Precision Teaching, Frequency-Building, and Ballet Dancing

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This article reports the effectiveness of a brief intervention aimed at achieving fluency in basic ballet moves in a 9-year-old Norwegian girl by use of frequency-building and Precision Teaching procedures. One nonfluent ballet move was pinpointed, and instructional and training procedures designed to increase the frequency of accurate responding were employed. During 9 days of training, the frequency of correct responses increased from 80 per min to 188 correct/per min with no learning possibilities. Follow-up probes after 32 weeks showed that frequency remained at the initial level. A Standard Celeration Chart, including follow-up data, is presented. Results and the use of behavioral methods in fine arts are discussed.

DESCRIPTORS: ballet, frequency-building, precision teaching, Standard Celeration Chart

The visual aesthetics of ballet appear when dancing has evolved from rule-governed to contingency-shaped behavior. The contingencies lie in the dancer's own body movements; the previous movement sets the occasion for the next. Overlearning of basic moves is traditionally an essential part of ballet teaching procedures, and the need for fluency is indisputable. Overlearning as it is implemented in ballet is a pedagogical strategy in which repeated rehearsal of material learned to a mastery criterion is continued to achieve automaticity (Rohrer, Taylor, Pashler, Wixted, & Cepeda, 2005). Empirical findings in dance research indicate that in order to produce an elite dancer, 10–15 years of training, starting at an early age, are required to refine the component movement skills of ballet (Schnitt & Schnitt, 1987). Some experts claim that ballet training should start as early as the age of 4 to obtain the fluent performance needed in an expert because some movements can only be acquired during early childhood years. One such movement is sufficient turnout of the feet.

Examinations are compulsory in formal Royal Academy of Dance (RAD) ballet, and the level of technique and rhythm must be high to pass these exams (Royal Academy of Dance, 2005). The usefulness of behavioral interventions in sports and athletics is well reported, but very few articles have been published on the use of such methods in ballet. A literature search has produced one published article by Fitterling and Ayllon (1983). Behavioral coaching of the execution of four barre (a rail attached to the wall) exercises called degagé, frappé, developé, and grand battement was compared to traditional ballet instruction with multiple single case reversal designs. Participants in this study were four 7- and 8-year-old performers. The behavioral coaching consisted of detailed comments on correct movements and orders to freeze when executing incorrect movements. The results showed that the execution of all trained barre skills increased from an average of 13% correct movements under traditional ballet instruction to 88% correct movements under behavioral coaching. The effect of behavioral coaching disappeared during reversal phases.

Fluent performance is essential in ballet. Fluent performance, observed as speed and accuracy (Lindsley, 1992), may be seen as equivalent to mastery or automaticity (Bloom, 1986). Behavioral fluency can be defined by four important learning outcomes, often represented by the acronym RESA: the *Retention*, *Endurance*, *Stability*, and *Application* characterizing mastery (Binder, Haughton, & Bateman, 2002; Layng, Twyman, & Stikeleather, 2004). Binder (1996) defines *retention*

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as "the relation between behavior frequencies at two points in time, between which the individual has had no opportunity to emit the behavior" (p. 164). The term *endurance* describes the quality of a person's performance over prolonged periods of time (Binder, Haughton, & Van Eyk, 1995). *Stability* refers to performance that is resistant to distraction (Lindsley, 1995). *Application* can be described as "the process of fluent component behaviors combining and affecting a composite behavior" (Kubina, 2005, p. 73). Furthermore, "Fluent performance goes beyond accuracy to include the speed of performance. On a continuum from a total lack of measurable performance to mastery, 100% correct is only part of the way there" (Binder et al., 2002, p. 2). This statement is especially true for ballet.

Frequency-building refers to the procedure used to increase response frequency to some pre-determined frequency criterion linked to behavioral fluency (Doughty, Chase, & O'Shields, 2004). Training is specifically directed to increase the response frequency to a specified aim by utilizing short training sprints. Research on frequency-building procedures has shown significant results in academic areas, such as language, pre-academics, and early social skills (Fabrizio & Schrimer, 2002; Fabrizio, Schrimer, Vu, Diakite, & Yao; 2003; King, Moors, & Fabrizio, 2003). Frequency-building sets the opportunity for practice and repetition in a limited amount of time, and is thereby time-effective for achieving fluency. For many different skills, frequency ranges where behavioral fluency is readily observed have been identified. The frequency where RESA is observed for particular skills cannot be precisely defined. Frequency aims should not be considered the end per se, but rather as a means to achieve the ultimate end: RESA. Frequency-building procedures as a means for reaching fluency have developed as a part of Precision Teaching.

Precision Teaching is as a system for decision-making in teaching based on behavioral frequencies displayed on Standard Celeration Charts (SCCs; Binder, 1996; Lindsley, 1992; West & Young, 1992). All precision teaching practice involves charting on this standardized measuring procedure, which makes registration and assessment possible for all types of human responses occurring from once every 24 hours to 1,000 responses per minute (Lindsley, 1992). Both response increases and decreases are registered within the chart, and so are

timed training sessions of varying time intervals. Setting frequency aims in the chart allows for teachers and students to predict the point in the learning process where fluency may be observed. Acquiring any new skill, in any area, is a gradual process that requires time, practice, and feedback. Reaching expert levels of performance requires high levels of motivation, consistent engagement in specific practice activities, and corrective feedback (Ericsson, Krampe, & Tesch-Römer, 1993). Based on the inherent characteristics of ballet training, and the implicit need for expert performance, frequency-building procedures and the use of SCCs could be described as a natural fit for ballet. Literature searches have provided no reports on the use of frequency-building procedures and precision teaching in this area.

This article presents a brief intervention on basic ballet movements by use of frequency-building and precision teaching procedures. The main aim was to observe whether acquired frequency of responding would lead to RESA, would continue over time, and would integrate in complex behaviors, that is, longer dance sequences. It was also of interest to identify the extent of training needed to reach the frequency aim.

METHOD

Participant

The participant was a 9-year-old typically developed girl. She had been a ballet dancer since the age of 4, with a steady, average development as a dancer. She had participated in a ballet class for 1 hr every week for 3 years, and for 2 hr per week the past 2 years. The current study was conducted before her Grade 1 ballet exam, which included execution of 20 different exercises on the floor and on the barre, in addition to two dances to music. The participant did not master all exercises necessary to pass the exam. In particular, she had been rehearsing one dance, the Polka Study, from The Royal Academy of Dance (RAD) syllabus, for 9 months without mastery. Mastery is identified by accurate performance and perfect pace. The participant's responding during ballet classes was fragmented, with low speed and high numbers of errors. One basic ballet movement in the dance was performed poorly and caused the dance to halt. This unmastered movement was a jumping sequence, with three similar small jumps on her left

foot, around her own axis to the right, resulting in a 90° turn. The participant consistently made two small jumps and one long jump, making a 180° rotation, and wound up in the wrong direction for the next move. She stopped, and the dance could not be continued. The participant showed extensive verbal frustration over the error.

The nonfluency remained for more than a semester; 30 weeks, in spite of 2 hours of ballet practice every week. The three small jumps were trained as a component skill for future performance of pirouettes. When emitting one jump at a time, the participant performed the defined skill correctly 100% of the time. The participant agreed to implement frequency-building and use of an SCC to overcome her halted development.

Procedure

The intervention was completed with the first author. The target behavior and dependent variable to be measured and *counted as one response* was: short jumps on the left foot around her axis, making a 30° turn to the right, keeping the right knee slightly bent, the right foot pointed, tapping the floor lightly with each jump. The participant's arms were to be held to the sides of her body, with palms facing upward. The counted response included the execution of several different component responses, for example, right knee slightly bent, palms facing upward. All these responses were mastered before the training; but the emission of all responses in a controlled jump was not. The operationally defined move was, by definition, both a composite skill and a component skill. The move was taken out of the dance, so the participant would not have to think further than the pinpointed jumps; she rehearsed only the nonfluent step. A certified RAD ballet teacher modeled the jumps for the participant and the first author to assure correct movement.

No established frequency aim range existed for the move pinpointed for training. A frequency aim was obtained through measurement of the response frequency of two 19-year-old ballet dancers who mastered the move. The frequency aim was set at 160 correct jumps per min, with no learning possibilities.

A single subject AB design was chosen for the study. On two baseline probes the frequency of correct responses was 80, with five learning possibilities. The learning channel set chosen for training was think–jump. Timing periods of 15 s were chosen based on the fact that achieving a high number of responses was possible, but exhausting. Furthermore, the accuracy in counting number of correct responses decreased when the timing period was extended.

The training was implemented in the participant's living room, with enough space to jump and trip without hitting anything. The same music was applied during training as in ballet class, and was identical to the music used on the exam. Frequencies of correct and incorrect responses were charted using the Standard Celeration Daily per Minute Chart.

Before each timed session, the participant was given a detailed description of the pinpointed behavior. She was instructed to make as many accurate moves as possible during the session, but as slow as necessary to perform accurately, and to speed up as she felt more secure. Verbal prompts were presented during timings to remind the participant of correct gaze and balance. Reinforcement in the form of verbal praise and error correction occurred immediately after timings. The criterion for reinforcement was touching or beating the previous speed and accuracy record. To keep motivation up, each training session was terminated when the participant had either met or beaten her own personal best.

The participant trained for 9 days, with an average of 6.5 (range of four to nine) timed sessions per day (see Figure 1). The daily duration of training was on average 3.1 min per session, for a total of 20 min per day and 180 min over the 9 days of intervention. This included preparations, timed sessions, instruction before timed sessions, reinforcement, error correction, and charting.

Data and reliability

The charting was performed by the first author. Daily scores were registered on a standardized Timings chart. The best daily score was registered in a Standard Celeration Daily per Minute chart. Three follow-up performance probes were completed 32 weeks after completed training. The training was observed by two independent observers in nine of a total of 60 timings (15%). Interrater agreement was

determined for both correct and incorrect responses by dividing the number of exact agreements by the number of agreements plus disagreements. Inter-rater agreement was 100% in all timed sessions. The four sessions completed after 32 weeks also showed an agreement of 100%.

RESULTS AND DISCUSSION

The brief frequency-building procedure proved to be effective in acquiring fluency in a previously nonfluent ballet move. On the two baseline probes, the participant's frequency of correct responding was 80 jumps per min, with four learning opportunities. Within 21 timed sessions, the frequency of correct responding increased to 188 per min, with zero learning opportunities. The frequency aim was set to 160 per min. The training was extended 5 days after the frequency aim was met, and the initial aim was not increased during this period. There were three reasons for this extension. Firstly, it was important to reduce the possibility of variation in performance by increasing the number of repetitions and thereby ensuring automaticity. Secondly, a frequency aim range for the defined skill has not yet been established; therefore it was of interest to explore the frequency further for future establishment of an aim range. Thirdly, it was essential that speed did not hinder accuracy. The ballet instructor judged that 188 correct responses per min were close to the physical limit for performance without reducing accuracy. In 1 week the participant had an acceleration of 2.35, more than doubling the frequency of correct responding (see Figure 1). After the third day of training, the small jumps were put back into the original dance with music, and the participant had fluent composite skills with no errors. The participant passed her RAD exam with merit 3 weeks later. The highest scores were obtained surprisingly fast.

Knowledge about the importance of establishing fluency in basic skills before teaching complex skills is seminal in the making of expertise. In Norwegian sports and arts, a limited amount of training is the norm. For children up to the age of 14, one training session per week is normal, and the repetition demanded to obtain fluency is uncommon. Repeated rehearsal is considered stressing and harmful for children.

This may explain why Norwegian stars are absent on the international ballet stage. This phenomenon is equivalent to problems found in international soccer, where Norwegian players are considered to have too poor technical skills to compete with international players. Contrary to a common Norwegian view on repeated rehearsal, the participant found frequency-building to be motivating. In the current study, the participant expressed that the training made the learning process seem faster than normal and that it increased the joy of training. The SCC made progress visible to all parties and gave the possibility for goal direction and orientation. The participant was eager to beat her own personal bests and was not preoccupied by errors during training. The reason may have been that the number of errors was low.

When the participant's performance was measured 32 weeks after reaching the frequency aim, it was fast and accurate, and returned to prior level within three 15-s timed sessions (see Figure 2). The participant completed 2 hours of ballet class per week both during the intervention period and in the 32 weeks after intervention. The trained move was applied during classes as part of more complex movements. No data are available on such use of the move.

The results suggest that the intervention may have caused the change in the participant's performance. The inference is aided by the continual assessment before and during the intervention (Kazdin, 1982). Maturation is a plausible alternative explanation. Still, the possibility of making a valid inference is limited by the research design used. But the problem of nonfluent jumping was present at a relatively stable level for a prolonged period prior to the intervention. The participant had trained for the steps for several months before the intervention, with many errors and lack of fluency, thus making maturation a less probable explanation. Since the steps trained were highly specialized parts of ballet, it is not likely that other factors were responsible for the observed effect. This is in accord with Kazdin (1981), who argues that an AB design could be sufficient for the evaluation of effect. Motor skills are normally difficult to reverse once mastery is acquired, as the follow-up data indicated. Hence, a reversal of the design would probably not have yielded further information. The training must be

viewed as a treatment package containing many possible effective elements or mechanisms. A detailed task analysis of target behavior, precise monitoring, frequent reinforcement, emphasis on speed, and a high number of repetitions are parts of the package. The participant also learned how to chart her own behavior on the SCC and was later eager to use this skill on other behaviors. Further research on frequency-building in ballet should focus on establishing frequency aims for component dance skills where fluency could be expected to appear, and on the use of SCCs for navigated teaching.
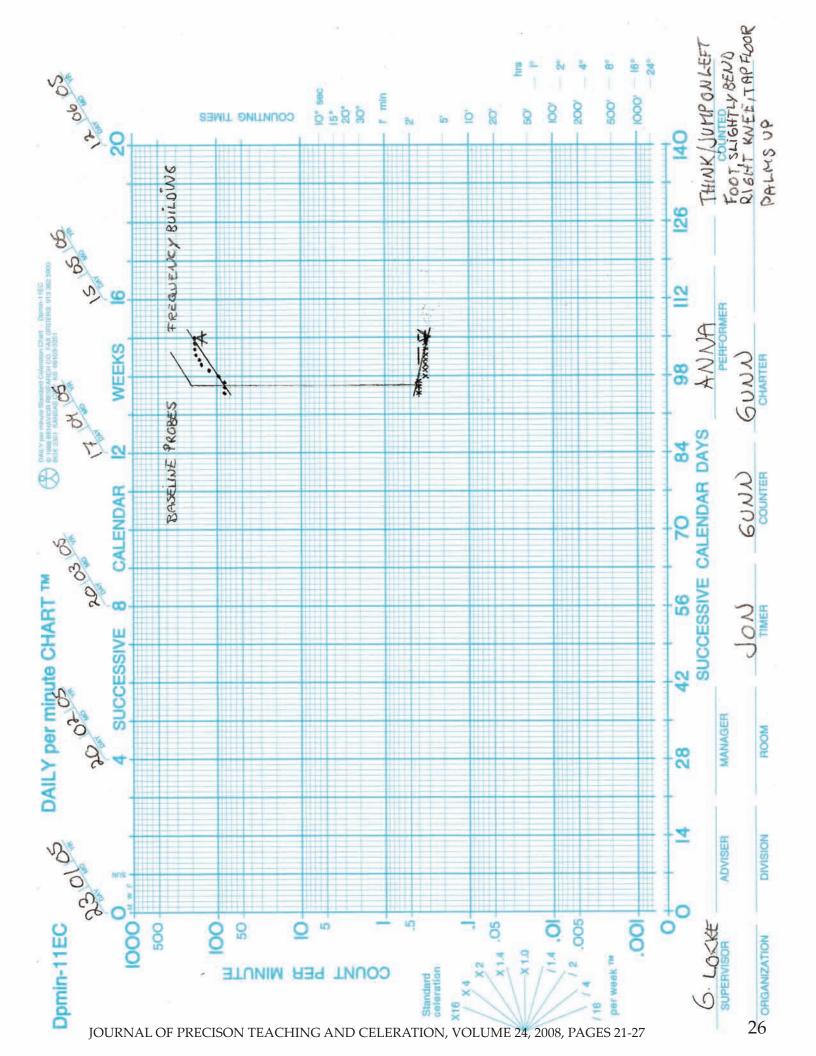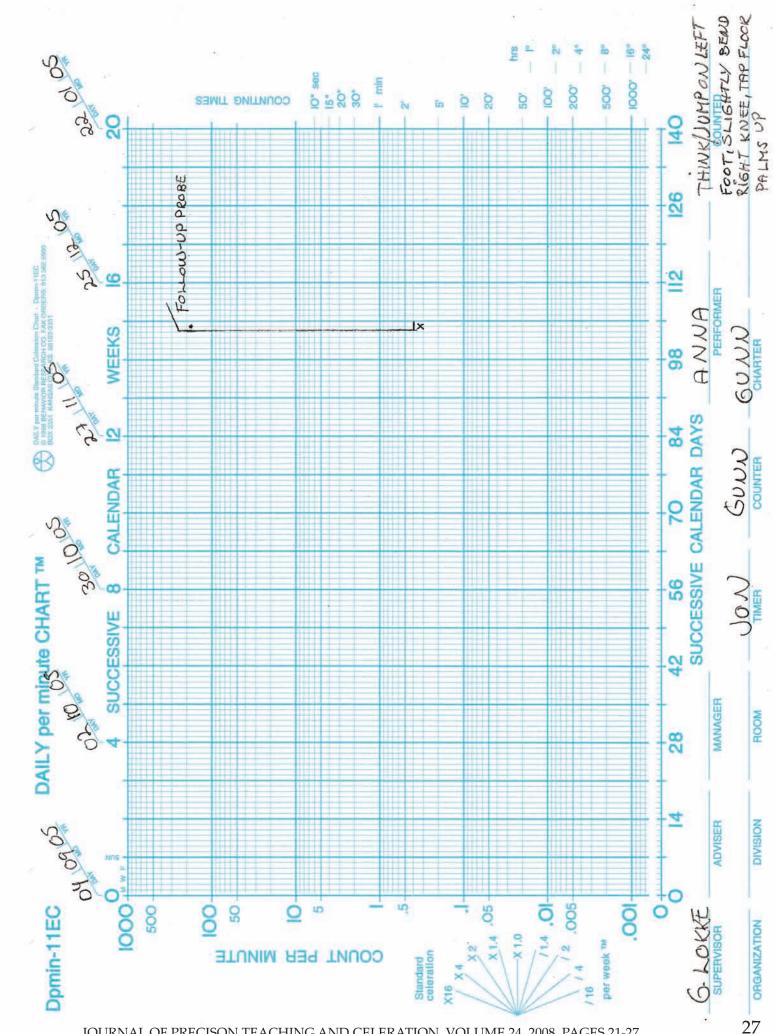
REFERENCES

Binder, C. (1996). Behavioral fluency: Toward a new paradigm. *The Behavior Analyst, 19*, 163–197.

Binder, C., Haughton, E., & Bateman, B. (2002). *Fluency: Achieving true mastery in the learning process.* University of Virginia: Professional Papers in Special Education.

Binder, C., Haughton, E. C., & Van Eyk, D. (1995). Increasing endurance by building fluency: Precision teaching attention span. *Journal of Precision Teaching, 12*, 29–34.

Bloom, B. S. (1986). The hands and feet of genius: Automaticity. *Educational Leadership, 43*, 70–77.

Doughty, S. S., Chase, P. N., & O'Shields, E. M. (2004). Effects of rate building on fluent performance: A review and commentary. *The Behavior Analyst, 27*, 7–23.

Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review, 100*, 363–406.

Fabrizio, M., & Schrimer, K. (2002). Teaching visual pattern imitation to a child with autism. Journal of Precision Teaching and Celeration, 18, 80–82.

Fabrizio, M., Schrimer, K., Vu, E., Diakite, A. & Yao, M. (2003). Analogue analysis of two variables related to the joint attention of a toddler with autism. *Journal of Precision Teaching and Celeration, 19*, 41–44.

Fitterling, J. M., & Ayllon, T. (1983). Behavioral coaching in classical ballet: Enhancing skill development. *Behavior Modification, 7*, 345–368.

Kazdin, A. E. (1981). Drawing valid inferences from case studies. *Journal of Consulting and Clinical Psychology, 49*, 183–192.

Kazdin, A. E. (1982). *Single case research designs. Methods for clinical and applied settings*. New York: Oxford University Press.

King, A., Moors, A., & Fabrizio, M. (2003). Concurrently teaching multiple verbal operants related to preposition use to a child with autism. *Journal of Precision Teaching and Celeration, 19*, 38–40.

Kubina, R. M., Jr. (2005). The relations among fluency, rate building, and practice: A response to Doughty, Chase, and O'Shields (2004). *The Behavior Analyst, 28*, 73–76.

Layng, T. V. J., Twyman, J. S., & Stikeleather, G. (2004). Engineering discovery learning: The contingency adduction of some precursors of textual responding in a beginning reading program. *The Analysis of Verbal Behavior, 20,* 99–109.

Lindsley, O. R. (1992). Precision teaching. Discoveries and effect. *Journal of Applied Behavior Analysis, 25, 51–57.*

Lindsley, O. R. (1995). Precision teaching: By teachers for children. *Journal of Precision Teaching, 12,* 9–17.

Rohrer, D., Taylor, K., Pashler, H., Wixted, J. T., & Cepeda, N. J. (2005). The effect of overlearning on long-term retention. *Applied Cognitive Psychology, 19,* 361–374.

The Royal Academy of Dance. (2005). Graded examinations in dance & presentation classes. *Grade 1-3. Male & female syllabus.* London: Royal Academy of Dance Enterprises Ltd.

Schnitt, J. M., & Schnitt, D. (1987). *Psychological aspects of dance*. In P. Clarkson & M. Skrinar (Eds.), *The science of dance training* (pp. 239–267). Champaign, IL: The Human Kenetics Press.

West, R. P., & Young, K. R. (1992). Precision Teaching. In R. West & L. A. Hammerlynck (Eds.), *Designs for excellence in education: The legacy of B. F. Skinner* (pp. 113–146). Longmont, CO: Sopris West.