1-1-2018

Selection And Implementation Of Skill Acquisition Programs By Special Education Teachers And Staff For Students With Autism Spectrum Disorder

Tiffany Kodak

Tom Cariveau

Brittany A. LeBlanc

Psychology Faculty Research and Publications/College of Arts and Sciences

Behavior Modification, Vol. 42, No. 1 (January 1, 2018): 58-83. DOI.

Selection And Implementation Of Skill Acquisition Programs By Special Education Teachers And Staff For Students With Autism Spectrum Disorder

Tiffany Kodak
University of Wisconsin–Milwaukee, WI
Tom Cariveau
University of Oregon, Eugene, OR, USA3Marcus Autism Center, Atlanta, GA
Brittany A. LeBlanc
University of Wisconsin–Milwaukee, WI

Abstract

The present investigation examined special education teachers' selection and use of teaching strategies for receptive identification training with children with autism spectrum disorder (ASD) in their classrooms. Teachers first responded to a survey in which they provided examples of receptive identification tasks taught in their classrooms, rated the efficacy of teaching strategies, described how they determined whether skills were mastered, listed any assessments they conducted to identify relevant prerequisite skills prior to receptive identification training, described how they selected teaching strategies for use in their classrooms, and listed their years of experience as a teacher and working with children with ASD. Subsequent observations of implementation of teaching strategies during trial-based instruction occurred in a proportion of teachers' classrooms. The results of the observations showed that participants did not consistently implement components of trial-based instruction as described in the literature, and there were differences in implementation depending on the types of skills targeted during instruction.

Keywords

autism spectrum disorder, classroom-based instruction, skill acquisition, treatment integrity, trial-based instruction

Autism spectrum disorder (ASD) is a serious, lifelong condition that affects 1 in 68 children (Centers for Disease Control and Prevention, 2014). A proportion of children with ASD who enter public school require specialized services provided through an Individualized Education Program (IEP). For example, students diagnosed with ASD in kindergarten through third grade comprised approximately 15% of all students receiving services through an IEP (Child Trends Databank, 2015). Based on the increase in prevalence in ASD over the past 10 years, the proportion of students with ASD receiving specialized services in public schools will remain high.

The extant literature on assessment and intervention for children and adolescents with ASD supports the use of educational and behavioral treatments based on the principles of applied behavior analysis (ABA; Dawson & Burner, 2011; Wong et al., 2014). In fact, federal agencies and professional organizations recommend ABA-based interventions for individuals with ASD (National Autism Center, 2015; United States Surgeon General, 1999) due to the preponderance of evidence for these interventions. As a result of the empirical support and endorsement by governing bodies for the use of behavioral interventions, parents have an increased familiarity with the efficacy of ABA practices. Furthermore, parents may request that public schools offer these services to their child with ASD in their educational placement, particularly as they relate to goals included within the child's IEP.

Trial-based instruction (e.g., Discrete Trial Instruction) is a common component of ABA-based intervention for children with ASD (Maurice, Green, & Luce, 1996). Skills are broken down into smaller units and taught to mastery. Due to the highly structured format of instructional trials, skills may be more easily taught with trial-based instruction by junior or newly trained staff members than other forms of instruction that require an adult to follow the child's lead or identify naturally occurring learning opportunities (e.g., incidental teaching, naturalistic environmental training; Sundberg & Partington, 1999). Nevertheless, many studies demonstrating the efficacy of trial-based instruction were conducted in highly structured settings and included treatment provided by individuals with supervision and training by professionals with expertise in ABA-based interventions (e.g., Sallows & Graupner, 2005; Smith, Groen, & Wynn, 2000). Less is known about the implementation of ABA-based interventions by teachers and staff in classrooms with higher levels of distraction, competing demands on time, fewer opportunities for initial and ongoing training, and variation in the population of students served in these settings.

In a notable exception, Carroll, Kodak, and Fisher (2013) evaluated implementation of behavior-analytic skill acquisition programs by classroom staff with students with ASD in classroom settings. The special education teachers reported that they implemented trial-based instruction with students with ASD in one-on-one and small-group formats in their classrooms. The authors examined the occurrence of targeted instructor behavior associated with trial-based instruction in the literature (Lovaas, 2003) including establishing ready behavior, securing attention, presenting a clear instruction, presenting an instruction once, delivering a controlling prompt, providing praise following a correct response, providing a tangible item following a correct response, and blocking or ignoring problem behavior. The experimenters recorded these responses during a total of 168 trials of instruction implemented by nine classroom teachers and paraprofessionals. The results showed that the mean percentage of trials in which educators emitted any of the targeted behaviors was below 75% (range = 21%-74%). Specifically, educators infrequently provide praise or a tangible item following correct responses (*M* = 58% and 21%, respectively), and they provided a controlling prompt (i.e., assistance to the student that results in the omission of a correct response) during only 41% of trials.

Although the results of Carroll et al. (2013) provide initial evidence that trial-based instruction used in classroom settings may not closely match the manner in which these practices are implemented in studies, they evaluated the integrity of trial-based instruction delivered by nine professionals in one district in one Midwestern state. It remains unclear whether their results are representative of the classroom practices of special education teachers and staff in other classrooms, districts, and states.

In addition, differences in the level of mastery of skills targeted during observations could influence opportunities for teachers to implement all components of instruction. For example, if students were in a later stage of acquisition (e.g., they had already mastered the task), instructors may fade prompts (i.e., gradually remove prompts from instruction) or thin reinforcement (i.e., provide reinforcement periodically rather than following every correct response; Daly, Witt, Martens, & Dool, 1997). It is possible that educators in the Carroll et al. (2013) study selected to be observed completing programs for which students were likely to be successful during intervention, which is supported by the proportion of correct responses that occurred during observed trials (i.e., 135 of 168 trials or 80% of trials). Identifying specific skills that are frequently included in students' IEPs, may be challenging to teach, and are taught with trial-based instruction may help reduce extraneous variables that influence measures of integrity during observations of trial-based instruction in classrooms.

Auditory–visual conditional discrimination (i.e., receptive identification) is a common skill that is targeted within ABA-based comprehensive intervention services and in school settings (Green, 1996). For example, a trial may begin with an instructor placing three picture cards on the table in front of the student (e.g., a picture of a pencil, dog, and sock). After the child looks at each picture, the instructor provides the auditory stimulus (e.g., says, "Pencil") and allows the student an opportunity to point to the picture of the pencil in the array. If the student responds correctly to the picture of the pencil within a certain time period, the instructor provides praise and brief access to a preferred item. On other instructional trials, the auditory stimulus changes so that responding to each picture is correct during a proportion of the trials. Conditional-discrimination training is considered a high-priority goal in most skill acquisition programs because these types of skills form the basis for many other, more complex skills that are taught to children in school (e.g., math, reading; Green, 2001). In addition, certain methods of instruction may lead to patterns of incorrect responding (e.g., Green, 2001; Grow, Carr, Kodak, Jostad, & Kisamore, 2011) and affect the acquisition of this skill (Grow et al.). Thus, examining special educators' implementation of conditional discrimination training should be of interest for behavior analysts who seek to determine the selection and accurate implementation of skill acquisition programs for commonly targeted skills in school settings.

It is not well known how special education teachers select specific instructional practices for use in their classrooms. In a survey study conducted by Burns and Ysseldyke (2009), the authors found that 133 special education teachers reported using ineffective intervention approaches as often as evidence-based intervention approaches (such as ABA). It is possible that teachers select instructional strategies based on their personal preferences, prior experiences with students, interventions taught within their training and credentialing programs, or requests to use specific forms of instruction from parents or school administrators. Specific to ABA-based intervention, teachers may be required to implement these interventions because of student IEP goals, district initiatives, or federal mandates to use evidence-based interventions in classrooms. Nevertheless, the teacher's exposure to training for the selected, requested, or required instructional practices in their classroom is unknown. Information regarding how special education teachers select interventions for use in their classrooms and receive training on selected practices may assist behavior analysts in identifying strategies for incorporating instruction and practice opportunities for ABA-based interventions prior to implementation in classrooms with students.

The purpose of the current investigation was to disseminate a survey regarding special education teachers' selection and use of behavior-analytic interventions to teach receptive identification to students with ASD. In addition, a proportion of teachers who completed the survey volunteered to participate in an observation of their implementation of selected practices in their classroom. We replicated classroom observations conducted by Carroll et al. (2013) by measuring the same teacher behavior during instruction with students with ASD, and we extended their study by evaluating additional measures of teacher behavior, observing training of a consistent skill across students and classrooms, conducting observations of teachers and staff across districts, and measuring more trials of instruction.

Method

Participants

Surveys were sent to special education teachers from 31 districts around a state in the Pacific Northwest. To include the respondent's data in the results, the respondent must have indicated that he or she either currently or previously worked with a student with ASD and taught receptive identification. Out of the 110 surveys we received, 64 respondents completed the entire survey. Nearly all of the respondents (i.e., 99%) indicated currently or previously working with a student with ASD. In addition, the respondents reported a mean of 10.7 years of experience (range = 1-30) working with students with ASD. Approximately half of the respondents reported earning a master's degree in special education (55%), 10% of respondents earned a master's degree in teaching, 4% of respondents earned a master's degree in speech therapy, and 10% of respondents did not specify the area in which their master's degree was earned. The mean years of teaching experience reported by respondents was 10.8 years (range = 0-28). In addition, respondents reported the number of paraprofessionals who worked in their classrooms. The mean number of paraprofessionals working in each special education classroom was three (range = 0-9). Refer to Tables 1 and 2 for descriptive data on survey respondents.

Table 1. Demographic Information on Teaching Experience for Survey Respondents.

Item	*n* (%)
Years of teaching experience (*n* = 62)	
1-3	10 (16.1)
4-6	10 (16.1)
7-10	15 (24.2)
11-15	10 (16.1)
16-20	7 (11.3)
20+	10 (16.1)
Years working with children with ASD (*n* = 64)	
1-3	7 (10.9)
4-6	14 (21.9)
7-10	19 (29.7)
11-15	13 (20.3)
16-20	7 (10.9)
20+	4 (6.3)

Note. ASD = autism spectrum disorder.

Table 1. Demographic Information on Teaching Experience for Survey Respondents.

Item	*n* (%)
Years of teaching experience (*n* = 62)	
1-3	10 (16.1)
4-6	10 (16.1)
7-10	15 (24.2)
11-15	10 (16.1)
16-20	7 (11.3)
20+	10 (16.1)
Years working with children with ASD (*n* = 64)	
1-3	7 (10.9)
4-6	14 (21.9)
7-10	19 (29.7)
11-15	13 (20.3)
16-20	7 (10.9)
20+	4 (6.3)

Note. ASD = autism spectrum disorder.

Table 2. Demographic Information on Degree, Endorsements, and Classroom Supports for Survey Respondents.

Item	*n* (%)
Degree (*n* = 64)	
Master's in special education	35 (55.4)
Master's in teaching	7 (10.8)
Master's in speech therapy	3 (4.6)
Master's in education	4 (6.2)
Master's (not specified)	7 (10.8)
Bachelor's in teaching	3 (4.6)
Bachelor's (not specified)	1 (1.5)
Endorsements (*n* = 5)	
Developmental disabilities	2 (40.0)
Early childhood	2 (40.0)
Curriculum development	1 (20.0)
Number of paraprofessionals in classroom (*n* = 61)	
0	5 (8.2)
1-2	27 (44.3)
3-4	13 (21.3)
5-6	13 (21.3)
7-9	3 (4.9)

Table 2. Demographic Information on Degree, Endorsements, and Classroom Supports for Survey Respondents.

Item	*n* (%)
Degree (*n* = 64)	
Master's in special education	35 (55.4)
Master's in teaching	7 (10.8)
Master's in speech therapy	3 (4.6)
Master's in education	4 (6.2)
Master's (not specified)	7 (10.8)
Bachelor's in teaching	3 (4.6)
Bachelor's (not specified)	1 (1.5)
Endorsements (*n* = 5)	
Developmental disabilities	2 (40.0)
Early childhood	2 (40.0)
Curriculum development	1 (20.0)
Number of paraprofessionals in classroom (*n* = 61)	
0	5 (8.2)
1-2	27 (44.3)
3-4	13 (21.3)
5-6	13 (21.3)
7-9	3 (4.9)

View larger version

Twenty-five of the respondents who completed the survey volunteered to be observed implementing receptive identification training with students with ASD in their classrooms. The first author contacted these respondents to confirm their continued interest in being observed implementing instruction in their classroom and set up an appointment to observe. Observations of six classrooms in five different districts from around the state were conducted.

Eighteen classroom teachers and paraprofessionals were observed implementing receptive identification training. The paraprofessionals had a mean of 1.75 years of experience (range = 3 months to 7 years 10 months) working as a paraprofessional in special education. Two paraprofessionals reported earning a bachelor's degree in an unrelated field (e.g., biology). One paraprofessional reported that she was working toward a bachelor's degree in teaching.

Setting and Materials

A 20-item survey was distributed electronically to special educators by districts around the state. The survey was available via Qualtrics™ and could only be completed once by each individual. Following completion of the survey, respondents entered their contact information into a separate document if they volunteered to be observed conducting receptive identification training in their classrooms.

Classroom observations occurred in the setting in which instruction was typically provided to students. All observations occurred in a special education classroom with at least one other student and adult present. One participant provided instruction to three students working on identical skills in a small-group format. All other participants provided instruction in a one-to-one format.

Typical classroom materials were present during observations (e.g., child-size tables and chairs, books, toys, puzzles), as were child-specific instructional materials (e.g., token boards, edible items, computer tablet, picture cards, small animal figurines, and foam letters). Additional materials for the classroom observation included data sheets, pens, and clipboards.

Response Measurement and Interobserver Agreement

The dependent variables for the survey included experimenter-generated categories of responses to questions (e.g., types of assessment tools used to measure skills related to receptive identification), frequency of endorsements of yes/no questions, participant rankings of perceived effectiveness of specific interventions, and the frequency of selections of responses presented within a checklist of teaching strategies. The respondent's ranking of the effectiveness of intervention was assessed using a 5-point Likert-type scale (1 = *very effective*, 2 = *somewhat effective*, 3 = *not sure about effectiveness*, 4 = *somewhat ineffective*, 5 = *very ineffective*).

For experimenter-generated categories for relevant survey questions, the experimenters developed a categorical scoring system by viewing respondents' responses post hoc and placing each respondent's response into one of the identified categories for each question. A second experimenter independently categorized a proportion of respondents' responses to survey questions. An agreement was scored if the experimenters selected the exact same category (or categories) for a response (e.g., both experimenters categorized use of DTI as trial-based instruction). Mean agreement for categorization was calculated for 35% of respondents by dividing questions in which the same category for the response was selected by both experimenters by the total number of questions in which categorical responses were possible, and this ratio was converted to a percentage. Mean agreement was 89.7% for all respondents (range = 79.4%-100%).

The dependent variables during the classroom observations were based on target behaviors and definitions provided by Carroll et al. (2013). Refer to Table 3 for definitions of target behavior based on Carroll et al. The observers also collected data on four additional behaviors during trial-based instruction that were not measured by Carroll et al., including (a) withholding reinforcement following an error or no response, (b) not providing inadvertent prompts, (c) randomizing the presentation of stimuli across trials, and (d) the frequency of instructions provided during each trial. Definitions for these four dependent variables are listed in Table 4.

Table 3. Operational Definitions of Teacher Responses During School Observations From Carroll, Kodak, and Fisher (2013).

Teacher response	Definition
Establish ready behavior	Teacher waits to present an instruction until the student does not engage in disruptive movements of the limbs and is oriented toward the teacher (i.e., shoulders facing the teacher).
Secure attending	Teacher requires the student to look (prompted or unprompted) at training materials before presenting the instruction.
Clear instruction	Teacher presents an instruction that is concise, clearly specifies the target behavior, and does not include unnecessary words.
Presents the instruction once	The teacher does not repeat an instruction in the absence of a controlling prompt following an error or no response from the child (this includes the same instruction previously provided with the same or different wording).
Praise contingent on correct response	Praise is delivered within 5 s of a correct unprompted or prompted response.
Tangible/edible contingent on correct response	A preferred tangible or edible item is delivered within 5 s of a correct unprompted or prompted response.
Controlling prompt	A prompt that evokes a correct response is provided within 10 s of an instruction following no response, or within 3 s following an incorrect response.
Does not attend, remove demands, and/or blocks problem behavior	The teacher does not provide verbal or physical attention, minimizes facial expression following problem behavior, and continues with the current trial. If it is necessary to block dangerous behavior, the teacher rearranges the environment or uses the minimum amount of physical interaction necessary to keep the student safe.

Table 3. Operational Definitions of Teacher Responses During School Observations From Carroll, Kodak, and Fisher (2013).

Teacher response	Definition
Establish ready behavior	Teacher waits to present an instruction until the student does not engage in disruptive movements of the limbs and is oriented toward the teacher (i.e., shoulders facing the teacher).
Secure attending	Teacher requires the student to look (prompted or unprompted) at training materials before presenting the instruction.
Clear instruction	Teacher presents an instruction that is concise, clearly specifies the target behavior, and does not include unnecessary words.
Presents the instruction once	The teacher does not repeat an instruction in the absence of a controlling prompt following an error or no response from the child (this includes the same instruction previously provided with the same or different wording).
Praise contingent on correct response	Praise is delivered within 5 s of a correct unprompted or prompted response.
Tangible/edible contingent on correct response	A preferred tangible or edible item is delivered within 5 s of a correct unprompted or prompted response.
Controlling prompt	A prompt that evokes a correct response is provided within 10 s of an instruction following no response, or within 3 s following an incorrect response.
Does not attend, remove demands, and/or blocks problem behavior	The teacher does not provide verbal or physical attention, minimizes facial expression following problem behavior, and continues with the current trial. If it is necessary to block dangerous behavior, the teacher rearranges the environment or uses the minimum amount of physical interaction necessary to keep the student safe.

Table 4. Additional Operational Definitions of Teacher Responses During School Observations.

Teacher response	Definition
Withholding reinforcement following an error or no response	The teacher does not deliver praise or a tangible within 5 s of an incorrect or no response.
Randomize presentation of materials	Alternate placement of pictures of objects in the array so that the target stimulus is not placed in the same position on more than two consecutive trials.
Does not provide inadvertent prompts	The teacher does not provide a prompt that is not listed in the protocol or is not described as part of the teaching strategy.
Repeating instructions	The teacher repeats an instruction (using the same or similar wording) within 3 s of the initial instruction, in the absence of a controlling prompt, and prior to a student response.

Table 4. Additional Operational Definitions of Teacher Responses During School Observations.

Teacher response	Definition
Withholding reinforcement following an error or no response	The teacher does not deliver praise or a tangible within 5 s of an incorrect or no response.
Randomize presentation of materials	Alternate placement of pictures of objects in the array so that the target stimulus is not placed in the same position on more than two consecutive trials.
Does not provide inadvertent prompts	The teacher does not provide a prompt that is not listed in the protocol or is not described as part of the teaching strategy.
Repeating instructions	The teacher repeats an instruction (using the same or similar wording) within 3 s of the initial instruction, in the absence of a controlling prompt, and prior to a student response.

Two independent observers simultaneously collected data on all dependent variables during instructional trials. A trial was scored as an exact agreement if both observers recorded the same target responses during that trial (e.g., both scored securing attending, delivery of a controlling prompt, withholding reinforcement following an error or no response, and ignoring or blocking problem behavior). The second observer collected data during

34% of instructional trials. We calculated trial-by-trial interobserver agreement by dividing the total number of trials with an exact agreement by the total number of trials during the observation and multiplying by 100. Mean agreement for all dependent variables during the classroom observations was 91.7% (range = 76.8%-100%).

Procedure

Survey

The experimenters contacted special education directors from 155 districts around the state. All districts that agreed to distribute the survey to special education teachers were sent an email which contained the consent document and a link to the 20-item survey. The survey was created in Qualtrics™, and any data completed by the respondents were saved within their survey response. Thus, it was possible for respondents to complete only a portion of the survey.

The survey contained open- and close-ended questions. Twelve of the questions were close-ended (e.g., do you currently or have you previously worked with students diagnosed with an ASD). Close-ended questions included check boxes for yes and no responses or a box to fill in a response that required a one-to-two word response or number (e.g., listing the number of years of teaching experience). Four of these 12 questions contained an open-ended portion following the close-ended question. For example, following the close-ended question “Do you have an established criterion or rules for determining whether children learn skills,” respondents who answered “yes” were asked to describe the criterion. Respondents completed the eight open-ended questions by typing in their responses.

Respondents also rated the efficacy of empirically validated and nonempirically validated practices including errorless teaching, model prompts (e.g., demonstrating how to perform the skill while the student observes), physical guidance (e.g., hand-over-hand assistance to complete the task), practicing a skill until a correct response occurs, providing praise contingent on a correct response, providing a tangible item contingent on a correct response (e.g., tokens, leisure items), ignoring an error and moving on to the next trial, repeating instructions, encouraging the student to answer (e.g., saying, “Come on; you know this one.”), placing the correct item closer to the student, and providing a break from the task contingent on a correct response. Respondents rated the effectiveness of each practice on a 5-point Likert-type scale.

Following completion of the survey, the program transitioned to another screen in which respondents provided their contact information to be entered into a drawing for one of 10 gift cards. On this same screen, participants could check a box if they wanted to volunteer to be observed conducting receptive identification training in their classrooms.

The experimenters collected all survey responses, regardless of whether the survey was completed. Survey data were entered into a database for subsequent descriptive and statistical analysis.

Classroom observations

The experimenters arranged classroom observations of survey participants and paraprofessionals delivering instruction on receptive identification to students with ASD. Each classroom observation occurred on one day of the week for 2 to 3 hr. The experimenters collected data during approximately 15 trials of instruction per participant. The experimenters asked teachers and paraprofessionals to conduct instruction based on their typical classroom procedures and schedule and obtained a description of typical instructional practices from the teacher. In addition, the first author spoke with the teacher to identify the specific students in the classroom with ASD and identify receptive identification training tasks to observe. The first author also requested that participants provide instruction on a portion of tasks for which the student with ASD was in an early stage of training and that were likely to evoke problem behavior to produce a range of opportunities to observe all of the dependent variables (e.g., delivery of a controlling prompt, ignoring and blocking problem behavior).

The experimenters collected data on the dependent variables listed in Tables 1 and 2 during observations of receptive identification training. Due to the high proportion of trial-based instruction provided during the day, there were sufficient opportunities to observe instructional trials. The experimenters did not provide any feedback to teachers and paraprofessionals during observations.

Results

Survey

The survey results showed that 80% of the respondents reported teaching receptive identification to students with ASD in their classrooms, and these respondents reported use of trial-based instruction to teach these skills. Respondents also provided examples of the types of receptive identification tasks that they taught to students with ASD including (but not limited to) teaching prepositions by having students place an item in a specific location, pointing to specific food items (e.g., marshmallow or apple), touching coins given the coin name, and pointing at a shape given the name of the shape. Respondents reported the three most common reasons for selecting a teaching procedure for receptive identification training with students, which were (a) use of the strategy in the past with another student, (b) receiving formal training on the strategy, and (c) the strategy was part of the curriculum used by the class, school, or district. To determine whether receptive identification skills were acquired by students, respondents reported using a criterion (9%), progress monitoring (50%), generalization (23%), students' responses (18%), or decreased levels of problem behavior (5%) as an indicator of skill acquisition.

Approximately 85% of respondents (35 of the 44 respondents to this question) reported measuring prerequisite skills for receptive identification training. Respondents reported measuring potential prerequisite skills such as visual discrimination (4%), auditory discrimination (17%), matching (3%), and scanning of stimuli (9%). Although respondents endorsed measures of specific prerequisite skills, the assessments that they used to measure these skills may not closely align with behavior-analytic assessments. For example, respondents reported use of the Boehm test of basic concepts, Brigance testing, easyCBM, and the student's learning profile from the district's curriculum to measure prerequisite skills. Nevertheless, 68% of respondents indicated a lack of awareness of assessments to measure potential prerequisite skills for receptive identification training.

Respondents' ratings of the efficacy of empirically validated and nonempirically validated teaching strategies showed that they were more likely to rate empirically validated strategies with a higher level of efficacy (see Table 5). For example, the mean ratings of efficacy for empirically validated strategies were 2.0 (range = 1-5) for errorless teaching strategies, 1.8 (range = 1-5) for model prompts, 2.2 (range = 1-5) for physical guidance, 2.3 (range = 1-5) for practicing a skill until a correct response occurs, 2.1 (range = 1-5) for contingent praise, 2.8 (range = 1-5) for a contingent break, and 2.6 (range = 1-5) for delivery of contingent tangibles following a correct response, with lower ratings indicating higher efficacy. In comparison, mean ratings of efficacy for nonempirically validated strategies were 4.2 (range = 2-5) for ignoring an error and moving on to the next trial and 3.5 (range = 1-5) for encouraging the student to answer. However, respondents did provide somewhat higher ratings for repeating instructions (M = 2.9, range = 1-5) and only placing the correct item on the table (M = 2.5, range = 1-5), despite a lack of empirical support for their use.

Table 5. Survey Respondent's Mean Rating of Efficacy of Instructional Procedures.

Item	*M*	Range	*n*
Instructional strategy			
Errorless learning procedures	2.0	1-5	36

Demonstrate/model the correct response	1.8	1-5	42
Hand-over-hand guidance	2.2	1-5	43
Repeat the instruction again	2.9	1-5	42
Repeatedly practice the skill until correct	2.3	1-5	43
Place the correct picture/item closer to the child	3.2	1-5	42
Only place the correct picture/item on the table	2.5	1-5	42
Give the child his/her favorite item, if correct	2.6	1-5	43
Give the child a choice of items, if correct	2.9	1-5	44
Provide praise, if correct	2.0	1-5	44
Give the child a break, if correct	2.8	1-5	41
Tell the child the answer and move on	3.7	1-5	29
Encourage the student to answer (e.g., “Come on, you know this.”)	3.5	2-5	39
Ignore the error and move on	4.2	2-5	41

Note. 1 = very effective, 2 = so ewhat effective, 3 = not sure about effectiveness, 4 = somewhat ineffective, 5 = very ineffective.

Table 5. Survey Respondent’s Mean Rating of Efficacy of Instructional Procedures.

Item	*M*	Range	*n*
Instructional strategy			
Errorless learning procedures	2.0	1-5	36
Demonstrate/model the correct response	1.8	1-5	42
Hand-over-hand guidance	2.2	1-5	43
Repeat the instruction again	2.9	1-5	42
Repeatedly practice the skill until correct	2.3	1-5	43
Place the correct picture/item closer to the child	3.2	1-5	42
Only place the correct picture/item on the table	2.5	1-5	42
Give the child his/her favorite item, if correct	2.6	1-5	43
Give the child a choice of items, if correct	2.9	1-5	44
Provide praise, if correct	2.0	1-5	44
Give the child a break, if correct	2.8	1-5	41
Tell the child the answer and move on	3.7	1-5	29
Encourage the student to answer (e.g., “Come on, you know this.”)	3.5	2-5	39
Ignore the error and move on	4.2	2-5	41

Note. 1 = *very effective*, 2 = *somewhat effective*, 3 = *not sure about effectiveness*, 4 = *somewhat ineffective*, 5 = *very ineffective*.

Correlations were calculated between the number of years of special education teaching experience and ratings of efficacy for each of the teaching strategies included in the survey (see Table 6). Pairwise deletion was used to maximize available data in analyses, meaning that sections of completed data were utilized from surveys with other incomplete data. The results showed that the association between teaching experience and ratings of the effectiveness of giving a child a break contingent on a correct response approached the conventional level of statistical significance ($r = .29$, $p = .06$), while the association between the number of years working with children with ASD was strongly positively correlated with ratings of the effectiveness of giving a child a break contingent on a correct response ($r = .56$, $p < .001$). This indicates that the longer a respondent had reported working with students with ASD, the more effective he or she reported it was to use contingent breaks. In addition, years of teaching experience was negatively correlated with ratings of effectiveness of encouraging the student to answer ($r = -.30$, $p = .049$), indicating that the longer a respondent had taught special education, the less effective he or she reported it was to encourage a student to answer.

Table 6. Correlation Matrix for Special Education Teachers' Ratings of Effectiveness of Various Strategies Used to Teach Receptive Identification Skills, Years Teaching Special Education, and Years Working With Children With ASD.

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Effectiveness of errorless teaching (*n* = 43-51)	—															
2. Effectiveness of modeling correct response (*n* = 43-50)	.342*	—														
3. Effectiveness of hand-over-hand guidance (*n* = 44-49)	353*	.326*	—													
4. Effectiveness of repeating instruction (n = 42-48)	.310*	.612**	.268	—												
5. Effectiveness of repeatedly practicing skill until correct (*n* = 43-49)	.158	.346*	.109	.463**	—											
6. Effectiveness of placing correct item closer to child (n = 44-49)	.399	.134	.268	.358*	.260	—										
7. Effectiveness of only placing correct item on table (n = 44-49)	378**	.255	.253	.359*	.225	.358*	—									
8. Effectiveness of delivery of favorite item contingent on correct responding (*n* = 44-47)	.143	−.021	.306*	.072	.135	.242	.442**	—								
Effectiveness of choice of items contingent on correct responding (*n* = 44-48)	−.033	−.061	.175	−.038	−.137	.049	−.146	.283	—							
10. Effectiveness of praise contingent on correct responding (*n* = 44-48)	.238	.362*	.521**	.183	.046	.187	.328*	.229	−.111	—						
11. Effectiveness of a break contingent on correct responding (*n* = 43-47)	.137	−.222	−.159	−.205	−.057	−.004	−.034	.084	.142	.002	—					
12. Effectiveness of providing correct response and moving on (*n* = 44-48)	.219	.006	−.086	.146	.110	.283	.081	−.020	.251	−.188	.133	—				

13. Effectiveness of encouraging student to answer (*n* = 43-46)	.011	.134	−.156	.217	.049	−.074	.152	−.013	.173	−.058	.205	.555**	—			
14. Effectiveness of ignoring error and moving on (*n* = 42-45)	−.111	−.102	−.205	.043	−.012	.089	−.190	−.115	.065	−.314*	.215	.297*	.200	—		
15. Number years teaching special education (*n* = 42-64)	.081	.042	.184	−.017	.031	.103	−.109	−.191	−.024	.227	.289	−.160	−.302*	.069	—	
16. Number years working with children with ASD (*n* = 42-64)	.218	.044	.138	.041	.204	.252	.090	.105	.245	.206	.562**	.117	−.052	.011	.666**	—

Table 6. Correlation Matrix for Special Education Teachers' Ratings of Effectiveness of Various Strategies Used to Teach Receptive Identification Skills, Years Teaching Special Education, and Years Working With Children With ASD.

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Effectiveness of errorless teaching (*n* = 43-51)	—															
2. Effectiveness of modeling correct response (*n* = 43-50)	.342*	—														
3. Effectiveness of hand-over-hand guidance (*n* = 44-49)	.353*	.326*	—													
4. Effectiveness of repeating instruction (*n* = 42-48)	.310*	.612**	.268	—												
5. Effectiveness of repeatedly practicing skill until correct (*n* = 43-49)	.158	.346*	.109	.463**	—											
6. Effectiveness of placing correct item closer to child (*n* = 44-49)	.399	.134	.268	.358*	.260	—										
7. Effectiveness of only placing correct item on table (*n* = 44-49)	.378**	.255	.253	.359*	.225	.358*	—									
8. Effectiveness of delivery of favorite item contingent on correct responding (*n* = 44-47)	.143	−.021	.306*	.072	.135	.242	.442**	—								
9. Effectiveness of choice of items contingent on correct responding (*n* = 44-48)	−.033	−.061	.175	−.038	−.137	.049	−.146	.283	—							
10. Effectiveness of praise contingent on correct responding (*n* = 44-48)	.238	.362*	.521**	.183	.046	.187	.328*	.229	−.111	—						
11. Effectiveness of a break contingent on correct responding (*n* = 43-47)	.137	−.222	−.159	−.205	−.057	−.004	−.034	.084	.142	.002	—					
12. Effectiveness of providing correct response and moving on (*n* = 44-48)	.219	.006	−.086	.146	.110	.283	.081	−.020	.251	−.188	.133	—				
13. Effectiveness of encouraging student to answer (*n* = 43-46)	.011	.134	−.156	.217	.049	−.074	.152	−.013	.173	−.058	.205	.555**	—			
14. Effectiveness of ignoring error and moving on (*n* = 42-45)	−.111	−.102	−.205	.043	−.012	.089	−.190	−.115	.065	−.314*	.215	.297*	.200	—		
15. Number years teaching special education (*n* = 42-64)	.081	.042	.184	−.017	.031	.103	−.109	−.191	−.024	.227	.289	−.160	−.302*	.069	—	
16. Number years working with children with ASD (*n* = 42-64)	.218	.044	.138	.041	.204	.252	.090	.105	.245	.206	.562**	.117	−.052	.011	.666**	—

Note. ASD = autism spectrum disorder.
*$p < .05$. **$p < .01$.

Classroom Observations

The experimenters observed a total of 290 trials of instruction in six classrooms. Participants (teachers and paraprofessionals) chose the specific receptive identification skills to conduct with students with ASD during the observation. The participants identified 59 (20%) of the trials as skills that were not-yet-mastered and likely to evoke problem behavior (Figure 1). The rest of the instructional trials were skills in later stages of acquisition (Figure 2).

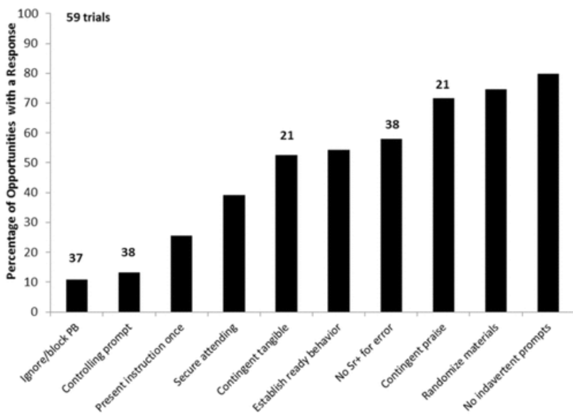

Figure 1. The percentage of opportunities with a participant response during 59 instructional trials of not-yet-mastered skills conducted with children with ASD in classrooms.

Note. PB = problem behavior; Sr+ = reinforcement; ASD = autism spectrum disorder.

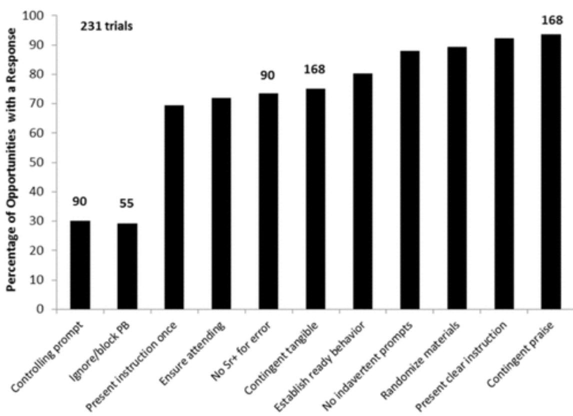

Figure 2. The percentage of opportunities with a participant response during 231 instructional trials conducted with children with ASD in classrooms.

Note. PB = problem behavior; Sr+ = reinforcement; ASD = autism spectrum disorder.

Figure 1 shows the percentage of trials in which participants implemented each of the target behaviors during instruction. Numbers above certain target behaviors indicate the trials in which participants had an opportunity to engage in the response. For example, participants had the opportunity to ignore and block problem behavior during 37 (63%) of not-yet-mastered trials because those were the only trials in which an instance of problem behavior (e.g., aggression, throwing or swiping materials) occurred. Any bars without a number above indicate that the target behavior could occur on each observed trial (e.g., establish ready behavior).

Overall, the percentages of occurrences of target behavior were relatively low for not-yet-mastered tasks (Figure 1). Only one target behavior, presenting a clear instruction, occurred during at least 80% of instructional trials. The lowest levels of target behavior were ignoring and blocking problem behavior (10.8%), presenting a controlling prompt (13.2%), and presenting an instruction once (25.4%). Thus, despite conducting instructional trials for skills that were not yet mastered by students, participants frequently presented instructions repeatedly (e.g., repeated “touch the cat” several times in rapid succession during a brief interval of time), attended to problem behavior (e.g., said, “I don’t like it when you hit me.”) or ended the instructional trial contingent on problem behavior (e.g., removed picture cards contingent on the occurrence of aggression), and rarely presented a prompt to end the instructional trial with the occurrence of a correct student response. In addition, participants withheld reinforcement following an error or no response during 57.6% of trials. Said another way, participants provided reinforcement following a student’s error or no response during approximately 43% of instructional trials for not-yet-mastered skills.

Figure 2 shows that participants had higher levels of target behavior overall during instruction for trials of skills in later stages of acquisition (e.g., skills that were mastered, skills that were near mastery), compared with levels of target behavior during not-yet-mastered tasks. Out of 11 target behaviors, four behaviors occurred during 80% or more of instructional trials (i.e., no inadvertent prompts, randomized presentation of materials, presenting a clear instruction, and contingent praise). The two target behaviors with the lowest levels of implementation were presenting a controlling prompt and ignoring and blocking problem behavior, which also were the same target behaviors with the lowest levels of occurrence during not-yet-mastered tasks. However, there were fewer trials in which participants had the opportunity to present a prompt because students only engaged in an error or did not respond during 39% of trials (compared with 64% of trials for not-yet-mastered tasks). In addition, withholding reinforcement following an error or no response occurred during approximately 73% of trials, which was higher than levels observed for not-yet-mastered tasks. Thus, participants refrained from reinforcing errors or no responses more often during trials of skills in later stages of acquisition.

Data on the frequency of repeated instructions (i.e., repeated verbal prompts) provided within trials showed that participants frequently provided at least one additional instruction prior to an opportunity for the student to respond. During not-yet-mastered tasks, participants delivered a mean of 1.9 additional instructions (range = 1-4) per trial. Repeated instructions occurred less often during skills in later stages of acquisition (M = 0.8; range = 0.2-1.8).

Discussion

The survey provided evidence that receptive identification training and trial-based instruction are common with students with ASD receiving special education services in school classrooms. In addition, the survey results showed that respondents frequently rated empirically validated practices as more effective than nonempirically validated practices. Nevertheless, observations of participant’s implementation of trial-based instruction in their classroom showed that their behavior did not consistently align with the implementation of trial-based instruction in the literature.

The results of the study replicate and extend the literature on the implementation of trial-based instruction in special education classrooms. First, the current results replicate those of Carroll et al. (2013); special education teachers and paraprofessionals in both studies did not consistently implement components of trial-based instruction with a high level of integrity. None of the targeted behaviors occurred during more than 75% of trials in Carroll et al. However, the level of integrity of trial-based instruction in the current study varied depending on the acquisition level of the skill. Trials in which participants provided instruction on not-yet-mastered skills were conducted with a lower level of integrity. None of the target behaviors occurred during at least 80% of not-yet-mastered task trials. In comparison, participants implemented four of the 11 targeted behaviors (36%) in at least 80% of trials of skills in a later stage of acquisition.

Carroll et al. (2013) did not specify either the types of skills targeted by educators during classroom observations or the level of acquisition of the observed skills. However, the proportion of opportunities to present a controlling prompt in Carroll et al. was similar to the proportion of opportunities during the not-yet-mastered tasks in the present study (i.e., 60% and 63% of trials, respectively). Thus, it is possible that the skills observed in Carroll at al. were not yet mastered. Therefore, the current findings extend those of Carroll et al. by showing that tasks at an earlier stage of acquisition may be more prone to implementation errors by instructors. This may be particularly concerning as instructional errors during an earlier stage of acquisition may have a negative effect on the acquisition of the target skill. Training of educators could include sufficient opportunities to practice accurate implementation of trial-based instruction for skills in early stages of acquisition and with students who engage in frequent problem behavior during these tasks to improve the integrity of trial-based instruction in classrooms.

Research on the effects of instructional errors on skill acquisition suggests that the observation data are a cause for concern. For example, participants provided a controlling prompt following an error during fewer than 30% of trials. This type of error has been described as an error of omission (i.e., omitting a programmed prompt) in the behavioral literature, and previous studies show that providing prompts following errors during only 50% of trials (Holcombe, Wolery, & Snyder, 1994) may slow or hinder acquisition of skills. Furthermore, providing prompts during 33% of trials, which is more often than observed in the current study, prevented acquisition for all participants (Noell, Gresham, & Gansle, 2002). Thus, participants in the present investigation delivered prompts at a level that previous research shows will prevent acquisition. In addition, participants provided reinforcement following an error or no response during approximately 45% of trials for not-yet-mastered task and 25% of trials for tasks at a later stage of acquisition. DiGennaro Reed, Reed, Baez, and Maguire (2011) found that providing reinforcement following errors during 50% of trials had the same effect on skill acquisition as providing reinforcement following every error. Thus, errors that occur during approximately 50% of trials are likely to hinder acquisition.

Most studies on instructional errors during intervention have examined the effects of a single error on acquisition. Nevertheless, participants in the present study made multiple errors simultaneously. For example, errors that frequently occurred within the same trial included failing to provide a controlling prompt, repeating the instruction, and attending to problem behavior. Carroll et al. (2013) found that making three errors (omitting a prompt following an error, omitting reinforcement for a correct response, and not presenting a clear instruction) during 67% of instructional trials prevented acquisition for four participants and slowed acquisition for two participants. The occurrence of simultaneous errors during trials may have more of a negative effect on skill acquisition than findings of previous studies that examined only one type of error. The results of classroom observations during trial-based instruction in the current study suggest a greater need for training and monitoring of intervention integrity in school settings, as well as monitoring of student skill acquisition as a function of the types of integrity errors made by teachers. Additional research is needed to examine the effects of simultaneous errors that frequently occur in classrooms on skill acquisition.

The current findings also extend those of Carroll et al. (2013) by examining implementation of instruction across school districts and during training of a commonly targeted IEP goal for students with ASD. The results of survey responses showed that receptive identification tasks were consistently taught with trial-based instruction to most students with ASD across districts. In addition, teachers across school districts in the present study reported the use of a statewide curriculum with all students with ASD, and the materials and practices from this curriculum were present in every classroom observation. Teachers in Carroll et al. did not report the use of a consistent curriculum. It is possible that the training and practice opportunities provided to participants to implement the statewide curriculum are at least partially responsible for the higher levels of accurate implementation of trial-based instruction by participants in the present study. The identification of strategies to improve the integrity of implementation of behavior-analytic practices in school settings is a critical area in need of additional research. Research on teacher training (e.g., Dib & Sturmey, 2007; Sarokoff & Sturmey, 2004) and feedback regarding teachers' implementation of practices in schools (e.g., Duhon, Mesmer, Gregerson, & Witt, 2009; Noell, Witt, Gilbertson, Ranier, & Freeland, 1997) offers strategies for establishing and maintaining high levels of implementation integrity. However, additional research is needed to identify effective methods for incorporating more behavior-analytic teaching strategies into special education teacher-training programs.

The effect of nonempirically validated strategies on skill acquisition warrants greater investigation. Our results showed that participants engaged in some nonempirically validated practices (e.g., repeating instructions, encouraging the student to respond) as frequently as they implemented empirically validated practices (e.g., prompts, reinforcement for correct responses). Similarly, Burns and Ysseldyke (2009) found that special education teachers reported equal use of evidence and nonevidence based practices. Although we might expect that teachers will implement a variety of instructional practices across students, their implementation of less effective components of instruction is concerning. Participants reported that they selected interventions based on use of the intervention previously with other students, receiving instruction on the intervention in their training program, and district or state requirements. Although modifications to teacher-training programs and district and state requirements may be possible to arrange with the dissemination of information regarding evidence-based practices, the most frequently endorsed rationale for selecting an intervention (i.e., based on having used it before with another student) may be challenging to address. Behavior analysts must advocate for ways to provide training to teachers and staff so that novel, evidence-based interventions are more likely to be selected than familiar (and possibly less effective) interventions. An increase in the availability of technology-based training platforms (e.g., Interactive Computerized Training; Higbee et al., 2016) may offer one avenue to disseminate training opportunities to special education teachers. However, additional research on the efficacy of technology-based training on accurate implementation of interventions in classroom settings and strategies to promote teacher participation in training is needed.

The present investigation extends the results of Carroll et al. by examining teacher report of their selection and use of empirically validated teaching strategies. Interestingly, the results of the teachers' ratings in the survey were not consistent with their implementation of training in their classrooms. For example, the results of the correlation matrix identified that experienced teachers were more likely to report that they provided breaks to students contingent on a correct response. However, we did not consistently observe contingent breaks provided following correct responding (i.e., contingent tangible [during a break] following a correct response occurred during 52% and 75% of opportunities for not-yet-mastered tasks and those in a later stage of acquisition, respectively). Furthermore, teachers reported the highest level of efficacy for demonstrating or modeling a correct response within the survey. Nevertheless, the delivery of a controlling prompt (such as a demonstration or model of a correct response) either prior to or following an incorrect or no response occurred infrequently during the classroom observations (13.2% for not-yet-mastered tasks and 30% for skills in a later stage of acquisition). Therefore, reports of effective practices within the survey were not consistent with the implementation of instruction in practice. Further research is needed regarding strategies to increase teacher's and paraprofessional's use of known effective strategies during instruction with students in their classroom.

There were several limitations of the present investigation. First, a proportion of respondents did not complete the entire survey, and some respondents skipped questions. Although 110 respondents opened and completed some portion of the survey, we obtained 64 completed surveys. The variables that led to failed completion of the survey remain unknown, but the most frequently skipped questions by respondents were open-ended questions that required typed responses. Second, we observed instruction in a small proportion of classrooms from districts around the state. We also collected most of the observation data during instruction between one adult and one student, with the exception of small-group instruction during only one of the observations. However, data on the occurrence of targeted behavior across schools, districts, and size of instructional groups were highly consistent, and suggest that the errors that occurred in these schools may be representative of instructional practices in other districts within the state.

Another limitation of the observation data is that we collected data on instruction provided by special education teachers and paraprofessionals, rather than collecting data on teacher behavior only. The survey respondents reported a relatively large number of paraprofessionals in their classrooms (*M* = 3 paraprofessionals). Our observations and teacher reports indicated that the paraprofessionals were frequently responsible for implementing trial-based instruction with students with ASD, while the special education teacher supervised the implementation of intervention and addressed questions or issues that arose in the classroom during instruction. Thus, implementation of instruction by paraprofessionals was standard classroom practice and appeared relevant to include in our observations and data analysis. However, states in which paraprofessionals do not provide instruction directly to students may show different results on measures of targeted behavior.

Individualization of trial-based instruction is an important and beneficial component of effective instruction for students with ASD. Thus, the addition or removal of specific components of instruction may be ideal for some learners (e.g., Carroll, Joachim, St. Peter, & Robinson, 2015; Lerman, Vorndran, Addison, & Kuhn, 2004). The classroom observation measures in the current study identified the occurrence or nonoccurrence of specific teacher behaviors across all instructional trials. However, including specific modifications to instruction within or across trials (e.g., a position prompt following repeated errors, nonrandomization of stimuli to treat a side bias, differential reinforcement following repeated correct responses to a stimulus) could be described as responsive and individualized instruction. Therefore, the occurrence or nonoccurrence of certain behaviors may not be problematic or indicative of a need for additional training. Although these procedural modifications were not reported by any teachers or paraprofessionals, it is possible that they occurred during observations. Researchers seeking to measure classroom practices could obtain more detailed descriptions of instructional practices prior to and following observations to prevent potential discrepancies between accurate instruction and fidelity measures.

We distributed a survey created by the first author rather than attempting to obtain a survey that had been used and validated in previous research. Due to an interest in measuring teachers' ratings of specific teaching strategies and the inclusion of empirically supported strategies during instruction for students with ASD in classroom settings, these specific variables were important to include in the survey. It remains unclear whether other, previously validated surveys would include similar variables of interest as those in the current study.

Although self-report data, such as survey responses, are not a common dependent variable in behavior-analytic research, measures of teachers' selection and implementation of interventions in their classrooms are variables that are amenable to data collection via a survey. Observation data that accompany survey responses can be used to validate the accuracy of survey responses and provide direct measures of targeted behavior. The combination of survey responses and classroom observations may allow for a more comprehensive evaluation of treatment selection and implementation. In the current study, participants rated empirically supported strategies as effective, yet the use of these strategies in behavior observations was generally low. This finding may indicate that variables related to the implementation of certain strategies may be responsible for treatment integrity errors, and not a lack of familiarity with efficacious instructional procedures.

The present study provides information on the variables influencing teacher's selection of interventions for students with ASD as well as teachers' impressions of the efficacy of empirically validated treatments. Furthermore, the observation data provide evidence regarding the extent to which empirically supported interventions are implemented in classrooms in a similar manner to those described in the literature. Further investigation of the research-to-practice gap in the area of intervention selection and implementation in special education classrooms is needed to identify how best to improve the efficacy of services offered to students with ASD in school settings.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received financial support for the research, authorship, and/or publication of this article: Funding for portions of this project was provided by the Fairway Faculty and Outreach Fund.

References

	Burns, M. K., Ysseldyke, J. E. (2009). Reported prevalence of evidence-based instructional practices in special education. The Journal of Special Education, 43, 3-11.
	Carroll, R. A., Joachim, B. T., St., Peter, C. C., Robinson, N. (2015). A comparison of error-correction procedures on skill acquisition during discrete-trial instruction. Journal of Applied Behavior Analysis, 48, 257-273.
	Carroll, R. A., Kodak, T., Fisher, W. W. (2013). An evaluation of programmed treatment-integrity errors during discrete-trial instruction. Journal of Applied Behavior Analysis, 46, 379-394.
	Centers for Disease Control and Prevention . (2014). Prevalence of autism spectrum disorder among children aged 8 years: Autism and developmental disabilities monitoring network, 11 sites, United States, 2010. Morbidity and Mortality Weekly Report: Surveillance Summaries, 63, 1-21. Retrieved from https://www.cdc.gov/mmwr/volumes/65/ss/ss6503a1.htm?scid=ss6503a1w
	Child Trends Databank . (2015). Individualized education plans. Retrieved from http://www.childtrends.org/indicators/individualized-education-plans/
	Daly, E. J., Witt, J. C., Martens, B. K., Dool, E. J. (1997). A model for conducting a functional analysis of academic performance problems. School Psychology Review, 26, 554-574.
	Dawson, G., Burner, K. (2011). Behavioral interventions in children and adolescents with autism spectrum disorder: A review of recent findings. Current Opinion in Pediatrics, 23, 616-620.
	Dib, N., Sturmey, P. (2007). Reducing student stereotypy by improving teachers' implementation of discrete-trial teaching. Journal of Applied Behavior Analysis, 40, 339-343.
	DiGennaro Reed, F. D., Reed, D. D., Baez, C. N., Maguire, H. (2011). A parametric analysis of errors of commission during discrete-trial training. Journal of Applied Behavior Analysis, 44, 611-615.
	Duhon, G. J., Mesmer, E. M., Gregerson, L., Witt, J. C. (2009). Effects of public feedback during RTI team meetings on teacher implementation integrity and student academic performance. Journal of School Psychology, 47, 19-37.
	Green, G. (1996). Early behavior intervention for autism: What does research tell us? In Maurice, G., Green, G., Luce, S. C. (Eds.), Behavior interventions for young children with autism(pp. 29-44). Austin, TX: PRO-ED.
	Green, G. (2001). Behavior analytic instruction for learners with autism: Advances in stimulus control technology. Focus on Autism and Other Developmental Disabilities, 16, 72-85.
	Grow, L. L., Carr, J. E., Kodak, T. M., Jostad, C. M., Kisamore, A. N. (2011). A comparison of methods for teaching receptive labeling to children with autism spectrum disorders. Journal of Applied Behavior Analysis, 44, 475-498.
	Higbee, T. S., Aporta, A. P., Resende, A., Nogueira, M., Goyos, C., Pollard, J. S. (2016). Interactive computer training to teach discrete-trial instruction to undergraduates and special educators in Brazil: A replication and extension. Journal of Applied Behavior Analysis 49, 780-793.
	Holcombe, A., Wolery, M., Snyder, E. (1994). Effects of two levels of procedural fidelity with constant time delay on children's learning. Journal of Behavioral Education, 4, 49-73.

Lerman, D. C., Vorndran, C., Addison, L., Kuhn, S. A. C. (2004). A rapid assessment of skills in young children with autism. Journal of Applied Behavior Analysis, 37, 11-26.

Lovaas, O. (2003). Teaching individuals with developmental delays: Basic intervention techniques. Austin, TX: PRO-ED.

National Autism Center . (2015). Findings and conclusions: National Standards Project, Phase 2. Randolph, MA: Author.

Noell, G. H., Gresham, F. M., Gansle, K. A. (2002). Does treatment integrity matter? A preliminary investigation of instructional implementation and mathematics performance. Journal of Behavioral Education, 11, 51-67.

Noell, G. H., Witt, J. C., Gilbertson, D. N., Ranier, D. D., Freeland, J. (1997). Increasing teacher intervention implementation in general education settings through consultation and performance feedback. School Psychology Quarterly, 12, 77-88.

Sallows, G., Graupner, T. (2005). Intensive behavioral treatment for children with autism: Four-year outcome and predictors. American Journal on Mental Retardation, 110, 417-438.

Sarokoff, R. A., Sturmey, P. (2004). The effects of behavioral skills training on staff implementation of discrete-trial teaching. Journal of Applied Behavior Analysis, 37, 535-538.

Smith, T., Groen, A., Wynn, J. (2000). Randomized trial of intensive early intervention for children with pervasive developmental disorder. American Journal on Mental Retardation, 105, 269-285.

Sundberg, M. L., Partington, J. W. (1999). The need for both discrete trial and natural environment language training for children with autism. In Ghezzi, P. M., Williams, W. L., Carr, J. E. (Eds.), Autism: Behavior analytic perspectives (pp.139-156). Reno, NV: Context Press.

United States Surgeon General . (1999). Mental health: A report of the surgeon general. Washington, DC: Author.

Wong, C., Odom, S. L., Hume, K., Cox, A. W., Fettig, A., Kucharczyk, S., . . . Schultz, T. R. (2014). Evidence-based practices for children, youth, and young adults with autism spectrum disorder. Chapel Hill, NC: Autism Evidence-Based Practice Review Group, Frank Porter Graham Child Development Institute, The University of North Carolina at Chapel Hill.