A Context for Science with a Commitment to Behavior Change

TABLE OF CONTENTS

PAGE 207. PRECISION TEACHING: THE STANDARD CELERATION CHARTS – ABIGAIL B. CALKIN.

PAGE 216. THE DIFFERENTIAL OUTCOMES EFFECT: A USEFUL TOOL TO IMPROVE DISCRIMINATIVE LEARNING IN HUMANS – ANGELES F. ESTÉVEZ.

PAGE 221. INSTRUCTIONS INADEQUATE TO THE TASK CONTROL RESPONSE RECOVERY AFTER DISCRIMINATION REVERSAL IN HUMAN BEINGS – MUCIO A. ROMERO AND N. JAVIER VILA.

PAGE 229. BRIEF REPORT: CAN CONTINGENT IMITATION REINFORCE TRUCK LIFTING IN A THREE-MONTH-OLD INFANT? – CAUTILLI AND DZIEWOLSKA.

PAGE 231. COMPLIANCE WITH DAILY LIVING ROUTINES: A CASE STUDY – LAURA D. NATIONS.

PAGE 235. CONSTRUCTING SINGLE-SUBJECT REVERSAL DESIGN GRAPHS USING MICROSOFT WORD™: A COMPREHENSIVE TUTORIAL – PATRICK GREHAN AND DANIEL J. MORAN.

PAGE 243. DISCOVERY OF MOTOR DEVELOPMENT: A TRIBUTE TO ESTHER THELEN – G.J.P SAVELSBERGH.

PAGE 249. COMPREHENSIVE ABA PROGRAMS: INTEGRATING AND EVALUATING THE IMPLEMENTATION OF VARIED INSTRUCTIONAL APPROACHES – MARY JANE WEISS.
PUBLISHER’S STATEMENT

VOLUME NUMBER 6, ISSUE NUMBER 4

ISSN: 1539-4352

Published: December 31, 2005

The Behavior Analyst Today (BAT) is published quarterly by Joseph Cautilli. BAT is an online, electronic publication of general circulation to the scientific community. BAT’s mission is to provide a concentrated behavior analytic voice among voices which are more cognitive and structural. BAT emphasizes functionalism and behavioral approaches to verbal behavior. Additionally, BAT hopes to highlight the importance of conducting research from a strong theoretical base. BAT areas of interest include, but are not limited to Clinical Behavior Analysis, Behavior Models of Child Development, and Community based behavioral analytic interventions, and Behavioral Philosophy. BAT is an independent publication and is in no way affiliated with any other publications.

The materials, articles, and information provided in this journal have been prepared by the staff of the Behavior Analyst Today for informational purposes only. The information contained in this journal is not intended to create any kind of patient-therapist relationship or representation whatsoever.

For a free subscription to The Behavior Analyst Today, send the webmaster an e-mail containing your name, email address, and the word “subscribe” in the subject box, and you will be added to the subscription list. You will receive notice of publication of each new issue via e-mail that will contain a hyperlink to the latest edition. You may also subscribe to the BAT journal by visiting http://www.behavior-analyst-today.com/subscribe.html.

Advertising in The Behavior Analyst Today

Advertising is available in BAT. All advertising must be paid for in advance. Make your check payable to Joseph Cautilli. The copy should be in our hands 3 weeks prior to publication. Copy should be in MS Word or Word Perfect format and advertiser should include graphics or logos with ad copy.

The prices for advertising in one issue are as follows:

1/4 page: $50.00, 1/2 page: $100.00 vertical or horizontal, Full Page: $200.00.

If you wish to run the same ad in all four issues for the year, you are eligible for the following discount: 1/4 Pg.: $40 - per issue, 1/2 Pg.: $75 - per issue, vertical or horizontal, Full Page: $150.00 per issue.

For more information, or place an ad, contact: Joe Cautilli via e-mail at jcautilli@cctckids.com or by phone at (215) 462-6737.
SUBMISSION INFORMATION

Most contributions are by invitation and all are then peer-reviewed and edited. The editors, however, welcome unsolicited manuscripts, in which case, we suggest potential authors send an abstract or short summary of contents and we will respond as to our interest in a full manuscript submission. In all cases, manuscripts should be submitted electronically saved in “rich text format” (.rtf) to BOTH Michael Weinberg at Michael.Weinberg@po.state.ct.us and Joe Cautilli at jcautill@astro.temple.edu. Please adhere to APA format and use “Times New Roman” font in 11 pt. throughout. In references, however, please italicize the places where APA format would have you underline. Abstracts and keywords must be included, as well as full contact information for all authors.

The above are only the bare bones submission guidelines. Please visit the BAT site for full information regarding submissions: http://www.behavior-analyst-today.com/submissions.html
OUR MISSION

The Behavior Analyst Today is committed to increasing the communication between the sub disciplines within behavior analysis, such as behavioral assessment, work with various populations, basic and applied research. Through achieving this goal, we hope to see less fractionation and greater cohesion within the field. The Behavior Analyst Today strives to be a high quality journal, which also brings up to the minute information on current developments within the field to those who can benefit from those developments. Founded as a newsletter for master level practitioners in Pennsylvania and those represented in the clinical behavior analysis SIG at ABA and those who comprised the BA SIG at the Association for the Advancement of Behavior Therapy, BAT has evolved to being a primary form of communication between researchers and practitioners, as well as a primary form of communication for those outside behavior analysis. Thus the Behavior Analyst Today will continue to publish original research, reviews of sub disciplines, theoretical and conceptual work, applied research, program descriptions, research in organizations and the community, clinical work, and curriculum developments. In short, we strive to publish all which is behavior analytic. Our vision is to become the voice of the behavioral community.

Behavior Toolbox

Behavior Toolbox is a unique collection of software programs for professionals who work with children with learning and behavior problems. They provide instant access to well recognized, research based intervention strategies according to age and the environment where the help is required. The products are used by thousands of professionals worldwide. Teachers, Educational and Child Psychologists, Pediatricians and Education, Medical and Mental Health Organizations are all benefiting from the ability to access solutions in such a straightforward way.

Adolescent Behavior Toolbox  Child Behavior Toolbox

The most prominent Internet, CD-ROM and PDA products dealing with emotional, behavioral and developmental problems

ABT and CBT contain more than 4000 intervention strategies across 120 behavior and development topics within the following categories:

- Attention
- Behavior
- Behavior Management
- Cognition
- Emotional Adjustment
- Health Promotion
- Memory
- Problem Solving
- Reading & Language
- Social-emotional Adjustment
- Social Relationships
- Social Skills
- Special Topics
- Visual Motor Skills

“This is the way to communicate to everyone that their needs and concerns are a priority worthy of attention and resources. Professionals working with children with emotional and behavioral problems can see that for every situation there are several options and everyone on the team has access to the same tool to foster agreement about how to approach a problem.”

Don Nance - State License Holder - Kansas

For more information go to the website or e-mail bt@conductmanagement.com

www.conductmanagement.com
Combining Pavlov’s (1960/1927) use of frequency as a standard unit in the measurement of scientific phenomena and Skinner’s (1938) use of frequency, free operant behavior, and the cumulative recorder with his knowledge of engineering and interest in navigation, Lindsley brought to psychology and education the most powerful and scientific use of measurement applied to human behavior. In 1965, he developed what was first called the Standard Behavior Chart, now more accurately described as a family of Standard Celeration Charts—standard measurement charts for human behavior in daily, weekly, monthly, and yearly time periods. This paper provides an overview of these four types of Standard Celeration Charts.

Key words: Precision Teaching, Standard Celeration Charts, frequency, continuous measure, behavior therapy

Since 1967, educators and others have used the Standard Behavior Chart (now called the Standard Celeration Chart) to observe human behavior and improve learning. The people behaving have ranged from fetuses to those in their 80s (Calkin, 1983; Cobane & Keenan, 2002; Edwards & Edwards, 1970). Some behaviors counted have included all day counts of fetal movement (Calkin, 1983), positive and negative feelings about self (Cobane & Keenan, 2002; Kostewicz, Kubina, & Cooper, 2000; Kubina, Haertel, & Cooper, 1994), as well as the more usual 1-minute timings of academic behaviors such as Hear Say question then answer (Zambolin, Fabrizio, & Isley, 2004), See Write math facts (Stromberg & Chappell, 1990), Think Say and Think Write American government facts (using 1-minute, 2-minute, and 5-minute timings) (Ellis, 1980), Write words (Albrecht, 1981), and See Say parts of a microscope or skeleton (Miller & Calkin 1980).

FREQUENCY AND CELERATION

Because of the design of the Standard Celeration Charts—the standard is the 34 degree angle of the doubling line from corner to opposite corner—all accelerations and decelerations are standard on all charts. Behavior Research Company publishes the series of Standard Celeration Charts for minutes, days, weeks, months, and years. Lindsley trademarked the term “Standard Change Chart” to describe general applications of the chart series.

Using the Standard Celeration Chart makes two critical elements apparent. First, behavior grows by multiplying, not by adding. If Janel wants to improve her learning, she knows that to grow from one to two is to double and is identical to growing from 50 to 100, not from 50 to 51. When she wants to learn something new or change a behavior or feeling, she wants change by doubling, not by adding or deleting one at a time. If Abigail says 35 Russian conversation words in one minute (to which no Russian will listen for long!) and grows by adding one a day, it will take 215 days, or 31 weeks, to reach fluent speech. If she learns by doubling each week, she can get from 35 words per minute to 250 in 50 days, or seven weeks. If Gemma is a slow reader and reads 62 words a minute at grade level and wants to read 200 words per minute, does her teacher want her to grow by adding or multiplying? If Alan has 100 suicide thoughts a day, does he want to reduce them by one or two per day or by ÷5.0 per week?

Secondly, the chart makes us look at not only the frequency of a person’s performance, but also at the growth of learning across time, (i.e., the celeration). Within the first five years of using the chart, several of its powerful elements became increasingly apparent. Frequency is performance: It tells what happened during one time period, but by itself it tells little about learning. To see whether performance accelerates or decelerates, we need to measure it across time. Since 1971, we have called this change in learning celeration. Acceleration indicates an increase in the growth of change of the frequency, in the learning of the behavior. Deceleration indicates a decrease in the learning of the behavior.

Frequency is the count per minute: the number of times Steve does independent or dependent actions per hour; the number of pieces of science equipment Greg names correctly and incorrectly in one minute; the number of...
words Chris reads correctly and incorrectly per minute; the number of pleasant and unpleasant self-thoughts Angie has per day. These behaviors show performance.

Celeration is the count per minute per week. It shows change in performance, or learning across time. We measure celeration, (i.e., learning) by the week, or, if using larger time measures, changes by the month, year, or decade. Celeration: Steve’s actions per hour, each day, per week; Greg’s pieces of equipment he points to and says per minute, each day, per week; Chris’s words read per minute, each day, per week; Angie’s thoughts about self per minute all day, each day, per week.

Most graphs give only the frequency at best, and often the graph represents a removal of the original data, replacing it with a percentage or rate. The Standard Celeration Chart displays the original data. Because of its design, the charter plots only frequency so the chart always displays performance within a time period. Further, if desired, one can read percentages from the Standard Celeration Chart. If Janel had zero errors, she had 100% correct answers. However, this gives no idea how many correct answers she said. In fact, Janel began with four answers correct per minute with heavy prompting from her tutor. With direct teaching two hours a week, she learned to say 28 correct answers per minute, also 100%, with no prompts after only five lessons and three weeks later. A percentage tells me her learning has not changed. The raw data charted on a frequency scale lets me know she has grown, celerated, by $x^7$ over three and a half weeks. With “guided” written above the timing of the four per minute, Janel had gone from heavy prompts in the first lesson to no prompts five lessons later.

In 1980, Steve, an 18-year-old high school senior, returned to school each Monday with low frequencies of independent actions (e.g., working without teacher direction, coming up with ideas without prompting) and high frequencies of dependent actions (e.g., asking for teacher help, starting only when told). Cindy Bartels, his teacher, and Steve counted these each hour he was in her history class. The Monday through Friday pattern jumped out. Bartels learned Steve had no home supervision on the weekend and returned to school each Monday, even at 18, behaviorally saying, “Please give me order.” At the end of week 2, Bartels helped him see he had to provide his own order every day, an essential since he was about to graduate and would suddenly require a lot more self-direction. After Bartels shared the data with Steve and discussed the weekly pattern with him, his independent actions increased and his dependent actions decreased. By midweek during weeks 3, 4, and 5, the frequencies had reversed and the independents were high, the dependents at zero.

The Daily Chart in Figure 1 shows Greg learning science—e.g., Grasp Release an object, See Say (read aloud) words, See Say (memorize) musical notation or the Periodic Table, Think Say facts from text in order (also called Free Say where the stimulus is unknown); 2) other outer behavior such as being out of seat, interrupting, greeting people, setting goals, making free choices; and 3) inner behaviors such as thoughts of a former wife, jealous feelings, positive and negative feelings about one’s marriage, pleasant and unpleasant feelings about oneself. The Daily Chart in Figure 1 shows Greg learning science facts by See Say—he sees the object and says its name or he sees the front of the flashcard and says the information on the back.

In four of the five phases, corrects accelerate (by about $x^{1.8}$, or an 80%, increase per week) and the errors decelerate, most dramatically in the first phase by a 1:10 per week. In the third phase, Science Facts #1 (Flash Cards) No Study, corrects and errors both increased. Seeing from a collection of charts that learning was not occurring well for about fifteen of her 19 students, Miller and Calkin, (1980) made the decision to add five minutes of study time. The students’ correct responses continued to accelerate and their errors began to decelerate. As you can see in Figure 1, Greg’s performance was no different, his corrects began to accelerate while his incorrects began to decelerate. Because the chart is standard, Miller could quickly see whether each student was learning and could tell whether she had made the correct teacher
Figure 1: Number of correctly and incorrectly identified science facts
Figure 2: Abigail’s illusions per week
Figure 3: Abigail’s illusions per month
Figure 4: Number of people killed during the “troubles of Ireland”
Weekly Chart

The Weekly Standard Celeration Chart is often used to measure behaviors of an organization or its people when such data are most clearly summarized on a weekly basis. Any daily behavior occurring from not at all to up to perhaps three or four times a day we best see totaled for the week and put on the Weekly Chart. Performance on the Weekly Chart goes from one per week up to 1,000,000 per week. We measure celeration on the Weekly Chart by the month. The Weekly Chart in Figure 2 shows Abigail’s illusions per week. An illusion is an image, a phantasma, or a sensory image that appears but the person having it knows that is not real. It is a stimulus that exists alone; other than to note its occurrence, Abigail had no response to it unless she thought it may have some potential literary value and record it for later use in a poem or story. An example is seeing three men, dressed in clothing of 1900, digging a sizeable hole in the street—their street is dirt, the one she is on is paved—and they weren’t there five seconds earlier. She had counted 12 behaviors daily for 13 months; some of these were of low frequencies and best displayed on a weekly or monthly chart. Her illusions gradually increased at X1.1 per week. Looking at the same data on the monthly chart, the acceleration is more evident, doubling every six months.

Monthly Chart

Like the Weekly Chart, the Monthly Standard Celeration Chart may also be used to measure the growth and change within an organization such as a business, school, or family. Performance on the Monthly Chart goes from one per month up to 1,000,000 per month. We measure celeration by the half years. The Monthly Chart in Figure 3 shows Abigail’s monthly illusions. The first month the data were charted, illusions occurred slightly over 30 per month. Illusions accelerated across the next 9 months peaking at 90 per month for three consecutive months. The tenth month had a jump-up to approximately 170 illusions per month decelerating slightly to approximately 140 illusions per month.

Yearly Chart

The Yearly Standard Celeration Chart usually measures business, school, family, political, economic, social, historical or ecological changes. Performance on the Yearly Chart ranges from one per year up to 1,000,000 per year. We measure celeration every five years. The Yearly Chart in Figure 4 shows the number people killed during The Troubles (of Ireland) from 1969 to 2001 (Sutton, 2003). The Civil Rights marches began in 1969 and across the next 4 years the deaths in Ireland dramatically increased from 17 in 1969 to almost 500 in 1972, their highest level in 31 years. By 1977, deaths per year had decreased to about 100 per year and maintained between 60-120 deaths per year for 18 years before decelerating in 1995, the year after the cease fire was declared. The hunger strikes of 1981 had little to no impact on the total number of deaths per year.

SUMMARY

The paper presented four charts — daily, weekly, monthly, and yearly. Using the Standard Celeration Chart has a number of advantages to conventional add-subtract charts typically used in behavior analysis and education. First, because the Standard Celeration Chart uses a standard scale to display change numerically, when you looked at each of these charts, you can tell immediately whether the line went up, down, or stayed the same. If you don’t already have the thought as to which line was the steepest, go back to any chart for a second look, the steepness (i.e., slope) of the line changes not because of a differently graphed scale on the left or across the bottom but because the behavior changed. Second, since each form of the Standard Celeration Chart is by definition standard, to read one Standard Celeration Chart is to have the ability to read any of them. The vertical axis on all standard charts multiplies by 10 and performance from corner-to-corner (i.e., bottom left to upper right) is interpreted based on a doubling of performance, or X2. Therefore, the ability to read one chart means one has the ability to read all charts providing information to make informed decisions across many different venues.

Lindsley began to measure the behavior of schizophrenics at Metropolitan State Hospital in Waltham, Massachusetts, and coined and first published the term “Behavior Therapy,” in the 1954 Boston telephone directory: Studies in Behavior Therapy (O. R. Lindsley, personal communication, October 11, 1999). In 1967, Lindsley formed the Behavior Bank to collect, analyze, summarize, and display facts about human behavior (Koenig, 1972). Banked projects include academic, personal management behaviors, and inner behaviors. Handbook of Precise Behavior Facts (Lindsley, Koenig, Nichol, Kanter, & Young, 1971) contains summaries of 11,947 Standard Celeration Chart projects on peoples’ learning. Volume I lists each pinpoint, the body part involved, the supervisors and contributors of the projects, the instructional technique, and the reward or punishment
for each project. Volume II displays the visual summary of the data for any pinpoint which had at least five charts banked; the highest, middle, and lowest frequency; and the most rapid (i.e., steepest), middle and the slowest (i.e., flattest) celeration. By 1973, the Behavior Bank contained 16,376 projects (Sokolove, 1973). The Behavior Bank closed in 1974 (Potts, Eshleman, & Cooper, J., 1993). However, by 2000, the vast majority of an estimated 1.2 million charts had come from education and direct work with students (Calkin, 2002).

In addition to helping students learn in regular and special education classrooms, learning centers, and universities, Precision Teaching has been used in many different fields including nursing (Dean, 1973/1974), inner behavior (Calkin, 1979/1980; Calkin, 1981; Calkin, 1983; Calkin, 1990; Calkin 1992; Calkin, 2000; Cobane & Keenan, 2002; Dean, 1973; Duncan, 1971; Judy, Malanga, Seevers, & Cooper, 1997; Kostewitz, et al, 2000; Kubina, et al, 1994), and education (Malanga, 2003; Sweeney, Sweeney, & Malanga, 2001; Teigen, Malanga, & Sweeney, 2001) to name just three. Precision Teaching has also had a cross-cultural influence as well and has been used in multiple countries including the United States, Northern Ireland, Australia, and Canada. The field now is shared across these and other countries via the Internet. Precision Teachers meet online at SClistserv@lists.psu.edu and has its own website www.celeration.org. In addition to these two resources, there are a number of useful Precision Teaching websites including: precisionteachingresource.net/, behavioresearchcompany.com/updates/, celeration.net/, www.schoolhouseotech.com/products/basicfacts/index.htm, fluency.org, fluencyfactory.com, and morningsideacademy.org. For those interested in learning more about Precision Teaching Graf and Lindsley (2002) recently published a handbook titled Standard Celeration Charting 2002 and the Journal of Precision Teaching and Celeration, which began in 1980, published its 20th volume in 2004.

REFERENCES
of one-minute warm up procedures on addition one-minute fluency timings. *Journal of Precision Teaching and Celeration, 17*(2), 76-88.
