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Journal of Emotional and Behavioral Disorders 2010 18: 27 originally published online 25 March 2009

DOI: 10.1177/1063426609333448

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A Comparison of Three Types of Opportunities to Respond on Student Academic and Social Behaviors

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An alternating treatments design was used to investigate the effects of three types of opportunities to respond (i.e., individual, choral, and mixed responding) on sight words and syllable practice in six elementary students with behavioral problems. During the mixed responding condition, five out of six students demonstrated a lower rate of disruptive behavior, and four out of six students had fewer intervals of off-task behavior. Results of the three types of opportunities to respond on participants' active student responding were less clear. A discussion of limitations, implications, and future research directions is included.

Keywords: *individual responding; choral responding; active student responding; disruptive behavior*

Teachers in general education classrooms typically use the lecture format during large group instruction and expect that their students passively watch and listen while course content is presented. The common questioning procedure used with this style of instruction is asking individual students to volunteer by raising their hands (Armendariz & Umbreit, 1999). However, a limitation of this instructional method is that only a handful of students, usually higher achievers, actively respond to teachers' questions (Greenwood, 2001; Greenwood, Delquadri, & Hall, 1984). In the past, Good (1970) found that students, in particular students who are low achievers, were not provided equal opportunities to respond and frequently passively watched and listened as their higher achieving peers answered questions. As a result, low achieving students may often fail to receive the practice and feedback that is necessary for achievement gains.

To increase teacher rates of opportunities to respond, researchers have theorized and conceptualized instruction as having a basic unit of instruction called a learning trial. A learning trial consists of a three-term, stimulus-response-consequent contingency sequence (Skinner,

Fletcher, & Hennington, 1996). Researchers have shown that improving the quality and increasing the quantity of learning trials results in higher learning rates (Barbetta & Heward, 1993; Carnine, 1976; Miller, Hall, & Heward, 1995). An example of a learning trial is when a teacher presents a science word on a flash card (i.e., stimulus), the student recites the word aloud (i.e., response), and the teacher then says, "Good answer" (i.e., consequent) (Skinner, Belfiore, Mace, William-Wilson, & Johns, 1997). Researchers have shown that increasing the number of learning trials could increase learning levels during the acquisition, fluency building, and maintenance stages of learning (Skinner, Smith, & McLean, 1994).

Using choral responding is one instructional strategy that increases both learning trial rates and learning rates during teacher-led instruction (Skinner et al., 1996). Choral

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responding occurs when all students are asked to respond following the presentation of an instructional stimulus (Heward, 1994). The purpose of using choral responding is to increase the number of active student responses and, as a result, increase the number of correct responses and the amount of time students are engaged during instruction while allowing the teacher to monitor each student's understanding of each question (Carnine, 1976; McKenzie & Henry, 1979; Miller et al., 1995; Sainato, Strain, & Lyon, 1987; Sutherland, Alder, & Gunter, 2003).

Providing students frequent opportunities to respond is important because researchers suggest that increased student responding is linked to on-task behavior and engagement during instruction (Carnine, 1976; Sainato et al., 1987; Sutherland et al., 2003). When students are engaged and actively responding to questions, teachers can focus on academic content rather than being concerned with inappropriate student behaviors. Increasing the focus on academic content is particularly important for teachers who instruct students with or at risk for emotional or behavioral disorders (EBD), because students with or at risk for EBD are more likely to engage in inappropriate behaviors than their typically achieving peers (Hastings & Oakford, 2003; Nelson & Roberts, 2002).

In a study designed to verify various effective instructional techniques, Anderson, Evertson, and Brophy (1979) found that during small group first-grade reading groups, choral responding was negatively related to achievement and individual responding (ordered turns) was positively related to achievement. However, McKenzie and Henry (1979) compared an individually addressed question condition with a unison hand-raising condition in two third-grade classrooms and found that students in the unison hand-raising condition had significantly fewer intervals of off-task behavior than students in the individual hand-raising condition. Results from several more recent studies indicate that increased rates of opportunities to respond by using choral responding produced a higher percentage of intervals of on-task behavior. Sutherland et al. (2003) demonstrated that when a teacher increased his rate of opportunities to respond and used choral responding, nine students identified as EBD in a self-contained classroom had more correct responses, fewer disruptions, and increased on-task behavior during math lessons. Haydon, Mancil, and Van Loan (in press) systematically replicated the Sutherland et al. (2003) study. Similar to the Sutherland et al. study, when the teacher increased his rate of opportunities to respond and used choral responding in a general education classroom setting, a fifth-grade student identified as at risk for EBD had higher percentages of on-task behavior and correct

responses and lower rates of disruptive behavior than during the individual responding condition.

Two more studies lend support for the advantage of using choral responding over individual responding. Sainato et al. (1987) compared choral responding with a baseline individual responding condition with three preschool children identified as having significant behavioral and developmental delays during morning circle time. Sainato and colleagues compared the use of two rates (three/min; five/min) of choral responding with a baseline individual responding condition and results indicated that on-task behavior and correct responding improved during the higher rate of choral responding. In a similar investigation, Sindelar, Bursuck, and Halle (1986) compared two modes of responding: ordered and choral. Findings suggested a slight but significant difference between sight words mastered across all three groups of students during the choral responding condition in comparison with the ordered response condition. On a post-instruction test, the students in the choral responding condition had a higher percentage of words read correctly than the students in the ordered responding condition. There was not a substantial difference in the percentage of on-task behavior between conditions (83% for the choral responding condition and 79% for the ordered responding condition).

However, Wolery, Ault, Doyle, Gast, and Griffin (1992) compared choral versus individual responding in small group arrangements and had contrasting findings to earlier findings. Results on the effectiveness of the two types of responding differed depending on the amount of opportunities to respond provided and student exposure to questions during each condition. The authors concluded that the two types of responding produced relatively equal learning and only a slight difference in effectiveness and efficiency (choral over individual responding) were found. However, these results could be due to a small group setting and may not replicate in a large group classroom setting where students may typically receive fewer individual opportunities to respond and be required to passively listen for longer periods of time.

Whereas researchers have compared choral and individual responding, Stevens and Rosenshine (1981) suggested that using mixed responding (a ratio of 70:30 choral to individual responding) might be a more effective and efficient instructional strategy. They hypothesized that students could benefit from frequent practice of choral responding, whereas teachers could test specific children and gain information on individual performance by using individual responding. In classroom-based research, it is important to determine the most efficient method of instruction to increase the likelihood that

teachers will use that strategy in the future. Comparing types of instructional strategies is one way to determine which instructional strategies produce the best results (Skinner, Johnson, Larkin, Lessley, & Glowacki, 1995).

This study addresses this issue and extends the learning trial literature in several ways. First, the effectiveness of decreasing students' disruptive and off-task behavior as well as increasing students' active student responding was examined by comparing three types of opportunities to respond (individual, choral, and a mixture of 70% choral responding and 30% individual responding) in a second-grade general education classroom setting. Second, the three types of opportunities to respond represented the use of an antecedent instructional strategy in the beginning of a learning trial as opposed to an error correction strategy at the end of a learning trial. Third, the three types of opportunities to respond were used with students identified as at risk for EBD.

The purpose of this study was to investigate the following research question: What effects do choral responding, individual responding, and a mixture of choral and individual responding procedures have on the disruptive, off-task behavior, and active student responding of students identified as high risk for EBD during group instruction in a general education classroom?

Method

Participants

To recruit participants, the first author contacted assistant principals at elementary schools in a southern school district to determine if the school was interested in participating in the study and if they had any second-grade teachers who would be interested in being participants. Two schools in the school district and three second-grade teachers from each school volunteered to participate.

Teachers. Six teachers were recruited and served as participants in this study. Teacher participants (a) had a minimum of 2 years of teaching experience, (b) used less than two opportunities to respond per minute during a pre-assessment condition, and (c) consented to participate in the study. All six teachers were Caucasian, and five of the six teachers were female. The average years of teaching experience was 3.0 (range = 2–6 years), and all six teachers had taken a behavior management class as undergraduate students.

Students. Six students identified as having chronic disruptive behaviors that placed them at risk for EBD participated in this study. Table 1 reports information

Table 1
Participant Characteristics

Name	Gender	Ethnicity	Age	SSBD Score
Frank	male	African American	7 years 6 months	25/35
D'Andy	male	African American	8 years 2 months	31/35
Monty	male	African American	7 years 5 months	29/35
Teo	male	African American	8 years 2 months	32/35
Amber	female	African American	8 years 2 months	30/35
Mats	male	Caucasian	7 years 6 months	27/35

Note: SSBD = *Systematic Screening for Behavior Disorders*.

on each participant's gender, ethnicity, age, and risk score. To determine if the student participants were at risk for EBD, the *Systematic Screening for Behavior Disorders* (SSBD; Walker & Severson, 1993) was conducted. The SSBD is an empirically validated, multiple gating procedure used to identify students with patterns of internalizing and externalizing behaviors (Walker & Severson, 1993). Identification occurs in three stages: (a) teacher nomination of students with externalizing or internalizing behavior problems, (b) ranking and evaluation of the top three students in either category, and (c) observation of these students by another professional in the classroom and playground setting.

Stage 1 of the SSBD was one of the regular practices used by the school to identify students at elevated risk for EBD. Thus, a separate consent was not needed for ranking students in the Stage 1 process. Following Stage 1, the first author obtained consent from the parents of the students who were ranked highest in the Stage 1 process in each class. Informed consent granted permission to implement the second and third stages of the SSBD (Walker & Severson, 1993) and participate in the study if scores indicated that the student was at high risk. Once informed consent was obtained, Stage 2 of the SSBD was conducted. All participants targeted for Stage 2 met criteria for inclusion in the study.

The following eligibility criteria were used to identify participants: They (a) were rated by the teachers as having high rates of disruptive behavior for more than 1 month according to the critical events index and combined frequency index on the SSBD, (b) were enrolled in a second-grade general education class, (c) were between the ages of 7 and 8, and (d) had parental consent to participate in the study.

Setting and Materials

Setting. The setting for the study was six second-grade general education classrooms in the south. Two schools,

one urban and the other suburban, were selected. Class size ranged from 18 to 22 students. Participants and Teachers 1 through 3 attended the urban school, whereas Participants and Teachers 4 through 6 attended the suburban school. The racial/ethnic make-up of the classrooms in the urban school was approximately 70% African American and 30% Caucasian, whereas in the suburban school, the percentage was roughly 50% African American and 50% Caucasian. This study took place during a large group instruction, teacher-directed academic activity that had the potential for high rates of opportunities to respond (Skinner et al., 1996). All instructional activities took place in the morning.

Materials. During the targeted activity, materials that are commonly used for language arts instruction were used in the study (5 in. × 7 in. flash cards). The primary experimenter developed, along with teachers, consistent lesson plans and instructional materials to teach content vocabulary and syllable practice. All six teachers used sight words that were at an equivalent level of difficulty and indicated that the content of the cards covered the same stories and review of previous spelling tests. The set of flash cards was the same for Teachers 1 and 3 and Teachers 4, 5, and 6. Teacher 2 opted to use her own sight word cards.

Teacher Training

Teacher training consisted of two phases: (a) information sharing and (b) practice until mastery occurred. Training was implemented during two 30-minute practice sessions on two separate days based on procedures employed by Sutherland et al. (2003). The first author trained Teachers 1 through 3 and Teachers 4 through 6 on separate occasions.

Phase 1: Information sharing. The first author presented a review of the operational definition of opportunities to respond and showed a 5-minute viewing of video clips of teachers using individual and choral responding. He then explained the expectations, procedures, and rules for the three responding conditions.

Phase 2: Practice until mastery. Practice of the three types of opportunities to respond consisted of (a) showing a sight word card to the class; (b) cueing the students verbally “5-4-3-2-1” to allow adequate wait time, providing a verbal prompt to respond; (c) providing feedback on whether the answer was correct or incorrect (e.g., “That is correct,” or “That is not correct. The correct answer is

_____.”); and (d) selecting another sight word card and beginning the next learning trial (Heward, Courson, & Narayan, 1989).

Comparison of the Three Interventions

Based on a randomized schedule, the teacher was instructed to implement either (a) individual responding, (b) choral responding, or (c) mixed mode responding—all at a rate of approximately five per minute. This rate was selected based on findings from Sainato et al. (1987) that suggested only slight differences between rates of three and five opportunities to respond per minute. The faster rate of five opportunities to respond per minute was selected because this rate produces a pacing that is appropriate for review of sight words and syllable practice (Heward, 1994).

During each of the three conditions, teachers implemented the four-step procedure for each learning trial as indicated in Phase 2 of the teacher training phase: The four-step procedure was identical for the three conditions (except for the second step, cueing procedures differed slightly for each condition; see below).

Individual responding. In this condition, the teacher followed the four-step procedure; reviewed the procedures, expectations, and rules for individual responding; and called on each student randomly to pronounce the word on the sight word card or indicate how many syllables were in the word. During this condition, the total exposure to questions (i.e., the number of times a student saw a sight word card presented either to oneself or to a peer) was approximately 40 over the entire session, however, the teacher ensured that the number of individual opportunities to respond (the number of times the teacher asked the targeted student to respond per word) was three.

Choral responding. In this condition, the teacher followed the four-step procedure; explained the expectations, procedures, and rules for the choral responding condition (specifically cueing procedures); cued all the students by saying “group”; showed a sight word card to the class; and cued the entire class to respond. During this condition, the total exposure to questions and opportunities to respond was equal and was approximately 40 questions over the entire session for the targeted student.

Mixed responding. In this condition, the teacher explained the expectations, procedures, and rules for the mixed responding condition (specifically cueing

procedures) and read from a list developed by the researcher indicating the type of opportunity to respond, either a choral or an individual opportunity to respond. For each individual response, the teacher said, "This is individual," showed a sight word card, read the definition, counted down from five, called on a student, and asked, "What word?" For each choral response, the teacher said, "This is for everyone," showed a sight word card, read the definition, counted down from five, and asked the entire class, "What word?" Using a ratio of 70% choral to 30% individual at a rate of approximately five opportunities to respond per minute yielded 28 choral responses to 12 individual responses for the 8-minute session. During choral responding, all students including the targeted student responded 28 times. During individual responding, the targeted student responded 3 times and 9 peers were randomly called to respond once. During this condition, the total exposure to questions for the targeted student was approximately 40 over the entire session, whereas the number of opportunities to respond was 31.

Dependent Measures

The dependent measures for this study included (a) disruption, (b) off-task behavior, and (c) active student responding. Disruptive behavior was defined as any behavior demonstrated by the target student that interrupted the flow of instruction or was disruptive to the on-task behavior of other students. The following behaviors are examples of disruptive behaviors: getting up from seat, touching others, talking to another student, speaking out loud without raising hand, taking things from others, throwing objects, making noise (tapping, banging), moving head up and down or from side to side, talking to others, rocking in chair, and so forth (Armendariz & Umbreit, 1999).

Because the activity required student eye contact with the flash card, off-task behavior was defined as occurring when the target student was not actively directed (looking) toward the teacher (e.g., looking around the room, looking at or drawing on the desk, playing with materials in the desk, hair, or clothes, etc.; Miller et al., 1995).

Active student response was defined as engaging in the behavior that was expected during the specific opportunities to respond condition and included (a) independent hand raising for the individual responding, (b) responding in unison with the group for choral responding, or (c) both, in the mixed responding condition (Godfrey, Grisham-Brown, Schuster, & Hemmeter, 2003).

Measurement

All observations lasted a total of 8 minutes; the first 4 minutes consisted of review of sight words followed by 4 minutes of syllable practice using the same sight words. During this time, the primary researcher served as the primary observer and collected real-time data using direct sequential recording of the teachers' use of opportunities to respond followed by student active responding during the activity period. Student disruptive and off-task behaviors were also recorded during the activity period using direct recording. Data were collected using a paper-and-pencil data collection system.

Prior to data collection, the first author spent time in each classroom for 30 minutes on five separate occasions to familiarize the students with his presence and decrease potential reactivity. To accurately capture the occurrence of both discrete and continuous behaviors, different types of measurement strategies were used. Student disruption was measured using a frequency count and translated into rate per minute using the following formula: frequency of disruption/total number of minutes (i.e., 8 min). Active student responses were measured using a percentage formula derived from counting the number of active student responses following a teacher's use of a specific opportunity to respond strategy (i.e., individual, choral, or mixed responding) and dividing each of those numbers by the total number of questions the student was exposed to.

Student off-task behavior was measured using momentary time sampling. During the 8-minute observation period, the primary observer continuously observed the teacher and target student. The observer was cued every 20 seconds (by a taped tone) to look at the targeted student and code if the student was off-task at that moment (Gunter et al., 2003). Because the length of each session was 8 minutes, there was a total of 24 observations for off-task behavior.

Interobserver Agreement

To provide evidence that the measures of the dependent variables were accurate, secondary observer(s) collected interobserver agreement (IOA) data within each condition of the study (Kennedy, 2005). Data collectors were aware of which condition was being observed (i.e., individual, choral, or mixed), but they were unaware of the relative effectiveness of any condition on the dependent variables.

IOA checks for the dependent variable of disruption were scored by exact event occurrence only formula (i.e., an agreement was scored when two observers scored the same number of events of disruption during each interval of observation) and calculated by using an

interval agreement formula, dividing the total number of agreements by the total number of agreements and disagreements and multiplying by 100%. Off-task behavior was calculated using an interval agreement formula. Active student responding interobserver agreement was calculated by using a total agreement method. Both observers maintained a frequency count of active student responding and agreement was computed by dividing the smaller total of occurrence of responding by the larger total occurrence of responding and multiplying by 100%. Prior to beginning data collection and IOA data, the primary and secondary observer(s) were trained to a reliability of at least 85% for three consecutive sessions on each dependent measure. To control for observer drift, the primary observer met with the secondary observer(s) on a weekly basis and/or repeated the training exercises once every five sessions (Cooper, Heron, & Heward, 1987). Interobserver agreement was calculated during 33.8% of observations. Average interobserver agreement for disruption was 93.02% (range = 75–100%), off-task 91.5% (range = 80.0–100%), and active student responding 98.63% (range = 90.47–100%).

Treatment Integrity

Direct measurement of the independent variable (i.e., teacher's implementation of the opportunities to respond procedure, i.e., individual, choral, or mixed mode at a rate of five/min) was conducted as a measure of treatment integrity on approximately 15% of the sessions by two secondary observers. Having two observers allowed the researchers to calculate IOA on integrity. Although this is not typically done (Yarbrough, Skinner, Lee, & Lemmons, 2004), clear support for the claim that the treatment was implemented as intended can be made when there is agreement between two independent observers (Noell & Witt, 1998). Interobserver agreement for treatment integrity was 100% for the rate of opportunities to respond (between 4.5 and 5.0 per min), the start of syllable practice, sequence of steps, and steps in the sequence (cue, wait time, questions, and feedback given).

A checklist sheet was used to record the occurrence or nonoccurrence of each step of the opportunities to respond instructional sequence in the individual, choral, and mixed conditions as described above. The accuracy of the teachers' implementation of the individual, choral, and mixed procedures—the four components: cueing students, allowing adequate wait time (counting down by 5), asking questions, and providing feedback on student responses, as well as the number of opportunities to respond per 8-minute session—was calculated using the total agreement approach.

In addition, the accuracy of the teachers' start of the implementation of syllable practice after 4 minutes (within 10 s) was also calculated. During mixed responding, two observers followed the teachers' verbal prompt (i.e., "This is individual." "This is group.") and recorded on the treatment integrity checklist the accuracy with which the teacher implemented the 70:30 ratio. They also recorded the number of questions asked to the targeted student.

Social Validity

After the completion of the study, the teachers were asked to complete three social validity surveys to obtain information about their perception of the acceptability and usefulness of each type of opportunities to respond. Teachers rated nine questions using a 4-point Likert-type scale, where 1 represents *not at all* and 4 represents *very much*. The rating scale consisted of three categories: (a) teacher's perceived ease of implementing each type of intervention, (b) teacher's perceived effectiveness of each type of intervention, and (c) teacher's likelihood of using each intervention in the future. Mean scores for each question were calculated by totaling each teacher's response and dividing by 6.

Experimental Design and Procedures

An alternating treatments design (Barlow & Hayes, 1979) was used to compare the three types of opportunities to respond (i.e., individual responding vs. choral responding vs. mixed responding [70% choral responding and 30% individual responding]). All sessions were 8 minutes in length; the first 4 minutes consisted of review of sight words followed by 4 minutes of syllable practice using the same sight words. Differences between conditions were determined mainly by noting distinct separation of data points using visual inspection as well as by examining mean difference between conditions. Trend lines were determined by using a split-middle trend estimation line (Kazdin, 1982).

Results

Treatment Integrity

Treatment integrity data were collected for each teacher to assess the implementation of each type of responding condition. Data indicated that the six teachers implemented the rate of opportunities to respond (between 4.5 and 5.0 per min) and the start of syllable practice 100% of the time. For Teachers 4 through 6, integrity on sequence of steps was 100%, and integrity on steps in the

Table 2
Means, Standard Deviations, and Ranges for Disruptive Behavior in Each Condition

Student	Individual		Choral		Mixed	
	<i>M (SD)</i>	Range	<i>M (SD)</i>	Range	<i>M (SD)</i>	Range
Frank	1.54 (0.32)	1.25–1.88	0.71 (0.27)	0.25–1.00	0.16 (0.12)	0.00–0.38
D'Andy	0.89 (0.33)	0.50–1.50	0.43 (0.20)	0.25–0.75	0.19 (0.11)	0.00–0.38
Monty	1.21 (0.19)	1.00–1.50	0.81 (0.31)	0.50–1.38	0.49 (0.19)	0.25–0.75
Teo	1.52 (0.87)	0.63–2.75	1.65 (1.28)	0.38–4.13	1.61 (0.48)	0.88–2.75
Amber	1.33 (0.14)	1.13–1.50	0.90 (0.13)	0.75–1.13	0.44 (0.22)	0.16–0.75
Mats	1.25 (0.16)	1.00–1.36	0.35 (0.09)	0.25–0.50	0.08 (0.07)	0.00–0.13

sequence was 100% for cue, wait time, questions, and feedback given. For Teacher 1, integrity on sequence of steps averaged 98.5% (range = 94.03–100%), and integrity on steps in the sequence averaged 100% for cue, wait time, and questions, and 94.03% for feedback. For Teacher 2, integrity on sequence of steps averaged 99.8% (range = 99.2–100%), and integrity on steps in the sequence was 100% for cue, wait time, and questions, and 99.2% for feedback (range = 97.6–100%). For Teacher 3, integrity on sequence of steps averaged 99.7% (range = 98.68–100%), and integrity on steps in the sequence averaged 100% for cue, wait time, and questions, and 98.68% for feedback (range = 97.36–100%).

Disruptive Behavior

Table 2 summarizes the means and ranges of disruptive behavior per minute, percentage of intervals of off-task behavior, and percentage of active student responses for the six students across the three types of opportunities to respond. For five out of six students, the mean rate of disruptive behavior per minute was less during the mixed responding condition than during individual responding or choral responding conditions. Because of the large variability and extreme scores in Teo's data, median scores rather than mean scores are reported (Borg & Gall, 1989).

Figure 1 depicts the rate of disruptive behavior per session for the six students. The level of disruptive behavior was typically lowest during mixed responding and highest during individual responding for all students except for Teo. With the exception of Teo, all the participants' data indicated stable trend lines with little variability.

Off-Task Behavior

Table 3 summarizes the mean scores and ranges of percentage of intervals of off-task behavior per type of opportunities to respond across students. Five out of six students demonstrated a lower mean percentage of off-task behavior in the mixed responding condition in comparison

with the individual and choral responding conditions. One student (Amber) demonstrated a slightly lower mean percentage of off-task behavior in the choral responding condition than in the mixed responding condition.

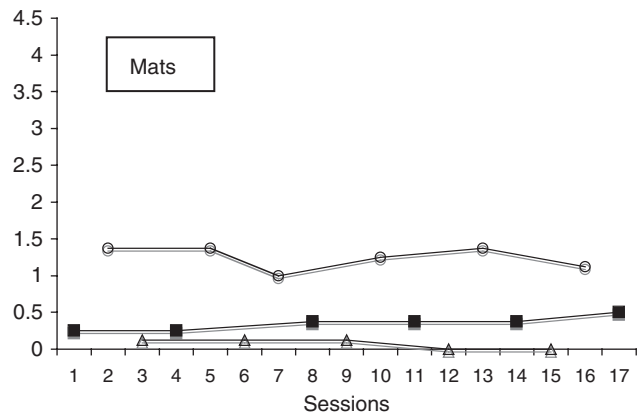
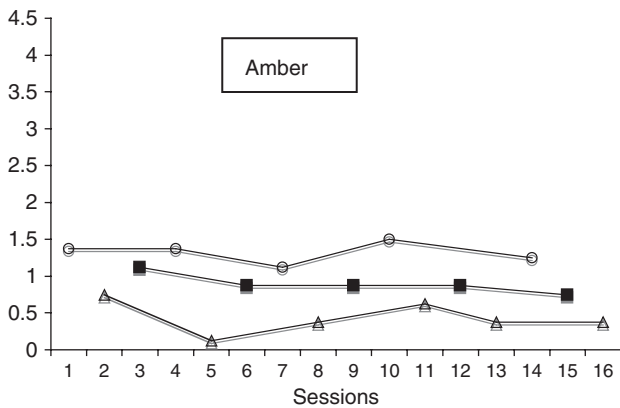
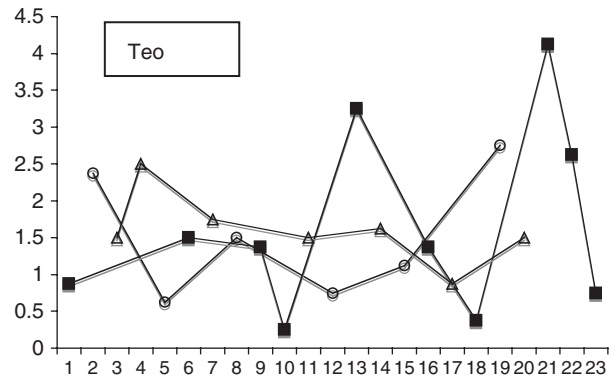
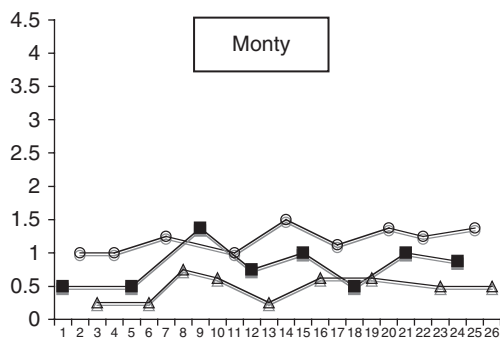
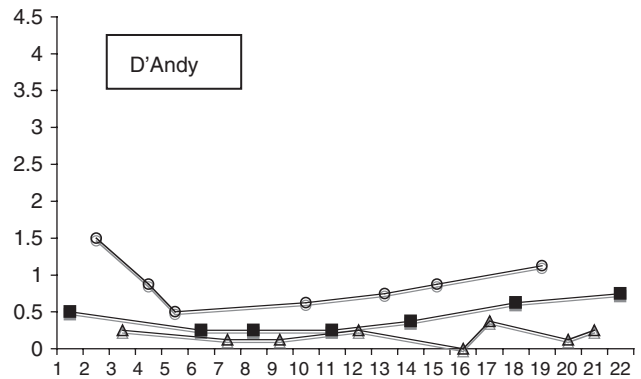
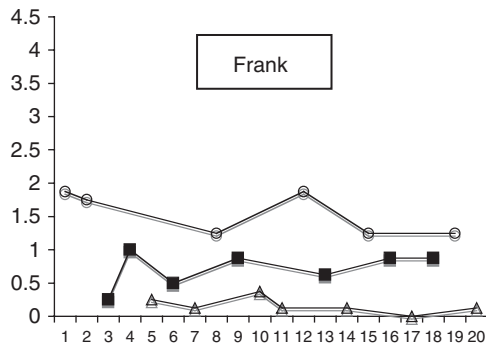
As indicated in Figure 2, the level of off-task behavior was typically lowest during the mixed responding condition for Frank, D'Andy, Monty, and Mats, whereas the level of off-task behavior was typically highest during the individual responding condition for Frank, Monty, Amber, and Mats. For Amber, the level of off-task behavior was lowest during the last two data points of the choral responding condition. For D'Andy, the level of off-task behavior was highest during the last two data points of the choral responding condition. Similar to disruptive behavior, Teo's data indicated a great deal of overlap between the conditions with no clear differences in magnitude, and with moderate to large variability.

Active Student Responding

The means and ranges for active student responses across the six participants are presented in Table 4. All six students demonstrated a higher mean percentage of active student responding in the mixed responding condition in comparison with the individual responding condition and a higher percentage of active student responding in the choral responding condition in comparison with individual responding. Results for active student responding between the mixed and choral responding were less clear. Three students (Frank, D'Andy, and Monty) demonstrated a higher mean percentage of active student responding in the mixed responding condition in comparison with the choral responding condition, whereas three students (Teo, Amber, and Mats) demonstrated a higher mean percentage of active student responding in the choral responding condition than in the mixed responding condition.

As indicated in Figure 3, the level of percentage of active student responding was typically highest during

Figure 1
Rate of Disruptive Behavior per Minute



the mixed responding condition for Frank, D'Andy, and Monty, whereas the level of percentage of active student responding was typically highest during the choral responding condition for Amber, Teo, and Mats. For Frank, Monty, Amber, and Mats, the level of percentage of active student responding was typically lowest and had the greatest amount of variability during individual

responding. The least amount of variability for the six participants occurred during mixed responding.

Social Validity

At the end of the study, all six teachers completed the social validity questionnaire, which consists of nine

Table 3
Means, Standard Deviations, and Ranges for Off-Task Behavior in Each Condition

Student	Individual		Choral		Mixed	
	<i>M</i> (<i>SD</i>)	Range	<i>M</i> (<i>SD</i>)	Range	<i>M</i> (<i>SD</i>)	Range
Frank	56.25 (6.85)	45.83–62.50	32.73 (5.60)	25.00–41.66	16.55 (7.91)	8.32–25.00
D'Andy	25.60 (6.56)	16.66–33.33	19.05 (5.82)	12.50–25.00	9.89 (4.42)	4.17–16.66
Monty	40.27 (10.21)	29.16–62.50	26.56 (7.69)	12.50–37.50	16.67 (9.32)	8.33–37.50
Teo	28.47 (20.65)	4.16–62.50	31.24 (20.72)	8.30–62.50	22.02 (9.54)	8.33–33.33
Amber	47.50 (15.21)	25.00–66.70	23.33 (6.97)	16.66–33.33	24.30 (7.17)	16.66–33.33
Mats	54.17 (9.86)	45.83–66.67	28.47 (9.29)	20.83–45.83	23.33 (5.59)	20.83–33.33

Table 4
Means, Standard Deviations, and Ranges for Active Student Responding in Each Condition

Student	Individual		Choral		Mixed	
	<i>M</i> (<i>SD</i>)	Range	<i>M</i> (<i>SD</i>)	Range	<i>M</i> (<i>SD</i>)	Range
Frank	22.31 (13.31)	12.5–46.15	69.34 (16.78)	44.73–89.18	84.35 (5.57)	76.31–94.73
D'Andy	89.32 (7.23)	74.28–94.73	93.25 (6.26)	81.57–100.00	97.28 (4.16)	88.88–100.00
Monty	60.19 (22.68)	33.33–91.89	84.2 (6.34)	71.42–91.66	90.50 (6.47)	77.77–100.00
Teo	82.20 (15.72)	52.63–94.44	93.79 (6.30)	82.60–100.00	84.28 (7.60)	72.72–94.17
Amber	58.10 (22.54)	34.14–92.10	96.38 (2.28)	94.87–100.00	87.65 (7.74)	80.55–97.14
Mats	42.20 (27.88)	13.04–67.50	75.27 (19.06)	40.00–94.44	62.80 (4.27)	56.41–67.50

questions with 4-point Likert-type scale responses ranging from 1 (*not at all*) to 4 (*very*). In response to which intervention was the most difficult to implement, four of six teachers thought the mixed responding was the most difficult to implement ($M = 2.33$; range = 1–3), one teacher believed choral responding was the most difficult, and one teacher replied that individual responding was most difficult to implement. Low mean scores ($M = 1.0$) on teachers' perceived difficulty with the study's procedures suggested that the teachers implemented individual and choral responding with ease. High mean scores ($M = 4.0$) suggested that teachers found the training sessions to be very helpful. Although teachers already implemented individual responding, the midrange scores for choral ($M = 2.83$; range = 1–4) and mixed ($M = 2.5$; range = 1–4) responding suggested that teachers might be likely to implement choral responding in the future.

Discussion

This study identifies several key findings. First, in terms of disruptive behavior, mixed responding appears to be a more effective instructional strategy than either choral or individual responding. Five of six students had lower mean rates of disruptive behavior during mixed

responding than during choral or individual responding. This finding supports Stevens and Rosenshine's (1981) strong recommendation for the use of mixed responding (70% choral, 30% individual). Second, results indicate that choral responding is a more effective instructional strategy than individual responding in terms of decreasing disruptive and off-task behavior. Five out of six participants had lower mean rates of disruptive behavior and lower mean percentages of intervals of off-task behavior during choral responding than during individual responding. This finding is consistent with earlier research (McKenzie & Henry, 1979; Sainato et al., 1987; Sindelar et al., 1986; Sutherland et al., 2003).

Differences between choral and mixed responding are less consistent for off-task behavior. Four students had fewer intervals of off-task behavior during mixed responding, and one student had fewer intervals of off-task behavior during choral responding. However, the group mean for intervals of off-task behavior during mixed responding was 18.8%, whereas the group means for off-task behavior during choral and individual responding were 26.9% and 42.0%, respectively. Given the criterion of 90% for student on-task behavior by the Council for Exceptional Children (1987), only the mixed responding condition (81.2%) somewhat approached

Figure 2
Percentage of Intervals Off-Task

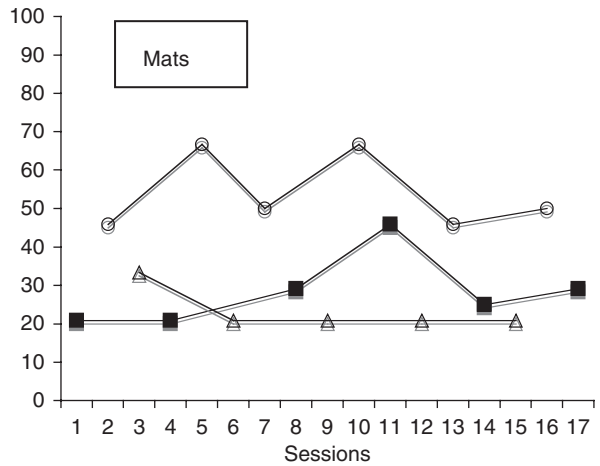
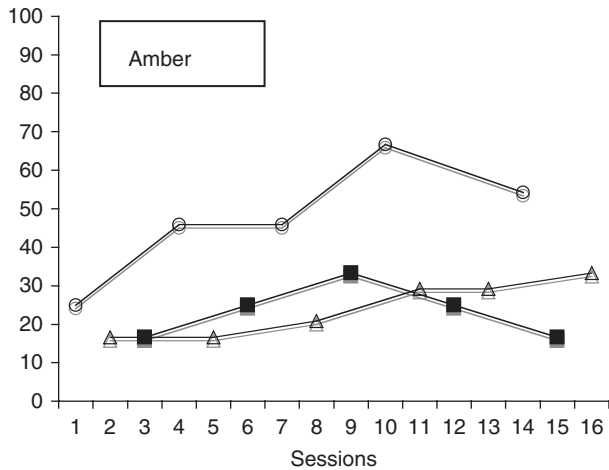
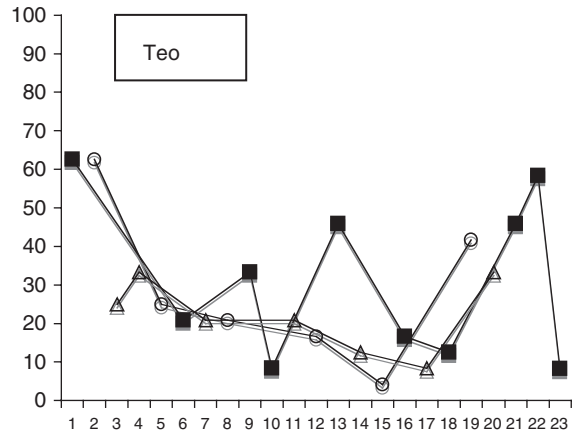
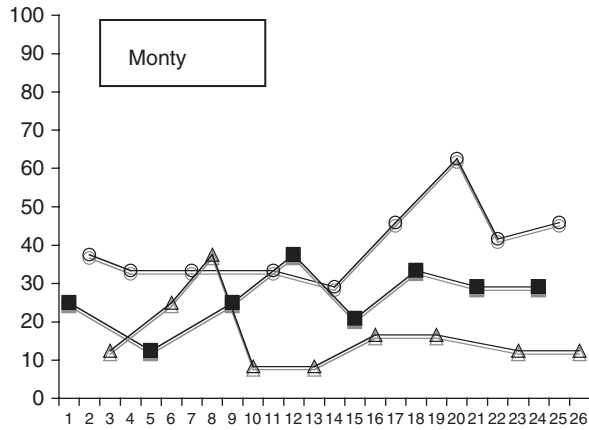
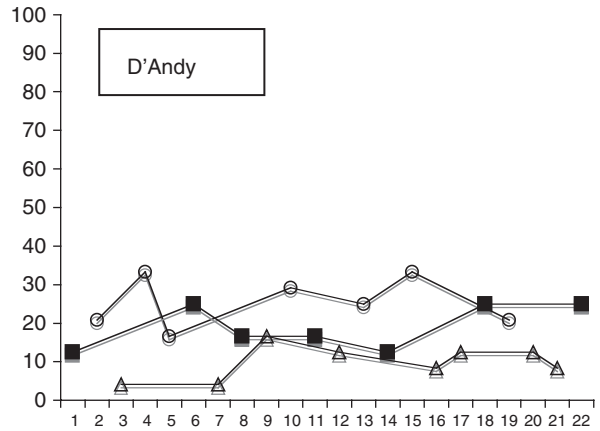
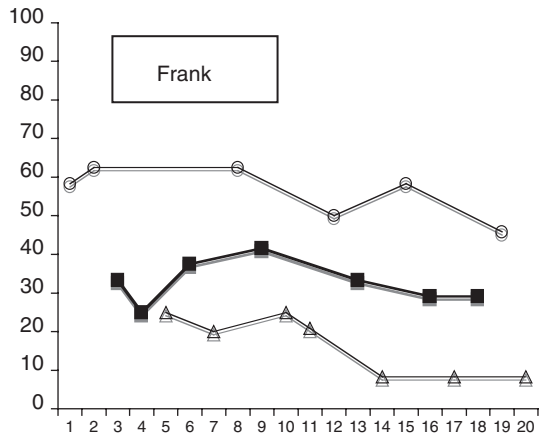
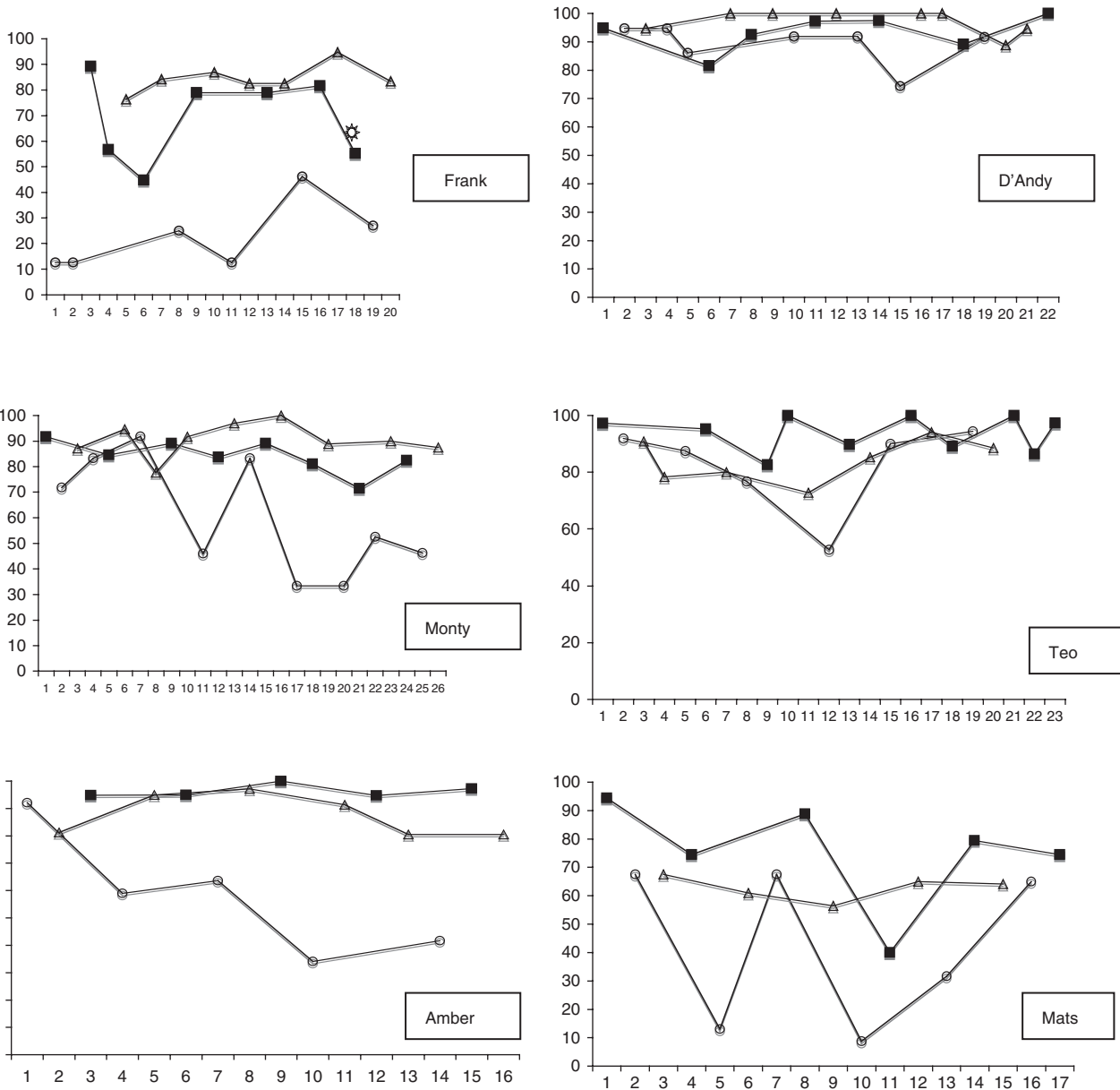


Figure 3
Percentage of Active Student Responding



CEC standards. However, in comparison with individual responding, there appears to be a measurable benefit (Horner et al., 2005).

For active student responding, three of six students had their highest mean percentages during mixed responding ($M = 90.7\%$), whereas three students had their highest mean percentages during choral responding ($M = 82.3\%$). In light of recommendations by the CEC (1987), these percentages approach or exceed the 85% criterion for student correct responses during review. However, the group mean for active student responding

during individual responding was lowest among the three conditions ($M = 59.1\%$), and this percentage was well below the criterion set by the CEC. In addition, mean percentages were highest for off-task behavior for all six participants during individual responding, again being consistent with previous research findings (McKenzie & Henry, 1979; Sainato et al., 1987; Sindelar et al., 1986; Sutherland et al., 2003).

The lack of differential effects across the three types of opportunities to respond on disruptive behavior and off-task behavior for one student, Teo, deserves further

attention. The mean rate of disruptive behavior was approximately equal across the three types of opportunities to respond. Teo's data for disruptive and off-task behavior among the three conditions show substantial variability and overlap. The high rates of Teo's disruptive behavior and off-task behavior may indicate that the instructional intervention of mixed or choral responding was not powerful enough to decrease his disruptive behavior and off-task behavior. For example, incidental observations indicate that during the teacher feedback procedure, Teo talked with a peer sitting next to him and the peer responded. It is possible that teacher prompts could have decreased the rate of Teo's disruptive behavior and frequency of off-task behavior. However, his teacher informally reported that she did not feel comfortable implementing and following up on negative consequences because she was not his homeroom teacher. Teo's disruptive and off-task behavior may also have been altered by the presence of setting factors (Davis & Fox, 1999). For example, Teo suffered from migraine headaches and this was not discovered until halfway through the study. Furthermore, the teacher indicated that she was aware of serious problem behavior during transition time before language arts.

Social validity data reveal that the six teachers felt that the study did not disrupt their classroom environment and that the training session was very helpful. All six teachers stated that they currently used individual responding and indicated that choral responding was easy to implement, supporting earlier research wherein teachers provided similar feedback (Sainato et al., 1987). Four of six teachers commented that mixed responding was the most difficult type of opportunities to respond to implement because they had to read a randomized list. Instead, these teachers endorsed approximating the 70% choral to 30% individual ratio from memory, indicating the acceptability of mixed responding as a teaching strategy (Schwartz & Baer, 1991). However, Teachers 1 and 6 reported that they would be very likely to use mixed responding in the future. Teacher 6 commented that the mixed responding had an "element of surprise" because students did not know if they were called on individually until the "very last second." After a visual inspection of the data, Teacher 1 stated that she would be very likely to use mixed responding in the future. Implementing increased rates of opportunities to respond that fit within the details of day-to-day classroom instruction and that do not radically alter teachers' curriculum are a few ways researchers can get teachers to maintain evidence-based practices in their classrooms (Gersten, Vaughn, Deshler, & Schiller, 1997).

It is interesting that most teachers' perceptions of the effects of the three types of opportunities to respond on the dependent variables were not confirmed by the data. For example, among the five teachers where mixed responding produced the lowest rate of disruptive behavior, only Teacher 3 had noticed decreases in disruptive behavior after implementing the mixed responding procedure; the other four teachers believed choral responding produced the largest effect. The fact that the teachers did not reliably discern the differential effects of the three different teaching strategies makes a strong case for using data collection and using objective criteria to make decisions about student classroom behavior (Witt, VanDerHyeden, & Gilbertson, 2004).

Although mixed responding appeared to be more effective in reducing disruptive behavior than choral and individual responding for five out of six students, a few limitations may temper the power of the statements that can be made as a result of this study. First, as is inherent in all single subject research designs, the small sample size limits the generalizability of the findings. Thus, generalization to other academic activities and other settings, or to students by age, grade, gender, or learning histories, requires systematic replication (Kazdin, 1982). However, obtaining similar responses across individuals and two different types of schools suggests that the effect of mixed responding might be generalizable (Trolinder, Choi, & Proctor, 2004).

Second, there are several overlapping data points among the participants' dependent variables with active student responding during choral and mixed responding. Thus, it is difficult to determine which instructional strategy is most effective in increasing active student responding. Third, although two observers were used to assess treatment integrity data and IOA was 100%, only 15% of the treatment sessions were observed.

Fourth, teacher implementation of contingent consequences outside of the learning trial was not recorded. Therefore, the extent of teacher use of individual attention, punishment, or extinction on the outcomes of the dependent variables is not known. For example, teacher attention may have affected the percentage of intervals of off-task behavior. Skinner and colleagues (1994) noted a similar limitation and reported in their study that individual attention might have been functionally related to high rates of attention to tasks.

As a logical next step, further research could compare choral responding with mixed responding: with students of different ages and across various subject areas such as math and science (Carnine, 1976), across sessions of more than 8 minutes (Sainato et al., 1987), and with children

identified with various learning disabilities or with autism (Koegel, Dunlap, & Dyer, 1980). These extensions would help establish and verify the conditions under which varying types of responding are more effective and efficient.

In addition, further research would do well to include summative assessments at the end of the study to measure the effect of the three types of opportunities to respond on individual student learning. For example, researchers could examine the influence of the three types of opportunities to respond on sight word acquisition and then measure increases in reading comprehension or sight word vocabulary (Skinner & Shapiro, 1989). Because the effects of the three types of opportunities to respond on one student were inconclusive, researchers could use functional assessments to gather information on the antecedent and consequent events that are associated with the occurrence of challenging behaviors in combination with instructional strategies (Scott & Kamps, 2007). In addition, social validity could be obtained from the students' perspective as part of future directions. Finally, researchers should continue to investigate an optimal rate of opportunities to respond on the percentage of correct responses and error rates (West & Sloane, 1986).

Implications for Practice

Before implementing the mixed and choral responding procedures, teachers could consider that for a few students who lack impulse control, the implementation of precorrection strategies (i.e., reminding students to remain quiet after each response and to use inside voices) may be needed. The long-term benefits of using a systematic questioning strategy may outweigh the initial time involved to acquire a new instructional technique. These benefits include the following: students can respond up to three or four times more (depending on group size) during choral responding than during individual responding (Sindelar et al., 1986), and teachers could use mixed and choral responding to reduce disruptive and off-task behavior and reduce the amount of time students passively attend during instruction (Sterling, Barbetta, Heward, & Heron, 1997).

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