


# Increasing Opportunities to Respond for Students With Internalizing Behaviors: The Utility of Choral and Mixed Responding

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## Abstract

Increasing students' opportunities to respond (OTR) is a low-intensity strategy effective in increasing engagement. Building on the work of Haydon and colleagues, we compared two types of OTR, choral and mixed (70% choral, 30% individual), to examine the utility of these strategies in increasing active student responding and accuracy during mathematics for two elementary-age students with internalizing behaviors. Results indicated the general education teacher implemented both OTR strategies with high fidelity with limited university support. However, results of this alternating treatment design were unable to distinguish either choral or mixed responding as superior to the other. Results suggested one student showed high active student responding with less than 80% accuracy, whereas the other student was highly accurate but responded less than 75% of the time. In the discussion, we highlight reasons why the two OTR strategies had similar effects on student outcomes, consider implications of these findings, and provide direction for future inquiry.

## Keywords

low-intensity supports, opportunities to respond, academic engagement, null result

Increasing opportunities to respond (OTR) is a relatively effective, user-friendly instructional strategy that addresses lesson pacing and supports engagement. OTR was first used to improve the achievement of students with special needs (e.g., Sutherland & Wehby, 2001). Subsequent research has shown OTR is also effective in general education classrooms and inclusive settings (MacSuga-Gage & Simonsen, 2015). The strategy is used with specially designed instructional activities allowing students frequent opportunities, within a set time period, to provide a verbal (e.g., individual hand-raising, choral responding), written (e.g., response cards), or gestural (e.g., thumbs up/down) response to teacher questions or prompts about targeted academic content. The goal is to deliver lessons that promote high levels of student engagement, facilitate a decrease in off-task behavior, as well as offer increased practice with the lesson content (Simonsen, Fairbanks, Briesch, Myers, & Sugai, 2008).

Montague and Bergeron (1997) suggested students who are not engaged academically most of the time tend to be passive learners; give up easily when confronted with challenging tasks; become anxious, withdrawn, and frustrated;

and experience poor academic outcomes. Yet, when teachers provide a high rate of OTR during instruction, students are more engaged, provide a greater number of correct responses, and receive more positive feedback than passive learning opportunities (Simonsen et al., 2008; Vaughn, Wanzek, & Denton, 2007).

In addition to whole-group instruction (Haydon, Mancil, & Van Loan, 2009), OTR can be used with small groups (Carnine, 1976); between peers, such as in Classwide Peer Tutoring (Veerkamp, Kamps, & Cooper, 2007); and through structured activities such as guided notes (Mastropieri, Scruggs, Spencer, & Fontana, 2003) and computer gaming

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(Haydon, MacSuga-Gage, Simonsen, & Hawkins, 2012). Stichter et al. (2009) reported naturally occurring OTR in elementary classrooms averaged 2.61/min ( $SD = 0.66$ ). When increasing OTR in the classroom, teachers must create a balance between setting a pace that is brisk with sufficient momentum, but not so rapid that students become lost or overwhelmed. Most recent recommendations for an optimal rate of OTR is 3.5 OTR per minute (Stichter et al., 2009). This rate is lower than previous recommendations (Council for Exceptional Children, 1987), but is supported by results suggesting nominal differences in student on-task behavior between three and five OTR per minute (Sainato, Strain, & Lyon, 1987).

Studies on OTR demonstrate improvements in student outcomes across a range of student characteristics, settings, and student response modalities. OTR strategies have been effective with students who are off-task (Wood, Mabry, Kretlow, Lo, & Galloway, 2009) students with or at risk for emotional or behavioral disorder (EBD; Haydon et al., 2010; Haydon et al., 2009), and students displaying low academic achievement (Carnine, 1976). OTR strategies have been implemented in preschool (Godfrey, Grisham-Brown, Schuster, & Hemmeter, 2003), elementary (Lambert, Cartledge, Heward, & Lo, 2006), and secondary (Haydon & Hunter, 2011) settings. Across the K–12 continuum, OTR has supported students in general education (Narayan, Heward, Gardner, Courson, & Omness, 1990), inclusive education (Wood et al., 2009), and self-contained classrooms (e.g., Sutherland, Alder, & Gunter, 2003). Studies have consistently shown increasing students' OTR leads to positive outcomes, including more frequent student participation (Haydon & Hunter, 2011), better academic performance (Munro & Stephenson, 2009), and decreases in undesired social behavior (e.g., disruption; Lambert et al., 2006).

OTR may also hold promise for supporting the achievement of students with internalizing behavioral concerns (e.g., anxiety, extreme shyness) who often have lower levels of engagement in instruction (Hughes & Coplan, 2010). To date, little research has examined OTR for students with these concerns. Research is warranted given internalizing behaviors have been associated with lower teacher perceptions of student academic competence and the type of feedback teachers use (Rudasill et al., 2014). For example, a student with extreme shyness, who is passive in the classroom or experiencing performance anxiety, may be interpreted by the teacher as having low motivation or not understanding the content (Hughes & Coplan, 2010). This can negatively affect student–teacher relationships and reduce the number of interactions, offering fewer social and academic opportunities (Buhs, Rudasill, Kalutskaya, & Griese, 2015).

Haydon et al. (2010) compared the effects of three types of responding: individual, choral, and mixed (both individual and choral) on sight words and syllable practice with six

elementary students with behavior challenges. Results suggested individual responding was the least powerful. Across choral and mixed responding conditions, the majority of students had lower levels of both off-task and disruptive behavior in comparison with individual responding conditions. Results were less clear when comparing choral and mixed responding. Four students had lower levels of off-task behavior during mixed responding, and one student had lower levels of off-task behavior during choral responding; where half the students had higher levels of active student responding in either choral or mixed responding. Haydon et al. suggested an important next step was to compare choral responding with mixed responding in other content areas, with longer sessions ( $>8$  min), and with students with other challenges—a charge we addressed in this study.

In terms of supporting students with internalizing behaviors, choral responding may offer students the opportunity to participate by reducing the fear of failure or harm. It may be students with internalizing behaviors feel more comfortable and perform better in choral or mixed responding conditions by reducing the fear of failure (Crozier & Hostettler, 2003). The choral OTR strategy may offer students with internalizing behaviors a way to engage in instruction and receive reinforcement for participation that does not require them to be singled out (Simonsen et al., 2008). In contrast, it is possible that the individual responding required during mixed responding conditions may be perceived as aversive by students with internalizing behaviors. As such, we conducted this study to compare these two variations: choral and mixed responding. Specifically, we sought to determine if choral responding would yield more desirable outcomes for students with internalizing behavior patterns when compared with mixed responding, given choral responding could enable engagement in a manner that allows students to escape social attention resulting from being asked to provide individual responses during mixed responding conditions (Umbreit, Ferro, Liaupsin, & Lane, 2007).

## Purpose

This study built on the work of Haydon et al. (2010) to address three objectives. First, we compared choral responding and mixed responding during daily math instruction for two fourth-grade girls with higher than average levels of internalizing behaviors by monitoring students' active responding and accuracy. Individual responding was not compared in the present study based on Haydon et al.'s (2010) original findings showing it to be less effective in comparison with either choral and mixed responding toward improving student responding, disruptive behavior, and off-task behavior. Including individual responding would have raised ethical considerations given previous inquiry established limited utility of this approach. Second, we examined

**Table 1.** Characteristics of Student Participants.

Variable	Student	
	Jackie	Meg
<b>Demographics</b>		
Age	9	10
Gender	Female	Female
Ethnicity	Multiracial	White
Receiving special education services	No	No <sup>a</sup>
<b>Screening</b>		
SRSS-IE—Winter		
SRSS-E7	2	2
SRSS-I5	9	4
<b>Fall trimester report card</b>		
Works independently	PR	PR
Math	A-	B
<b>AIMSweb (mathematics)—Winter</b>		
Concepts and applications (percentile)	43–48	82–84
Computation (percentile)	45–46	13
<b>SSIS rating scales (standard scores)</b>		
<b>Teacher</b>		
Social skills	77 (below average)	92 (average)
Problem behaviors	116 (above average)	112 (average)
Academic competence	88 (average)	75 (below average)
<b>Parent</b>		
Social skills	74 (below average)	93 (average)
Problem behaviors	125 (above average)	98 (average)
<b>Instructional sessions attended</b>		
% sessions observed: Fidelity (n)	100 (16)	100 (16)

Note. SRSS-IE = *Student Risk Screening Scale—Internalizing and Externalizing* (adapted from Drummond, 1994); PR = progressing; SSIS = *Social Skills Improvement System—Rating Scale* (Gresham & Elliott, 2008); SRSS-E7 = *Student Risk Screening Scale—Externalizing* (cut scores: 0–3 = low risk, 4–8 = moderate risk, 9–21 high risk); SRSS-I5 = *Student Risk Screening Scale—Internalizing* (cut scores: 0–1 = low risk, 2–3 = moderate risk, 4–5—high risk; Lane et al., 2016).

<sup>a</sup>Meg, later in year, received special education classification of specific learning disability in math calculation and problem solving.

the extent to which this low-intensity strategy could be implemented with treatment integrity within the general education setting with only limited university support. Third, we examined social validity by assessing teacher and student perspectives prior to and following intervention completion to examine whether this strategy could be implemented in a feasible manner, particularly given school personnel were responsible for all aspects: delivering the intervention, monitoring integrity, assessing student performance, and examining social validity. Specific research questions included the following:

**Research Question 1:** Did choral responding yield improvement in student outcomes relative to mixed responding?

**Research Question 2:** To what extent were these low-intensity strategies implemented with integrity?

**Research Question 3:** To what degree did stakeholders view the low-intensity strategies as feasible?

## Method

### Participants and Setting

**Students.** Participants were two fourth-grade girls: 9-year-old Jackie and 10-year-old Meg. Both students attended a large, public, suburban elementary school in the Midwest (see Table 1). Students were selected for participation using systematic screening criteria, examining behavioral concerns and work habits (inclusion criteria to follow). Both students were typically developing and neither were receiving supplemental supports nor special education services at the beginning of the study. Meg was being closely monitored for needing supplemental supports in the area of mathematics as part of the school's response to intervention process. During the study, Meg qualified for special education services under the specific learning disability category in the areas of math calculation and problem solving as determined by a multidisciplinary team.

**Table 2.** Characteristics of Teacher Participants and Knowledge, Confidence, and Use of Low-Intensity Support Strategies.

Variable	Teacher primary role		
	General educator	Special educator	Administrative intern
<b>Demographics</b>			
Age	25	34	39
Gender	Female	Female	Female
Ethnicity	White	White	White
Years teaching experience	3	11	16
Years teaching current school level	3	7	16
Certified in the area currently teaching	Yes	Yes	Yes
Highest degree earned	Bachelor's	Master's	Master's
Completed course in classroom management	Yes	Yes	Yes
Professional development in academic screening	Yes	Yes	Yes
Professional development in behavior screening	Yes	Yes	Yes
<i>M (SD)</i>			
<b>Low-intensity support strategies survey</b> (Lane, Oakes, & Ennis, 2013)			
Knowledge	2.4 (0.52)	3.0 (0.00)	2.9 (0.32)
Confidence	2.2 (0.42)	3.0 (0.00)	2.8 (0.42)
Use	2.5 (0.53)	3.0 (0.00)	2.4 (0.70)
<b>Opportunities to respond item</b>			
Knowledge	2	3	3
Confidence	2	3	3
Use	2	3	2

Note. Scores from the Low-intensity Support Strategies Survey range from 0 to 3, with 3 indicating higher levels.

**Educators.** Educators were a fourth-grade general education teacher, a special education teacher, and an administrative intern (see Table 2). The fourth-grade teacher was in her third year of teaching and was dual certified in general elementary education and special education. The special education teacher was in her 11th year of teaching, with a teaching credential and master's degree in special education. The administrative intern provided a range of supports to teachers and the principal, such as leading the prereferral team, assisting the principal with daily tasks, and providing professional learning on research-based practices. The administrative intern was in her 16th year of teaching and in her first year as administrative intern. She was an instructional support teacher and before that a general education elementary teacher. She held a teaching credential and master's degree in leadership.

**Setting.** This suburban elementary school was located in the Midwestern region of the United States, serving 578 kindergarten through fifth-grade students (71.11% White, 22.49% Asian/Pacific Islander, 5.19% Multiracial, 0.87% Hispanic, and 0.34% Black), with 3.11% of students eligible for free or reduced-price lunches (National Center for Education Statistics, 2013–2014). The inclusive fourth-grade class in this study had 21 students (11 boys). The intervention occurred during math block: 90 min at the beginning of

each school day. A math workshop model served as the framework for lessons, which involved an opening, introduction, minilesson, explore/work time, and reflection/sharing time. The teacher also used a gradual release of responsibility framework so that the students had a teacher model, whole-group guided practice, and independent or group exploration time to apply the concept or skill. Lessons were aligned with state and national standards, priorities, and practices. Students worked in different places around the room: independent or group work at tables, minilesson on the carpet in front of the board, and lesson practice around the room. The school did not have school-wide behavioral components, though the fourth-grade classroom had a whole-class token economy system and established expectations (respect yourself, respect others, and respect the school).

**Student inclusion criteria.** Data collected as part of regular school practices were used to determine which students might benefit from this particular intervention. Specifically, behavior screening and report card data were used to detect students with internalizing behavior challenges as well as challenges working independently (as assessed on the report card). The teacher reasoned this indicator of working independently was most closely related to students' level of academic engagement. Inclusion criteria were as follows: (a)

scoring in the moderate or high risk category on the internalizing dimension of the *Student Risk Screening Scale—Internalizing and Externalizing* (SRSS-IE), and no indication of concern on the externalizing dimension; (b) earning a progressing or limited progress grade on works independently per the fall 2014 trimester report card (suggesting moderate or substantial challenges regarding academic engagement); (c) passing grades in math instruction on the fall 2014 trimester report card (an A - for Jackie and a B for Meg, indicating they were able to successfully participate in the math lessons—performance deficit rather than acquisition deficit); and (d) parental consent and student assent.

**SRSS-IE.** The SRSS-IE12 is an adapted version of the *Student Risk Screening Scale* (Drummond, 1994). SRSS-IE elementary version includes the original seven items and five new items reflecting internalizing behaviors (Lane et al., 2012). The SRSS-IE12 contains two subscale scores: the SRSS-E7 and the SRSS-I5. The SRSS-E7 includes the original seven items: (a) steal; (b) lie, cheat, sneak; (c) behavior problems; (d) peer rejection; (e) low academic achievement; (f) negative attitude; and (g) aggressive behavior. The SRSS-I5 includes five items: (a) emotionally flat; (b) shy, withdrawn; (c) sad, depressed; (d) anxious; and (e) lonely. Teachers independently rate each student on each item using the original 4-point, Likert-type scale: *never* = 0, *occasionally* = 1, *sometimes* = 2, and *frequently* = 3. SRSS-E7 and SRSS-I5 subscales are computed by summing items, which place students into one of three risk categories (SRSS-E7: 0–3 low, 4–8 moderate, and 9–21 high risk for antisocial behavior; SRSS-I5: 0–1 low, 2–3 moderate, and 4–15 high risk for internalizing behaviors). Cut scores for the internalizing subscale were determined through a convergent validity study with the Teacher Report Form (Achenbach, 1991; see Lane, Oakes, et al., 2015).

## Procedures

The general education teacher previously participated in *Empowering Teachers with Low-Intensity Strategies to Support Instruction*, an institutional review board approved project to develop the knowledge base regarding low-intensity, teacher-delivered supports. During the prior year, she participated in a study on instructional choice (Lane, Royer, et al., 2015). After learning this strategy, she expressed an interest in exploring additional strategies to add to her instructional repertoire.

After securing district and site-level approvals to participate in this multisite project, one of the principal investigators worked with the general education teacher to determine intervention focus and which students might benefit from participation. The general education teacher expressed an interest in focusing her intervention efforts with a goal of

supporting students with internalizing behaviors to become more active in their participation. The fourth-grade general education teacher, special education teacher, and administrative intern (hereafter referred to as the intervention team) completed a brief survey, *Low-Intensity Support Survey Self-Assessment: Knowledge, Confidence, and Use* (Lane, Oakes, & Ennis, 2013). This survey examines teachers' knowledge, confidence, and perceived utility of 10 low-intensity supports: behavior specific praise, active supervision, OTR, precorrection, instructional choice, instructive and corrective feedback, group contingencies, proximity, self-monitoring, and behavior contracts. Teachers rate each item using a 4-point Likert-type scale ranging from 0 to 3, with higher scores indicating greater knowledge about the strategy, higher confidence in their ability to implement the strategy, and more positive views that the strategy would be useful in their teaching (see Table 2). Scores were reviewed with the general education teacher during a planning meeting and collectively a decision was made to explore increasing students' OTR.

Then, she analyzed winter screening data in conjunction with other data collected as part of regular school practices to detect students with limited participation in math instruction. Two such students were identified and invited to participate.

A consenting meeting was held with the three educator participants using Skype to explain the purpose of the study and answer questions. All three teachers consented, and instructions were provided on how to send home the parental consent letters to the parents of these two students. Parental consent letters were mailed in a package to the general education teacher prior to the consenting meeting. Student names were provided to the principal investigators (PIs) after securing parent consent. One parent contacted the PI to ask questions regarding time commitments prior to consenting. One PI assented students individually using the same web-based technology and in the presence of the general education teacher. Both parents consented and children assented.

## Baseline Procedures

For alternating treatment design, baseline conditions are optional (Gast & Ledford, 2014). Contextual variables such as business as usual practices and other dimensions that are consistent across treatment conditions can be monitored in an effort to combat threats to internal validity. For this study, intervention procedures were implemented during a 90-min math class. Math started with an opening, such as students entering the classroom and beginning a problem of the day. Then there was an introduction to the lesson. Examples of introductions included telling a story related to the math topic of the day or a video clip that got students thinking about the math content of the lesson. Next, the teacher

conducted a minilesson, which included teaching of the math vocabulary, content, and processing what the students needed to learn to be successful with the lesson tasks. A guided practice element to the minilesson was almost always present. At the end of the minilesson, the teacher presented students with explore/work time tasks. At the end of the lesson or throughout the explore/work time, depending upon what students needed to be successful in the tasks, the class stopped working for reflection/sharing time. Students would come to the carpet and volunteer to share their strategies for solving the problem(s). Only students who showed the need for more individualized behavioral supports beyond the whole-class token economy received them.

### **Intervention Procedures**

**Intervention conditions.** Intervention procedures closely paralleled the procedures presented by Haydon and colleagues (2010). The OTR intervention occurred after the opening to math block and before the minilesson as it was used as a review session for students. The general education teacher identified 16 days during which this intervention would be tested and randomly selected 8 days for choral responding and 8 days for mixed responding by putting the 16 dates into a container. The first 8 days picked out of the container were determined to be choral responding days. During choral and mixed responding conditions, the general education teacher implemented a four-step sequence of (a) posing a question to the class and mentioning whether it would be for the whole class or an individual student to respond, (b) cueing the students verbally “5–4–3–2–1” to offer wait time, (c) providing feedback as to whether or not the answer was correct (e.g., “That is correct,” or “That is not correct. The correct answer is \_\_\_\_.”), and (d) posing another question and beginning the next learning trial (Haydon et al., 2010; Heward, Courson, & Narayan, 1989).

A question library of measurement review questions was developed by the first author (e.g., “What is the smallest unit? (a) centiliter, (b) milliliter, (c) deciliter, (d) liter”). The questions posed during the 10-min OTR sessions focused on a review of measurement concepts including metric and customary units of length, volume, time, and mass. Questions surrounding current math vocabulary, conversions between units within the same system of measurement, and practice determining which unit of measurement is appropriate to use in different scenarios were included in the question bank. Questions are available upon request. The only difference between conditions was the provision of whether the question was for either (a) the whole class to respond in unison or (b) for an individual student, as specified during the initial posing of the question. Students created their own response cards (e.g., A, B, C, and D cards) to be used and held up across OTR strategies. For both choral and mixed responding, students responded using these response cards. The general education teacher explained the

two types of responding to the class—choral and individual, and they practiced the responding conditions during the math block prior to the first intervention session. Before each session, the teacher reminded students of the procedures for responding.

**Choral responding.** Choral responding refers to questions posed to the class for all students to respond. For the choral responding condition, the teacher explained the expectations, procedures, and rules (mainly for the cueing procedures), and then read from a list of questions developed by the teacher with assistance from the researcher. The teacher used the phrase “this is for the class,” posed the question verbally and projected the question with answer choices on a SMART board, counted down from five, cued the whole class to respond, and provided feedback on whether the class’s answer was correct or incorrect. During this condition, 30 questions were targeted during the 10-min session. In actuality, the general education teacher provided 34 to 39 choral response questions.

**Mixed responding.** Mixed responding refers to questions posed to either the whole class or toward an individual student (70% choral, 30% individual). For the mixed responding condition, the teacher explained the expectations, procedures, and rules (mainly for the cueing procedures), and then read from the list of questions. For the individual responding questions, each time a question was posed the teacher said, “This is for one person,” posed the question verbally and projected the question with answer choices on a SMART board, counted down from five, called on a student, and provided feedback on whether the student’s answer was correct or incorrect. For choral responding questions, the teacher followed the procedures described in the previous paragraph, saying “This is for the class.” At the onset of the study, the research team set a goal of using a questioning ratio of 70% choral to 30% individual at a rate of approximately three to four OTR per minute (Stevens & Rosenshine, 1981). This yielded a target of approximately 21 choral responses to nine individual responses for the 10-min session. During the individual responding, the goal was for three questions to be asked of Jackie, three of Meg, and the other three to be distributed among the remaining students in the class. On the back of the review questions, the classroom teacher made a note of which questions were for the target students, which were for other students, and which were choral questions ahead of time. During this condition, the goal for total exposure to questions for Jackie and Meg was ~24 for the 10-min session (21 choral and three individual).

**Intervention team training.** Prior to implementing the intervention, the intervention team listened to a narrated PowerPoint describing OTR procedures, treatment integrity protocols, and completed a 15-item quiz that included questions specific to OTR strategy and procedural integrity

(e.g., implementation, design, data collection, treatment integrity). All three scored 93% on this check for understanding. This was followed by watching an OTR training video provided by Haydon to observe how the strategy was implemented in a whole-class format. Next, the general education teacher practiced each OTR condition using the four-step sequence (pose question, cue and wait, offer feedback, and posit the next question) as described. The teacher practiced the intervention strategy and data collectors completed reliability training across measurement systems (e.g., treatment integrity and dependent variables) until reaching mastery, defined as three consecutive, 5-min practice sessions at 85% accuracy or above.

### Descriptive Measures

**AIMSweb.** AIMSweb is a curriculum-based measurement (CBM) and general outcome measurement used for universal screening and progress monitoring of overall performance of key foundational skills (Pearson Education, 2014). AIMSweb is available for reading, language arts, and math through Grade 8. AIMSweb Mathematics Concepts and Applications (M-CAP; Pearson Education, 2012) is a problem-solving measure through the areas of number sense, operations, patterns and relationships, measurement, geometry, and data and probability for Grades 2 to 5. AIMSweb Mathematics-Computation (M-COMP; Pearson Education, 2012) is a measure of basic facts, complex computation, decimals, and fractions for Grade 4. The M-CAP and M-COMP are psychometrically valid and reliable (e.g., alternate form reliability of .80–.86 and .82–.90 across Grades 1–8, respectively; convergent validity demonstrated by correlations with Mathematics Assessment and Diagnostic Evaluation of .73–.84 for Grades 1, 3, and 8).

**The Social Skills Improvement System—Rating Scales (SSIS-RS).** The SSIS-RS is a nationally norm-referenced, diagnostic tool to assess social skills, problem behaviors, and academic competence (Gresham & Elliott, 2008). The teacher version is designed for teachers to use with students ranging in age from 3 to 18 years. The parent version offers input on social skills and problem behaviors. Information can be used to inform the development of secondary interventions targeting academic, social, and behavioral performance. Psychometric studies establish the SSIS-RS as a reliable and valid tool (Gresham, Elliott, Vance, & Cook, 2011). This information provided reliable, descriptive data of students' skill sets.

### Measurement of Dependent Variables

All observation sessions occurred for 10 min. While the general education teacher conducted this review session, the special education teacher and administrative intern served as

primary and secondary data collectors, respectively, using paper-pencil techniques. Across dependent measures, real-time data were counted per occurrence using direct sequential recording of the teacher's use of OTR (see treatment integrity) and students' active responding and accuracy for each question posed.

**Active student responding.** Active student responding referred to engaging in the behaviors expected for the OTR condition including (a) responding in unison with the group for the choral responding condition and (b) responding as requested (for individual questions, responding individually by independently holding up the card with answer choice A, B, C, or D and responding verbally; for choral questions, responding in unison with the group) for the mixed responding condition (Godfrey et al., 2003). Active student responding was measured using a percentage formula by counting the number of active student responses by student and dividing those numbers by the total number of questions the student was exposed to.

**Accuracy.** Accuracy was measured by indicating whether the students answered each question correctly, incorrectly, or did not respond when it was expected. Students were expected to respond to all questions during the choral questioning as well as when they were called upon individually during individual questioning. Accuracy was measured using a percentage formula by counting the number of correct responses by student and dividing those numbers by the total number of questions the student was exposed to.

**Interobserver agreement (IOA).** IOA was obtained during 37.5% of each condition (three out of eight choral sessions, three out of eight mixed sessions). Agreement for each student was computed by dividing the smaller total of occurrence of responses by the larger total occurrence of responses and multiplying by 100 to obtain a percentage (range = 0%–100%). IOA for active student responding across conditions was as follows: choral (Jackie:  $M = 96.00$ ,  $SD = 0.00$ ; Meg:  $M = 98.00$ ,  $SD = 2.00$ , range = 96.00%–100%) and mixed (Jackie:  $M = 97.33$ ,  $SD = 1.15$ , range = 96.00%–98.00%; Meg:  $M = 97.33$ ,  $SD = 3.06$ , range = 94.00%–100%). IOA for accuracy across conditions was as follows: choral (Jackie:  $M = 96.00$ ,  $SD = 2.00$ , range = 94.00%–98.00%; Meg:  $M = 95.33$ ,  $SD = 4.16$ , range = 92.00%–100%) and mixed (Jackie:  $M = 96.67$ ,  $SD = 2.31$ , range = 94.00%–98.00%; Meg:  $M = 95.33$ ,  $SD = 4.16$ , range = 92.00%–100%).

### Treatment Integrity

In addition to clearly defined procedures for the intervention practice, treatment integrity data are needed to make accurate decisions about the effect of the intervention (Hagermoser Sanetti, Gritter, & Dobe, 2011).

*Teacher self-report component checklist: Baseline and OTR strategies.* The general education teacher used two component checklists to monitor baseline conditions and OTR strategies. First, she made a component checklist (eight items) of daily components of baseline procedures and monitored the extent to which these practices remained in place across the 16 OTR sessions. This was done to make certain other regular practices during the math block remained in effect, with the only change being the introduction of the OTR conditions. The general education teacher additionally completed a component checklist of OTR procedures to determine the extent to which each OTR strategy was in effect during each of the 16 intervention sessions (Lane, Menzies, Ennis, & Oakes, 2015). This component checklist (10 items) included general procedural items pertaining to preparing the math questions, maintaining a presentation rate of three OTR per minute overall and, for each target student, students' understanding of how to use the response cards and following the OTR sequence.

*Outside observer direct observation: OTR condition, ratio, sequence, and rate.* The primary observer recorded treatment integrity of OTR condition, ratio, instructional sequence, and rate across all 10-min OTR intervention sessions. Treatment integrity for implementing the correct OTR condition (choral or mixed) was calculated by adding the number of sessions correctly implemented, dividing by the total number of sessions, and multiplying by 100. For OTR ratio, treatment integrity of choral cueing was calculated by adding the number of choral cues asked, divided by total number of questions asked in a session, and multiplying by 100. Treatment integrity of individual cueing was calculated by adding the number of individual cues asked, divided by total number of questions asked in a session, and multiplying by 100. We also computed the percentage of individual cueing offered to each student to determine if the 10% criterion (three individual questions per mixed session per target student) was achieved. For OTR instructional sequence, treatment integrity was recorded by the occurrence or nonoccurrence of each step in the OTR instructional sequence: cueing students, providing wait time by counting down from five, providing feedback on accuracy, and moving on to the next question. Treatment integrity was calculated by adding the number of sequences correctly delivered, dividing by the total number of sequences delivered, and multiplying by 100. OTR rate was calculated for each condition to ensure both conditions had comparable rates. Rate was computed by summing the number of choral response opportunities and individual response OTR and dividing the value by the total duration of observation session. IOA for these fidelity measures was collected by a secondary observer on the same days that IOA data on the dependent variables were collected. IOA was computed by dividing the smaller number by the larger number and multiplying by 100.

## Social Validity

We assessed social validity prior to beginning and after completing the testing of the two OTR conditions. The intervention team individually completed the Intervention Rating Profile (IRP-15; Witt & Elliott, 1985) to obtain their views regarding the importance of intervention goals, acceptability of the procedures, and importance of the outcomes. Teachers rated 15 statements on the IRP-15 using the 6-point Likert-type scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*) for each student, with item-level data summed to create a total score ranging from 15 to 90, with higher scores suggesting higher social validity.

Jackie and Meg completed a modified version of the Children's Intervention Rating Profile (CIRP; Witt & Elliott, 1985) to obtain their views, with minor wording changes to soften the language. They independently rated the seven items on the CIRP on a 6-point Likert-type scale ranging from 1 (*I do not agree*) to 6 (*I agree*). Negatively worded items were reflected and summed. Total scores ranged from 7 to 42, with higher scores suggesting greater social validity.

## Experimental Design

An alternating treatment design was used to compare the two types of OTRs (choral vs. mixed responding; Gast & Ledford, 2014). For this comparison design, a baseline phase is not required for determining a functional relation, as the purpose of this design is to compare two or more interventions (Gast & Ledford, 2014). Differences between phases were examined using traditional visual inspection procedures to determine stability, level, and trend for choral and mixed responding conditions for Jackie and Meg.

## Results

### Treatment Integrity

Table 3 provides summary statistics for whole-class, Jackie and Meg's teacher-reported, and outsider-observed fidelity of the intervention components across all 16 days. Below we report treatment integrity as reported by the classroom teacher and outside observers.

*Classroom teacher.* As reported by the classroom teacher, expected baseline practices remained in effect during both OTR conditions with 100% integrity showing that the only change in instruction was the intervention. She also reported OTR strategy conditions were implemented with 100% integrity during choral condition and at 80% integrity for the mixed responding condition according to component checklists. The only item not consistently reached was presenting rate of three OTR per minute for each target student during mixed condition.



**Table 3.** Treatment Integrity by Student and Intervention Condition.

Rater and treatment integrity measure	Conditions			
	Choral ( <i>n</i> = 8)		Mixed ( <i>n</i> = 8)	
	<i>M</i> ( <i>SD</i> )	IOA <sup>a</sup> <i>M</i> ( <i>SD</i> ) <i>n</i> = 3	<i>M</i> ( <i>SD</i> )	IOA <sup>a</sup> <i>M</i> ( <i>SD</i> ) <i>n</i> = 3
<b>Classroom teacher</b>				
Component Checklist %				
Baseline practices <sup>b</sup>	100 (0.00)		100 (0.00)	
OTR strategies <sup>c</sup>	100 (0.00)		80.00 (0.00)	
<b>Outside observers</b>				
OTR condition	100 (0.00)	100 (0.00)	100 (0.00)	100 (0.00)
OTR responding ratio <sup>d</sup> %		100 (0.00)		98.63 (1.08)
Choral cues	100 (0.00)		68.61 (2.33)	
Individual cues	0 (0.00)		31.39 (2.33)	
Jackie %, <i>n</i>			11.06 (1.14), 3.75 (range 3–4)	
Meg %, <i>n</i>			10.65 (1.86), 3.63 (range 2–4)	
Other students %, <i>n</i>			9.68 (3.35), 3.25 (range 1–4)	
OTR instructional sequence %	100 (0.00)	100 (0.00)	100 (0.00)	100 (0.00)
OTR rate	3.68 (0.20)	100 (0.00)	3.39 (0.20)	100 (0.00)

Note. IOA = Interobserver agreement; OTR = opportunities to respond.

<sup>a</sup>IOA percentage for treatment integrity was calculated via item-by-item analysis, and *n* represents the number of sessions observed. <sup>b</sup>Baseline practices refers to essential aspects of instruction across conditions specific to core instruction during target intervention time that are consistent across OTR intervention conditions. <sup>c</sup>OTR strategies refers to essential aspects of instruction specific to either choral or mixed responding during intervention sessions. <sup>d</sup>Ratio during choral conditions was set at 100% choral questioning; ratio during mixed conditions was set at 70% choral, 30% individual; ratio of individual cueing is also reported for Jackie, Meg, and toward other students.

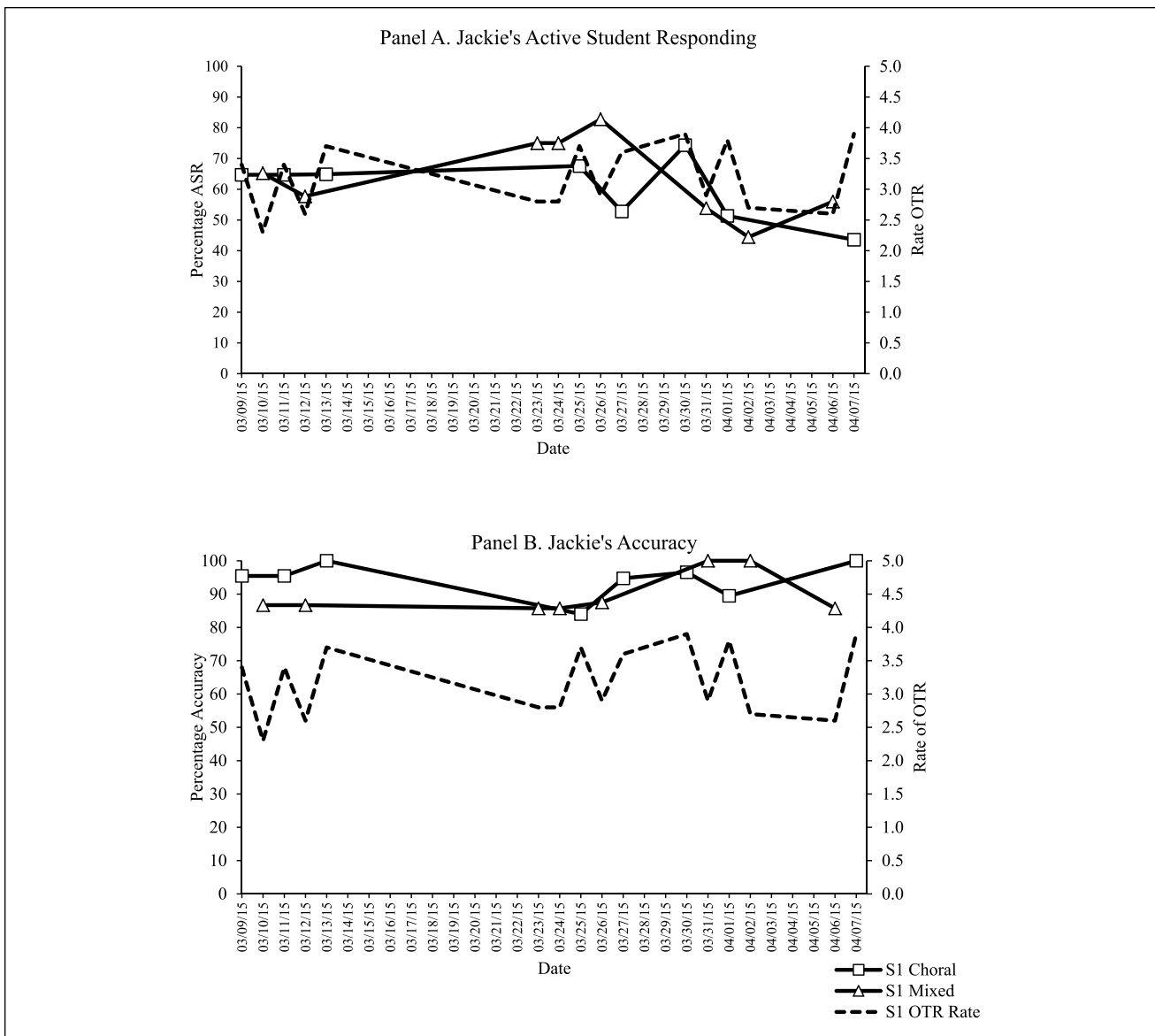
**Outside observers.** According to the outside observers, the teacher implemented the correct OTR treatment condition (e.g., choral or mixed) for each of the 16 sessions. In terms of OTR responding ratio, during choral condition the general education teacher used the choral questioning with 100% integrity, with no individual questions provided. During mixed conditions, the teacher averaged 68.61% ( $SD = 2.33$ , range = 65.71–73.53) choral to 31.39% ( $SD = 2.33$ , range = 26.47–34.29) individual cueing. In regard to individual cues, Jackie received an average of 11.06% ( $SD = 1.14$ , range = 8.82–12.50), Meg received an average of 10.65% ( $SD = 1.86$ , range = 6.25–11.76), and other students received an average of 9.68% ( $SD = 3.35$ , range = 2.94–13.33) in a given session. Jackie and Meg both received more than an average of three individual responses during the mixed condition, with respective mean scores of 3.75 and 3.63 questions. The teacher called on Jackie between three and four opportunities, for Meg between two and four opportunities, and other students between one and four opportunities.

For the four-step instructional sequence, outside observers reported the general education teacher implemented the OTR sequences with 100% fidelity during both choral and mixed intervention conditions. In terms of meeting the targeted rate of three OTR per min, during choral response condition, the general education teacher asked on average 3.68

questions per minute ( $SD = 0.20$ , range = 3.40–3.90) to the class. For meeting the targeted rate of three OTR per minute during mixed conditions, the general education teacher asked on average 3.39 questions ( $SD = 0.20$ , range = 3.00–3.60). In this condition, she asked Jackie on average 2.70 questions per minute ( $SD = 0.20$ , range = 2.30–2.90) and for Meg on average 2.69 questions per minute ( $SD = 0.22$ , range = 2.30–2.90) as the group question target fell just short of the 70% goal. Figures 1 and 2 show rate of OTR by student for each session as well as student outcomes.

### Student Outcomes

**Jackie.** Figure 1 shows results for Jackie's active student responding (Panel A) and accuracy (Panel B). Results were undifferentiated, suggesting null effects. Jackie had comparable levels of active student responding in the choral ( $M = 60.49$ ,  $SD = 10.18$ ) and mixed ( $M = 63.74$ ,  $SD = 13.01$ ) responding conditions, with a downward trend in each condition. Although her active student responding was below Reavis et al.'s (1996) goal of 70% engagement during academic tasks, her accuracy was very high in both conditions (choral:  $M = 94.46$ ,  $SD = 5.37$ ; mixed:  $M = 89.76$ ,  $SD = 6.36$ ), particularly in choral responding. A trend analysis indicated Jackie's accuracy was flat during choral responding and slightly increased during mixed responding.



**Figure 1.** Jackie's active student responding and accuracy across treatments.  
 Note. OTR = opportunities to respond; ASR = active student responding.

**Meg.** Figure 2 shows results for Meg's active student responding (Panel A) and accuracy (Panel B). Results were also undifferentiated for Meg. They suggest Meg had high levels of active student responding in the choral ( $M = 90.47$ ,  $SD = 2.70$ ) and mixed ( $M = 91.38$ ,  $SD = 7.22$ ) responding conditions, with an upward trend in the mixed condition that suggests a subtle shift in the desired direction. Although her active student responding was high, her level of accuracy was just above 60% in both conditions, with 65.60% accuracy ( $SD = 11.79$ ) in the choral and 63.67% accuracy ( $SD = 8.22$ ) in the mixed responding phase. A trend analysis indicated Meg's accuracy was increasing in both conditions, particularly in mixed responding.

**Social Validity**

We assessed social validity from the perspectives of all three adults as well as Jackie and Meg. Prior to beginning the intervention, the adults' IRP-15 scores ranged from 74 to 78 ( $M = 76.00$ ,  $SD = 2.00$ ) for Jackie and 74 to 78 ( $M = 75.33$ ,  $SD = 2.31$ ) for Meg. For Jackie, following the test of both conditions, social validity scores increased slightly for the general and special educators, but decreased for the administrative intern ( $M = 76.00$ ,  $SD = 4.58$ ). For Meg, all three raters showed slightly higher IRP-15 scores following the intervention. The general educator and administrative intern both noted that Jackie seemed less attentive or likely



**Figure 2.** Meg's active student responding and accuracy across treatments.  
 Note. OTR = opportunities to respond; ASR = active student responding.

to respond during choral responding and showed more signs of attending and being prepared to respond during mixed conditions. The general educator noted Meg was quick to respond and that her accuracy seemed to improve over time.

In terms of students' views, CIRP scores decreased from 26 to 23 for Jackie, indicating the intervention fell slightly short of her expectations. However, Meg's scores increased from 28 to 35, suggesting the intervention exceeded her expectations.

**Discussion**

We conducted this study to examine the extent to which choral and mixed responding supported active student responding. OTR offers educators a strategy to facilitate

high levels of engagement, working toward the targeted 70% to 75% range desired during academic tasks (Johns, Crowley, & Guetzloe, 2008; Kauchak & Eggen, 1993; Reavis et al., 1996), and support accurate participation for students with internalizing behavior patterns. Building on the recommendations by Haydon et al. (2010), this study expands the scope of this intervention by targeting (a) a new content area—mathematics, (b) a new population—students at heightened risk for internalizing behaviors, (c) longer sessions—increased from 8 to 10 min, (d) less university support, and (e) stakeholders' views—assessing social validity from multiple perspectives. For students with internalizing behaviors, we felt it was possible that the choral responding may be a preferred and more effective strategy given it does not require any individual responding (which

may be aversive to individuals wanting to avoid social attention; (Hughes & Coplan, 2010; Umbreit et al., 2007). Results suggested students at risk for internalizing behavior problems showed moderate-to-high rates of active student responding during mathematics, with Jackie being highly accurate in her responding, despite falling below the 70% to 75% targeted level for engagement. Yet, neither choral nor mixed responding differentiated themselves as superior in this alternating treatment design, supporting previous literature demonstrating choral and mixed responding as functionally equivalent (Haydon et al., 2010).

### *Treatment Integrity*

Despite the null effects, integrity data suggested this relatively simple and effective, low-intensity, teacher-delivered strategy can be implemented with fidelity by classroom teachers. As reported by the classroom teacher, baseline practices that were expected to remain in effect during choral and mixed responding were implemented consistently as planned. Furthermore, both strategies were taught with adequate integrity, with the mixed condition somewhat more challenging to implement (80% integrity). Information on baseline practices and OTR strategy is important, as too often data are only collected on the introduction of the independent variable without confirming other components intended to continue remain in place (e.g., Lane, Royer, et al., 2015).

Although it was somewhat difficult to achieve the 70% choral to 30% individual response ratio, the number of choral cues closely approximated target levels with a mean score of 68.61; and individual cue ratios hit the target of at least 10% for both Jackie and Meg, and were close to the target for the class as a whole (9.68%). Data also suggest that for the choral and mixed responding conditions, the teacher was able to implement the four-step process of delivering OTRs with integrity and that the target of at least three OTR prompts per minute were achieved for both choral ( $M = 3.68$ ) and mixed ( $M = 3.39$ ) conditions. Currently available technologies such as Plickers® and MotivAider® may be used to provide additional support when using more complex OTR strategies such as the mixed condition. Nonetheless, the current teacher was quite successful not only with implementation, but also in securing local resources (e.g., the outside observers) to assess treatment integrity. These results are promising and provide a contrast to previous research indicating the many challenges educators face in implementing evidence-based practices with adequate levels of treatment integrity in the absence of support (DiGennaro-Reed, Coddling, Catina, & Maguire, 2010; Long et al., 2016).

### *Student Outcomes*

In examining intervention outcomes, results indicated Jackie's level of engagement did not reach the 70% to 75%

targeted average during either condition. However, she was highly accurate in her responding, with an increasing trend in accuracy during the choral condition. In contrast, Meg's level of active student responding was very high in both conditions, far exceeding desired thresholds. Yet, despite the high level of participation, her accuracy was less than optimal, falling below 80% accuracy. In Meg's case, it might have been wise to modify the strategy to encourage her use of the full wait time during the countdown ("5, 4, 3, 2, 1") to allow her time to more fully process the question. It also should be noted that during this study, Meg was determined to be eligible for special education in the area of specific learning disability in math calculation and math problem solving, suggesting she may have needed more processing time or additional instruction to master the skills covered during the question and answer sessions. Progress monitoring data could also be used by the teacher to plan questions that maximize behavioral momentum—that is, planning three to five questions or prompts that allow for high rates of accuracy followed by a newly learned question or prompt.

Studies such as these, that have demonstrated negative or no-consequential results, are rarely published, and make up much of the file drawer problem (Rosenthal, 1979). As we consider the null result, we note, "Science progresses by integrating, and not by throwing out, seemingly discrepant data" (Sidman, 1960, p. 83). Experimental outcomes that do not show the expected or hypothesized effect (null result; Seftor, 2016) should not be confused with no effect or a failed study. Rather, results simply did not support the hypothesis. In the current study, a functional relation was not established: The two participants with internalizing issues did not respond differentially to choral and unison conditions. Failure to establish a functional relation can lead to the discovery of limitations of current interventions, and "spur further research rather than lead to a single rejection of the original data" (Sidman, 1960, p. 74). Future research is needed to unpackage how different OTR modalities (e.g., choral responding, mixed responding) and OTR rates might influence student outcomes. In this study, Jackie and Meg's rate of response opportunities across choral and mixed responding might have been too similar. Future research is needed to specifically compare mixed responding with a higher proportion of individual OTR than in this study and whether it has differentiated effects when compared with choral responding with similar and different response opportunity densities.

### *Social Validity*

Social validity scores from the adults suggest moderate levels of social validity before and after the OTR strategies were tested and, despite the null effects, both the general and special educators' scores suggest the intervention

slightly exceeded expectations. The general education teacher continued to use the increased OTR procedures throughout the remainder of the school year. Though not as formally structured as during the study, the general education teacher felt confident in implementing the OTR strategy during math instruction and during instruction in other subject areas. She found the strategy to be relatively easy to incorporate into her lesson plans and to implement on the spot. For the students, the intervention exceeded Meg's initial expectations, but fell short of Jackie's. Prior to the intervention, Jackie noted it was hard for her to keep up with each question, which may have been a contributing factor to her scores being lower at posttest. The classroom teacher indicated Jackie would lose focus during portions of the review sessions.

### *Limitations and Future Directions*

We encourage the reader to consider the following limitations when interpreting findings. First, this study involved only two students in one teacher's class, which calls for additional inquiry and replication before generalizing these results. Yet, we also view this study as offering initial evidence to suggest teachers can implement this low-intensity strategy—OTR—in inclusive classroom contexts, while attending to important core quality indicators that allow educators to draw accurate conclusions regarding intervention outcomes (e.g., treatment integrity, social validity, reliability of dependent variables; Cook & Tankersley, 2013).

Second, whereas we applaud the teachers and administrator involved in this study, from an empirical perspective it would have been optimal to have IOA of the teacher-self report of baseline and OTR strategies for the full instructional block each day. Yet, this was not feasible due to the personnel resources that would have been required across the 16 days of this study.

Third, the classroom teacher indicated that the class appeared to become less interested (e.g., bored) with the consistent format of the daily increased OTR sessions over time. They seemed to enjoy the format at the beginning, but it was more of a teacher-required mandate to them by the end rather than a positive, engaging segment of the math block like it was at the beginning of the study. A future direction could be examining whether social validity would be higher if the intervention sessions were spread out over more time or if there were variations in response mode to keep the sessions more engaging for students. We encourage other research teams to explore the issue of novelty (Cooper, Heron, & Heward, 2007).

Finally, the general education teacher in this study had already participated in another low-intensity support strategy study examining instructional choice (Lane, Royer, et al., 2015). This prior participation is both a strength and a limitation. Other teachers may not be as open to the level of

time and effort involved in this study without prior experience in even less time-intensive strategies such as instructional choice. Just as we conducted this study by building on the work of Haydon et al. (2010) by examining a new content area (math), with a new population (students with internalizing issues), using longer sessions (increased from 8 to 10 min), with limited university support, and incorporating social validity from multiple stakeholders' view, many other facets of OTR remain to be explored in future inquiry.

### *Educational Implications and Summary*

Despite these limitations, findings from this study build on the work of Haydon and colleagues (2010), suggesting this was a feasible strategy to be implemented with high fidelity. Yet, a functional relation was not established. Overall, intervention outcomes were relatively comparable, with choral responding yielding similar outcomes as mixed responding conditions. In actuality, the choral responding may be easier for teachers to implement. If the outcomes are comparable, one could argue for the more feasible approach—or at least beginning with choral responding before shifting to mixed responding conditions.

Another important implication is that occasionally singling out responses from students with internalizing behaviors did not impair engagement or accuracy. Future inquiry might address this to better understand the student's perspective. Namely, if implemented on a regular basis and perhaps for a longer period of time, can the percentage of individual responses be gradually increased in the mixed condition and still lead to comparable outcomes? Nonetheless, it is encouraging to see choral and mixed OTR yielded comparable outcomes as those in the Haydon et al. (2010) study, working equally well for the two students with internalizing behaviors. Students with internalizing issues may not be hampered by the inclusion of individual responding within a mixed responding condition.

Another positive outcome of this study is that the school-site intervention team could plan for, implement, and collect data on the OTR strategy with limited university supports. This is encouraging, given the importance of empowering teachers with low-intensity supports such as increasing students' OTR to assist in engaging all students—particularly those with internalizing issues (Hughes & Coplan, 2010). Although neither choral nor mixed responding were differentiated in this alternating treatment design, students with evidenced risk for internalizing behavior problems showed moderate to high rates of active student responding. Per the classroom teacher, the OTR strategy fit in seamlessly with the mathematical practices already in place and was sustained to support active student responding even after the study concluded.

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