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STATEMENT OF PURPOSE: As the official journal of the Standard Celeration Society, the Journal of Precision Teaching and Celeration has dedicated itself to a science of human behavior founded on a technology of direct, continuous and standard measurement. This measurement technology includes: a standard unit of behavior measurement – frequency; a standard measure of change in behavior frequencies – celeration; a standard measure of the variability of behavior frequencies – bounce; and a Standard Celeration Chart to display frequency, celeration and bounce data. The Standard Celeration Chart enables chart based statistical procedures to determine changes in frequency-frequency jumps, changes in celeration – celeration turns and changes in bounce – bounce verge.

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The Standard Celeration Society (SCS) publishes the Journal of Precision Teaching and Celeration (ISSN# 1088-484X) two times a year. SCS members receive the Journal of Precision Teaching and Celeration. To join the SCS fill out a membership application located at the back of the journal. Please send SCS membership to Brad Frieswyk, SCS Treasurer, PO Box 256643, Chicago, IL 60625-6643. Membership dues: Student – 25.00 yearly membership includes two issues of the Journal of Precision Teaching and Celeration and a copy of the Standard Celeration newsletter; Regular – 50.00 yearly membership includes two issues of the Journal of Precision Teaching and Celeration and a copy of the Standard Celeration newsletter; Sustaining – 100.00 yearly membership includes two issues of the Journal of Precision Teaching and Celeration, an extra copy of each issue, and a copy of the Standard Celeration newsletter; Institutional – 90.00 yearly membership includes two issues of the Journal of Precision Teaching and Celeration and a copy of the Standard Celeration newsletter. To join the SCS or order journals with a credit card please visit: https://www.paypal.com. Open an account and choose the "Send Money Option." Send money to SCSstreas@aol.com. Standard Celeration Society members please send your change of address or other membership questions to the Standard Celeration Society treasurer Brad Frieswick, PO Box 256643, Chicago, IL 60625-6643.
A professional journal serves as a repository for the collected information deemed important to a specified field of study. Over time, a journal tells the story of what the field of study has discovered. The stories, told by experimental, descriptive, or discussion articles allow readers to judge the worthiness of the respective articles, but also to peek into future through the eyes of the journal's contributors. This editor feels humbled that he had the opportunity to help the Journal of Precision Teaching and Celeration add a few more chapters to its dynamic and extensive account of learning and Standard Celeration technology.

What began in 1980 with Pat McGreevy, carried on in the 1990s with Claudia McDade and came to me, Rick Kubina, early in 2000 now looks to add another steward. The outgoing editorial staff, Clay Starlin and myself, extends gratitude and best wishes to the incoming staff, Co-Associate Editors Alison Moors and Clay Starlin (who graciously decided to extend his term) and new editor Jesus Rosales-Ruiz. Speaking for the Precision Teaching community we all look forward to seeing to the changes and updates the new editorial team will make.

Before bidding a final farewell, I have the pleasure of describing the current issue of the Journal of Precision Teaching and Celeration. The contributors for the current article describe a number of studies examine the impact of Precision Teaching on academic tasks. The first application study by Gryiec, Grandy and McLaughlin explores the effectiveness of the cover, copy, and compare procedure on correct and error words in spelling with an elementary school student with Fetal Alcohol Syndrome. Kaatz-Sulgrove and McLaughlin describe the effects of an additional timed reading on reading rate three fourth grade students with mild disabilities. The last application article discussed how a procedure called “cover, copy, and compare” and flash cards impact the correct rate of math facts for a middle school student with learning disabilities. The authors, Hayden and McLaughlin also discuss how to apply the cover, copy, and compare procedure and flash card practice with middle school students. This issue also has six chart shares. The chart shares range in diversity of procedures and participants. The word “improvement” best describes the common theme among all of the chart shares.
The Effects of the Copy, Cover, and Compare Procedure in Spelling with an Elementary Student with Fetal Alcohol Syndrome*

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This study examined the effectiveness of the cover, copy, and compare drill and practice procedure on the number of correct and error words in spelling with an elementary school student with Fetal Alcohol Syndrome (FAS). An AB time series design was employed to examine the copy, cover, and compare procedure. The cover, copy, and compare procedure did improve the frequency of correct words spelled and decreased the participant's errors. An examination of outcomes indicated some variability in the participant's performance during the copy, cover, and compare intervention. The applicability of copy, cover, and compare for use with student with FAS is discussed.

DESCRIPTORS: Copy-cover-compare procedure, Fetal Alcohol Syndrome

Fetal Alcohol Syndrome (FAS) presents one of the most dramatic and severe impacts on the education of children (Burgess & Streissguth, 1992; McLaughlin, Williams, Howard, & Williams, 1995). It has also been one of the most extensively researched and documented problems in North America (McLaughlin, Williams, & Howard, 1998; Streissguth, 1994, 1997; Williams, Howard, McLaughlin, 1994). Exposure to other substances such as marijuana, heroin, methamphetamine, tobacco, and caffeine also have documented deleterious effects of greater and lesser degrees along the continuum with children. Of these pharmacological teratogens, marijuana and alcohol have been identified as the most frequently used secondary drugs in the general population (Hingson et al., 1982).

While considerable attention has been paid to the characteristics and needs of children who have FAS/FAE (Burgess & Streissguth, 1992; Griffith, 1992; Streissguth, 1994, 1997), there continues to be an ever increasing number of children with such a disability. Since these children display problems which are both complex and in many cases severe, there are no easy solutions for successfully working with these children (Howard et al., 1994; McLaughlin et al., 1995, 1998). For many parents and educators, management and instructional strategies which can be used in academic and social skills training for other children, may have little impact on this population (Colvin & McLaughlin, 1993; Howard, Williams, & McLaughlin, 1994).

However, it has been suggested and urged (e.g., Howard et al., 1994; McLaughlin et al., 1995, 1998; and Williams et al., 1994) that data-based and effective strategies and teaching procedures be implemented and evaluated with children and youth with FAS. One possible strategy that has strong empirical support with both children with and without disabilities has been the cover, copy, and compare or add-a-word self-practice procedures (McLaughlin & Skinner, 1996; Skinner, Turco, Beatty, & Rasavage, 1989).

Employing the copy, cover, and compare procedure in spelling involves just a small number of steps. First, the student looks at the spelling word. Next, the student covers the word and writes the word from memory. The student then uncovers the stimulus word evaluates their spelling by comparing it to the original word. If the student determines that the spelling of the target word was accurate, the student moves down the list to the next word and repeats the procedure. If the student determines that the word was spelled incorrectly, some type of error correction procedure (e.g., repeat the cover, copy, and compare procedure or write the word and its correct spelling three times in rapid succession, etc.) before going on to the next item (McLaughlin & Skinner 1996; Skinner et al., 1989). For example, Schermerhorn and McLaughlin (1997) examined the use of the copy, cover, and compare procedure.

*Preparation of this project by the first two authors was in partial fulfillment of the requirements of EDSE 410 Precision Teaching, a component of the Department of Special Education at Gonzaga University, Spokane, Washington.

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completeness, accuracy, and neatness of creative writing homework assignments (Glomb & West, 1990). An error monitoring strategy known as COPS, developed in the learning disability institute at the University of Kansas (Schumaker, Deshler, Alley, & Warner, 1983), proved beneficial to students with learning disabilities in the detection and correction of mechanical errors. Other writing research that indicated self management an effective tool in helping students improve their writing skills include Shannon and Polloway's study (1993) in the COPS error monitoring strategy, which proved beneficial to sixth grade students participating in the study by helping them focus on the mechanics of writing. Thus, using an error monitoring strategy, such as COPS, to help students with learning disabilities become successful and acquire the necessary skills to become competent writers is of great interest.

The advancement of monitoring teacher effectiveness has been enhanced by Precision Teaching. Precision Teaching is a precise and systematic method of evaluating the effects of instruction. One of the basic elements of precision teaching is the use of number of responses per unit of time to monitor the development of fluency (that is, speed plus accuracy and quality) of a learner's work to a performance standard (for example, 20 to 25 words per minute for free writing) (Binder, 1990). Frequency (number of errors/unit of time and number of corrects/unit of time) indicates how well a student can do a task. In addition, fluency facilitates generalization and maintenance of skills, and often has functional implications as well (for example, reading a map).

Precision Teaching uses frequent assessments of learner performances and displays those assessment data on Standard Celeration Charts (Pennypacker, Koenig, & Lindsley, 1972) to allow teachers to evaluate the effectiveness of instruction (Binder, 1990). Many precision teachers and their students use one-minute counting periods when counting and charting performance (Binder, Haughton, & Van Eyk, 1990).

Although gains have been made in the effectiveness of instructional methods for other writing aspects (for example, composing, style) for students with a learning disability, there is limited knowledge of the strategies needed to assist students to improve their proofreading skills. Self management combined with specific precision teaching qualities (that is, one-minute assessments, Standard Celeration Chart) should offer great potential for helping students with a learning disability acquire proofreading skills.

The purpose of this study was to determine the effects of self managed proofreading on the detection of capitalization errors, punctuation errors, and spelling errors. Specifically, this study investigated whether using self managed proofreading involving a visual prompt and written cues affected the number of mechanical errors detected and the number of errors corrected by students with a learning disability.

The following questions were the focus of this study: (a) What effect will practice sheets have on students' detecting mechanical errors on experimenter-prepared writing samples? (b) What effect will practice sheets have on students' error correction on experimenter-prepared writing samples? (c) What effect will self managed proofreading have on students' detecting mechanical errors on experimenter-prepared writing samples? (d) What effect will self managed proofreading have on students' error correction on experimenter-prepared writing samples? (e) What effect will self managed proofreading have on students' maintaining proofreading skills on experimenter-prepared writing samples after instruction has been terminated? (f) What effect will the use of experimenter-prepared writing samples have on the type of mechanical errors detected by students with learning disabilities over the course of the study?

METHOD

Participants

The experimenter selected seven students with specific learning disabilities. The specific learning disabilities were documented by school records (such as grades, performance in class) and diagnostic testing in accordance with state guidelines for student eligibility for special education services. Criteria for participant selection included: (a) teacher identification of students who had experienced difficulty in the mechanics of writing, (b) teacher recommendation that these students would benefit from error monitoring instruction and self managed proofreading, and (c) students' willingness and parental permission to participate in the study. All students participating in the study were eleven-year old males. Two students were in fourth grade and five students were in the fifth grade. Two students were African-American and five students were Caucasian.

Setting and Materials

The study was conducted in an urban elementary school with an approximate enrollment of 400 students in grades K 5 located in the midwest. The individualized assessment and instructional sessions were held in either of two separate, quiet, well lit rooms equipped with a table and three chairs. The rooms were large enough to
on spelling performance with an entire combination fifth-and sixth-grade parochial school class. The students copied their spelling words, wrote the word and their attempt at spelling the word on the same sheet of paper next to the first target word and then checked their word for accuracy. If students made an error, they repeated the procedure. The outcomes in their study indicated significant increases on end of the week posttests. The copy, cover, and compare procedure has been shown to be effective across a wide range of individuals ranging from college students (Noland, McLaughlin, & Sweeney, 1994) to children with mild disabilities (McLaughlin, Reiter, Mabee, & Byram, 1991; Skinner et al., 1989; Stading, Williams, & McLaughlin, 1996; Murphy, Hern, Williams, & McLaughlin, 1990; Pratt-Struthers, Bartalamay, Williams, & McLaughlin, 1989; Pratt-Struthers, Struthers, & Williams, 1983), to low achievers (McAuley & McLaughlin, 1992). Also it has been shown to assist children learn academic materials in math (Skinner et al., 1989; Skinner, Bamberg, Smith, & Powell, 1993; Stading et al., 1996) social studies (Skinner, Belfiore, & Pierce, 1992), and spelling on end of the week posttests (McAuley & McLaughlin, 1992; Noland et al., 1994; Pratt-Struthers et al., 1989, 1994; Schermerhorn & McLaughlin 1997) and student spelling in creative writing (Pratt-Struthers et al., 1983).

METHOD

Participant and Setting

The participant of the study was a second grade female student enrolled for 60 minutes each day in special education for spelling and language instruction. She was seven years old and attended a medium sized urban elementary school in the Pacific Northwest. The participant matched the state and Federal definition for learning disabilities and as well as fitting the suggested guidelines for FAS. This diagnosis was made by the child's medical doctor. The participant was highly distractible, had poor eye hand coordination, temper tantrums, and displayed marked delays in language, and had weak fine motor skills. The student was also below grade level in spelling and language. All teaching and testing sessions took place in the school's library.

Dependent Variables and Measurement Procedures

The dependent variables were number of words spelled correctly on a spelling test containing 10 words from the Dolch list used in the district. The first two authors administered the student her spelling exams and kept a permanent copy of her performance for each session. Data were collected from two to three times a week for approximately 10 to 20 minutes per session across seven weeks.

Experimental Design and Conditions

An AB design (Kazdin, 1982) was utilized in the study to assess the effects of the cover, copy, and compare procedure.

Baseline. Baseline consisted of two spelling tests on separate days to establish correct and error rate for spelling. The words came from the Dolch list. One of the first two authors gave the words to the child by saying the work, using the word in a sentence, and then saying the word again. Data were taken for three data days.

Cover, copy, and compare. During the cover, copy, and compare procedure. The student copied the word and wrote its spelling, covered the word and wrote the words spelling from memory. After the student wrote the problem correct for three days, the word was removed and another word from the Dolch list was added. The form that was employed can be seen in Figure 1. The student was not timed. This condition was in effect for six weeks with from 2 to 3 sessions taking place each week of school.

Reliability of Measurement

Reliability of measurement was taken for each session. The tests were regraded and the words were copied to another sheet of paper so the previous grading marks could not be used by the other grader. If both persons scored the word in the same manner, it was scored as an agreement. Any discrepancies were scored as disagreements. Reliability of measurement was 100%.

RESULTS

Frequency of Correct and Error Words

The number of words spelled correctly or as an error for each of the sessions can be seen in Figure 2. The mean number of words correct for baseline was 5.33, while the mean number of errors was 4.67. With the implementation of the copy, cover, and compare procedure, the number of corrects increased while the number of errors decreased. The mean number of correct words dur-
ing the copy, cover, and compare phase was 7.31, range 2 to 10. The number of error words also decreased to an average of 2.69, (range 0 to 5) during this phase.

Percent Correct

Overall percent correct for baseline was just 53.3% (range 40 to 60%). During copy, cover, and compare procedure was erratic at times. For some sessions the student did very well, while on other sessions such as Session 11, the participant's performance was variable and erratic. A discussion with the classroom teacher revealed that the child had been sent to an out of class time out twice that day. In addition, during some sessions, the student was highly irritable and distractible, these are some of the typical characteristics found in children with FAS (McLaughlin et al., 1995; Streissguth, 1994. 1997).

An analysis of the data between the frequency of corrects and errors to that of percent correct provides one with a very different picture. The more accurate outcomes can be seen when correct and error frequency are plotted over time (See Figure 2). The overall mean percent for both corrects and errors was misleading. The use of averages as well as percent correct with its ceiling effect has been suggested as a highly suspect manner in which to evaluate intervention strategies (Kunzelmann, Cohen, Hutten, Martin, & Mingo, 1970).

The present paper does provide some beginning evidence that data-based and effective intervention strategies such as the cover, copy, and compare procedure developed by C. H. Skinner and his colleagues can improve the frequency of correctly spelled words as well as reduce the error frequencies for a young child with FAS. The erratic performance of the participant reported in the present case report, clearly warrants further analysis. Anecdotally, the first two authors felt that some of the variability in performance was due to the fact that they could not come each day and work with the child. Also, like many students with attention deficits, there were some days when other things in the school environment seem to occupy her.

There were several positive features of employing Precision Teaching procedures with copy, cover, and compare. First is was easy for us to implement and carry out. The procedures themselves also allowed for a permanent product of the outcomes to be developed and displayed. This material could be valuable information in the IEP process. Finally, we observed that the child appeared to look forward to the arrival and teaching the drill and practice by the first two authors. The use of the Standard Celeration Chart made it possible to determine and inform the teacher of the child's progress over time. This was done at the end of each session.

We and others have urged that children with FAS, due to the severity of the syndrome, receive the best possible teaching and intervention strategies (Howard et al., 1994; McLaughlin et al., 1995, 1998; Williams et al., 1994). The present case report begins that process. Clearly, more detailed and long term studies are warranted.

REFERENCES


The Effects of an Additional Timed Reading on Reading Rate*

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The purpose of this research was to increase correct frequency and decrease error frequency of see/say words in context (oral reading) in Corrective Reading. The participants were three fourth grade students with mild disabilities enrolled in a special education resource room program in a small rural school district. The number of correct and error words from Corrective Reading were measured. These data were collected after each Corrective Reading Lesson. The intervention was to decrease the number of timed readings in the Corrective Reading lesson. The overall outcomes indicated a small decrease in errors and an increase in correct responses when additional timed readings were employed. The benefits of additional timings for teachers and students are discussed.

DESCRIPTORS: Corrective Reading, Timed Readings, Frequency

Reading is an essential skill, and teachers must regard the attainment of functional literacy as a right of all children (Gregori & McLaughlin, 1996; Guthrie & Cunningham, 1982; Sweeney, Omness, Janusz, & Cooper, 1990). There is agreement among teachers and researchers that children must have graphonic knowledge in order to read. That is, they must understand that written symbols make up written words. The debate lies in which method is most effective in imparting this knowledge to the student (Liberman & Liberman, 1986; McIntyre, 1993; Stahl, 1990; Stahl & Miller, 1989).

The failure of students to acquire skills in reading has been linked to dropping out of school (Ekstrom, Goertz, Pollack, & Rock, 1986; Greenwood, 1996; Hart & Risley, 1995; Howard, McLaughlin, & Vacha, 1996; McLaughlin & Kellogg, 1995; McLaughlin & Vacha, 1991; Slavin, 1989; Steinberg, Blinde, & Chan, 1984). Being a school dropout has been linked to being a problem in the neighborhood or community, (Tremblay, Masse, Perron, & LaBlanc, 1992), producing increased family strife (Barkley, 1990), and in later life, acquiring low paying jobs (Barkley, 1990), experiencing frequent unemployment (Barkley, 1990; Darby, 1995), and living in poverty (Danziger & Gottschalk, 1995; Zigler, 1997).

Fortunately, skill-based reading instruction where skills are taught directly with data-based and effective teaching procedures have been shown to be an effective approach to improve the literacy of all children and adults (Adams & Engelmann, 1996; Carne, Silbert, & Kameenui, 1997; Slavin, 1996). Direct Instruction emphasizes frequent teacher-student interaction guided by carefully sequenced lessons utilizing modern learning principles and advanced programming strategies (Engleman & Carnine, 1982). The two major rules of Direct Instruction are to "teach more in less time", and to "control the details of what happens" (Engleman, Becker, Carnine, & Gersten, 1988). Direct instruction employs an increase in opportunity to respond. The pupil is active in the learning and evaluation process. Evaluations of Direct Instruction and skill based approaches with children at-risk for failure in reading, have been extremely positive (Becker, 1977; Gersten, 1985; Gersten, Carnine, & Woodward, 1987; Gersten & Dimino, 1991; Gersten & Keating, 1987; Gersten, Keating, & Becker, 1988; Lloyd, Cullinan, Heins, & Epstein, 1980).

The present study attempted to replicate and extend the findings of Drago and McLaughlin, (1996) Blackwell, Stookey, and McLaughlin (1996), Holz, Peck, and McLaughlin, (1996) in reading. In that series of research studies, the use of the Precision Teaching measurement system was combined with Direct Instruction. Also, in the present analysis, Corrective Reading (Engleman, Meyer, *Preparation of this project was in partial fulfillment of the requirements of EDSE 510 Precision Teaching, a component of the Master of Education in Special Education in the Department of Special Education at Gonzaga University, Spokane, Washington.

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Johnson, & Carnine, 1988) was used with elementary students with mild disabilities rather than high school students at-risk for school failure.

METHOD

Participants and Setting

The participants were three students enrolled in a resource room setting located in an elementary school in rural eastern Washington. Two of the students (James and Garry) matched the State and Federal definition for learning disabilities while the third (Kyle) was labeled as behaviorally disordered. "Kyle" had difficulty with expressive and receptive language and exhibited autistic-like behaviors such as echolalic speech, rhythmic movements, flat affect, etc. This was done through psychometric testing and multi-disciplinary team (MDT) meetings. The two students with learning disabilities received 90 minutes of instruction while the last was enrolled in the resource room program for 150 minutes per day in reading, math, and social studies. The resource room was managed by a single teacher with four years of teaching experience and one para-educator. Prior to data collection, the tool rates (Kunzelmann, Cohen, Hutten, Martin, & Mingo, 1970; Lovitt, 1989; White & Haring, 1980) for each of the participants were gathered. The tool rate for see to say words for the participants was 117 corrects and 0 errors for Gary, 96 corrects and 3 errors for James, and 68 corrects and 0 errors for Kyle.

Dependent Variables and Measurement

The behaviors measured were the number of correct and error words read aloud by each student. After the reading lesson was completed each participant read from their Corrective Reading, B2 (Engelmann et al., 1988). Data were gathered from Lessons 10 through 27. A word was scored as read correctly if it was pronounced exactly as it was written in the text. An error was defined if the word was mispronounced, omitted, inserted, or was not read within 5 seconds.

Experimental Design and Conditions

An AB single case design (Kazdin, 1982) was used to evaluate the rate of see-to-say words with and without an additional 1-minute timing in context from Corrective Reading (Engelmann et al., 1988).

Baseline. During baseline, the students read for 1-minute timed sample after they completed their respective lesson in Corrective Reading. This phase lasted for 7 data days and just over three calendar weeks.

Additional 1-minute timings. During this phase, everything in baseline remained the same. The only changes, were of additional 1-minute timing on data days as well as having data days take place more frequently. This phase lasted for 20 data days and just over eight weeks.

RESULTS AND DISCUSSION

The number of corrects and errors during each 1-minute timed reading during baseline and with an additional 1-minute timings can be seen in Figures 1 through 3. As the data indicate, there was a small increase in corrects and a slight decrease in errors.

For "Kyle" (See Chart 1), the number of corrects for baseline ranged from 80 to 100 with an overall mean of 97.05 words. Kyle's error frequencies ranged from 0 to 1 with an overall mean of .429. When the additional 1-minute timed reading was added, Kyle's performance increased (M = 104; range 86-120), while his error rate increased slightly (M = .632; range 0 to 3).

For "Garry" in Chart 2, the number of corrects for baseline ranged form 96 to 114 with an overall mean of 103.86. His performance for errors averaged 1.0, range 0 to 2. When the additional 1-minute timing was employed, his performance improved for corrects (M = 112.05, range 97 to 132) and errors (M = .80; range 0 to 2).

As can be seen in Chart 3, correct rate for James was stable (M = 98.0; range of 94-104) while his errors ranged from 1 to 3 with an overall mean of 1.6 during baseline. Then timings were increased from one to two per session, his performance improved (M = 102.18; range 80 to 130) for corrects and errors showed a slight increase (M = 2.0; range 0 to 5).

As the present outcomes indicate, the use of repeated timings (Sweeney et al., 1990) along with Direct Instruction materials could increase correct rate for each participant. For errors, only two of the students decreased their errors. However, for the third child, James, his errors were higher after absences than when he attended school daily.

Due to the small changes in performance a Friedman Analysis of Variance (Siegel, 1956) was carried out for both corrects and errors across participants. Significant differences were found for errors for each participant (r2 = 9.292; p = .009) Follow up tests Wilcoxon Matched Pairs were significant for Kyle and Jerry.

The present set of findings also replicate and extend the combining of Precision Teaching procedures and Direct Instruction (Blackwell et al., 1996; Drago & McLaughlin, 1996; Stenseth & McLaughlin, 1996). However, in the present analy-
sis, elementary students rather than preschool or high school students participated.

The procedures were very easy to carry out. The Direct Instruction materials are scripted and very easy to implement. The use of an additional 1-minute timing required little additional preparation or data analysis.

Additional research may wish to examine the use of additional 1-minute timings. Timings could be longer, so that instead of using two 1-minute timings, one could employ one 2-minute timing. The children enjoyed the program and the teacher as well as their parents were happy with their progress in reading.

REFERENCES


The Effects of Cover, Copy, and Compare and Flash Card Drill on Correct Rate of Math Facts for a Middle School Student with Learning Disabilities*

Jennifer Hayden

and

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We examined the effectiveness of the cover, copy, and compare drill and practice procedure to that of card practice on the correct and errors responses of write math facts. A with a middle school student with learning disabilities served as the participant. The cover, copy, and compare procedures did improve correct rate but produced only a small change in errors. The frequency of correct responses increased and errors declined and remained at 0.0 occurrences after flash card practice with another peer. We discussed the applicability of cover, copy, and compare procedure as well as flash card practice with middle school students.

DESCRIPTORS:

A solid foundation in math facts is a prerequisite to most employment in our globally competing world. Potential employers are interested and frequently hire employees with sound math skills. Sound math skills are built on a fluent mastery of math facts. Math is like an inverted pyramid of higher ordered skills. Building fluent math tool skills is a prerequisite for learning and mastering higher order math skills. Higher order math skills are sought and handsomely paid in today's competitive job market.

Learning multiplication facts is a basic part of the math curriculum. Students with learning disabilities often use counting strategies such as finger counting and using multiplication matrices, to solve basic mathematical problems (e.g. Lerner, 1999; Skinner, Turco, Beatty, & Rasavage, 1989). These strategies typically a fluency blockers in computing math problems. Fluency blockers can dramatically diminish the performance of mathematical functions and the requirements of many math related tasks (Skinner et al., 1989; Skinner & Schock, 1995).

Calculation skills is one predictor of school success (Lloyd, 1978; Haring, Lovitt, Eaton, & Hansen, 1978). For example, Lloyd (1978) found that poor academic performance, as early as the third grade, predicted later school failure and increased the risk of later dropping out of school. Building fluency (i.e. accuracy plus speed), math skills should improve the likelihood of a student's future academic and social success (Miller & Heward, 1992).

Immediately recalling of math facts is superior to using counting strategies, and allows students to respond with less effort and more skill across settings (Pieper, 1981). For example, many of the math skills need to be performed at a certain rate or speed in order to be functional (Heward, 1994; Johnson & Layng, 1994; McLaughlin & Skinner, 1996; Miller & Heward, 1992). The use of finer counting strategies may be acceptable for learning addition and subtraction, but are insufficient for multiplication and division and more complex problem types (Silbert, Carnine, & Stein, 1996). Further, individual's with deficiencies in math skills may also be excluded from certain vocational and career options (Skinner & Smith, 1992). In addition, automatically recalling basic number facts allows the student to devote more attention to more complex mathematical procedures (Binder, 1994; Johnson & Layng, 1994).

Two essential components of increasing fluency are a) providing many opportunities to respond, and b) immediate corrective feedback (Skinner et al., 1989). Practice and review has also been viewed as critical for the maintenance of skills over time (Silbert et al., 1996). The copy, cover, and compare procedure (Murphy, Hern, McLaughlin, & Williams, 1990) or cover, copy, and compare procedure (McLaughlin & Skinner, 1996; Skinner et al., 1989; Skinner, Belfiore, & Pierce, 1992; Skinner, Turco, Beatty, & Rasavage, 1989) meets these criteria and has been successfully used to improve student performance in spelling (McLaughlin, 1990).

*Preparation of this project was in partial fulfillment of the requirements for EDSE 410—Precision Teaching, a component of the Department of Special Education at Gonzaga University. Requests for reprints should be addressed to Jennifer Hayden, Department of Special Education, Gonzaga University, Spokane, WA 99258-0001 or e-mail tmclaughlin@soe.gonzaga.edu.
Reiter, Mabee, & Byram, 1991; Noland, McLaughlin, & Sweeney, 1994; Pratt-Struthers, Bartalamay, Williams, & McLaughlin, 1989; Pratt-Struthers, Struthers, & Williams, 1983; Schererhorn & McLaughlin, 1997; Struthers, Bartalamay, Bell, & McLaughlin, 1994), geography (Kavon, McLaughlin, Williams, & Urlacher 1995; Lee & Tingstrom, 1994; Ozaki, Williams, & McLaughlin, 1996; Skinner et al., 1989; Stading, Williams, & McLaughlin, in press). Effective teaching allows for individualization, frequent collection of data, and rapid and easy modification of procedures (Binder, 1994). Copy, cover, and compare procedures are highly adaptable, and typically produce impressive outcomes (McAuley & McLaughlin, 1992; McAuley & Skinner, 1996). One drawback that has been noted by teachers who have implemented the cover, copy, and compare student self-drill and practice procedure has been the tracking of which problems of works to add or remove from the procedure.

The propose of this study was compare the use of cover copy, and compare to flash card drill to increase the correct rate and decrease errors see to write math facts with a single middle school student with learning disabilities. In addition, a comparison between cover, copy, and compare and in class flash card drill was carried out.

**METHOD**

**Participants and Setting**

The participant of the study was a 15-year-old student enrolled in a self-contained special education math class, attended a medium sized middle school in the Pacific Northwest, matched the state and Federal definition for learning disabilities in math. The student was 3 years below grade level and he had been receiving a failing grade in math at the beginning of this research. All sessions took place in the students' special education classroom.

**Dependent Variables and Measurement Procedures**

The dependent variables were number of correct and error digits per minute. The first author used timed practice sheets to collect data for both digits correct and errors per minute. Data were collected from two to three times a week for approximately 10 to 15 minutes per session. A sample probe sheet that was used can be seen in Figure 1. Each probe sheet contained 135 movements and were composed of single digit multiplication problems consisting of problem sets of x 1 random.

**Baseline.** The student was provided with the practice sheets. The Baseline consisted of two one-minute timings on separate days to establish correct and error rate. Also, these timings provided the problem sets that would be used in the cover, copy, and compare procedure. In addition, the participant's tool rate for see to write digits was also taken.

**Cover, copy, and compare.** Cover, Copy, and Compare mandates, an academic stimulus, a response, an evaluation procedure, and an error correction procedure. In the present report, the student copied the problem and solution, covered the problem and answer, and wrote the problem and product from memory. The student completed this self-drill and practice procedure. After the student wrote the problem and its solution correctly for three consecutive trials, it was removed and another problem added. Since the error rate was so low, only three problems were kept for three consecutive data days. The student was timed for 1 minute on the appropriate probe sheet. At the end of the session, the student was timed on this appropriate practice sheet.

**Flash card drill.** During this phase the participant and a peer engaged in flash card drill prior to completing their 1-minute practice sheet in math (See Figure 1). Flash cards were made form 3" by 5" note cards with the problems on one side and the problem and solution on the other. After flash card drill the standard cover, copy, and compare procedure was used. Data were collected from the students practice sheets for three school weeks (six data days).

**RESULTS**

The overall outcomes can be seen in Chart 1. During baseline the participant wrote from 22 to 28 corrects (M = 25.0) with 0.0 errors per minute. The implementation of the cover, copy, and compare procedure correct rate per minute improved (M = 34.2; range 25 to 42). However, error rate per minute increased (M = 1 range 0 to 2). There was an increase in correct rate and a decrease in errors during flash card drill.(See Chart 1). Overall, correct increased to an average of 41.8 per minute (range 27 to 50) with errors remained at 0.0 per minute.

**DISCUSSION**

The results of the study indicate that math facts can be increased for a student with learning disabilities by copy, cover, and compare and flash card drill. There were strengths and limitations in the present case report. A strength of the research
was the fact that an undergraduate student could implement, manage, and assess project. However, there were several limitations in the present case study. First, data were not able to be collected each day due to schedule conflicts between the first author and her university classes. Data collection could have been carried out over a longer period of time. A six week analysis with five data days in one condition (cover, copy, and compare) and six in the other (flash card drill) may not be long enough to allow the effects of either intervention to be evident. Also having data collection and practice each day allows for more feedback which has been shown to improve student performance in math (Skinner, Shapiro, Turco, Cole, & Brown, 1992) and in reading (McLaughlin, 1992). However, the use of a tool rate assessment allowed one to make the judgment that the participant did approximate his tool rate (43.25) on three data days during flash card drill. The use of either intervention did not require additional training of staff and could be employed with little disruption to the ongoing classroom routine.

To resolve the issue as to which is more effective, flash card drill or cover, copy, and compare, additional data will have to be gathered. An analysis where one of the three procedures (baseline, cover, copy, and compare, or flash card drill) are employed for one session and then withdrawn and another procedure employed would have yielded an alternating treatments design (Kazdin, 1982). This would have allowed for a more rigorous analysis. In the present analysis there was an increase correct rate during flash card drill as well as a reduction of errors to zero. But due to the short periods of time in this phase, caution is urged.

REFERENCES


Answering informational questions—also called "Wh" questions—is a component skill of language that is important to holding even a basic conversation; as such, it is a skill clinicians should consider when they intervene with children with disorders that affect language development, such as autism. Answering informational questions helps form the needed foundation for functional verbal communication and allows children to participate more fully in typical social interactions. Failing to learn these skills limits the child's ability to participate in individually chosen activities and poses a barrier to the child controlling or enhancing their environment through language. This chart share illustrates one boy's journey learning this skill.

Connor was nine-years old when he started learning to answer "Wh" questions. He had a diagnosis of autism, but while a relatively highly skilled youngster, he struggled when he tried to engage in conversations. Connor attended a public elementary school where he was fully included in his fourth grade classroom; he also received approximately 20 hours per week of one-on-one behavior analytic intervention in his home. Connor's home intervention consisted largely of Direct Instruction curricula and charts that sought to improve his language as well as charts designed to improve his mathematics and reading comprehension skills. The language programs focused on Connor's social language development.

One area of particular social language difficulty for Connor was answering basic informational questions. When asked a question during a conversation, Connor responded with unrelated statements. When he did attempt to answer a question posed to him, he rarely answered correctly and did not discriminate what information should follow any given type of "Wh" question. For example if someone asked him, "Who gave you that ice cream cone?" he would answer, "It's chocolate."

We designed the piece of instruction shown on these charts to improve Connor's ability to correctly answer "Wh" questions. Connor practiced this skill at home with a therapist (either the first or third author) two to four days each week. During the timings on this skill, Connor's therapist read a statement and then followed that statement with a question for Connor to answer. Which questions the therapists asked depended on which phase of the chart they were working on. For example, during the "Who and Where" phase, an exchange between Connor and his therapist went something like this:

Therapist says: "Dave and Sally went to the park."
Therapist says: "Who went to the park?"
Connor says: "Dave and Sally"
Therapist says: "Where did they go?"
Connor says: "to the park"

Connor's therapists set a daily improvement goal for him each day based on his best previous performance. Connor worked on this particular skill for no more than 10 minutes each day. When he met his daily improvement goal, he earned a self-chosen reward such as jumping on a trampoline, or playing on the computer. During the timings, the therapists asked Connor questions in random order to control for any sequence effects in the instruction and used a very wide range of sentence types to ensure that Connor learned to answer each question appropriately. For example, if Connor only ever answered questions based on sentences that consisted of a simple subject, a verb, and a direct object (John hit the ball), he would likely have great difficulty applying that answering ability to more complex sentence structures (Late last Saturday night, John and Margaret hit the ball on their way home from school).

The first phase of question answering for Connor consisted of "where" questions and "who" questions at a timing interval of one minute. While Connor's correct frequency of questions answered accelerated nicely across the first eight days of timed practice during this phase, his corrects flattened out across the last three days of practice. Although he made few errors, his frequency of corrects remained flat at 20 per minute. Because the expected frequency aim for this skill was around 25 correct responses per minute, we changed what we were doing to help him achieve that frequency aim.
The intervention we used to help Connor reach the frequency aim was to emphasize the words "who" or "where" in the questions we asked. This looked something like:

Therapist says: "The boys went to the park on Monday."
Therapist says: "WHO went to the park?"
Connor says: "The boys"
Therapist says: "WHERE did they go?"
Connor says: "to the park"

Once we added this intervention, Connor reached the aim of 25 correct responses per minute within two days.

During the next phase on this chart, we added "what" questions. During this phase, Connor answered "who", "where", and "what" questions based on the same statement. After stepping down on the first day of timed practice, Connor reached the aim in six days. We next added "when" questions. He reached the frequency aim of twenty-five correct answers per minute in four days of timed practice in this phase, however, the number of practices he required to reach twenty-five was high each day. Connor needed 6-7 timed practices each day to reach the aim of 25 correct answers. Although his frequency of corrects remained consistent, he was working very hard each day; as a team, we did not want to add an additional question until he was answering the current questions with ease. Connor's therapists noted that he was having difficulty discriminating between "where" questions and "when" questions. When asked a "where" question, he often said the answer to a "when" question and vice versa. As an intervention, Connor was asked only "where" and "when" questions (no "who" questions). After six days of practice, Connor answered 28 "where" and "when" questions correctly per minute with no errors within only three practices. After this, Connor again practiced answering "where" and "when" questions along with "who" and "what" questions. Across three days of timed practice, his performance accelerated nicely to the frequency aim.

We next introduced "why" questions into timed practice. Connor practiced "why" questions alone at first, and then we asked Connor to answer "why" questions with all other questions previously taught. We expected a slightly lower frequency aim when Connor answered only one question per statement so that we could allow time for increased therapist talk in our one-minute timing. When we introduced "where", "when", "what", "who", and "why" cumulatively, his performance reached the frequency aim in six days. We allowed him two more days of practice, and on the eighth day, he achieved 28 questions correct in one minute with zero errors in only one timing.

The last question we introduced was "how". Again, Connor progressed nicely in his answering of only "how" questions in four days. When we next arranged for Connor to practice all the "Wh" questions he had learned to date, it took him only three days to get 28 questions correct in one minute with no errors.

Finally, before we finished this chart and stopped working on the skill altogether, we evaluated the fluency of Connor's answering "Wh" questions by empirically testing for fluency's outcomes: retention, endurance, application, and stability. We evaluated the endurance of Connor's performance by increasing the length of his timed practice by a factor of three. Because Connor had previously answered questions in one-minute timings, we tested the skill's endurance by using a three-minute timing (endurance check). To evaluate the stability of his performance, we tested whether Connor could answer questions at the same rate in the face of distraction (stability check). For Connor, anything to do with the television or music served as a major distraction; while he answered his "Wh" questions during his stability check, he also had his favorite movie "Pinocchio" playing in the room. The application check tested whether Connor could answer completely novel question (questions he had never heard before). Finally, we evaluated the retention of Connor's skill by stopping all practice on the skill for one month and then timing him again.

Connor passed all fluency outcomes checks in only one timing per check. The endurance, stability and retention check all came in at 25 corrects per minute with no errors. The application check fell a little lower at 20 corrects per minute with zero errors; however, Connor was already readily applying his newly developed question answering ability in conversations with his family and friends. Therefore on February 1st, approximately eight months after it began, this chart was stopped. We happily report that while we write this chart share a full two years after Connor completed the chart, he continues to easily and accurately answer informational questions people ask him both at home and at school.
HEAR a Statement and a "Wh" Question/
SAY the Answer to the Question

● = Correct answers
X = Incorrect answers

M. Fabrizio
K. Zambolin
S. Isley
K. Zambolin/ S. Isley
K. Zambolin/ S. Isley
K. Zambolin/ S. Isley
Connor

HEAR a Statement and a "Wh" Question/SAY the Answer (1 of 2)
HEAR a "Wh" Question and a Statement/SAY the Answer

- = Correct answers
X = Incorrect answers
Becoming an Efficient Teacher at Morningside Academy

Elizabeth A. Swatsky
The Pennsylvania State University

I taught at Morningside Academy (MA) for 3 summers and 2 school years as a full time classroom teacher from July 2001- August 2003. As I am now pursuing a Masters in Special Education, I think my reflection may have more clarity about the big picture since the details have faded. I feel fortunate to have "gotten my first masters at MA". I think the wealth of information in that school is what makes the walls turn bright, bold and cheerful colors, not Kent Johnson’s decorating taste! (Almost like a scene from Willy Wonka and the Chocolate Factory:)

My chart symbols show estimated hours and actual hours. A comment on the estimated hours- during this phase of the graph, I can say the estimate is with precision. Because I began and finished work each day at the same times, I know that my estimate has little error. For example, The first summer I know that I had put in 100 hour weeks because I would get to school at 6:00 am and leave at 12:00 pm (18 hours X 5 days=90hours/week + 5 hours X weekend days= 10 for a total of 100hours/per week). The error did that exist would not show a difference on the chart. The error consisted of spending an hour or less after school each day talking to parents, faculty, staff etc. These conversations were not always school related. Microwave meals, too.

I’ll explain the 100 hours in depth since this comes as a shock to most. And, I admit I am a little nutty about meeting my goals. Because of this, Kris Melrose encouraged me to chart my hours in September 2002. (Where the “actual hours” phase change line was drawn.)

The setting events associated with 100 hours per week of MA are mentioned below. I didn't want my class to suffer from the trials and tribulations of a first year teacher- more than they had to. Furthermore, after hours I engaged in activities such as sharpening pencils (for 4th graders), moved my classroom 4 times during the first week of the six weeks, organized the new math curriculum being used from the publisher (filing). This was on top of learning new scripts, refreshing myself on boardwork, establishing classroom management and of course running about 150 charts between my afternoon and morning sessions (after-school correcting & dot-dropping). Activities I did not think to ask for help with or assign to the office staff or even to the children. I contracted through the summer and needed to prove myself for the school year. After hours, Joanne Robbins or Sue Malmquist would stop by quick allowing me to snag some valuable Q&A sessions highly reinforcing. During my first summer, I lived with my boyfriend’s brother and sister-in-law while my boyfriend was still in Oregon. This also served as motivation to stay at school slight avoidance. I loved, loved, loved every minute of my learning experience even through the moments that I thought "This is not humanly possible!"

My private thoughts and overt actions showed love-love-loving to be efficient. I put my time in, I was learning to learn. With Kent as my mentor, I could skim scripts and put my own flare to them, really teach reading comprehension, dot drop in class, while running my daily point sheets, and maintaining my high praise rates (at times 4/ minute). That sounds too perfect I was implying I was getting better. I learned the quirks of the new copier, to cut down my talk time after school and let the kids sharpen their own pencils. And, each break in the school year I took time to reflect and design programs for my class on how I could do it better than before. The most noticeable change in my classroom management was after reading Structuring Your Classroom for Academic Success by Stan Paine in December 2001. (1st phase change on the chart)

My charting stopped when I realized I was happy with hours spent at MA. I became aware I was efficient and that considering the difference between 60 and 70 hours was not meaningful to me. I was willing to put in the time it took to be prepared for the children and my chart showed my hours decelerated by divide 2 from summer 2001 to summer 2002.

Kent, Thank you for the opportunity!
Using Precision Teaching to Prepare Students with Learning Differences for the SAT

Sonia M. Lewis
Guided Tutoring of Greater Atlanta

Guided Tutoring of Greater Atlanta is an educational consulting company that specializes in preparing students with learning differences for the SAT. The course uses a variety of teaching techniques including Precision Teaching, Diagnostic and Prescriptive Teaching, and Direct Instruction to teach high school students the skills and strategies necessary to improve on both the Verbal and Math portions of the SAT.

According to the Princeton Review, a national test-preparation company, the Verbal SAT is mostly a test of vocabulary and gives a list of the most likely occurring words. We teach these vocabulary words at Guided Tutoring by using SAFMEDS (Say All Fast a Minute Every Day Shuffled) combined with Precision Teaching. The students make flashcards with the vocabulary word on one side and the definition on the other. During the 1-minute timings the students see the vocabulary word and say the definition.

Steve Graf (SAFMEDS of the Web) suggests that learners should be able to reach 50 counts per minute correct, depending on the characteristics of the cards. Since the learners are seeing the word and stating the definition, our goal is 30-35 definitions correct per minute. Once baseline is established students are taught to study the vocabulary words using a "folding-in" technique. They separate the words into known and unknown piles. At the beginning of each practice session, if the student can state each of the definitions in their known pile correctly within 3 seconds, they add 2 of the unknown words into the known pile and continue to practice until fluent. If students are fluent on all the words at the beginning of the next practice session they add 2 more words and so on. There is limited study time during class time, so students are instructed to study for brief 5-10 minute sessions each day of the week.

This chart is an example of how we monitor every students' acquisition and fluency of vocabulary words. This chart represents Lauren's progress. Lauren was in our course preparing for the March 27, 2004 SAT. She is a 17-year old junior diagnosed with dyslexia. Lauren attended class twice a week for eight weeks. Sonia Lewis taught the course of eight students. The dots on the chart show the number of definitions correct per minute and the X's show the number of unknown or incorrect definitions per minute. Lauren improved from 2 definitions correct per minute on February 4, 2004 to 25 definitions correct per minute on March 10, 2004. Her celeration rate was x 1.5.

Since the Verbal SAT is mostly a test of vocabulary, as vocabulary acquisition increases we would hope to see this correlate to higher scores on the Verbal SAT. Lauren's initial SAT on January 31, 2004 was 330 points. On March 27, 2004 her Verbal score was 460, an increase of 130 points. (A score of 500 is considered average.)
Name of Behaver: Lauren

Name of Behaver: Lauren

Movement Cycle: See/Say Vocabulary Definitions

SoniaLewisChart.xls — Standard Celeration Chart
I chose to monitor my thoughts throughout the day in hopes of reducing the number of negative thoughts I have about others. I was noticing myself getting very impatient and unforgiving about others and needed to change.

I used a bracelet bead counter and pen slash marks on my hand to keep track of both positive and negative thoughts. At the end of the day at about 6-7 o'clock I would write down in a journal the numbers and then record on my chart. I decreased my negative thoughts by 1.4 and increased my positive thoughts by $x 1.4$ merely by counting and charting. However, to push a little harder I began to make a conscious effort, using a written reminder in my daily planner, to keep an open mind about others. This intervention did not maintain or increase my positive thoughts but I did continue to improve at $x 1.1$.

My acceleration goal was 20 positive thoughts about others a day, but my highest frequency was 16 positive thoughts in a day. My negative thoughts continued to decline at $1.3$ with the daily planner prompt. My deceleration goal was three negative thoughts a day which I achieved on two days and exceeded on one day having only two!

*This project was completed as a class project in an undergraduate winter term 2002 course at the University of Oregon entitled Evaluation for Decision Making, taught by Clay Starlin.
Using Profane Language versus Using Alternative Words*

Abby Lovett
University of Oregon

I chose to work with my roommate Sara on the "Teach Another Project." We decided to count her use of swear words versus alternative words in order to cut down on her swearing.

I decided to count her swearing to begin with, during about 100 minutes while we got ready for dinner, did homework or watched TV with idle conversation, anywhere between 6:00 pm and 9:00 pm. I used the bracelet bead counter, and if I forgot it, I used a pen and made slashes on my hand. Sara showed some improvement by merely counting and charting. Alternative words increased at x 2 and swear words decreased at 1.3. The first intervention was reminding her of an alternative word to use instead of the swear word she used, then asking her to rephrase what she said using the alternative word. This had an undesired impact on swear words which increased at X 1.8 although alternative word usage improved with a x 3 celeration.

The second intervention involved Sara counting and charting her own words. The alternative word usage improved at x 1.2 which was a turn down from the previous phase. However, the swear words showed a marked improvement decelerating by 1.7.

Sara made her goal of only 1 curse word every 100 minutes, and I've noticed her, since the project ended, using alterative words, or nothing at all when expressing frustration or discouragement about something.

*This project was completed as a class project in an undergraduate winter term 2002 course at the University of Oregon entitled Evaluation for Decision Making, taught by Clay Starlin.
Oregon K-12 School Funding and Graduation Rates*

Cheryl Stephens
University of Oregon

Chart A shows the increase in funds for K-12 education in Oregon between 1970 and 1999. Note that the up the left scale has been multiplied by 10,000 so it runs from 10,000/year to 10 billion/year. The funding increase over this time climbed from $587 million to $3.6 billion at a celeration of x1.4.

Chart B shows the number of high school graduates from 1971 through 1997. This shows a decline of +1.1. Declining from 32,000 to 28,000 over this 16 year period.

It appears as if the amount of money we invest in K-12 Education in Oregon does not improve the number of high school graduates. However, without doing a more in-depth analysis of the factors related to this data (e.g. Did the definition of drop out, graduate change during this time?, What categories of funding increased/ decreased?) it is not possible to draw any firm conclusions.

However, these charts represent the type of data that educators at district and state levels can represent graphically to support decision making regarding various fiscal, policy and legislative issues.

*This project was completed as a class project in an undergraduate winter term 2001 course at the University of Oregon entitled Evaluation for Decision Making taught by Clay Starlin.
Journal Description

The Standard Celeration Society publishes the *Journal of Precision Teaching and Celeration* (JPTC) two times a year. JPTC provides a forum for research, practical applications and discussions of Precision Teaching and Celeration technology. JPTC has dedicated itself to the promotion and diffusion of Precision Teaching and Standard Celeration technologies.

Journal Sections:

Authors may submit their original contributions to one of five sections of JPTC:

I. **Application Articles**: “Application articles” require:
   (1) Use of Standard Celeration Charts;
   (2) Use of basic charting conventions;
   (3) Description of variables or procedures supporting the interpretation of the data.

   “Application articles” usually represent data from applied settings such as schools, clinics, human service agencies.

II. **Research Articles**: “Research articles” require:
   (1) The use of Standard Celeration Charts;
   (2) Descriptions of the collection and analysis of data;
   (3) Use of basic and advanced charting conventions and analysis;
   (4) Description of variables or procedures supporting the interpretation of the data;
   (5) Control for extraneous variables or report of their influence.

III. **Discussion Articles**: “Discussion articles” offer explanations, reviews, and extensions of Precision Teaching and Standard Celeration concepts.

IV. **Chart Shares**: “Chart shares” contain data displayed on Standard Celeration Charts along with brief descriptions of the performer, what occurred, and other relevant observations. [Note: We encourage performers (e.g. students, clients, patients) to submit their own charts to the chart share section.]

V. **Technical Notes**: Brief technical descriptions clarifying, elaborating, or reporting upon Precision Teaching and Standard Celeration concepts.

Submission Guidelines:

To submit a manuscript authors must conform to the following guidelines:
(1) Submit three (3) typewritten, doubled spaced copies of the manuscript without author’s names or affiliations;
(2) Follow the format outlined in the Publication Manual of the American Psychological Association (5th edition, 2001);
(3) Do not exceed 20 words in the article title;
(4) Include an abstract and do not exceed 250 words in the abstract (Technical Notes do not require an abstract);
(5) Select 3 to 5 key words that describe the manuscript;
(6) Secure permission for use of copyrighted materials;
(7) Send submissions to: Dr. Jesus Rosales-Ruiz, University of North Texas, Department of Behavior Analysis, PO Box 310919, Denton, TX 76203-0919.

The Editors reserve the right to edit all material accepted for publication.
### BASIC CHARTING CONVENTIONS for the DAILY STANDARD CELEBRATION CHART

<table>
<thead>
<tr>
<th>TERM</th>
<th>DEFINITION</th>
<th>CONVENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CHARTED DAY</td>
<td>A day on which the behavior is recorded and charted.</td>
<td>1. Chart the behavior frequency on the chart on the appropriate day line.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Connect charted days except across phase change lines, no chance days and ignored days.</td>
</tr>
<tr>
<td>a) ACCELERATION TARGET FREQUENCY</td>
<td>Responses of the performer intended to accelerate.</td>
<td>Chart a dot (●) on the appropriate day line.</td>
</tr>
<tr>
<td>b) DECELERATION TARGET FREQUENCY</td>
<td>Responses of the performer intended to decelerate.</td>
<td>Chart an (x) on the appropriate day line.</td>
</tr>
<tr>
<td>2. NO CHANCE DAY</td>
<td>A day on which the behavior had no chance to occur.</td>
<td>Skip day on daily chart.</td>
</tr>
<tr>
<td>3. IGNORED DAY</td>
<td>A day on which the behavior could have occurred but no one recorded it.</td>
<td>Skip day on daily chart.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Connect data across ignored days.)</td>
</tr>
<tr>
<td>4. COUNTING-TIME BAR</td>
<td>Designates on the chart the performer’s lowest possible performance (other than zero) in a counting time. Always designated as “once per counting time.”</td>
<td>Draw solid horizontal line from the Tuesday to Thursday day lines on the chart at the &quot;counting-time bar.&quot;</td>
</tr>
<tr>
<td>(aka Record Floor)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. ZERO PERFORMANCE</td>
<td>No performance recorded during the recording period.</td>
<td>Chart on the line directly below the &quot;counting-time bar.&quot;</td>
</tr>
<tr>
<td>6. PHASE CHANGE LINE</td>
<td>A line drawn in the space between the last charted day of one intervention phase and the first charted day of a new intervention phase.</td>
<td>Draw a vertical line between the intervention phases. Draw the line from the top of the data to the &quot;counting-time bar.&quot;</td>
</tr>
<tr>
<td>7. CHANGE INDICATOR</td>
<td>Words, symbols or phrases written on the chart in the appropriate phase to indicate changes during that phase.</td>
<td>Write word, symbol and/or phrase. An arrow (↑) may be used to indicate the continuance of a change into a new phase.</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 8. AIM STAR         | A symbol used to represent: (a) the desired frequency, and (b) the desired date to achieve the frequency. | Place the point of the caret...
^ for acceleration data
^ for deceleration data
...on the desired aim date. Place the horizontal bar - on the desired frequency. The caret and horizontal line will create a "star."
|
| 9. CALENDAR SYNCHRONIZE | A standard time for starting all charts. | It requires three charts to cover a full year. The Sunday before Labor Day begins the first week of the first chart. The twenty-first week after labor day begins the second chart. The forty-first week after Labor day begins the third chart. |
| 10. ACCELERATION LINE | A straight line drawn through 7-9 or more charted days. This line indicates the amount of improvement that has taken place in a given period of time. A new line is drawn for each phase for both acceleration and deceleration targets. (Note: For non-research projects it is acceptable to draw free-hand celeration lines.) | Acceleration Target | Deceleration Target |

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BASIC CHARTING CONVENTIONS

1. Charted day
2. No-chance day
3. Ignored day
4. Counting-time bar
5. Zero performance
6. Phase change line
7. Change indicator
8. Aim star
9. Calendar synchronization
10. Celeration line

OPTIONAL: The age of the performer when the chart begins. If not filled in, draw a line through the space.

A clear description of the performer's counted behavior. Use a learning channel and active verb/noun (e.g., see/say reading books).

The name of the person whose performance appears on the chart.
The name of the person who charts the performer's counted behavior.
The name of the person who works with the performer on a daily basis.
The name of the person who advises the manager or performer on a weekly basis.
The name of the person who sees the performer's chart on a monthly basis. The person may give advice to the Adviser or Manager.

The name of the division of the organization.
The name of the organization where the counted behavior takes place.
The room where the counting occurs.
The name of the person who times the performer.
The name of the person who counts the performer's behavior.

OPTIONAL: Any additional information relevant to the performer or chart. If not filled in, draw a line through the space.
### ADVANCED CHARTING CONVENTIONS for the DAILY STANDARD CELERATION CHART

<table>
<thead>
<tr>
<th>TERM</th>
<th>DEFINITION</th>
<th>CONVENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. FREQUENCY CHANGE (FC)</td>
<td>The multiply &quot;x&quot; or divide &quot;÷&quot; value that compares the final frequency of one phase to the beginning frequency in the next phase. Compute this by comparing: (1) the frequency where the celeration line crosses the last day of one phase -to- (2) the frequency where the celeration line crosses the first day of the next phase. (e.g. a frequency jump from 6/minute to 18/minute. FC = x 3.0)</td>
<td>Place an &quot;FC =&quot; in the upper left cell of the analysis matrix. Indicate the value with an &quot;x&quot; or &quot;÷&quot; sign (e.g. FC = x 3.0)</td>
</tr>
<tr>
<td><strong>CELERATION:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. CELERATION CALCULATION (Quarter-Intersect Method)</td>
<td>The process for graphically determining a celeration line (aka &quot;the line of best fit.&quot;) (1) Divide the frequencies for each phase into four equal quarters (include ignored and no chance days), (2) Locate the median frequency for each half, (3) draw a celeration line connecting the quarter intersect points.</td>
<td>See advanced charting conventions sample chart.</td>
</tr>
<tr>
<td>3. CELERATION FINDER</td>
<td>A piece of mylar with standard celeration lines which can be used to compute celeration line values.</td>
<td>Buy commercially or copy and cut out part of the vertical axis on the Standard Celeration Chart.</td>
</tr>
<tr>
<td>4. PROJECTION LINE</td>
<td>A dashed line extending to the future from the celeration line. The projection offers a forecast that enables the calculation of the celeration change value.</td>
<td>See advanced charting conventions sample chart.</td>
</tr>
<tr>
<td>5. CELERATION CHANGE (CC)</td>
<td>The multiply &quot;x&quot; or divide &quot;÷&quot; value that compares the celeration of one phase to the celeration in the next phase (e.g. a celeration turn down from x1.3 to ÷ 1.3. CC= ÷1.7)</td>
<td>Place an &quot;CC =&quot; in the upper middle cell of the analysis matrix with the value indicated with a x or ÷ sign. (e.g., CC = ÷1.7).</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Example</td>
</tr>
<tr>
<td>---</td>
<td>-------------</td>
<td>---------</td>
</tr>
<tr>
<td>6. Celeration Collection</td>
<td>A group of three or more celerations for different performers relating to the same behavior over approximately the same time period.</td>
<td></td>
</tr>
<tr>
<td>7. Bounce Change (BC)</td>
<td>The multiply &quot;x&quot; or divide &quot;÷&quot; value that compares the bounce of one phase to the bounce in the next phase. Computed by comparing: (1) the total bounce of one phase -to- (2) the total bounce of the next phase. (e.g., a bounce change from x 5.0 to x 1.4, BC = ÷ 3.6)</td>
<td>Place a &quot;BC=&quot; in the upper right cell of the analysis matrix with the value indicated with a multiply &quot;x&quot; or divide &quot;÷&quot; symbol (e.g., BC = ÷ 3.6)</td>
</tr>
<tr>
<td>8. Analysis Matrix</td>
<td>The analysis matrix provides the numeric change information regarding the effects of the independent variable(s) on frequency, celeration and bounce between two phases.</td>
<td>Place the analysis matrix between the two phases being compared. For acceleration targets place the matrix above the data. For deceleration targets place the matrix below the data.</td>
</tr>
<tr>
<td><strong>Optional:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Frequency Change P-Value (FCP)</td>
<td>The frequency change p-value is the probability that the noted change in frequency would have occurred by chance. (Use the Fisher exact probability formula to compute the p-value.)</td>
<td>Use &quot;FCP =&quot; and indicate the p value in the lower left cell on the analysis matrix (e.g., FCP = .0001).</td>
</tr>
<tr>
<td>10. Celeration Change P-Value (CCP)</td>
<td>The celeration change p-value is the probability that the change noted in celeration would have occurred by chance. (Use the Fisher exact probability formula to compute the p-value.)</td>
<td>Use &quot;CCP =&quot; and indicate the p value in the lower middle cell of the matrix (e.g., CCP = .0001).</td>
</tr>
<tr>
<td>11. Bounce Change P-Value (BCP)</td>
<td>The bounce change p-value is the probability that the change noted in bounce would have occurred by chance. (Use the Fisher exact probability formula to compute the p-value.)</td>
<td>Use &quot;BCP =&quot; and indicate the p value in the lower right cell of the analysis matrix (e.g., BCP = .0001).</td>
</tr>
</tbody>
</table>
ERRATUM

In Volume 19, issue 2, we misspelled Malcolm Neely's first name (we wrote Malcom and it should have read "Malcolm").