

*DEVELOPING FLUENCY AND ENDURANCE IN
A CHILD DIAGNOSED WITH ATTENTION DEFICIT
HYPERACTIVITY DISORDER*

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We examined the effect of a teaching method on skill fluency and on-task endurance of a 9-year-old boy who had been diagnosed with attention deficit hyperactivity disorder. An academic task that occurred at low fluency during 10-min baseline sessions was taught to fluency. When responding was not yet fluent, brief reversals to baseline showed that the learner's rate of responding decreased and that he did not spend entire sessions on task. However, once a fluency goal had been reached, responding remained fluent and he remained on task in the third reversal condition.

DESCRIPTORS: attention deficit hyperactivity disorder, precision teaching, endurance, fluency

Many children diagnosed with attention deficit hyperactivity disorder (ADHD) have difficulty sustaining attention to task-relevant stimuli and inhibiting responses to nonrelevant stimuli (Barkley, 1991). Many fluency-oriented educators such as precision teachers claim that attention span or *endurance* is a by-product of behavioral fluency, which is defined as the combination of speed plus accuracy (Binder, 1996).

Precision teaching (PT) is a technical offshoot of behavior analysis (Potts, Eshleman, & Cooper, 1993). It is not a way of teaching, as the name suggests; rather, it is a general approach that involves repeated practice, error-correction procedures, timed drills to meet predetermined fluency aims, and the use of the standard celeration chart (Pennyacker, Koenig, & Lindsley, 1972). Data from PT classrooms suggest that, until students attain certain minimum levels of fluency, they lack the ability to maintain a stable performance for extended periods of

time. Conversely, when learners reach fluency, they can work steadily for extended periods of time and maintain high levels of correct responding (Binder, Haughton, & Van Eyk, 1995). This study extends the work of Binder et al. by assessing 1 learner's level of endurance on an academic task at different levels of skill fluency.

METHOD

Participant and Setting

Ciaran was a 9-year-old boy who had been diagnosed with ADHD at the age of 4 years. His teachers reported that he did not sustain on-task behavior for any substantial period. Teaching sessions were one-to-one with the first author and lasted approximately 20 to 30 min. They were conducted at Ciaran's home, and took place 2 afternoons per week after school. Ciaran received 5 mg of methylphenidate three times per day throughout this study.

Dependent Variables and Scoring Procedures

The dependent variables were the number of letter sounds identified correctly and in-

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correctly per minute and the time spent on task. A correct response was defined as a correct vocalization of the letter sound displayed on a flash card. Sounds were defined as the phonic sound each letter makes in isolation (e.g., “b” sounds as “buh,” “c” sounds as “cuh,” “l” sounds as “luh”). An incorrect response was defined as an incorrect vocalization to a card or a missed card. If the learner self-corrected after an error had been made, both an incorrect and a correct response were recorded. Time spent on task was defined as time spent engaged in sounding letters. Any other behavior that occurred while the timer was running was regarded as time spent off task. During baseline and reversal, the number of correct and incorrect responses made during each minute of the 10-min session were recorded. The highest 1-min score from each 10-min session was reported. During intervention, scores were recorded for each timing and the highest score was reported for that session. If no incorrect responses occurred, a data point was plotted below the record floor (which indicates the lowest possible nonzero frequency) to indicate that no errors had been observed during that period (White, 1986). Fluency goals were selected from performance standards suggested by the Great Falls Precision Teaching Project (Beck & Clement, 1991) and were set at 60 to 80 sounds per minute.

Interobserver agreement checks were conducted during 17% of the sessions. Scores were calculated by comparing two observers’ recordings of correct and incorrect responses. Percentage agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. Interobserver agreement averaged 97%.

Procedure

The baseline condition consisted of four 10-min sessions. A set of 26 cards displaying the letters A to Z, each measuring 10 cm by

15 cm, were arranged on the floor in random order. Each card contained the upper and lowercase letter as well as a word and picture that began with the letter. During baseline sessions, no practice or instruction took place except at the end of the timing, when Ciaran was told how many correct and incorrect responses he had made.

During intervention, the cards were again placed in random order on the floor and Ciaran was required to practice sounding letters before any timing began. The teacher offered verbal prompts whenever needed, and feedback was given on correct and incorrect responses. Any letters identified incorrectly or missed during practice were subject to an error-correction procedure in which the incorrect responses were isolated and additional practice took place with these cards until no errors occurred. The cards then were placed with the rest of the set and practice using the entire set resumed. No scores were recorded for these practice sessions. Data recording began during the first 1-min timing made after practice sessions. Timing began once Ciaran made his first response, and no prompts or instructions were given during timings. All responses were scored as described previously. Ciaran was allowed to complete as many timings as he wanted, but he was always required to do at least two. If he had matched or beaten the previous session’s score, he was allowed to choose an item from a bag containing edible items and small toys. Once the fluency goal had been achieved, reinforcement was contingent on correct responses remaining at goal level.

The reversal followed the same procedure as baseline sessions in that no practice or instruction occurred prior to timings. A total of three reversal sessions were conducted while letter sounding was at mid-fluency, and four were conducted when letter sounding was at the fluency goal.

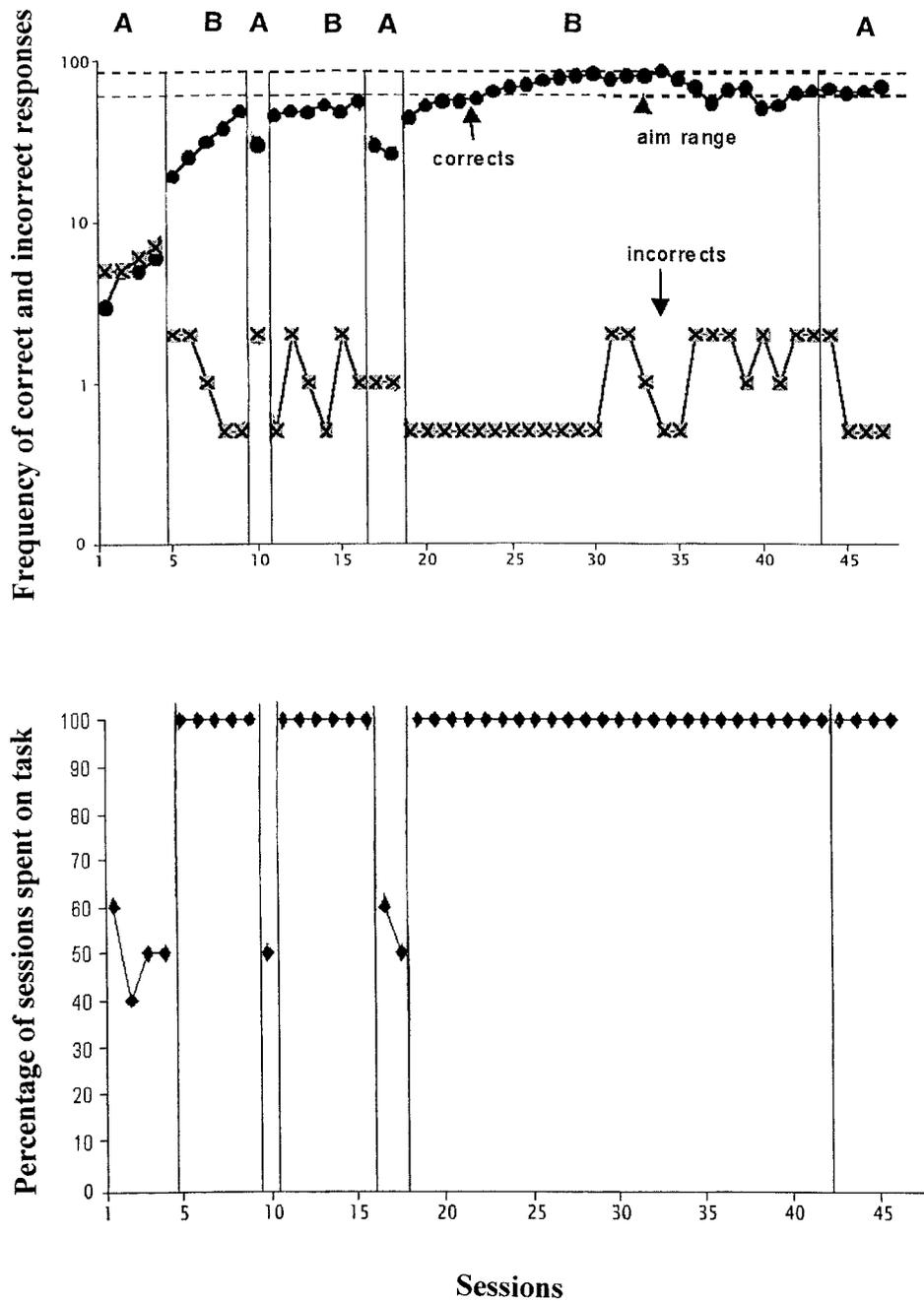


Figure 1. The upper panel shows the learner's rate of responding on the letter task under baseline (Condition A) and intervention (Condition B). The lower panel shows percentage of time spent on task.

RESULTS AND DISCUSSION

The upper panel of Figure 1 shows that in baseline low rates of correct responding occurred (3 to 6 responses per minute), and

that incorrect responding occurred at a slightly higher rate (5 to 7 responses per minute). The rate of both correct and incorrect responses increased across the four

baseline sessions. However, incorrect responses continued to occur at a higher rate than correct responses, indicating that the speed, rather than the accuracy, with which Ciaran was responding was increasing. Furthermore, he spent an average of only 50% of each 10-min session on task (lower panel).

The intervention resulted in an immediate increase in correct responses and a decrease in incorrect responses. Ciaran remained on task for 100% of these sessions. Two brief reversals before responding had reached fluency resulted in decreases in correct responding. The lower panel of Figure 1 shows that Ciaran spent between 50% and 60% of baseline sessions on task. Fluency goals were achieved on the 24th session (64 correct responses per minute). However, teaching and practice continued for an additional 19 sessions to ensure maintenance of this responding, particularly when the frequency of incorrect responses increased slightly after a 2-week vacation (Session 31). A final reversal to baseline (beginning with Session 44) showed that there was no significant decrease in the rate of correct responses; further, Ciaran spent 100% of all four sessions on task (lower panel).

These findings are consistent with those reported by Binder et al. (1995), who reported that increases in fluency were accompanied by increased on-task endurance. The results show that the reversal to baseline when fluency goals had not been met re-

sulted in a decrease in the rate of correct responding. In addition, Ciaran did not remain on task for the entire 10-min session. After repeated exposure to the intervention, Ciaran's performance remained fluent and endurance improved during the third reversal to baseline. Future research will need to evaluate the extent to which fluency may have influenced endurance. It is equally possible that both fluency and endurance were improved by the intervention, so fluency did not necessarily produce the change in endurance.

REFERENCES

- Barkley, R. A. (1991). *Attention deficit hyperactivity disorder: A handbook for diagnosis and treatment*. New York: Guilford Press.
- Beck, R., & Clement, R. (1991). The Great Falls Precision Teaching Project: An historical examination. *Journal of Precision Teaching*, 8(2), 8–12.
- Binder, C. (1996). Behavioral fluency: Evolution of a new paradigm. *The Behavior Analyst*, 19, 163–197.
- Binder, C., Haughton, E., & Van Eyk, D. (1995). Increasing endurance by building fluency: Precision teaching attention span. *Journal of Precision Teaching*, 12, 29–34.
- Pennypacker, H. S., Koenig, C. H., & Lindsley, O. R. (1972). *The handbook of the standard behavior chart*. Kansas City, KS: Behavior Research Co.
- Potts, L., Eshleman, J. W., & Cooper, J. O. (1993). Ogden R. Lindsley and the historical development of precision teaching. *The Behavior Analyst*, 16, 177–189.
- White, O. R. (1986). Precision teaching: Precision learning. *Exceptional Children*, 52, 529.
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