8 12 16 20

TEACHER DISCRIMINATION

COUNT PER MINUTE: 1000 500 100 50 10 5 1 .5 .1 .05 .01 .005 .001 0

COUNTING PERIOD FLOORS

MIN	HRS
1	
2	
5	
10	
20	¼
50	½
100	1
200	2
500	5
1000	8
	16
	24

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140

SUCCESSIVE CALENDAR DAYS

SUPERVISOR	ADVISER	MANAGER	BEHAVER	AGE	LABEL	COUNTED
		Sweeney	Ann	6	DME	Balls Thrown

DEPOSITOR	AGENCY	TIMER	COUNTER	CHARTER
Ward	The Ohio State University	Drevno	Cull/Ward	Sweeney