

THE EFFECT OF VARYING TEACHER PRESENTATION RATES ON RESPONDING DURING DISCRETE TRIAL TRAINING

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- A disproportionate number of children with autism engage in high rates of escape and avoidance behaviors (Koegel, Koegel, Frea, and Smith, 1995) during instructional sessions.
- Moreover, Covert and Koegel (1972) found that self-stimulatory behavior in children with autism often interferes with the learning of simple discrimination tasks
- When self-stimulatory behavior is reduced they found that learning occurred at a higher rate.
- Consequently, the ultimate outcome for many children with autism may be at least partially depend upon teacher's manipulation of instructional variables that leads to improved learner attention to teacher directed activities for reasonable periods of time each day. (Drash & Tudor, 1993)

- This may be especially important with children with autism since they frequently fail to learn through exposure to even enriched social environments (Smith, 2001).
- As an alternative to mere exposure to everyday experiences the method of discrete trial training (Lovaas, 1981, 1987; Smith, 2001) has been demonstrated to be one of the most effective instructional tools for teaching important language, social and cognitive skills to children with autism.
- The method is modelled after Skinner's (1968) three (3) term contingency arrangement whereby a stimulus is presented by a teacher, a response is evoked and a consequence follows the response in order to strengthen or weaken its likelihood of occurring again under similar conditions.
- When discrete trial training has been used as a component of a comprehensive program of intensive intervention for children with autism long term benefits have been achieved with many children (Lovaas, 1987, Smith, 1999, McEachin, Smith & Lovaas (1993)).

- However, the high demand requirements of discrete trial training may evoke problem behavior in the form of tantrumming, flopping, off task behavior, high rates of stereotypies, aggression, and self-injury.
- Smith (2001) explains “.....children with autism may attempt to escape or avoid almost all teaching situations, as well as any requests that adults make of them” (p. 89).
- Consequently, a thorough conceptual understanding and practical teacher repertoire related to the modification of instructional variables that reduce escape, avoidance and self-stimulatory problem behavior during discrete trial training of children with autism appears essential.

- Manipulation of instructional variables related to consequences such as reinforcement and extinction have been extensively studied in the behavior reduction and replacement literature under the rubric of functional assessment and functional communication training (FCT) (See Hanley, Iwata & McCord, 2003, for a review of this literature).
- In recent years additional emphasis has been placed upon the manipulation of antecedent variables to reduce interfering behaviors when teaching persons with developmental disabilities and autism (Carbone, Morgenstern & Zecchin (in preparation 2006), Dunlap & Kern (1996), Dunlap, Kern-Dunlap, Clarke & Robbins, 1991; Dunlap, Kern, dePercel, Clarke, Wilson, Childs, K. E., White & Falk ,1993; McGill, 1999, Michael, (2000)Munk and Repp, 1994; Smith and Iwata, 1997; Wilder and Carr, 1998;.
- Notwithstanding the attention given to antecedent control of behavior very little research has focused on the effects of teacher rate of presentation of instructional demands as an antecedent variable.

- Only two studies that included children with autism have measured the effects of teacher rate of presentation of instructional demands
- Both of these studies Koegel, Dunlap, & Dyer, (1980) and Dunlap, Dyer & Koegel (1983) manipulated the duration of inter trial intervals resulting in either slow or fast pace presentation of instructional demands
- Inter-trial interval was defined as the duration of time between the delivery of the consequence for one behavior and the presentation of the next instructional stimulus or demand.
- Koegel et al (1980) were the first to investigate the functional relationship between inter trial interval (ITI) duration and correct learner responding in children with autism.
- The researchers systematically manipulated the duration ITIs. Long durations ranged from 4 seconds to 26 seconds and short durations were from 1 to 4 seconds.

- Using an alternating treatment design they demonstrated that shorter duration of ITIs produced a higher rate of correct responses.
- Their incidental recording of self-stimulatory behavior showed a decrease in these response topographies. They attributed this effect to the reduced opportunity for problem behavior during the shorter ITIs.
- Dunlap et al (1983) replicated the previous study and then extended the findings by precisely measuring occurrences of self stimulatory responses in their participants who were children with autism.
- They found that correct responding and self-stimulatory behavior were inversely related.

- Self stimulatory responses decreased with shorter inter trial intervals while correct responding correspondingly increased.
- Neither of these studies with children with autism measured the effects on any other type of problem behavior than self-stimulatory responses.
- Dunlap, et al., (1983) specifically called for future research to include measures of the effects of teacher presentation rates on other topographies and functions of problem behavior frequently emitted by children with autism during intensive teaching sessions.
- Other researchers have studied the effects of teacher rate of presentation of instructional demands or ITI on the response patterns of populations of participants other than children with autism.
- The first study of this type was conducted by Carnine (1976) with low achieving first grade learners.

- He found that fast rates of presentation, one second or less, increased correct responding, decreased off-task behavior and increased learner response rates on reading tasks as compared to slow rates of presentation of five seconds.
- These results were replicated and extended by Tincani, Ernsbarger, Harrision and Heward (2004) with typically developing pre-K children using measures of academic performance while teaching communication skills using the direct instruction program *Language for Learning*.
- They found that one sec ITIs were superior to five second ITIs across all measures including percentage of intervals off-task behavior, rate of correct responses per minute and opportunities to respond per minute across all four participants.
- Darch and Gersten (1985) found similar results with learning disabled learners during reading activities.

- Notwithstanding the positive findings related to faster rates of teacher presentation of instructional demands or short ITIs some investigators have failed to produce consistent results.
- Valcante, Roberson, Reid and Wolking (1989), studied the effects of fast teacher presentation rates (one sec. ITI's) vs slow rates (10 sec. ITI's).
- In addition, the focus of this research included the effects of long vs. short wait times (response latencies) on correct responding.
- The participants in this study were learners with multiple disabilities (5-11 years old) who were presented academic tasks during the experimental sessions.
- On measures of correct responding the faster paced instruction provided no substantial benefit.

- However, a modicum of benefit was noted in the short ITI/long wait condition.
- The authors suggest that the low rates of self-stimulatory behavior of the participants may account for this difference.
- Notwithstanding these findings, the authors point out that fast paced instruction provided nearly twice the number of learning trials per session as compared to the slower paced instruction.
- They conclude that the additional number of trials occurred without reducing rates of correct responding suggesting greater efficiency of faster rates of teacher presentation of instructional demands.
- In a study by Smith, Iwata, Goh, & Shore, (1995), the authors reported a higher rate of self-injurious escaped motivated behavior in individuals with developmental disabilities during faster paced presentation of instructional demands.

- In conditions in which 30 demands were delivered in a 15 minute session there was always a higher rate of self-injurious behavior as compared to session where only 15 demands were presented each session.
- The authors warn that these results may be difficult to interpret since faster paced presentation sessions always included a greater number of demands.
- Consequently, the effects of pace is confounded with the sheer number of demands therefore rendering interpretation difficult.
- Skinner, Smith and McLean, (1994) found that there was no difference between fast and slow presentation on the acquisition of sight words in three learning disabled and behaviorally disordered elementary school children.

- The three elementary school participants were not reported to have high rates of problem behavior at the start of the study.
- Tincani et al. (2004) suggest that the benefits of faster paced instruction may differentially effect the performance of learners with high rates of problem behavior.
- They offer that as an explanation for inconsistent findings between studies on pace of instruction.
- It appears that learners with higher rates of problem behavior during instructional sessions may derive greater benefit from faster paced instruction.

Purpose

- Given the dearth of research regarding the effects of pace of instruction with children with autism and conflicting reports on this topic this study was designed to:
 - replicate the findings of other researchers regarding the effects of altering the pace of instructional demands on the occurrences of problem behavior and correct responding during instructional settings with children with autism.
 - examine the effects of teacher rate of presentation of instructional demands with children with autism who exhibited several topographies of problem behavior including self-stimulatory but also responses that appeared to be maintained by a history of social reinforcement, e.g. aggression, bolting from instructional setting, etc.
 - extend the research with children with autism to include measures of opportunities to respond and magnitude of reinforcement as a function of faster vs. slower rates of teacher presentation of demands.
 - Provide a finer grain analysis of the effects of teacher paced instruction with children with autism by measuring 3 rates of presentation commonly recommended in instructional programs for children with autism.

Method

Participant and Setting

- Two children with a diagnosis of autism participated in this study. They resided in the North of Wales, UK, with their parents.
- Both participants received a combination of school and home based intervention using Applied Behavior Analysis with emphasis upon teaching communication skills using B.F. Skinner's analysis of verbal behavior as a conceptual guide.
- Both children's program included one-on-one intensive teaching in the form of discrete trial training interspersed with learning opportunities in the more naturalized environments in the home setting. A similar program was implemented for both children in the school setting for part of the instructional day.
- Both participants exhibited high rates of disruptive behavior during instructional sessions and therefore were selected to participate in this study.

- David was a 7 year old male diagnosed with autism. All of his instruction was provided in Welsh by instructors who had received training in the application of behavioral principles to the instructional needs of children with autism.
- David had a weak communication repertoire that included requesting items but only when they were present in his immediate environment. His vocal responses were articulate and therefore most persons in his environment could effectively respond to his communication efforts.
- He could follow instructions in routine situations and would respond to requests to fill-in words to commonly presented phrases
- David's labelling or tact repertoire was weak but developing however he demonstrated relatively strong textual behavior, e.g. reading words.
- David engaged in high rates of self-stimulatory behavior which frequently interfered with his acquisition of skills during discrete trial instructional sessions. In addition, he frequently "bolted" from the instructional environment or would mand for other activities that were incompatible with the delivery of instructional demands.

- The second participant in the study Sarah was an 8 year old female with a diagnosis of PDD.
- Sarah had an overall weak communication and basic learner skill repertoire. She did not produce any intelligible vocalizations and therefore she was a candidate for teaching alternative methods of communication.
- Despite strong efforts to teach her manual sign language she had acquired only a few functional responses over a substantial period of time of instruction.
- However, her unique tendency to respond to textual stimuli provided an opportunity to teach her to communicate with text and then to translate that repertoire to the use of a Lightwriter®.
- The Lightwriter® is an electronic device that allows the user to operate a keyboard to spell words that are then produced as a synthetic voice output by pressing a key as the final step in the process.

- At the time of the study Sarah was transitioning from using a book of text stimuli to learning to type and communicate with the Lightwriter®. She spontaneously requested many preferred items and activities using the Lightwriter®.
- In addition, Sarah had developed over a 100 word labelling repertoire and she could respond effectively to most of the verbal behavior of others.
- Notwithstanding her developing verbal repertoire Sarah exhibited high rates of disruptive behavior in the form of shouting, whining, hitting, pinching and kicking.
- These responses occurred frequently during high demand situations such as during discrete trial training.

Setting

- All of the experimental sessions were carried out in the home of each participant as this was where most of the intensive teaching sessions occurred.
- The instructional setting for each child was in the family living room where a television was available to display videos as a form of reinforcement.
- Each child was seated at an instructional table and the instructor sat opposite David and at the side of Sarah. Task materials were laid out on the floor next to the instructor.
- A video camera was also set up on a tripod next to the instructional table for purposes of recording each session.

Dependent variables, Response Definitions and Measurement Procedures

- The dependent variables were defined and measured in this experiment as shown below:
 - Frequency of Problem Behavior per session: an occurrence of problem behavior was recorded when suspected self-stimulatory behavior; aggression / self injurious behavior (SIB); bolting from the instructional table and mands that interfered with instructional demands were exhibited. Self-stimulatory behavior was defined as any stereotypic behavior that occurred during teaching and in this study repetitive vocalizations and hand flapping were observed. Aggression / SIB responses that included hand hits to any part of the body, pinches and kicks to any part of the body. Unsuccessful attempts to engage in these behaviors were also recorded as problem behavior. Bolting from the table was defined as the learner suddenly leaving their chair and walking or running from the instructional setting. The teacher blocking any of the bolts was recorded as an occurrence of problem behavior. Mands were defined as any verbal response that interfered

- Frequency of teacher presented instructional demands: The frequency of teacher presented instructional demands was defined as the total number of instructions delivered during a ten minute session, this included the number of instructions that were repeated during the error correction procedure and also the number of instructions that received no responses from the learners.
- Magnitude or duration of reinforcement: Magnitude or duration of reinforcement was defined as the number of minutes the learner viewed a preferred video segment during each 10 minute session. While viewing the video the learners could access books, pictures, cars and some edibles.
- Percentage of correct responses: The percentage of correct responses was the number of responses that were correct on the first presentation of an instructional demand divided by the total number of demands and multiplied by 100 per 10 minute session.

- Each of the dependent variables was measured following each experimental session by transcribing the responses from the video recording of the session. The second author acted as the primary observer by viewing each session of a digital recording of the session played on a computer.
- In front of her was a data recording sheet developed specifically to measure frequency of problem behavior, frequency of instructional opportunities, frequency of responses per session, magnitude of video presentation as a form of reinforcement and percentage of correct and incorrect responses.
- For all three frequency measures a tally mark was recorded indicating the occurrence of the responses and then the tally's were totalled to derive the frequency per session.
- In the case of problem behavior a tally was recorded for the occurrence of any of the topographies of problem behaviors as defined above.
- The percentage of participant responses was derived by recording the number of total responses per session and dividing by the number of total responses plus number of failures to respond to an instructional demand.
- The magnitude or duration of reinforcement was measured by recording the time each video reinforcer was presented. The duration for each of these opportunities were summed to produce a total duration of reinforcement per session in minutes.

Experimental Conditions and Design

- Using an alternating treatment design teacher demands were presented at the rate of every second, every five seconds or every 10 seconds during experimental sessions. For example, a teacher might hold up a picture of an object and ask the learner “what is it?” The presentation of the next demand would be one, five or 10 seconds after the response according to which of the three experimental conditions were in force.
- In one condition, instructional demands were presented one second after the participant responded to the previous demand. This is referred to as the fast teacher presentation condition.
- In the medium teacher presentation condition instructional demands were presented five seconds after the last participant response.
- The third experimental condition was called the slow teacher presentation phase in which a participant response was followed by a 10 second delay before the next instructional task was presented.

- A non baseline type of alternating treatments design (Harlow & Hayes, 1979) was used to assess the effects of the three different treatment conditions; fast, medium and slow teacher presentation rates.
- The alternating treatments design is used in applied research to compare the effects of two or more treatments to different groups of subjects. The basic characteristic of the design is a rapid alteration of two or more different treatments or conditions and the effect on a target behavior is noted.
- In this study the alternating treatments were the teacher presentation rates of one, five and 10 seconds.
- The order of the experimental conditions were selected randomly.

Procedures

- Each experimental session was 10 minutes long and two sessions were conducted each day.
- Throughout each session the instructor presented instructional demands on the appropriate instructional level for the learner based upon an academic assessment of the participants skills across several domains.
- The instructor carefully presented these demands consistent with the rate of presentation condition, such as one, five or 10 seconds, that was in force during that session.
- However, instructional techniques including error correction, prompting procedures, types of skills presented, number of demands before a reinforcer (schedule of reinforcement), interspersal of mastered and target skills and mixing of skill domains were held constant for each participant across all three experimental conditions.
- Self-stimulatory behaviors and aggressive responses were all blocked to prevent injury but did not alter the rates of teacher presentation of instructional demands.
- Any attempts to move away from the instructional table were also blocked to prevent interruption of the instructional sessions

- All of these responses however were recorded as instances of problem behavior and were reflected in the data sets presented below.
- Both learners had a history that demonstrated that brief opportunities to view preferred age appropriate videos acted as a form of reinforcement. Therefore, following the appropriate number of responses based upon their pre-determined variable interval schedule of reinforcement each participant received an opportunity to view about one minute of a preferred video.
- The variable interval schedules of reinforcement were held constant across all three experimental conditions to control for rate and magnitude of reinforcement measures. In other words, if duration of each reinforcer and schedule of reinforcement were not controlled then these two variables could have accounted for treatment effects as opposed to the independent variables of rate of teacher presentation.
- A potential threat to internal validity was removed by carefully controlling these variables.
- A variety of instructional tasks were mixed during the session to include tacting objects in pictures (labelling), receptive discrimination of commands and pictures of objects, motor imitation, intraverbal responses (answering “wh” questions) and word-picture matching. All of the sessions were conducted at the instructional table as described above.

Inter-observer Agreement

- Interobserver agreement was assessed for the two learner responses for frequency of problem behavior and participant responses for 35 percent of the sessions.
- Interobserver agreement was calculated by determining the frequency count for each independent observer and dividing the smaller number by the larger number and multiplying by 100 per session.
- The average interobserver agreement was 92 percent for problem behavior and 91 percent for participant responses.

Procedural Fidelity

- In this experiment three independent variables were manipulated; one, five and 10 second delays between learner responses and presentation of instructional demands. These delays produced fast, medium and slow paced instruction for each of the participants.

- The procedural fidelity was assessed to determine the extent to which the independent variables were implemented according to the requirements of the experimental design.
- To assess the procedural integrity the video tape record of each treatment sessions was viewed by the second author to determine the instructors compliance with the one, five and 10 second duration delays.
- The data were obtained for a randomly selected sample of 25 % of the treatment sessions.
- Each observer recorded the duration in seconds between the participants response and the presentation of the instructional demand.
- These data were analyzed by calculating the percentage of trials observed that fell within a reasonable range around the designated duration for that condition for both participants. During the fast pace (one second) condition 99 % of the durations were two seconds or less.
- During the medium paced instruction (five second duration) 98 % of the durations were within the range 3 – 7 seconds.
- For the slow paced instruction or 10 second duration 95% of the durations fell within the range 8- 12 seconds.
- These data indicate that the independent variables related to pace of instruction were applied consistently across both participants in this study.

Results

- As shown in Figure 1, both learners engaged in higher rates of problem behavior during the slow (10 secs) teacher presentation. David exhibited on average 45 problem behaviors per session and Sarah exhibited on average 25 problem behaviors per session.
- During the medium presentation (5 secs), David exhibited on average 23 problem behaviors and Sarah exhibited on average 10.
- During the fast presentation (1 secs), on average David exhibited about 5 problem behaviors and Sarah exhibited on average 1. During 4 of Sarah's sessions, no problem behavior occurred.
- As shown in Figure 2, both learners were presented with more instructional demands during the fast presentation. On average David was presented with about 55 demands during the session and Sarah was presented with about 45 demands.

- During the medium paced presentation on average David was presented with about 35 demands and Sarah presented with about 30 demands.
- In the slow paced presentation, on average David was presented with about 20 demands and Sarah was presented with about 25 demands
- As shown in Figure 3, both learners received a larger magnitude of reinforcement during the fast paced presentation as compared to the medium and slow presentation sessions.
- The results indicate that both David and Sarah engaged in more responses during the fast presentations than during the slow or medium presentations.
- The results showed that there was no difference in percentage of correct responses for either learner during the 3 different teacher presentation rates.

Discussion

- The results of this study demonstrated that using a fast instructional teacher presentation rate (1 secs) had positive effects on frequency of problem behavior, number of instructional demands, number of responses and magnitude of reinforcement for the participants in this study.
- These findings are generally consistent with the outcomes reported by previous authors.
- However, the results of this study fail to replicate the findings that faster presentation rates increases correct responding. While overall the data for this measure clearly show a pattern of improvement with faster rates, the number of data points overlapping among the conditions forces one to conclude that the effects of the treatments were not differentiated as it relates to correct responding.
- It is possible that the already high rates of correct responding rendered the differences produced by varying presentation rates insignificant.
- This study extends our understanding of the importance of pace of instruction with children with autism by providing measures of number of demands, learner responses and magnitude of reinforcement

- The findings suggest that faster paced rate of presentation of instructional demands increases the number of instructional demands that a learner is presented and therefore increases the number of opportunities to respond to instructional material.
- When these results are combined with the fact that this can be accomplished with a lower rate of problem behavior and greater magnitude of reinforcement the benefits to children with autism is obvious.
- This study is limited by the fact that a small number of participants were available and the number of sessions was reduced by conditions outside the control of the experimenters.
- Future research that includes a functional analysis of problem behavior prior to treatment implementation will add to an analysis of the differential effects of pace of instruction related to functions of problem behavior.

- An interpretation of the behavioral variables that account for these effects implicates the reflexive motivating operation (CMO-R)
- The CMO-R is an antecedent and evocative variable whose presentation may increase the rate of all behaviors that have been negatively reinforced with the removal of the presenting stimulus due to a history of correlation with a worsening set of conditions.
- Michael, (2000) suggests that the escape motivated behavior of learners during intensive teaching of persons developmental disabilities may occur due to the increase in the value of negative reinforcement established by the presentation of instructional demands.
- He suggests that modification of teaching procedures may result in abolishing the CMO-R.
- In light of Michael's (2000) analysis the findings of this study suggest that pace of instruction may act as an abolishing operation by decreasing the value of negative reinforcement and therefore abating the problem behaviors.

References

- Cameron, M.J., Luiselli, J.K., McGrath, M. & Carlton, R. (1992). Stimulus control analysis and treatment of noncompliant behavior. *Journal of developmental and physical disabilities*, Vol. 4, No. 2, 141-150.
- Carnine, D. W. (1976). Effects of two teacher presentation rates on off-task behavior, answering correctly, and participation. *Journal of Applied Behavior Analysis*, 9, 199-206.
- Darch, C., & Gersten, R. (1985). The effects of teacher presentation rate and praise on LD learners' oral reading performance. *British Journal of Educational Psychology*, 55, 295-303.
- Drash, P. W., & Tudor, R. M. (1993). A functional analysis of verbal delay in preschool children: Implications for prevention and total recovery. *The Analysis of Verbal Behavior*, 11, 19-29.
- Dunlap, G., Dyer, K., & Koegel, R. L. (1983). Autistic self-stimulation and intertrial interval. *Journal of Mental Deficiency*, 88, 194-202.
- Barlow, D.H. & Hayes, S.C. (1979). Alternating treatments design: One strategy for comparing the effects of two treatments in a single subject.
- Heckaman, K.A., Alber, S., Hooper, S., & Heward, W.L. (1998). A comparison of least to most prompts and progressive time delay on the disruptive behavior of learners with autism. *Journal of Behavioral Education*, Vol. 8, No. 2, 171-201.
- Iwata, B.A., Smith, R.G. & Michael, J. (2000). Current research on the influence of establishing operations on behavior in applied settings. *Journal of Applied Behavior Analysis*, 33, 411-418.
- Koegel, R.L., & Covert, A. (1972). The relationship of self stimulation to learning in autistic children. *Journal of Applied Behavior Analysis*, 5, 381-387.
- Koegel, R.L., Dunlap, G., & Dyer, K. (1980). Intertrial interval duration and learning in autistic children. *Journal of Applied Behavior Analysis*, 13, 91-99.
- Laraway, S., Snyderski, S., Michael, J., & Poling, A. (2001). The abative effect: A new term to describe the action of antecedents that reduce operant responding. *The Analysis of Verbal behavior*, 18, 101-104.
- Lovaas, I. (1981) *Teaching Developmentally Disabled Children: The ME Book*, Austin: TX, PRO-ED.
- Lovaas, I (1987) Behavioral Treatment and normal education and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology*, 55, 3 – 9.
- Lovaas, I (2003) *Teaching individuals with developmental delays: Basic intervention techniques*. Austin, TX: PRO-ED.

Maurice, C. (1996) Behavioral Intervention for Young Children With Autism: A Manual for Parents and Professionals. PRO-ED>

McEachin, J.J., Smith, T., & Lovaas, O.I. (1993) Long Term Outcome for Children With Autism Who Received Early Intensive Behavioral Treatment. American Journal on Mental Retardation, 4: 359-372

McEachin and Leaf, 1997,

Michael, J. (2000) Implications and refinements of the establishing operation concept. Journal of Applied Behavior Analysis, 33, 401-410.

Munk and Repp, 1994; Dunlap, G., Kern-Dunlap, L., Clarke, S., & Robbins, F. R., 1991; Dunlap, G., & Kern, L., dePercel, M., Clarke, S., Wilson, D., Childs, K. E., White, R., & Falk, G.D. ,1993; Dunlap, G., & Kern, L. (1996). Smith and Iwata, 1997; Wilder and Carr, 1998; McGill, 1999, Michael, 2000)

Skinner, C.H., Smith, E.S., & McLean, J.E. (1994). The effects of intertribal interval duration on sight-word learning rates in children with behavioral disorders. Behavioral Disorders Vol. 19 No. 2 98-107.

Smith, T., (1999). Outcome of Early Intervention for Children With Autism. Clinical Psychology and Practice, 6, 33-49.

Tincani, M., Ernsbarger, S., Harrison, T.J., & Heward, W.L. (2005). Effects of two instructional paces on pre-K children's participation rate, accuracy, and off task behavior in the language for learning program. Journal of Direct Instruction, Vol. 5, No. 1, 97-109.

Valcante. G., Roberson, W., Reid, W.R., & Wolking, W.D. (1989). Effects of wait time and intertrial interval durations on learning by children with multiple handicaps, Journal of Applied Behavior Analysis, 22, 43-55.

Weeks, M. & Gaylord-Ross, R. (1981). Task difficulty and aberrant behavior in severely handicapped learners. Journal of Applied Behavior Analysis, 14, 449-463.

West, R.P., & Sloane, H.N. (1986). Teacher presentation rate and point delivery rate. Effects on classroom disruption, performance accuracy, and response rate. Behavior Modification, Vol. 10, No. 3, 267- 286.

Zanolli, K., Daggett, J., Pestine, H. (1995). The influence of the pace of teacher attention on preschool children's engagement. Behavior Modification, Vol. 19, No. 3, 339-356.

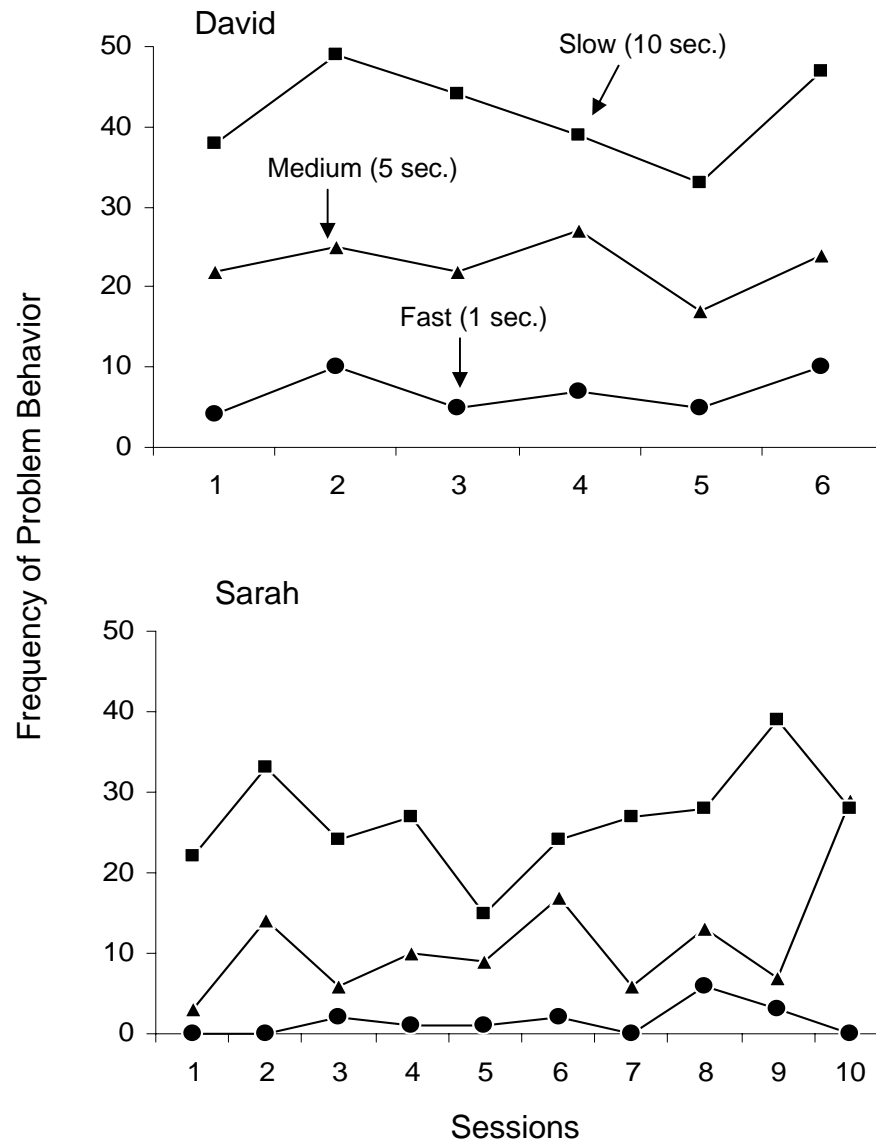


Figure 1: Frequency of problem behavior per session during fast, medium and slow teacher presentation rates for David and Sarah.

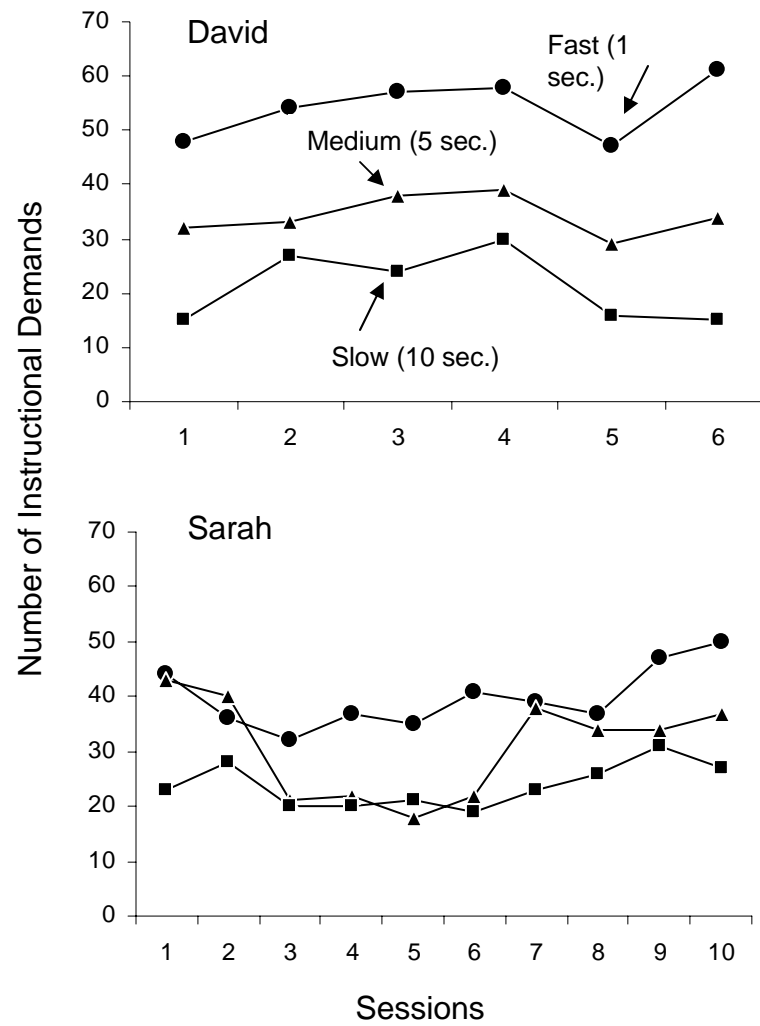


Figure 2: Number of instructional demands per session during fast, medium and slow teacher presentation rates for David and Sarah.

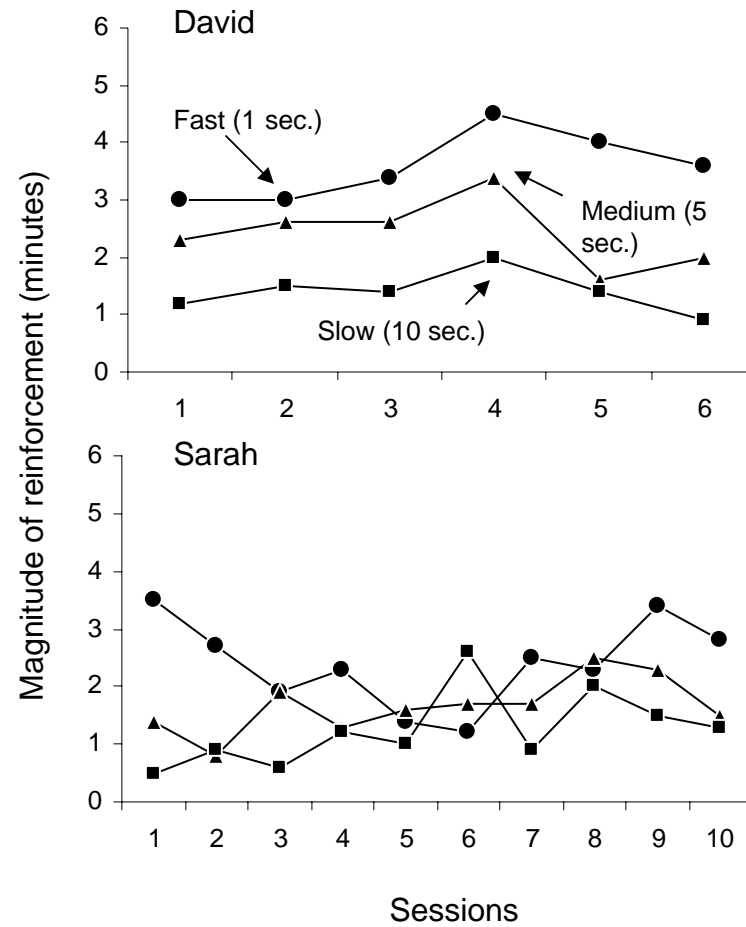


Figure 3: Magnitude of reinforcement in minutes per session during fast, medium and slow teacher presentation rates for David and Sarah.