Effects of Pace of Instruction on Skill Acquisition and Problem Behavior

National Autism Conference
August 5, 2019

Willow Hozella
Few studies have been conducted on rate of presentation of trials in the applied setting. (Francisco & Hanley, 2012)

Rapid pace of instruction for students in special education settings is not always thought to be beneficial. (Heward, 2003)
Pace of Instruction in Practice

Classrooms teaching students with autism often use discrete trial instruction as an element of instruction (Matson & Jang, 2014).

Antecedent manipulations, including instructional pace, are a critical factor when designing instruction for students in special education settings (Heward, 1997).
Pace of Instruction in Practice

Instructional pace is a significant variable when working with students with intellectual disabilities (Dunlap et al., 1996; Koegel et al., 1980; Tincani & Crozier, 2008).

There are a surplus of assumptions about teaching methodologies in these settings that are not coherent with available research (Heward, 2003).
Some Terminology

**Antecedent** – What happens immediately before a behavior occurs.

**Behavior** – An observable and measurable movement of an organism in their environment.

**Consequence** – What happens immediately after a behavior.

**Intertrial Interval** – During instruction, the time between a student’s response (behavior) and the next instructional demand. Sometimes abbreviated as ITI.
Some Terminology

**Discrete Trial Instruction** – An instructional format where each teacher presented demand and student response to that demand is evaluated using the Antecedent-Behavior-Consequence (ABC) analysis. Sometimes abbreviated as DTI or DTT.

**Reinforcement** – Any consequence that increases the frequency of the behavior that preceded it in the future.

**Motivation** – An antecedent that alters the value of reinforcement.

(e.g. Needing to get to work on time makes information about the location of my car keys valuable and leads to me asking my wife...
Some Terminology

**Fluency** – A measure of responses that includes both accuracy and rate (e.g. correct *and* rapid responding).

**Errorless Teaching** – A teaching procedure where a previously mastered skill is used as a prompt to teach a new skill to prevent the student from making errors.
Pace of Instruction in Research

The Effect of Varying Teacher Presentation Rates on Responding During Discrete Trial Training for Two Children With Autism

Carole A. Roxburgh and Vincent J. Carbone

Abstract
Recent research has emphasized the importance of manipulating antecedent variables to reduce interfering behaviors when teaching persons with autism. Few studies have focused on the effects of the rate of teacher-presented instructional demands as an independent variable. In this study, an alternating treatment design was used to evaluate the effects of varied rates of teacher-presented demands (1 s, 5 s, 10 s) on the occurrence of problem behavior, opportunities to respond, responses emitted, accuracy of responding, and magnitude and rate of reinforcement for two children with autism. Results indicated that fast presentation rate (1 s) resulted in lower rates of problem behavior, higher frequencies of instructional demands, higher frequencies of participant responding, and greater magnitudes and rates of reinforcement. Differential effects on accuracy of responding across conditions were not observed. Implications for manipulating the rate of teacher-presented instructional demands as an antecedent variable to reduce problem behavior are discussed.

AN EVALUATION OF PROGRESSIVELY INCREASING INTERVAL INTERVALS ON THE ACQUISITION AND GENERALIZATION OF THREE SOCIAL SKILLS

Monica T. Francisco
UNIVERSITY OF KANSAS

AND

Gregory P. Hanley
WESTERN NEW ENGLAND UNIVERSITY

We evaluated the effects of different interval intervals (ITIs: time between programmed learning opportunities) on the acquisition and generalization of 2 preschoolers' social skills. Independent and generalized skills were observed only when the daily ITI was gradually increased from short to progressively longer intervals.

METHOD

Participants and Setting
Two children enrolled in a full-time, inclusive preschool classroom participated. Hari was...
Roxburgh and Carbone (2013)

- Indicates better rates of responding, reinforcement, and increased instructional trials when pace is rapid.

- Also, shows a significant reduction in problem behavior when rapid instructional pace is used with students who engage in problem behavior.
Figure 1. Frequency of problem behavior per session during fast, medium, and slow teacher presentation rates for David and Sarah.

Figure 3. Frequency of teacher presented instructional demands per session during fast, medium, and slow teacher presentation rates for David and Sarah.
Francisco and Hanley (2012)

- Showed an increase in generalization of specific social skills taught with a greater ITI.

- Progressive schedule of ITI resulted in greater generalization across environments.
Francisco and Hanley (2012)

- This increase in generalization is likely related to the skills that were taught (Responding to name, saying, “Thank you” and “Excuse me”)

- These social skills were not taught using a discrete trial format and issues related to specific motivations (e.g. when is it appropriate to say “Thank you” vs. “Excuse me”) should be considered in relation to the ITI

- May indicate that progressively longer ITIs are useful for teaching specific social skills, responses
Replication of Roxburgh and Carbone (2013)

• Four participants. Two in elementary school and two in high school

• Each participant’s instruction maintained their targets, schedules of reinforcement, and previously mastered skills (Nothing was changed for the research other than the pace of instruction)

• All participants were taught using three different ITI (1s, 5s, and 10s) during 10 minute instructional sessions
1, 5, and 10-second intertrial intervals: A pause of 1, 5, or 10 seconds occurs following the student’s response before the instructor presents the next task.

All sessions were 10 minutes in length, starting with the first instructional demand and ending when a timer indicated that ten minutes had passed.
Results: Rapid Instructional Pace

- Reduces problem behavior
- Increases opportunity for correct responses to contact reinforcement
- Increases frequency of teaching trials for new skills, potentially increasing skill acquisition
- Increases review of previously mastered skills, potentially preventing skill regression
Rapid Instructional Pace (Video)
Slowest Instructional Pace (Video)
Problem Behavior

• Brisk instructional pace reduces problem behavior
  – Escape maintained problem behavior
  – Increased frequency of reinforcement reduces motivation to escape instruction
  – More rapid instruction prevents downtime that might be filled with problematic behavior
  – Use of errorless teaching procedures reduces the number of student errors when learning new skills
Figure 10. Frequency of problem behavior (Hand flapping, vocal stereotypy, repetitious question asking) across 1 s, 5 s, and 10 s intertrial intervals for Nathan.
Problem Behavior

The role of motivation to escape or delay the onset of demands during instruction:

• CMO-R – Antecedent stimuli serve as a warning signal that worsening conditions (e.g. lower rates of reinforcement, difficult tasks, etc.) are imminent (Michael, 2000; Carbone, Morgenstern, Zecchin-Tirri, & Kolberg, 2010).
Problem Behavior Analysis

- Faster rates of teacher presented demands result in higher rates of reinforcement for correct responding and reduction in downtime.

- Use of errorless teaching and prescribed error correction procedures reduces “frustration” with learning new skills and prevents repeated errors.

- Because new skills are made easier to learn, error responses are addressed systematically, and rates of reinforcement are increased, motivation to escape instruction (CMO-R) is reduced.
Frequency of Reinforcement

• Reducing motivation (CMO-R) to escape instruction by increasing rates of reinforcement

• Rapid pace of instruction allows the student to contact more improving consequences for accurate responding (practice effects)

• Consider which rate of payment you would prefer in a job setting
Figure 1. Frequency of student access to reinforcement across 1 s, 5 s, and 10 s intertrial intervals for Samantha.
Error Responses

• Types of errors: Wrong response, No response within two seconds, Scrolled response

• While errors were not significantly reduced across all participants, some participants had slightly less errors during more rapid paced instruction

• Role of problem behavior and error responses
Figure 16. Frequency error responses (no response within 2 s, wrong response, scrolled response) across 1 s, 5 s, and 10 s intertrial intervals rates for Jason.
**Figure 20.** Percentage of correct responses across 1 s, 5 s, and 10 s intertrial intervals rates for Jason.
Error Responses

• Because errorless teaching should prevent errors from occurring, new skills are unlikely to evoke error responses

• However, downtime during the longer ITI provides opportunity for other behavior to occur (e.g. problem behavior, attending to things in the classroom, etc.)

• If this other behavior was incompatible with correct responding when the next trial was presented it resulted in an error response
Error Responses

• The longer ITI are analogous to an instructor searching for materials, pausing to find what they should do next, or engaging in other behavior that interferes with teaching
Skill Acquisition

- Mastery of skills requires repeated practice of accurate responding
Skill Acquisition

- Mastery of skills requires practice and reinforcement
  - Errorless teaching provides practice at responding accurately
  - Errorless teaching allows for reinforcement to occur for more independent responding when learning new skills
  - Frequency of this type of practice is likely to affect skill acquisition
Figure 6. Frequency of target skills being taught using errorless teaching procedures across 1 s, 5 s, and 10 s intertrial intervals for Nathan.
Review of Previously Mastered Skills

• Loss of previously mastered skills for children with autism is often reported by parents and clinicians (Lord, Shulman, & DiLavore, 2004; Barger, Campbell, & McDonough, 2013)

• The potential for loss of previously taught skills must be considered and addressed when designing instructional programs
Review of Previously Mastered Skills

- What skills have you lost and why?

- Diagram the following sentence: Professor Villa made her students read four novels.
Review of Previously Mastered Skills

• Practice and review of previously mastered skills is what facilitates retention

• There is no magic number of times that a skill must be practiced

• Practice of easy skills also reduces the value of engaging in escape maintained problem behavior (Carbone, Morgenstern, Zecchin-Tirri, & Kolberg, 2010)
Figure 21. Frequency of previously mastered trials across fast, medium, and slow teacher presentation rates for Samantha.
When Might Instructional Pace Not be Rapid?

- Teaching appropriate requesting (Mand Training) and other social skills relies on manipulating the environment to establish motivation.

- This requires instructor efforts to make particular items, activities, interactions, etc. valuable to the student.

- Additionally, the amount of time between the student’s response and the presentation of the next trial will involve consideration of how long a student should interact with a reinforcer they have requested.
In order for a brisk pace of instruction to be established, an instructor must arrange their environment to facilitate fluent teaching.

- Materials Organization
- Scheduling Instruction
- Staff Training
- Consultation
Fluency of Instructor Responding

How do we make sure instructors can teach fluently?

Materials organization

– Instructional materials should be kept in one place (e.g. student cart, specific shelf in room, specific area where instruction will take place, etc.)

– All instructional materials must be available to staff, including data collection materials, reinforcement systems, etc.
Materials Organization

• Clipboards
  – Additional data sheets:
    • Behavior data
    • Fluency data
    • Social skills data

• Data collection tools:
  – Pencil
  – Highlighter
  – Ruler
  – Calculator
  – Tally counters
  – Timer
Materials Organization

Rolling Bins for Each Student

- Materials for target skills
- Materials for maintenance skills
- Program book
- Data collection tools
- Reinforcers
Fluency of Instructor Responding

• Having valuable reinforcement available at all times
  – What is valuable to the student
    (*changes from moment-to-moment*)
  – Best items allow immediate delivery and brief engagement/consumption
Available Reinforcement

• Having valuable reinforcement available at all times

• Take control of the reinforcers!
  Reinforcers visible but out of reach:
  • Reinforcer bins
  • Compartment bins
  • Zip lock bags
  • Apron
  • Shelves
Fluency of Instructor Responding

- Classroom schedules
  - Instruction must be planned or time will be lost
  - Brief (20 min.) intervals of instruction then transition
  - Flexible scheduling that includes unforeseen changes (e.g. absent staff, student leaving early, assemblies, etc.)
Classroom Schedules

Active student engagement is one of the factors directly correlated with student achievement and reduction in problem behavior.
Classroom Schedules

- **Who**: specifies which student(s) staff is working with
- **When**: start and end time for the session
- **Where**: area/station in the classroom
- **What**: specific instructional program
General Schedule Guidelines

• Provide clear information on instruction expected.

• Indicate which staff is assigned to which student(s) throughout the day.
Fluency of Instructor Responding

• Staff training
  – Must involve analogue practice of skills to be used in class (e.g. errorless teaching, error correction procedures, reinforcement schedules, etc.)
  – Competency based
  – Good teaching methods for students = Good teaching methods for staff
Fluency of Instructor Responding

- In-class consultation
  - Direct feedback
  - Modeling procedures
  - Data collection on staff behavior
  - Fidelity checklists
In order for a brisk pace of instruction to be established a student’s responses must also be fluent.

Discrete trial training is generally used to teach students to respond to common instructional demands (e.g. labelling common objects, following basic instructions, imitation, repeating what was said, etc.)

Often does not involve problem solving skills such as talking oneself through a question to get the right answer.
Fluency of Student Responding (Example)

Please respond on signal

What is it?
Fluency of Student Responding (Example)

Please respond on signal

Who was the first president of the United States of America?
Please respond on signal

Who was the 39th president of the United States of America?
Fluency of Student Responding

Why does the response “George Washington” come to strength so much faster than “Ronald Reagan”?

How would you figure out the name of the fortieth president? (“Obama was 44, so W. Bush was 43, and he came after Clinton, who was preceded by H.W. Bush, who was V.P to Reagan, and before Reagan was Jimmy Carter!”)
Fluency of Student Responding

Fluency is a response that is both accurate and quick (response accuracy and response rate).

Responses that do not require problem solving should be occur fluently.

Fluent responding of these skills is part of building a verbal repertoire that allows problem solving to occur.
Fluency of Student Responding

Problems with assumptions of “processing”
• The brain is not a computer, analogies appealing to this assumption are flawed (Epstein, 2016; Barrett, 2016).

• “Processing” involves circular logic. How do you know someone has difficulty processing? They respond slowly. Why do they respond slowly? They have difficulty processing!

• Fluency can be taught, rather than lowering expectations for how quickly someone can respond to a demand.
Fluency of Student Responding

For pragmatic recommendations for teaching students to respond quickly and accurately please see session 78 on Thursday 9:00am - 12:00pm

The Role of Fluency in Programming for Children with Language Delays by Lori Chamberlain
In Closing

Pace of instruction is a variable that can be manipulated by classroom staff.

Pace of instruction is a critical variable in student’s education.

Students who have difficulty mastering or retaining skills will benefit from increased frequency of teaching new skills, review of previously mastered skills, and the commensurate increase in positive reinforcement that occurs with fast-paced instruction.
In Closing

“To improve education we are said to need "imaginative innovations," a "broad national effort" leading to a "deep and lasting change," and a "commitment to excellence."

More specific suggestions have been made, however. To get better teachers we should pay them more, possibly according to merit. They should be certified to teach the subjects they teach. To get better students, scholarship standards should be raised. The school day should be extended from 6 to 7 hours, more time should be spent on homework, and the school year should be lengthened from 180 to 200, or even 220, days. We should change what we are teaching. Social studies are all very well, but they should not take time away from basics, especially mathematics.

As many of us have learned to expect, there is a curious omission in that list: *It contains no suggestion that teaching be improved.* [emphasis added]”

(Skinner, 1984, p. 947)
References


References


References


References


References


References


Willow Hozella  
wozella@pattan.net

Commonwealth of Pennsylvania

Tom Wolf, Governor