

## Post-training Discrete-Trial Teaching Performance by Instructors of Young Children with Autism in Early Intensive Behavioral Intervention

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The current study examined instructors' discrete-trial teaching responses after a performance-based training procedure in which instructors were required to demonstrate criterion-level performance on written and oral quizzes and on performance demonstrations. Twelve discrete-trial teaching responses were labeled and operationally defined. Post-training measures of the target responses were obtained during home-based early intervention teaching sessions with young children with autism. The director provided discrete-trial performance feedback to the instructor after each session. Mean accuracy of performance for the instructors was 92% or above across 10 sessions. These data were contrasted with the substantially lower levels of accuracy from normative data of instructors conducting sessions in a comparable setting. These data suggest the importance of requiring criterion-level performance during training.

keywords: autism; discrete-trial teaching; early intensive behavioral intervention; staff training.

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The purpose of the current study was to examine instructors' discrete-trial teaching performance with young children with autism after a training procedure that included a stringent accuracy criterion was implemented. Training to criterion is not typically established in the staff training literature (Matson, 1990).

Discrete-trial teaching is an instructional method that incorporates the principles of applied behavior analysis by breaking down complex tasks into small units and presenting them in a simplified, repeated manner to facilitate learning (Green, 1996; Newman, Reeve, Reeve, & Ryan, 2003; Sarokoff & Sturmey, 2004; Sundberg & Partington, 1998). Discrete-trial teaching is used to: (a) allow data collection and assessment of learner and instructor behavior, (b) clarify what is expected of the learner and instructor, and (c) maintain consistent teaching conditions and requirements. Green (1996) and Smith (2001) noted that discrete-trial teaching is an effective strategy for teaching new skills with children with autism.

In the present study, instructors were trained to emit discrete-trial teaching responses using staff training procedures established and accepted in the literature, including verbal, written, and video instructions; modeling; role-playing; in-vivo practice; and performance feedback (Gardner, 1972; Gladstone & Spencer, 1979; Harris, Bushell, Sherman, & Kane 1975; Johnson & Fawcett, 1994; Kazdin & Moyer, 1976; Kissel, Whitman, & Reid, 1983; Koegel, Russo, & Rincover, 1977; Reid & Green, 1990; Sepler & Meyers, 1978). Following training, accuracy of discrete-trial teaching behavior was assessed during home-based teaching sessions for young children with autism. Feedback for teaching performance was presented following each teaching session during the Post-training phase.

### Method

#### *Participants*

Three special education instructors (22 to 45 years old) of children with autism participated in the study. All participants were informed of the nature of their participation and provided consent for their participation. The instructors were employed through an early intensive behavioral intervention agency that served children with autism and their families. The instructors were not previously trained in using behavior analytic methods. The children served by the agency were 2 to 3 years old, and were diagnosed with an autistic-spectrum disorder, as

documented by a physician and psychologist. For purposes of the current study, two male children with autism were involved during instructor training sessions. Each child was allotted 20 hours/week of behavior analytic services delivered by special educators.

### *Setting*

The study took place in the urban homes of children participating in a home-based early intensive behavioral intervention program for children with autism. The areas of the homes used during teaching sessions were arranged prior to conducting teaching sessions. A classroom at Queens College, CUNY was used for meetings and training sessions with instructors.

### *Materials*

Training manuals including information regarding early intensive behavioral intervention, autism, behavior analysis, discrete-trial teaching, professional behavior, categories of acceptable behavior, courteous service delivery, and feedback presentation were distributed to the instructors. Quizzes were designed according to the training manual. The training materials were created by the program director and were not commercially available.

A Panasonic camcorder and compact-sized videotapes were used to record all sessions. Data sheets and recording devices, such as, stopwatches, digital timers, kitchen timers, and tally keepers, were used to record behavior. Parents were requested to provide materials to be used for training purposes.

### *Procedure*

*Training.* During Training, printed materials and structured teaching schedules were delivered to the instructors (Quilitch, 1975). Training was conducted with small groups of five individuals. Training topics included: early intensive behavioral intervention, autism, applied behavior analysis, data-collection techniques, discrete-trial method of teaching, professional behavior, and self-monitoring techniques (see listing in Appendix A). The following training procedures were used: (a) verbal instructions in a lecture format, (b) videotaped instruction, (c) role-playing, and (d) in-vivo training (Arco, 1991; Demchak, Kontos, & Neisworth, 1992; Gardner, 1972; Harris, et al., 1975; Johnson, & Fawcett, 1994; Matson, 1990; Quilitch, 1975; Sepler, & Myers, 1978). The program director, the first author of the study and a certified behavior analyst, conducted training sessions, viewed teaching sessions, and provided feedback. Training continued until instructors met 100% accuracy on 20 written and oral quizzes and demonstrations designed by the program director; each instructor met criterion in one quiz opportunity. There were 25-35 teaching sessions; each session lasted 1 to 2 hr.

*Target responses.* The accurate use of the discrete-trial method of teaching was trained and evaluated in this study. The target responses included: (a) distraction-free, (b) materials, (c) attending, (d) verbal direction, (e) voice tones, (f) wait, (g) praise statement, (h) contingent reinforcer(s), (i) prompting and correction procedure, (j) pause for inter-trial interval, (k) incidental or additional teaching responses, (l) data recorded. Appendix B provides the definitions of the discrete-trial target responses.

*Post-training.* During Post-training, the program director viewed videotapes of all sessions conducted by each instructor within 1 to 3 sessions. The program director provided feedback to the instructor on her accuracy in emitting the 12 responses required in the discrete-trial teaching procedure. Sessions were scheduled Monday through Friday for all instructors using counterbalancing methods. Instructors' performance was monitored using videotaped versus live recording to decrease the likelihood of reactivity (Hay, Nelson, & Hay, 1977). Each session was

defined as the presentation of one educational program including a minimum of 10 discrete trials. Session duration ranged from 2 to 15 min. The total number of sessions for the study was determined based on the instructors' performance.

During each session, the instructors conducted one of three categories of educational programs: (a) receptive language, (b) expressive language, and (c) nonverbal imitation. Educational programs were devised in accord with each child's educational needs and behavioral repertoire. Each educational program addressed a specific behavioral goal. The instructions, prompting procedures, and consequences within an educational program were identical across behavioral goals. The consequences for correct responses were behavior-specific praise and social, tangible, or edible reinforcers. Trial sequencing was individually determined.

For the receptive language program, the target response was a nonverbal action specified through the instructions. The procedure for the receptive language program included an instruction to, "Point to (item)," with the target items located at a close distance from the child. The receptive language prompting procedure delivered when the child did not respond, was brief physical guidance to have the child use his pointing finger to point. The error correction procedure for an incorrect response was an instruction, "This is 'point to (item)'," along with modeling and physical guidance of the point response.

For the expressive language program, the target response was an appropriate verbal utterance specified through the instructions. The procedure for the expressive language program included a question that did not match the child's response, e.g., "What do you want?" with the appropriate response such as, "(item)." The prompting procedure was verbal presentation of the initial sound of the target response; such as, "ja" for "juice," for the child to repeat and complete the utterance required. The error correction procedure was, "Try again, '(item)'," emphasizing the sounds of the words for the child to repeat each word.

For the nonverbal imitation program, the target response was a nonverbal action that matched the action modeled by the instructor. The procedure for the nonverbal imitation program included an instruction, "Do this," while modeling the target action. The prompting procedure involved physical guidance of the appropriate body part(s) to move in the same manner as the model presented. The error correction procedure was, "This is 'do this'," with physical guidance to have the child perform the target response.

For scoring purposes, the order in which videotapes of each session, or educational program, viewed was block randomized. A data sheet for recording the target responses on a trial-by-trial basis was used. Responding was recorded during the first 10 trials of each session. The duration of the session, beginning with having materials available and ending after the last trial, was recorded.

All 12 teaching responses were scored one time on each trial. On a given trial, a '+' was scored if the response was demonstrated, based on the target response definition. A '-' was scored if the response was not demonstrated. The percentage of accurate responding was obtained for each target response by dividing the number of demonstrated responses, scored as +', by the total number of trials, 10, multiplied by 100. A summary sheet was used to report the data and percentages of demonstrated responses observed in each session.

Feedback addressing the observed instructor's performance of the target responses during the session was presented to the instructor by the program director following each videotaped session observation, prior to the next training day. Praise statements were made for target

responses accurately emitted. Then, inaccurate responses were described along with a rationale for change and a description of correct responding. Acknowledgment from the instructor was requested and practice of the correct responses was conducted with the instructor and the program director. Additional practice using role-play or in-vivo techniques were used so as to demonstrate effective responses. The program director requested that instructors ask for clarification. The feedback ended with an appreciation statement from both the program director and the instructor.

*Normative sample.* The first author collected data in the same manner as described above from four instructors in a center-based special education setting as they conducted receptive and expressive language programs with young children with autism. The language programs were conducted in the manner described above with children from 3 to 5 years old.

*Interobserver agreement.* Interobserver agreement was assessed by having an independent observer, in addition to the program director, score videotaped sessions. Observers were three advanced undergraduate Psychology students trained using the identical procedures specified above. The observers used the identical data recording procedures described above. All observers demonstrated criterion performance specified above during training sessions, prior to serving as independent observers. Agreement measures were obtained between the program director and a second independent observer. The primary observer was the program director.

Agreements and disagreements were obtained by comparing the pairs of observers' session data for each of the 12 target responses on a trial-by-trial basis. Agreements were defined as two '+' or two '-' scores recorded by the primary and secondary observers; disagreements were defined as one '+' and one '-' scores recorded by the primary and secondary observers. Dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100 to obtain a percentage measure was used to calculate agreement data. Agreement was assessed for 75% of the sessions across the three instructors conducting each of the three educational programs. Across responses, reliability averaged 98% (range, 89% to 100%).

#### *Acceptability Questionnaire*

Acceptability refers to the overall evaluation of the training procedures (Wolf, 1980). A 7-item, Likert-type questionnaire (see Appendix C) was used to assess instructor acceptance of the session observation procedures. The questionnaire was completed anonymously by each instructor following each phase of the study. Answers from each item were categorized.

### Results

Each instructor performed at criterion level for all of the 20 oral and written quizzes and performance demonstrations during Training. Percentage of accuracy data for each of the teaching responses recorded during Post-training is presented for Instructors 1, 2, and 3 in Figure 1 (Panels A, B, and C, respectively). Instructors 1, 2, and 3 showed mean percentage of accurate responding pooled across 10 sessions of 94.8%, 92.4%, and 89.6%, respectively. Each instructor showed considerably lower accuracy for *incidental or additional teaching responses* than the other responses ( $M = 59.6\%$ ; range = 50.4% - 77%). Instructors 1 and 3 showed lower accuracy for *contingent reinforcement* than the other responses (77.7% and 57%, respectively).

*Normative data.* The instructors for whom normative data were collected showed mean percentage of accurate responding pooled across four sessions of 70.5%, 48.8%, 70.9%, and 63%. These instructors showed considerably lower accuracy for *attending, praise statement, incidental*

or additional teaching responses, and record data than for the other responses.

*Acceptability questionnaire.* Instructors who completed the questionnaire ( $N = 3$ ) following Training and Post-Training rated each item as meeting the highest satisfaction criterion, e.g., 'very satisfied.'

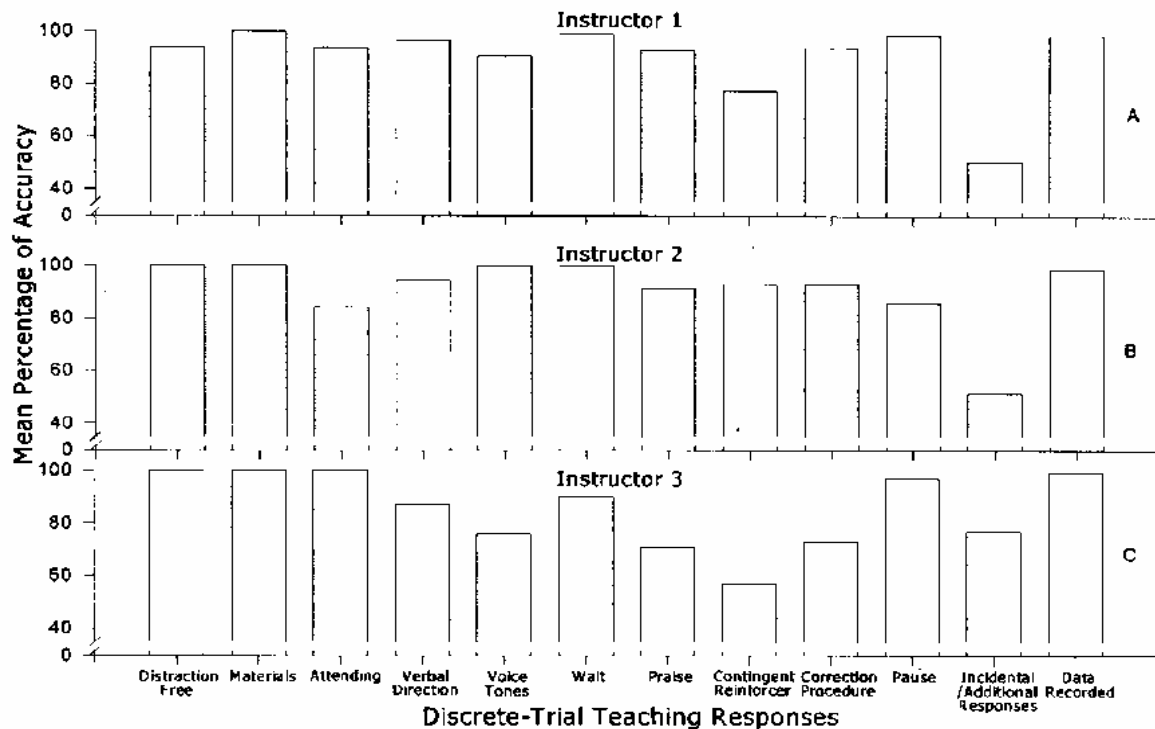


Figure 1. Percentage of accurate responding across the 12 discrete-trial responses for Instructors 1, 2, and 3 as displayed in Panels A, B, and C, respectively. Response labels and definitions are indicated in Appendix B.

### Discussion

The present study examined the results of a training package that was designed to ensure high levels of discrete-trial teaching accuracy by implementing performance criteria. Mean accuracy of Post-training responding in the clinical setting was high. Further, four instructors of children with autism in a typical special education setting showed mean accuracy levels that were considerably lower than those of the instructors in the present study. These findings suggest the importance of requiring instructors to meet a performance criterion prior to completion of training.

The present findings match the findings in the literature regarding the effectiveness of training procedures using verbal and video instruction, modeling, role-playing, in-vivo practice and instruction, and performance feedback to lead to accurate teaching performance (Arco, 1991; Cullen, 1988; Fleming, Oliver, & Bolton, 1996; Harchik, Sherman, Hopkins, & Strouse, 1989; Krumhus & Malott, 1980; Reid & Green, 1980; Sepler, & Myers, 1978). In addition, the current results are consistent with the findings from long-term study of training effectiveness that individual feedback with praise presented in a continuing manner has been noted as the best assurance that teaching responses will be maintained (Adkins, 1996; Harchik, Sherman, Hopkins, & Strouse, 1989; Realon, Lewallen, & Wheeler, 1983).

All instructors in the current study showed low accuracy levels of *incidental or additional teaching responses* during teaching sessions. According to the literature, incidental teaching is invaluable for stimulating spontaneous variety and generality in speech in a variety of learning environments (Hart & Risley, 1974, 1975, 1980; McGee, Krantz, Mason, & McClannahan, 1983; McGee, Krantz, & McClannahan, 1985). Instructors were trained to emit these responses; however, further instruction may be required to improve instructor performance.

According to the current results, the training procedures may be useful in training instructors, other professionals and staff, and parents to demonstrate and maintain discrete-trial teaching responses effectively in other agencies where minimal supervision is available. Parent training and maintenance procedures are critical to the success of early intensive behavioral intervention for children with autism (Green, 1996, Koegel & Koegel, 1995; McClannahan, Krantz, & McGee, 1982; McEachin, Smith, & Lovaas, 1993; Schreibman, 1988).

It may be possible to use the current training method in such a way as to train staff using a modified version of the rapid training program described by Parsons, Reid, and Green (1996). Parsons et al.'s (1996) training program lasted one day and served to increase staff teaching skills; however, maintenance was not assessed. Future study may involve rapidly teaching staff teaching skills using a stringent performance criterion and measuring maintenance of skills.

A shortcoming of the current study is that baseline data were not collected prior to Training. Based on verbal reports, the instructors indicated to the first author that they were not familiar with applied behavior analytic teaching methods prior to Training; however, there were no baseline data recorded on their level of discrete-trial teaching accuracy.

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Appendix A

Training Topics

1. Autism
2. Applied Behavior Analysis
3. Reinforcement
4. Discrete-Trial Teaching
5. Schedules of Reinforcement
6. Teaching Techniques
7. Generalization and Maintenance
8. General Programming Procedures
9. Professionalism
10. Observational Learning
11. Incidental Teaching
12. Peer Interaction
13. Activity Schedules
14. Group Direction Following
15. Functional Analysis of Behavior
16. Punishment
17. Behavior Reductive Approaches
18. Collecting and Graphing Data
19. Troubleshooting and Problem Solving
20. Initial Curricular Areas and Skills

Appendix B

Definitions of Discrete-Trial Target Responses

*Distraction-free:* make the teaching area distraction-free by removing extraneous stimuli, such as sounds, toys, people; reinforcers are within the reach of the instructor and out of the reach or direct view of the child.

*Materials:* have teaching materials used for the program within reach of the instructor and as needed, the child; containers or boxes should be open or ready for use; items such as edible or tangible reinforcers are within reach of the instructor.

*Attending:* establish appropriate attending responses by having the child sit or stand with hands and feet still in a position facing the instructor or task materials while making eye contact with the instructor or looking at the task materials in anticipation of the delivery of a direction.

*Verbal Direction:* present a clear, brief, and appropriate instruction appropriate to the program; one particular direction should be presented, with or without a prompt, that was brief in word length; the words should be clearly spoken, concisely presented, and not repeated.

*Voice tones:* differential voice tones used, i.e., a neutral, directive tone of voice for instructions; an enthusiastic tone of voice for reinforcer words and sounds; a firm voice for corrective feedback.

*Wait:* allow appropriate amount of time for the child to respond to instruction, approximately 5 s, after an instruction was presented by the instructor, as appropriate to the program.

*Praise statement:* immediately following a correct response, the instructor will deliver a behavior-specific praise statement specific to the correct target response made by the child, within 2 s - 4 s, e.g., "Great (specified behavior)."

*Contingent reinforcers:* present primary or secondary reinforcer(s), e.g., tangible, social, or edible, for a brief duration during praise statement, contingent on correct responses.

*Prompting and correction procedure:* provide an appropriate prompting procedure within 5 s after the child's failure to respond or an appropriate correction procedure as a predetermined gestural, verbal, and/or physical prompt, immediately following an incorrect response, as appropriate to the program and target response.

*Pause for inter-trial interval:* allow a brief pause in instruction, up to 5 s, following delivery of the consequential stimuli after a target response and during the inter-trial interval, prior to presenting the next trial.

*Incidental or additional teaching:* present additional or incidental teaching responses, during the interval following the consequential stimuli presentation, the instructor may make a response related to the reinforcing stimulus or event.

*Data recorded:* record data for correct or incorrect responses following each of the child's responses, after each trial on the data sheet.

## Appendix C Trainee Satisfaction Questionnaire Form

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## Appendix C

## Trainee Satisfaction Questionnaire

Name (optional): \_\_\_\_\_ Date: \_\_\_\_\_

Please write an appropriate number for each question on the line provided.

1. How would you rate the quality of training you received?  
1 (poor) - 4 (excellent) \_\_\_\_\_
2. Did you get the kind of training you wanted or expected?  
1 (definitely not) - 4 (definitely) \_\_\_\_\_
3. To what extent has our training met your needs in working with children with autism and their families in Early Intervention?  
1 (none of my needs have been met) - 4 (almost all of my needs have been met) \_\_\_\_\_
4. Would you recommend our program to other instructors or professionals?  
1 (no definitely not) - 4 (yes definitely) \_\_\_\_\_
5. How satisfied are you with the amount of training you received and supervision after training?  
1 (quite dissatisfied) - 4 (very satisfied) \_\_\_\_\_
6. Have the training services you received helped you to deal more effectively with the consumers you come into contact with in this program?  
1 (no they seemed to make things worse) - 4 (yes they helped a great deal) \_\_\_\_\_
7. If a similar training program were offered for your colleagues, would you recommend that they attend?  
1 (no definitely not) - 4 (yes definitely) \_\_\_\_\_
8. Please add your general comments related to the training. Use the back as needed.

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Thank you for participating! Please mail this to the office after completion.