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A Comparison of Three Opportunity-to-Respond Strategies on the Academic Engaged Time Among High School Students Who Present Challenging Behavior

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Abstract

A single subject alternating treatment design across three student-teacher dyads was used to investigate the comparative impact on student academic engaged time of three opportunity-to-respond (OTR) strategies: guided notes, class-wide peer tutoring, and response cards. Participants were three high school students with disabilities with noted behavioral concerns and poor academic performance within mathematics general education courses. Results indicated all OTR interventions were effective in improving percentage of academic engaged time and reducing behavioral disruptions. Using visual analysis and an additional replication phase, response cards proved to the most efficacious in improving student outcomes. Implications for the existing knowledge base on the efficacy of OTR as well as future research within high school settings are discussed.

Keywords

ADHD, opportunities to respond, general education, mathematics

Students with disabilities who display significant behavioral problems are being educated increasingly within general education settings and less frequently in pullout or self-contained classrooms (Trout, Nordness, Pierce, & Epstein, 2003; U.S. Department of Education, Office of Special Education and Rehabilitative Services, 2015). Thus, ensuring academic success among students with behavioral problems often falls to general educators, who typically have minimal training in behavior and classroom management, especially at the secondary level (Reschly & Christenson, 2006). Delivering effective instruction in secondary classrooms to promote individual student academic and behavioral success is a difficult task for many teachers as evidenced by the high rate of teachers leaving the field due to student behavioral challenges (Simpson, Peterson, & Smith, 2011).

Perhaps the most important element of effectively meeting students' academic and behavioral needs is implementing effective instruction. Education for students with behavioral problems must ensure student academic growth toward graduation or postsecondary education, and limit problem behavior that can disrupt student progress (Trout et al., 2003). Students with behavioral problems often display low school engagement, poor attendance, low academic achievement, conflicts with adults and peers, disruptive behavior, mental health issues, failing grades, high drop-out rates, and increased risk for school suspension (Lane, Carter, Pierson, & Glaeser, 2006; Merrell & Walker, 2004; U.S. Department of Education, Office of Special Education and Rehabilitative Services, 2008).

Effective learning environments that contribute to successful short- and long-term outcomes for students with significant behavioral problems typically address the individual needs of students, with a focus on the academic and social success of all students (Haydon, Borders, Embury, & Clarke, 2009). Moreover, the combined effects of academic struggles and behavioral challenges are well known (National Longitudinal Transition Study–2, 2007). Coutinho (1986) stated that in elementary school, students with behavioral problems typically perform 1.5 to 2 grade levels behind their peers and that this gap widens to 3.5 grade levels by secondary school. In addition, Gregory, Skiba, and Noguera (2010) summarized research suggesting clear correlations among low achievement, antisocial behavior, and disciplinary actions. Much of the existing research on the academic and behavioral needs of students has focused on students at the elementary level, given the importance of attempting to alter the trajectory of chronic and intense behavioral patterns that

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leads to poor postsecondary outcomes (Hinshaw, 1992). In contrast, relatively little research has addressed the efficacy of specific academic and behavioral interventions for secondary students.

Environments that discourage behavioral disruptions, teach replacement behaviors, and successfully address a student's academic and behavioral needs must cultivate a structure where students are able to take academic risks and feel secure learning alongside higher achieving peers (Sprick & Borgmeier, 2010). Unfortunately, students with behavioral problems often create patterns of negative reinforcement with educators, where the classroom teacher may disengage and make fewer task demands when students engage in high rates of disruptive and inappropriate behavior in the classroom (Wehby, Lane, & Falk, 2003). For example, when students are asked to engage with difficult material or challenging instruction, such as individually asking a student to respond to a complex question, a student may consistently respond in an inappropriate manner. To avoid negative student behavior, teachers avoid asking students to respond to difficult tasks. Many students with behavioral problems find taking these academic risks, such as individually responding aloud in front of their peers to an academic-related question, to be aversive and they create escape patterns through acting out and causing disruptions (Sutherland, Wehby, & Yoder, 2002).

Ensuring success for high school students who have academic deficits and well-established patterns of challenging behavior requires universal interventions to be implemented that are flexible enough to address varied student abilities, can be implemented with fidelity, and are easily embedded within any instructional content area (Sprick, & Borgmeier, 2010). One intervention that has all these characteristics is increasing the number of student opportunities to respond (OTRs).

More than two decades ago, the Council for Exceptional Children (CEC; 1987) proposed optimal rates of OTRs for students with high-incidence disabilities at a minimum of four to six OTRs per minute. In a study examining the rate of various instructional strategies at the elementary level, Stichter and colleagues recommended an optimal OTR rate of 3.5 per minute during periods of direct instruction to effect student engagement and achievement (Stichter et al., 2009). This recommended rate was derived from the overall higher rates of academic engagement and reduction in off-task behavior observed at this level, compared with that observed when teachers provided lower rates of OTRs. Although we might conjecture that similar rates of OTRs would be desirable in instructional contexts at the secondary level, research in high schools has yet to validate a recommended rate. Recent research by Hirn and Scott (2012), however, indicated teachers at the secondary level are not meeting these recommended rates. Across 1,347 observations of general education classrooms that included students with problem behaviors in six high schools, students were individually given an OTR at a rate of 0.056 per minute, or about once every 20 min (Hirn & Scott, 2012). Clearly, these rates are strikingly different from the CEC recommendations, and from findings at the elementary level (Stichter et al., 2009).

OTRs can be described as a three-part sequence: (a) presented stimulus, (b) student response, and (c) response contingency (Simonsen, Myers, & DeLuca, 2010; Skinner, Fletcher, & Henington, 1996; Stichter et al., 2009). The initial presented stimulus is specifically aimed at eliciting a response from students and can be delivered by a teacher, another student, or material requiring a student response (e.g., a blank within a reading passage requiring student to write a word). Student responses can also take various forms such as a verbal, nonverbal gesture, or an action such as writing or manipulating an object or device. Finally, the third step in providing an OTR is the response contingency (Skinner et al., 1996). This interaction has largely been described within OTR research as verbal praise or feedback regarding the accuracy of the response (e.g., Sutherland & Wehby, 2001). This interaction between presented stimuli and student response followed by a reinforcing response contingency is critical to increase the likelihood the student engages in instruction (Skinner, Pappas, & Davis, 2005). The majority of OTR research to date has focused on teacher-generated stimuli requiring student verbal (choral or individual) responses (e.g., "what is the capital of Missouri?"), or nonverbal responses (e.g., written answer to math problem on individual student white board; Armendariz & Umbreit, 1999). The elements of OTRs have also been studied through peer-presented stimuli (e.g., peer tutoring; Spencer, Scruggs, & Mastropieri, 2003) and within whole-group instruction (e.g., guided notes [GNs]; Mastropieri, Scruggs, Spencer, & Fontana, 2003).

Multiple methods of OTR implementation have been investigated across educational settings with the majority using elementary-aged students, and showing improvements in both academic and social behavior (e.g., Blackwell & McLaughlin, 2005; Simonsen, Fairbanks, Breisch, Myers, & Sugai, 2008). The use of OTRs has been shown to help students with skill acquisition and classroom performance (Sutherland & Wehby, 2001). The increase in student engagement, a primary outcome of OTR implementation, has the effect of increasing participation with academic content (Skinner et al., 2005), with the immediate impact of reducing off-task or disruptive behavior and longer term effects on student learning and achievement.

Despite the potentially positive impact of OTR interventions, to date there has been limited, albeit promising, research at the secondary level on various types of OTRs. For example, GNs have been described as an effective tool for increasing the overall academic performance of students with disabilities (Blackwell & McLaughlin, 2005). GNs involve handouts for the students to follow along through the lecture with prepared spaces for the

students to write key facts and information. In a review of evidence-based practices in the classroom, Simonsen and colleagues (2008) considered GNs to be an evidence-based practice for addressing classroom management needs based on the amount and quality of research showing positive effects on academic achievement. The use of GNs was investigated with high school students with mild disabilities during an in-class review in a general education history class (Mastropieri et al., 2003). In this study, a qualitative measure was used and results indicated that students found GNs to be a positive learning tool to increase their performance.

Another method of increasing rates of OTRs is class-wide peer tutoring (CWPT; Greenwood & Delquadri, 1995). In CWPT, students work in pairs to tutor one another according to a very specific tutoring protocol, which includes rules for corrective feedback and praise, and involves students switching roles halfway through the tutoring session (Bowman-Perrott, 2009). CWPT has been investigated at the middle and high school levels, with CWPT compared with typical instruction; this research has included comparisons of students with behavioral problems with peers without disabilities as well (Bell, Young, Blair, & Nelson, 1990; Bowman-Perrott, 2009; Spencer et al., 2003). CWPT has demonstrated positive outcomes in terms of engagement with instruction, higher rates of praise between peers, and generalization of praise to other periods outside of the CWPT intervention (Bowman-Perrott, 2009). In addition, CWPT has been shown to result in increased engagement with instruction and positive academic growth (e.g., Bell et al., 1990; Ryan, Reid, & Epstein, 2004).

An additional OTR strategy investigated with secondary-aged students is the use of response cards (RCs). RCs are personal white boards, slates, blank card stock, or preprinted cards, which students use to answer teacher questions (Haydon et al., 2009). The use of RCs has been investigated across many academic subject areas (e.g., social studies, science, history, and mathematics) and is perhaps the most researched OTR strategy with high school students (Randolph, 2007). Randolph (2007) conducted a meta-analysis of 18 RC studies conducted at both the elementary and secondary level. Randolph found that RCs have a statistically significant and positive impact on multiple outcome measures for students including response accuracy, participation with academic instruction, and rates of disruptive behavior. Although four studies reviewed by Randolph investigated the effects of RCs with high school students, and the overall results are promising, more research at the secondary level is clearly needed.

Given that a growing body of literature supports the use of strategies to increase OTRs as a means of increasing engagement and consequentially reducing disruptions, but that relatively little of this research has focused on students at the secondary level, we planned the present study with two aims. First, the present study was designed to examine the comparative effects of three OTR strategies on the academic engaged time (AET) of high school students with behavioral problems. Specifically, through the use of an alternating treatment design, GNs, CWPT, and RCs were compared in terms of effects on student AET and disruptive behaviors. Second, to contextualize our findings and assess broader impact of the interventions, we also examined related impact on students' overall academic performance by collecting permanent product data on a number of academic outcomes (i.e., classwork, homework, quiz and test scores) for participating students.

Method

Participants

Participants were selected from a public high school located in the Midwest. The targeted high school was selected from schools that were participating in a national randomized control trial examining the effectiveness of a range of interventions with secondary-aged students with significant behavioral challenges (see Kern et al., 2015).

Students were invited to participate in the present study if they (a) were identified with a disability per the larger study, (b) were currently receiving a failing grade or showing signs of failing within a core academic class, and (c) had documented behavioral problems such as office discipline referrals or suspensions. Teachers participating in the larger study who taught core subject areas and who also had students in their classes who met the student criteria outlined above were interviewed to determine their interest in participating in the current study. A total of five teacher-student dyads were initially selected for inclusion in the study.

Teachers. Five teacher–student dyads were identified for participation. All teachers (four total teachers, one having two eligible students) were invited to participate based on presenting student academic and/or social behavior problems and on their low rates of verbal, physical, or written OTRs (less than four per minute). During initial classroom assessments, all four teachers provided limited opportunities for student active engagement during teacher-led instruction (M = 1.24 OTRs per minute with a range of 0–3 per minute). Of the five teacher–student dyads initially identified, only two of the teachers indicated that increasing OTRs would be feasible and acceptable and indicated a willingness to implement multiple methods of OTRs during a single class period for the duration of the study. Thus, two classrooms, with three teacher–student dyads (one teacher having two eligible students) were included in the study.

Teacher 1, a 22-year-old Caucasian female, had a bachelor's degree in mathematics. This was her first year teaching and she reported having limited experience working with students with behavioral challenges. Teacher 1 taught students in Grades 10, 11, and 12 as a general education

mathematics teacher and had certification in secondary mathematics Grades 9 through 12.

Teacher 2 was a 28-year-old Caucasian male with a master's degree. This was his first year teaching and he reported having never worked with any students with behavioral challenges. Teacher 2 taught students in Grades 10, 11, and 12 as a general education mathematics teacher and had certification in secondary mathematics Grades 9 through 12.

Students. Student 1 was a 16-year-old African American/Caucasian male in the 11th grade enrolled in Teacher 1's general education algebra course. Student 1 had an accommodation plan based on attention deficit-hyperactivity disorder (ADHD). He received a failing grade in his algebra class in the previous year. Student 1 had also received a total of 16 office referrals during the previous school year and had a total of 6 days of in-school suspension for insubordination.

Student 2 was a 16-year-old Caucasian male in the 11th grade, also enrolled in Teacher 1's algebra course. Student 2 was identified as eligible for special education under the category of Other Health Impairment (OHI), based on a medical diagnosis of ADHD. Student 2 had no office discipline referrals or suspensions from the previous year.

Student 3 was a 15-year-old Caucasian male in the 10th grade in Teacher 2's algebra course. Student 3 also received special education services under the category of OHI based on a medical diagnosis of ADHD. Student 3 had a total of three office referrals from the previous year for insubordination. Student 3 also had a high number of failing grades from the previous year, having failed nine separate semester and quarterly classes including math.

Interventions

Participating teachers implemented three OTR strategies—(a) GNs, (b) RCs, and (c) CWPT—in a randomized order, consistent with an alternating treatments design, in each 90-min class period during the intervention phase. Classroom teachers were trained to implement each of the three OTR methods using the *Center for Adolescent Research in Schools (CARS) Classroom Procedures Manual* (CARS, 2012). This manual provides an overview of each of the instructional strategies and contains an instructional planning guide for incorporating strategies into the classroom context.

The first step of the intervention involved the investigator meeting with each of the teachers and using the *Classroom Procedures Manual* to highlight key components of each OTR strategy and demonstrating what the OTR strategy looked like. After explanation and practice of all components of each of the three interventions, consultation between the investigator and teacher occurred about the materials needed for each intervention and a plan to create or acquire the needed materials was developed. In addition, a specific plan for teaching each of the strategies to the students was developed and any potential barriers to fidelity of implementation were discussed. This information was recorded in the *Opportunities to Respond Worksheet* (CARS, 2012), which teachers could then use to help guide implementation.

Training for each method of OTR implementation lasted between 30 and 45 min. Training included a specific description of each of the three OTR strategies and all essential features, an instructional outline for lesson planning, and specific examples and nonexamples of each method. Together, the teacher and researcher outlined an example lesson that incorporated each OTR method, essential features, and any necessary material and equipment required for implementation. After initial training, the researcher provided ongoing technical assistance, if needed, to the classroom teacher during the intervention phase of the study. Prior to implementation, a decision rule to provide training booster sessions was set if integrity fell below 80% for any of the OTR intervention strategies.

Procedures and Data Collection

An alternating treatment design (Gast, 2010) was used to compare the three OTR procedures. This design allowed for comparison of the relative effects of the three OTR interventions on student AET. The effect of the interventions on student behavior was measured through direct observation. To assess collateral effects, observers also collected data on classroom performance on a weekly basis to provide a general descriptive measure of student academic performance. Response contingency components were also observed during intervention to determine the nature, type, and rate of reinforcement provided by teachers across the three OTR strategies. Finally, observers collected feasibility and acceptability data from both students and teachers to determine the suitability of each OTR intervention within the general education classrooms.

Following the establishment of a stable baseline, each OTR strategy was implemented during the 90-min class period each day during the intervention phase. The OTR strategies were implemented in a randomly established order to help control for the possibility of carryover and sequencing effects (Gast, 2010). Data collection began when the first OTR sequence was initiated with the first presented stimuli and continued for 10 min. Once a differentiated pattern of responding across the three OTR strategies was established during the alternating treatments phase, the most effective OTR strategy was implemented in isolation during the final phase of the design. The final OTR intervention was determined based on the separation among conditions in terms of overall level, trend, and variability of AET data for each OTR intervention. In cases where clear differentiation among the data patterns for the three interventions was not apparent, overall levels of student performance (i.e., highest mean AET) and teacher and student input on their OTR preference and perceived impact

were used to determine which intervention would be continued in the final phase.

Observer training. Four data collectors were trained across a minimum of four training sessions. First, data collectors were trained to collect frequency and duration data using paper and pencil methods while observing videos of classroom problem behaviors. In these initial sessions, observers learned specific observational codes, and were shown examples and nonexamples of the targeted teacher and student behaviors. Once data collectors achieved at least 80% reliability with the trainer on the video observations of problem behaviors, they were given personal handheld electronic devices (a personal digital assistant, or PDA) with the Multi-Option Observation System for Experimental Studies (MOOSES; Tapp, Wehby, & Ellis, 1995) program to record observational data. Data collectors were then required to achieve an interobserver agreement (IOA) with the trainer of at least 80% during in vivo coding of nonresearch classrooms using the PDAs.

Once observers reached 80% or better with the trainer during in vivo practice, data collection in the target classroom began. Agreement data were collected and IOA calculated between the observer and the trainer for at least 30% of the total number of observations in target classrooms. If at any time data collectors' IOA fell below 80%, they were retrained using the above procedures until a minimum of 80% agreement was achieved with the trainer.

Dependent variables. The primary measure across the study was direct observation of student AET using duration recording. AET was calculated based on observers' recording of the mutually exclusive student behavior codes of active engagement and off-task. A student was considered academically engaged if he or she was interacting with the academic instruction and not exhibiting any of a range of "off-task" behaviors.

Frequency recording was used to document student disruptive behaviors and response contingencies during OTR interactions. Student disruptive behaviors were defined as behaviors that did or potentially could distract the teacher and/or other students from their task. Disruptive behaviors could be low-intensity (e.g., distracting another student by whispering something to him/her) to high-intensity (e.g., making threatening statements, destroying property) behaviors. Examples of disruptive behaviors include being out of seat without permission and talking to peer, loudly ripping or crumbling paper, audibly cursing at or threatening teacher or peers, verbalizing refusal to complete assignment or comply with directions, and yelling out response when expectation is to raise hand. Non-examples include texting while class is watching a movie, sleeping in class, and staring out the window. Continuous disruptive behavior (e.g., a student making a lengthy disruptive statement) was coded as a single instance of disruptive behavior. A new disruptive behavior was coded when changes in topography or dialogue occurred. For example, a disruptive student comment, followed by a teacher redirection, and then another disruptive comment was coded as two instances of disruptive behavior.

During baseline, observers recorded the specific response contingencies observed. The authors then categorized observed teacher responses into four types–praise, pace of instruction, reinforcement with extra credit points or grades, and tangible reinforcers (e.g., candy). Pace of instruction refers to the teacher moving on from the target student without reinforcing the student's response–for example, to provide an OTR to another student or moving to another topic; thereby ending attention focused on the target student.. Observers then used these categories to code observations of response contingencies during intervention and best treatment phases.

To provide an assessment of related academic impact of the OTR interventions, participants' academic performance was also measured through a review of permanent products related to course requirements (i.e., in-class assignments, homework, quizzes, and tests). All documents were graded by the classroom teacher and made available to the investigator.

Treatment integrity. Treatment integrity forms were developed as part of the larger study (Kern et al., 2015) and adapted for use in this study. A specific integrity form was used for each intervention method and completed by the lead investigator. Treatment integrity forms for GNs and RCs included three integrity questions, whereas the form for CWPT had six integrity questions (CARS, 2012). Integrity checks, consisting of a checklist of critical components of each OTR intervention, were conducted on the first 3 days of each OTR implementation. For GNs and RCs, if any of the components were missed, integrity was not met. For CWPT, because of the complexity of the intervention, one component could be missed and intervention would still meet the 80% integrity level threshold. After an 80% established integrity level was met, OTR integrity was measured once a week for all three intervention methods during the remainder of the intervention phase. During the replication phase, additional integrity data were collected. If at any time an individual teacher fell below the required 80% integrity rate, a booster session would be conducted; however, no booster sessions were required during the course of the study due to integrity issues. The two participating teachers did struggle with the implementation of three different methods of OTRs within one class period. A conversation with each of these teachers took place related to the time required of each condition. During the conversation, each teacher was reminded about having materials readily available to change intervention conditions, and brainstorming occurred about how to transition from one phase to another by preteaching and reviewing expectations for transition.

Social validity. All teachers and students completed an acceptability measure. The acceptability measures were adapted from the *Treatment Acceptability Rating Form* (TARF; Reimers & Wacker, 1988). For teachers, social validity data were collected at the end of the alternating treatment conditions and best treatment phase for each OTR implementation method. The acceptability measure included 18 Likert-type scale items (range = 1–7; 1 = *strongly disagree*, 7 = *strongly agree*) and addressed areas of (a) acceptability, (b) effectiveness, (c) disruptiveness, and (d) cost.

Students were also given an acceptability measure at the end of the study that reflected their perceptions of the collective OTR interventions. Student social validity data were collected across two categories: (a) acceptability and (b) effectiveness. This assessment also included seven Likert-type scale questions (range = 1–7; 1 = *strongly disagree*, 7 = *strongly agree*). The acceptability category contained a total of six questions; perceptions of effectiveness in changing behavior were addressed by one question.

Results

Results are described for the primary dependent variable, student AET for each teacher–student dyad across baseline, alternating treatments, and best treatment phases (see Figure 1). Data on student disruption are provided in Table 1.

Direct observation data were graphed and visually analyzed for comparisons across phases and within the alternating treatments phase (see Figure 1). Overall, there was a clear level change in AET for all OTR strategies over baseline. However, no single OTR intervention emerged as a clearly more effective strategy across the three student participants. As described previously, teachers and students were asked directly which strategy they felt was the most acceptable and feasible and, therefore, likely to continue to be used beyond the study; this OTR preference was selected for the final intervention condition.

Student Academic Engagement Behavior

During the baseline phases, all three students demonstrated low levels of AET and disruption. Once the three different types of OTRs were introduced (GNs, CWPT, and RCs), all three students demonstrated overall higher percentages of AET. Data variability was observed for all three students during both baseline and alternating treatment phases; however, when the preferred treatment was provided a reduction in variability was observed. Teacher–student dyad outcomes are described below.

Student 1. During baseline, Student 1's level of AET averaged 12.0% (range = 0.0% - 29.8%). During the alternating treatments phase, Student 1's AET averaged 45.1% (range = 13.6%–73.9%) during the GN intervention condition, 60.2% (range = 14.7%–85.1%) during the CWPT condition, and 71.7% (range = 58.3%–100%) during the RC condition. In addition to the higher level and reduced variability in AET during the RC condition, an increasing trend in AET was also observed. The average rate of AET during best treatment was 88.8% (range = 73.9%–100%)

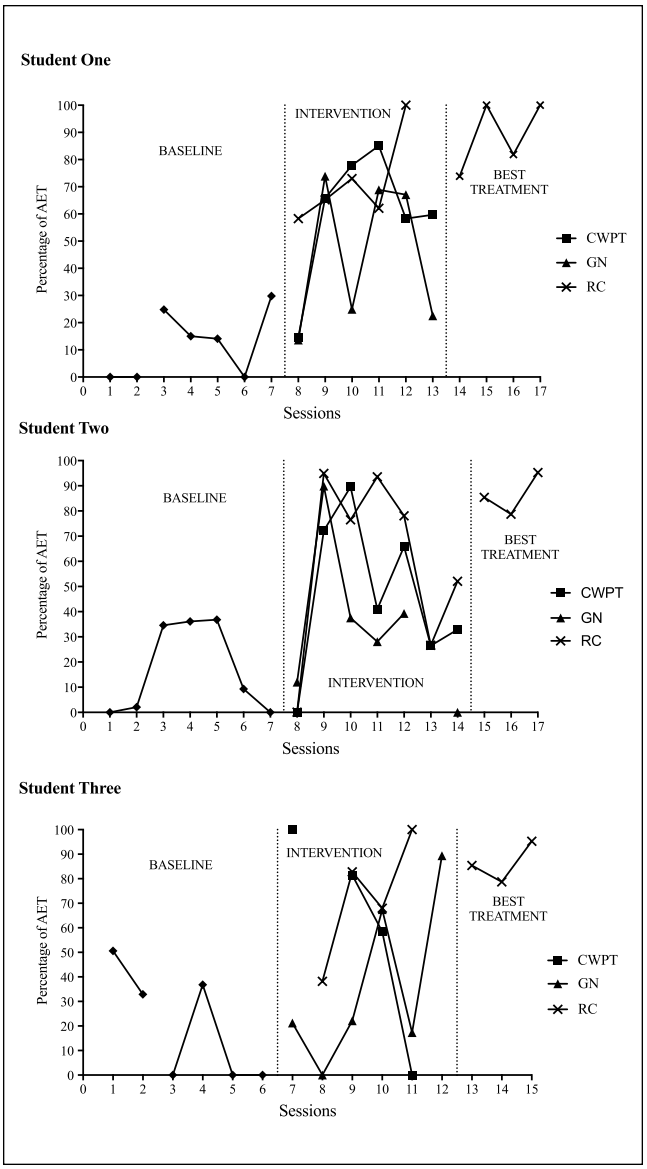

Figure 1. Percentage of time students were academically engaged during 10-min observations of mathematics instruction before, throughout three different OTR intervention conditions, and during the best treatment.
Note. OTR = opportunity to respond; AET = academic engaged time; CWPT = class-wide peer tutoring; GN = guided note; RC = response card.

Student 2. During baseline, Student 2's level of AET had a mean percentage of 17.0% (range = 0.0%–36.8%). Two of

Table 1. Mean Student Disruption Rates Across Each Phase and Condition.

Study phase	Student 1	Student 2	Student 3
Baseline	0.58 (0.26–1.20)	0.46 (0.00–1.53)	0.60 (0.26–0.93)
Alternating treatment			
GNs	0.22 (0.00–0.60)	0.46 (0.00–1.50)	0.29 (0.00–0.70)
CWPT	0.28 (0.00–0.50)	0.36 (0.00–1.50)	0.30 (0.00–0.50)
RCs	0.22 (0.00–0.60)	0.42 (0.06–1.00)	0.42 (0.18–1.00)
Best treatment	0.07 (0.00–0.20)	0.20 (0.10–0.30)	0.13 (0.00–0.30)

Note. CWPT = class-wide peer tutoring; GN = guided note; RC = response card.

the observation periods demonstrated no AET, and one session with just 2.1% of engaged time. During the alternating treatments phase, Student 2's AET averaged 36.4% (range = 11.3%–89.9%) during the GN intervention condition, 46.9% (range = 0.0%–89.6%) during the CWPT condition, and 55.9% (range = 10.1%–94.9%) during the RC condition. Although the data during the alternating treatments phase were highly variable, only one data point was less than the mean baseline AET. The average rate of AET during the best treatment condition was 91.0% (range = 81.8%–95.8%).

Student 3. During baseline, Student 3's mean percentage of AET during baseline was 20.0% (range = 0.0%–50.6%). This student had six sessions of baseline data collection. One day of data collection was missed because of student truancy. The decision to implement the alternating OTR conditions was made because even though variability was evident during baseline, the highest percentage of AET was still low and was occurring at a decreasing trend. During the alternating treatments phase, Student 3 had an average AET of 36.2% (range = 0.0%–89.4%) during the GN intervention. During the CWPT intervention, Student 3's AET mean was 60.0% (range = 0.0%–100%). The RC intervention condition had the highest mean percentage of AET at 72.2% (range = 38.2%–100%). During the best treatment phase, average AET was 86.5% (range = 78.7%–95.3%).

Student Disruptive Behavior

Mean rates of disruptive behavior were computed per phase and are presented in Table 1. Similar to AET, the introduction of OTR strategies during instruction resulted in a drop in disruptive behavior for each of the three participants. A further reduction in disruptive behavior was observed for all three subjects during the best treatment OTR intervention phase.

Student Academic Performance

Potential collateral impacts of the interventions on homework, classwork, quizzes, and tests were recorded, and weekly averages were computed for each of these student work samples. As can be seen in Table 2, student performance was variable, especially for Student 1 and Student 2, and improved in many areas during intervention and best treatment phases.

OTR Rates and Response Contingencies

Throughout all 81 observations, a total of 378 response contingency components of the OTR interactions were observed. Participating teachers initiated a mean of 4.6 OTR interactions per 10-min observation. See Table 3 for a description of OTR rates provided for each of the three participants for each study phase.

Praise was provided by teachers in response to a total of 19.3% (n = 73) of the possible opportunities for a response contingency. The most often used consequent contingency was pace of instruction. This was used for a total of 67.5% (n = 255) of all OTR interactions. Giving a naturally occurring reinforcer within the classroom, such as a credit toward in-class participation or even extra credit, was used in 11.4% (n = 43) of opportunities. The lowest rate of consequent contingency used was a tangible reward, used in 2.1% (n = 8) of the opportunities.

IOA

Across all observations, 30.1% included a second observer to measure reliability through IOA with an overall mean of 95.8% agreement across all variables (i.e., AET, off-task, disruptions, OTRs, consequent contingency type). IOA was computed by dividing the smaller duration or frequency score by the larger and multiplied by 100 (Gast, 2010). During baseline, rates ranged from 86% to 100% of agreement with a mean of 93.3%. During the alternating treatment condition, IOA was assessed for 17 of 51 (33%) of observations, and IOA ranged from 88% to 100% with a mean of 96.2%. Finally, during the best treatment intervention, three observation sessions (out of 10) included a second observer, and IOA was determined to range from 96% to 99.4%, with a mean of 97.9%.

Social Validity

Both participating teachers rated RCs as the most acceptable and effective OTR intervention (M = 6.2 on a 1–7 scale), and rated RCs the same as GNs with respect to disruptiveness to the classroom routine (M = 5.8) and cost of implementation (M = 6.75). Overall, Teacher 1 rated OTR implementation methods more positively than Teacher 2. Scores from both teachers demonstrated effectiveness and acceptability as a strength of the best treatment condition.

Students rated all OTR implementation methods on a single one to seven rating form. The mean rating of the acceptability of OTR interventions for Student 1 was 7.0, the highest rating it could receive. He also thought that the

Table 2. Students Weekly Classroom Performance Percentage Average.

	Student 1				Student 2				Student 3			
Design week	Homework	Classwork	Quiz	Test	Homework	Classwork	Quiz	Test	Homework	Classwork	Quiz	Test
Baseline												
Week 1	80.8	0.0	43.3	91.0	83.3	75.0	73.2	—	100	73.3	87.5	68.8
Week 2	96.7	0.0	46.8	—	0.0	54.0	95.3	89.2	100	55.7	—	70.6
Week 3	0.0	0.0	0.0	58.0	65.0	25.0	81.3	—	90.0	43.3	—	60.0
M	59.1	0.0	30.1	74.5	74.2	51.3	83.2	89.2	96.6	57.4	87.5	66.5
Intervention												
Week 1	100	66.7	54.0	69.3	100	—	76.2	65.9	80.0	6.7	80.0	43.9
Week 2	100	75.0	—	—	81.0	100	—	—	100	60.0	—	—
Week 3	50.0	75.0	—	—	78.3	80.0	—	—	20.0	80.0	80.0	43.9
Week 4	100	100	89.4	—	100	66.7	68.1	—	0.0	52.0	80.0	—
M	87.5	79.2	71.7	69.3	89.8	82.2	72.1	65.9	50.0	49.7	80.0	48.9
Best treatment												
Week 1	0.0	100	65.0	78.6	80.0	80.0	56.7	72.1	100	80.0	80.0	—
Week 2	84.0	80.0	74.0	—	—	85.0	—	—	100	100	96.0	—
M	42.0	90.0	69.5	78.6	80.0	82.5	56.7	72.1	100	90.0	88.0	—

Note. (—) indicates that no academic performance criterion was recorded during the designated week.

Table 3. Average Opportunities to Respond per Minute for each Participants, by Phase

Phase	Student 1	Student 2	Student 3
Baseline	0.5 (0.0 - 1.4)	0.4 (0.0 – 1.1)	0.1 (0.0 – 0.7)
Alternating treatments			
Guided notes	0.5 (0.2 – 0.8)	0.5 (0.0 – 0.7)	0.7 (0.0 – 1.7)
CWPT	0.3 (0.0 – 0.5)	0.5 (0.0 – 0.8)	0.3 (0.1 – 0.7)
Response cards	0.5 (0.3 – 0.7)	0.6 (0.1 – 1.3)	0.3 (0.0 – 0.8)
Best treatment			
Response cards	0.3 (0.2 – 0.4)	0.6 (0.1 – 1.3)	0.4 (0.1 – 0.7)

Note: CWPT = class-wide peer tutoring. Ranges provided in parentheses.

effectiveness of the intervention helped him to improve in school. The mean rating of acceptability for Student 2 was 6.2, including a rating of 5 regarding whether the intervention helped him. Student 3 rated the acceptability of OTRs at 4.2, with a 3 on a question regarding things that he did not like about the intervention package; Student 3 believed that OTR interventions helped him some (rating of 4) to improve in school.

Intervention Fidelity

Intervention fidelity data were collected during the intervention condition for the first 3 days of implementation for each OTR intervention. All teachers scored 100%, indicating they met each component listed on the intervention checklist. Data indicate that both teachers were able to implement each of the three instructional approaches of implementing OTRs (GNs, CWPT, and RCs) at a high level.

Discussion

The purpose of this study was to examine the comparative impact of three empirically validated OTR strategies on the AET of high school students with behavioral problems. Specifically, through the use of an alternating treatment design, the relative impact of GNs, CWPT, and RCs was assessed. Similar to the few studies conducted with high school age students, all three OTR strategies improved overall levels of academic-related behavior and were associated with reduced disruptive behaviors (e.g., Bell et al., 1990; Blackwell & McLaughlin, 2005; Bowman-Perrott, 2009; Mastropieri et al., 2003; Spencer et al., 2003). The findings of the present study are important in that they add to a very limited knowledge base of OTR studies conducted at the high school level using general education teachers working directly with high-risk students. The study also extends the knowledge base in several important new directions.

First, researchers using alternating treatment designs to study OTR interventions have focused primarily on comparing one intervention strategy, or a mixed responding method, to a traditional method of response such as choral responding (e.g., Blackwell & McLaughlin, 2005; Haydon et al., 2010). Although studies incorporating a traditional method as comparison have shown favorable outcomes for increasing AET, researchers have suggested more research should focus on the comparison of multiple methods of enhancing OTR rates compared with the natural teaching environment (e.g., Haydon, Mancil, & Van Loan, 2009). The present study specifically compared the most often recommended and supported OTR strategies in the professional literature in an attempt to identify the most efficacious strategy suitable for high school classrooms.

Second, asking teachers to implement all three interventions during daily instructional periods gave teachers and students the opportunity to make direct comparisons of the acceptability, feasibility, and effectiveness of each OTR method (Haydon, Mancil, & Van Loan, 2009; Hayling, Cook, Gresham, State, & Kern, 2008). One explanation for the similar increase in students' AET during the conditions phase is that the essential components of these interventions require teachers to change their traditional instructional format by eliciting much higher rates of responding from all students in the classroom. Although all strategies were shown to be effective for increasing the rate of AET for students, the RC condition demonstrated the strongest social validity among teachers and students.

Third, the present study provides at least some support for the recommended OTR rate of three to four per minute during teacher-led direct instruction (CEC, 1987; Stichter et al., 2009). During GNs and RCs, teachers were able to implement OTRs at the recommended rate, and this level of intervention resulted in improved student behavior.

Fourth, the present study, similar to work conducted at the elementary level, examined the specific components of the OTR process (see Sutherland & Wehby, 2001; Sutherland et al., 2002). Examining the various types of response contingencies provided by teachers during the OTR implementation has been recommended as an essential component of understanding the impact of OTRs on various student populations (Skinner et al., 2005), but to date, this has rarely been explored. In previous research implementing OTR strategies, a response contingency component of verbal praise was the chief consequence delivered by teachers for correct responding (Sutherland & Wehby, 2001). Purposefully allowing teachers to select from a range of possible student contingencies for correct responding provides a starting point for understanding acceptable reinforcers and the natural preferences of teachers and students in secondary settings. In contrast to prior research at the elementary level, we noted that high school teachers implementing OTR strategies showed a noted absence of consistent teacher praise or other reinforcing stimuli. In fact, the opposite was observed, and it appeared that escaping or avoiding teacher attention (whether it be praise or corrective requests in the case of individual student errors) may have served to maintain student responding. In other words, it appears that, for our sample of high school students, the high rate of responding and engagement appears to have been maintained by negative reinforcement, whereby the student increased responding to escape teacher attention and response demands. This hypothesis was supported anecdotally by the students when asked why RCs were the preferred OTR strategy; one student response was "the teacher doesn't single me out if I get it wrong." This potential difference between elementary and high school students clearly warrants additional research to determine whether similar results would be found across multiple instructional contexts and student–teacher dyads at the high school level.

Finally, as noted in the professional literature, AET is often targeted as a primary dependent variable in classroom studies (Simonsen et al., 2008). Although the OTR strategies did result in marked improvements in AET, as well as a reduction in disruptive behavior, the interventions were not associated with clear improvements in the overall academic functioning of the students. Modest gains were noted in work completion, a necessary prerequisite to passing a class, but the same gains were not evident in the accuracy of students' work. Although disappointing in an applied sense, this outcome was not unexpected. Given the short amount of time the OTR interventions were in place in this study, it would be unreasonable to expect a single instructional strategy to be robust enough to counteract years of academic skill deficits or the impact of the students' disability on learning. Nonetheless, this finding does highlight the potential limitations of AET as an isolated outcome variable when assessing the overall effectiveness of interventions.

Limitations

As with all research, this study has limitations that must be taken into account when interpreting the results. Because this study was conducted within a larger study where additional interventions and supports were in place, it is not known whether these additional interventions may have impacted student and teacher behaviors in ways that we did not capture. These interventions may have directly affected increased academic performance or student classroom behaviors, for example. Replication of the present study without the potential additive effect of the larger study would provide information on the specific effectiveness of these interventions.

Both the teachers who participated in the study were first-year teachers. The individual teachers' willingness to implement and adapt instruction may be a direct reflection of lack of an established teaching style or routine. In addition, low baseline rates may also have been influenced by the teachers' lack of fluency in teaching the content, managing behavior, and other challenges common among beginning educators. Also, due to the convenience sample used in this study, teachers who consented to participate taught within only one core subject area. Therefore, the generalizability of our findings to secondary settings as a whole is limited. Future research should address replication to other academic subject areas (i.e., English, history, and science), settings, gender, and grades.

Classroom performance measures were drawn from teacher-developed and graded assignments. Although this is a permanent product that is commonly used to analyze students' performance related to passing courses and acquiring credit toward graduation, there were many weeks where no performance measure within the specific category was recorded, or where the specific performance measured varied based on subject matter and format. Therefore, only a small descriptive sample of classroom performance artifacts was available, and the overall performance increases we observed

must be interpreted with caution. A curriculum-based measure may have been a more appropriate measure that could have been held consistent across the length of the study.

Implications

All OTR intervention methods demonstrated positive impact on students' academic and social behavior and teacher rates of implementing effective OTR practices. A systematic approach for teaching secondary general education teachers, who are the primary instructors of most secondary students who have or are at risk of disabilities, is needed to promote greater awareness and implementation of these methods of enhancing OTRs–especially RCs, which had the greatest impact on AET and were evaluated most positively by participating teachers. Although research is still very limited in secondary settings, our findings build on previous research at the elementary level to suggest that strategies for increasing OTRs in high school settings also hold promise. Results from this study demonstrate that commonly advocated OTR intervention strategies can lead to improvement in AET, reductions in disruptions, and at least modest improvement in course-related activity completion.

Authors' Note

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