Effects of Differential Consequences on Choice Making in Students at Risk for Academic Failure

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Abstract

Problem behavior can be reduced through choice making and use of preferred instructional activities. However, the opportunity to choose does not imply students are more engaged with instructional activities. The purpose of this study was to evaluate the effects of differential consequences on the on-task behavior of students within the context of teacher versus student selection of instructional activities. Students were exposed to two contingencies (i.e., escape + differential attention vs. escape + physical proximity) across two stimulus events (i.e., teacher vs. student choice of preferred instructional activities) using an alternating-treatments design within an A-B-A-B design. Choice of instructional activities increased on-task behavior during student-choice conditions compared to the teacher-choice conditions, but only when differential attention was provided. Differential attention was also more effective than physical proximity at increasing on-task behavior. Implications for practice and future research are discussed.

Keywords Students · On-task · Choice · Differential reinforcement · Instructional activities

Problem behavior compromises educational experiences of school-aged children. For example, off-task behavior results in poor academic engagement and can negatively affect academic achievement (Jez & Wassmer, 2015). As a result, most behavioral research focuses on identifying the antecedent and consequent determinants of problem behavior so effective interventions can eliminate this behavior (e.g., Pence, Roscoe, Bourret, & Ahearn, 2009). These interventions are typically controlled by the teacher, including the academic tasks, when reinforcers are delivered, and how reinforcers are delivered. A common consequence-based procedure used in the treatment of problem behavior is the differential reinforcement of alternative behavior (DRA). DRA involves withholding

reinforcement following a behavior selected for reduction (i.e., target behavior) while simultaneously delivering reinforcement contingent on a behavior selected as an alternative response to the target behavior (e.g., Durand & Carr, 1991; Hanley, Iwata, & Thompson, 2001; Vollmer, Roane, Ringdahl, & Marcus, 1999). The intended outcome of this procedure is a shift in responding toward the appropriate behavior (e.g., on-task behavior) and away from the problem behavior. For example, a student who frequently engages in off-task behavior to escape from a boring academic task can be taught to request a brief break from the teacher. In this instance, it is likely that the student will engage in less off-task behavior and instead engage in a more appropriate escape-maintained behavior (e.g., request a break) if the request is reinforced with a brief break.

Most studies suggest that a shift in response allocation toward an alternative behavior is more likely when extinction is used as part of the DRA procedure (e.g., Fisher et al., 1993; Hagopian, Fisher, Sullivan, Acquistio, & LeBlanc, 1998; Volkert, Lerman, Call, & Trosclair-Lasserre, 2009). However, extinction procedures may be difficult to implement consistently in classroom settings. For example, extinction may produce unwanted side effects, such as extinction bursts or extinction-induced aggression (Lerman, Iwata, & Wallace, 1999). Furthermore, a teacher may be unable to prevent

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reinforcement from being delivered for escape- or attention-maintained problem behavior, and in some cases ignoring severe problem behavior may be harmful to the student or others.

Some research suggests DRA without extinction may have some success at decreasing problem behavior and increasing alternative behavior (e.g., Athens & Vollmer, 2010; Petscher, Rey, & Bailey, 2009). For example, Worsdell, Iwata, Hanley, Thompson, and Kahng (2000) evaluated the effectiveness of functional communication training (FCT) in increasing alternative behavior when it was implemented without using extinction for problem behavior. The authors used a fading procedure to systematically provide less and less reinforcement for problem behavior while continuously reinforcing the alternative behavior. That is, reinforcement was provided for the alternative behavior while fading out the extinction component of the DRA procedure. The authors found that response allocation for four of the five participants shifted toward the alternative behavior as the extinction component was eliminated. Vollmer et al. (1999) examined a DRA intervention at various levels of treatment integrity. The full treatment integrity condition consisted of reinforcing alternative behavior continuously while simultaneously extinguishing all problem behavior. The participants were then exposed to several schedules of partial implementation (e.g., alternative behavior reinforced 75% of the time and problem behavior reinforced 25% of the time). The authors found that alternative behavior increased and problem behavior decreased when alternative behavior was reinforced more often than problem behavior. Taken together, the results of these studies suggest extinction may not be a necessary component of a DRA treatment procedure.

As previously mentioned, teachers may not always implement extinction procedures accurately in the classroom. They may also find it difficult to implement DRA procedures accurately for some types of problem behavior. For example, off-task behavior maintained by escape from instructional demands is still possible despite reinforcing appropriate alternative behaviors. In these instances, antecedent interventions may be effective. One such antecedent intervention is the opportunity for students to choose how a task is completed or the reinforcing stimuli associated with task completion (e.g., Powell & Nelson, 1997; Romaniuk et al., 2002). Several studies illustrate the effects of task preference or choice making competing with different reinforcement contingencies for problem behavior. For example, Powell and Nelson (1997) assessed whether choice making would decrease problem behavior for a student with attention deficit hyperactivity disorder. In the choice condition, the student chose from among three teacher-selected instructional activities. In the no-choice condition, the student worked on the same activities as the classmates. The student's

problem behavior decreased during the choice conditions but increased following a return to the no-choice condition. Although Powell and Nelson's (1997) study concluded choice of instructional activities reduced problem behavior, it is possible that the choice-making intervention simply allowed the student access to preferred materials.

Previous studies have shown highly preferred items and activities may reduce problem behavior (Foster-Johnson, Ferro, & Dunlap, 1994; May & Howe, 2013; Vaughn & Horner, 1997). For example, Vaughn and Horner (1997) investigated whether providing preferred versus nonpreferred instructional activities during choice and no-choice conditions would decrease the problem behavior of three students with severe disabilities. They found that problem behavior decreased simply by using preferred instructional activities, regardless of whether they were chosen by the teacher or student. Therefore, student choice may or may not be necessary if preferred activities are used during instruction. However, Vaughn and Horner (1997) reported that the teacher ignored or redirected problem behavior, and students were not allowed to physically escape from instructional activities. There may have been an interaction between teacher-selected activities and the inability to escape those tasks.

Researchers have suggested high rates of engagement with instructional activities is a mediating factor in student learning (e.g., Duda, Dunlap, Fox, Lentini, & Clarke, 2004; Green, Reid, White, Brittain, & Gardner, 1988). More specifically, providing students with the opportunity to choose preferred instructional activities may evoke higher rates of responding that compete with escape-maintained, off-task behavior. For example, Killu, Clare, and Im (1999) investigated the effects of choosing preferred versus nonpreferred instructional activities on the on-task behavior of three students. The authors found students engaged in instructional activities more during the conditions involving preferred tasks, regardless of whether the activities were assigned by the teacher or chosen by the student. In addition, more on-task behavior was observed in choice of nonpreferred instructional activities conditions than in no-choice of nonpreferred instructional activities conditions, suggesting choice making has an effect even if the activities are not preferred by students. A strength of the Killu et al. (1999) study was the use of yoked-control conditions to isolate the effects of choice rather than the preferred and nonpreferred activities, per se. For example, an activity selected by the participant in a choice of nonpreferred instructional activities condition was the same task provided by the experimenter in a no-choice of nonpreferred instructional activities condition. However, the experimental design may have limited the interpretation of the results. For two of the three participants, choice of nonpreferred activities was only comparable to no choice of nonpreferred activities, choice of preferred activities was only comparable to no choice of preferred

activities, and yoked no choice of nonpreferred activities was only comparable to yoked no choice of preferred activities.

It is clear problem behavior can be reduced through choice making and use of preferred instructional activities. However, the opportunity to choose preferred or nonpreferred activities does not imply a student is more engaged with instructional activities. With the exception of Killu et al. (1999), these studies illustrate the effects of task preference or choice making competing with different reinforcement contingencies for problem behavior. It is equally clear problem behavior can be reduced by using DRA procedures without extinction in situations where implementation of the extinction component is not feasible. The current study is a component analysis evaluating two independent variables. The effects of differential consequences on the on-task behavior of students were examined within the context of teacher versus student selection of instructional activities. In addition, choice versus no choice of instructional engagement stimuli were evaluated while holding the consequences for both on- and off-task behavior constant (i.e., escape, physical proximity, and differential attention for on-task behavior).

Method

Participants and Setting

Participants included three kindergarten students selected from a Midwestern public school serving students with and without disabilities. Eligible students exhibited off-task behavior and received behavior support services at the school. The students struggled with following directions, sitting still in their seats, talking to peers at inappropriate times, and disrupting the learning environment. Travis was a 5-year-old male diagnosed with an emotional behavior disorder, received social skills instruction 60 min per week through small-group instruction, and received reading supports. Sloane was a 5-year-old female diagnosed with an emotional behavior disorder, received social skills instruction 30 min per week through small-group instruction, and received reading supports. Morgan was a 5-year-old female diagnosed with a developmental disability and received small-group social skills instruction 30 min per week.

All procedures were conducted in the students' classroom during daily morning seatwork for prereading. The classroom teachers identified prereading activities (i.e., tracing and writing letters or words, drawing a line between letters and the pictures correlating with correct beginning sounds, and writing word-wall words) as those most likely to evoke off-task behavior. These activities took place from 9:00 a.m. to 10:00 a.m. each day. Each session lasted 20 min for each student.

Experimental Design, Response Definition, and Measurement

All instructional activities followed the daily class schedule and were implemented by the classroom teachers. Students were exposed to two types of contingencies (i.e., escape + differential attention vs. escape + physical proximity) analyzed across two stimulus events (i.e., teacher vs. student choice of preferred instructional activities) using a multielement design embedded within an A-B-A-B design (Kennedy, 2005). Each session consisted of one condition per day in counterbalanced fashion.

On-task behavior was defined as physical contact with the instructional materials in a way that could result in task completion, asking the teachers questions about the activity, or gathering materials relevant for the instructional activity. A momentary time-sampling procedure was used for the experimental conditions (to be described next). The experimenter divided each session into 10-s observation intervals. If any student engaged in on-task behavior at the end of the 10-s interval, the observers scored the interval as an occurrence. If the on-task behavior did not occur at the end of the interval, the observers scored it as a nonoccurrence. The percentage of intervals with on-task behavior was quantified by dividing the total number of intervals in which on-task behavior occurred by the total number of intervals of each session and multiplying that number by 100.

The experimenter reviewed behavioral definitions with the teachers and a graduate assistant (the second observer). The experimenter and graduate assistant then practiced the data-collection system in the classroom during prereading instructional activities. Training continued until agreement was at least 90% for three consecutive sessions. The experimenter calculated interobserver agreement (IOA) by dividing the number of intervals of agreement by the total number of intervals and multiplying by 100. During the experiment proper, observers independently collected data during 25% of the sessions. Agreement ranged between 90 and 100% ($M = 90\%$) for Travis, 94% and 100% ($M = 95\%$) for Sloane, and 92% and 100% ($M = 94\%$) for Morgan.

The classroom teacher implemented the procedures so the effects of choice versus no choice of instructional activities could be evaluated while holding consequences for on- and off-task behavior constant. The experimenter measured procedural integrity during 25% of sessions for each student by coding the percentage of intervals in which the teachers used the correct consequences following behavior. The experimenter calculated procedural integrity by dividing the number of intervals that behavior was followed by the correct consequence by the number of observation intervals and multiplying by 100. Correct implementation scores ranged from 95 to 100% ($M = 96\%$) across the teachers. The IOA for procedural fidelity was calculated by dividing the number of agreements

by the total number of agreements plus disagreements and multiplying by 100. Agreement between the observers ranged from 92 to 100% ($M = 95\%$) across the teachers.

Procedure

Preassessment The experimenter used descriptive assessment data to determine the behavioral function of off-task behavior (O'Neill et al., 1997). Off-task behavior was defined as looking around the classroom or at peers, asking off-topic questions or engaging in off-topic conversations with peers, or engaging in activities unrelated to the academic task. The experimenter analyzed antecedent and consequent events for each participant to develop appropriate experimental conditions. The descriptive analysis identified escape from instructional demands as the behavioral function, and teacher-selected instructional activities (i.e., assignment to an instructional task) as predictable antecedents to off-task behavior. Consequences for off-task behavior included the instructional staff standing in proximity to deter the student from leaving the area. Escape was never prevented for off-task behavior, as a student could still be off task despite being in the physical location of the activity.

A multiple-stimulus without-replacement (MSWO) procedure similar to that used in the study by DeLeon and Iwata (1996) determined preferred instructional activities for each student. Instructional activities for the preference assessment were obtained in an informal interview with the teachers. The preference assessment included three sessions per day for 3 days. The experimenter began each session by randomly placing all instructional activities across the table. After an activity was chosen, the student interacted with it freely for 1 min. The activity was then removed from the session. Students were given a 5-min break between sessions, and no other feedback was provided. Preferred instructional activities were determined by summing the lowest preference to greatest preference each session across each day. The experimenter then selected the top three preferred instructional activities for each student for the experimental conditions described in the next sections. Each student chose the create-a-book, cut and paste, and color by letter or word worksheets as preferred instructional activities.

Escape + Differential Attention (Student Choice) The escape + differential attention condition (E + DA) evaluated on-task behavior when the student was allowed to escape preferred instructional activities chosen by the student. However, the teacher provided contingent positive attention every 60 s when the student was participating in the instructional activities. The teacher began these sessions by saying, “You can choose the create-a-book, cut and paste, or color by letter [or word] worksheets.” Following off-task behavior, the teacher removed the activities and provided

the student with a 30-s break. At the end of the break, the student was given a directive for on-task behaviors (i.e., each student was prompted again to engage in the activities). All other preferred instructional activities were restricted.

Escape + Differential Attention (Teacher Choice) This E + DA condition evaluated on-task behavior when the student was allowed to escape from preferred instructional activities chosen by the teacher. However, the teacher provided contingent positive attention every 60 s when the student was participating in the instructional activities. The experimenter yoked instructional activities selected in the E + DA student-choice sessions to the sessions conducted in this condition. That is, the instructional activities chosen by the student in Session 1 of the E + DA student-choice condition were used in Session 1 of the E + DA teacher-choice condition, the instructional activities chosen by the student in Session 2 of the E + DA student-choice condition were used in Session 2 of the E + DA teacher-choice condition, and so on. The teacher began these sessions by saying, “It’s time to work on ____.” Following off-task behavior, the teacher removed the activities and provided a 30-s break. At the end of the break, the student was given a directive for on-task behaviors. All other preferred instructional activities were restricted.

Escape + Physical Proximity (Student Choice) The escape + physical proximity condition (E + PP) evaluated on-task behavior when the student was allowed to escape instructional activities chosen by the student. However, the teacher used physical proximity in an attempt to encourage the student to stay in the activity area. The teacher provided a verbal command to sit down after the initial off-task behavior and then sat beside the student for the rest of the condition. Following off-task behavior, the teacher removed the instructional activity and provided the student with a 30-s break with no additional attention. After the 30-s break, the teacher brought the student back and repeated the physical proximity procedure. All other preferred instructional activities were restricted.

Escape + Physical Proximity (Teacher Choice) In the E + PP teacher-choice condition, the experimenter yoked instructional activities selected in the E + PP student-choice sessions to the sessions conducted in this condition. That is, the instructional activities chosen by the student in Session 1 of the E + PP student-choice condition were used in Session 1 of the E + PP teacher-choice condition, the instructional activities chosen by the student in Session 2 of the E + PP student-choice condition were used in Session 2 of the E + PP teacher-choice condition, and so on. The procedures for this condition were identical to the E + PP student-choice condition; otherwise, all other preferred instructional activities were restricted.

Results

Figure 1 depicts the percentage of intervals of on-task behavior for Travis, Sloane, and Morgan. Overall, on-task behavior occurred on average during 83% of intervals (range 78–90%), 86% of intervals (range 82–90%), and 80% of intervals (range 74–85%) for Travis, Sloane, and Morgan in the E + DA student-choice condition, respectively. In the E + DA teacher-choice condition, the percentage of intervals on task was slightly lower. On-task behavior occurred in 65% (range 60–70%), 65% (range 60–70%), and 64% (range 52–70%) of intervals on average for Travis, Sloane, and Morgan, respectively. There was a clear effect of student choice on the

percentage of intervals on task compared to teacher choice when differential attention was provided for on-task behavior.

On-task behavior in the E + PP student-choice condition decreased compared to the E + DA student-choice condition. Travis's on-task behavior occurred in 69% (range 64–73%), Sloane's on-task behavior occurred during 70% (range 65–75%), and Morgan's on-task behavior occurred during 61% (range 52–70%) of intervals. On-task behavior in the E + PP teacher-choice condition was relatively unchanged when compared to the E + DA teacher-choice condition and slightly lower when compared to the E + PP student-choice condition. Travis's on-task behavior occurred in 65% (range 60–69%), Sloane's on-task behavior occurred during 65% (range 60–

Fig. 1 Percentage of on-task behavior per session for Travis (top panel), Sloane (middle panel), and Morgan (bottom panel). Solid circles represent student choice of instructional activities, and open circles represent teacher choice of instructional activities, during the E + DA and E + PP conditions

72%), and Morgan's on-task behavior occurred during 61% (range 52–70%) of intervals. Although student choice of preferred instructional activities in the E + PP conditions produced slightly higher on-task behavior than teacher choice did, physical proximity as a deterrent for escape minimized its effects.

Discussion

The purpose of this study was to evaluate the effects of differential consequences on the on-task behavior of students within the context of teacher versus student selection of instructional activities. Choice of preferred instructional activities played a clear role in increasing on-task behavior because the students were more engaged during the student-choice conditions than the teacher-choice conditions, but only when differential attention was provided for on-task behavior. Students were not as engaged with instructional activities during physical proximity conditions. No significant benefits of physical proximity were evident because there was little change in responding between student and teacher choice of instructional activities when physical proximity was implemented. Thus, there was an interaction effect between the type of consequence provided for on-task behavior and whether or not the student or teacher selected the preferred instructional activities. Differential attention was generally more effective than physical proximity regardless of instructional activities being chosen by the student or teacher.

The effects of choice and preference were isolated in this experiment using a yoked condition to ensure teacher selection was not systematically different from the student-selected preferred instructional activities. The goal was to control for the possibility that the teachers chose less preferred instructional activities than the students across sessions. Results supported the Killu et al. (1999) study, which found that the opportunity to choose instructional activities increased on-task behavior in students. This study also extends results of Vaughn and Horner (1997) in that it controlled for the maintaining consequences of problem behavior (i.e., negative reinforcement) and the consequences for on-task behavior. That is, whereas the function of off-task behavior appeared to be escape from instructional demands during prereading activities, combining student choice of preferred activity with differential reinforcement increased on-task behavior and competed with escape contingencies for off-task behavior. The current study also extends previous findings that suggest that the use of preference assessments (i.e., MSWO) identified stimuli to be used that lead to higher rates of engagement (e.g., Green et al., 1988; Killu et al., 1999) and that preference assessments can be used to identify activities that compete with consequences that maintain problem behavior (e.g., May & Howe, 2013).

There are some limitations to the current study. First, it could be argued that attention is inseparable from the consequences imposed by the teachers in an applied setting. For example, when students are not participating in instructional activities, teachers rarely ignore the students. Instead, they interact with the students by redirecting them to the instructional activities. Thus, off-task behavior could be maintained by escape from instructional activities, attention received from the teacher for refusing to participate, or both. If attention was maintaining off-task behavior in this experiment, increases in on-task behavior would be evident in physical proximity conditions because it would directly compete with attention provided for off-task behavior.

A second limitation is that is not always possible for teachers to provide preferred instructional activities to teach academic concepts for a few reasons. First, preference can change from session to session (Mason, McGee, Farmer-Dougan, & Risley, 1989). Therefore, it is possible that the effects of using preferred instructional activities could vary over time (i.e., the novelty of using alternative stimuli for academic tasks could wear off), or constantly changing activities to suit the preference of the students could be disruptive to instructional time. Vaughn and Horner (1997) discussed that some of the participants in their study actually chose less preferred activities from session to session, implying that a presumption of preferred activities is not the same thing as choosing an activity.

Another limitation is that students can satiate with an activity (e.g., DeLeon, Anders, Rodriguez-Catter, & Neidert, 2000). This could happen in the current experiment during the yoked conditions. That is, yoking instructional activities in a teacher-choice session from a preceding student-choice session could make task engagement aversive or less preferred because the activities become boring or cumbersome when exposed to them in consecutive sessions. It is also possible for students to persevere on one activity despite countereducational effects (e.g., Bruckner & Yoder, 2007). This phenomenon was not evaluated in the current experiment.

A final limitation is the lack of assessment of academic achievement. The extent to which the preferred activities met the instructional objectives for lessons was not examined. An obvious aspect of any intervention is that the desired outcome is achieved. Furthermore, the results can only be applied to students at risk for academic failure due to poor on-task behavior, not necessarily those who engage in severe problem behavior. The current study examined on-task behavior, which was selected for the purposes of exploring the effects of choice making and differential reinforcement for task engagement rather than behavior reduction alone.

Future research might continue examining differential consequences in the context of antecedent manipulations to improve on-task behavior. The literature has already exhaustively demonstrated that problem behavior can be reduced by

differentially reinforcing alternative behaviors or manipulating antecedents independently. The target of intervention should be increasing task engagement, which in turn affects academic performance. Therefore, research should also focus on sustained engagement and instructional performance (e.g., task completion or accuracy). Additionally, research should address how frequently activities need to be changed or how often choices among activities should be provided to sustain attention as it corresponds to academic success.

Research in applied settings should focus on evaluating additional contingencies to those identified during indirect and descriptive behavioral assessments (e.g., attention-maintained behavior), but by holding preference constant through choice conditions. It may also be possible to explore the additive effects of various competing consequences. For example, the quality of directive statements made by teachers to redirect student attention during conditions of choice between preferred or nonpreferred instructional activities could be evaluated for their additive or competing effects with on- and off-task behavior. A replication of this study for future research could evaluate the addition or removal of antecedent or consequent events to determine the effects of choice making and preference on task engagement or problem behavior.

The current study indicates that choice making improves task engagement, but only when differential attention for task engagement is used compared to physical proximity. In other words, teachers could use instructional activities with which students are most likely to engage while maintaining some instructional control over the intended academic outcomes. It could be that teachers who use preference assessments when using choice making are more likely to improve a student's on-task behavior than personnel relying on choice making alone.

Compliance with Ethical Standards

Conflict of Interest There are no conflicts of interest in the work that is reported on in this manuscript.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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