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Incorporating Auditory and Visual Feedback and Student Choice into an Interdependent Group Contingency to Improve On-Task Behavior

Beth Giguere
University of South Florida, bgiguere@mail.usf.edu

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Incorporating Auditory and Visual Feedback and Student Choice into an Interdependent Group Contingency to Improve On-Task Behavior

by

Beth Giguere

A thesis defense submitted in partial fulfillment of the requirements for the degree of Master of Science Applied Behavior Analysis Department of Child and Family Studies College of Behavioral and Community Science University of South Florida

Major Professor: Kwang-Sun Cho Blair, Ph. D., BCBA-D Kimberly Crosland, Ph.D., BCBA-D Raymond Miltenberger, Ph.D., BCBA-D

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Abstract

Group contingencies are efficient and effective behavioral interventions that allow teachers to apply a reinforcement criterion to a large group of students. However, most research on group contingencies has not examined the impact of types of teacher feedback and student choice of teacher feedback incorporated into the use of group contingencies. The current study used a multiple baseline across participants design with an embedded alternating treatments design to explore the use of an interdependent group contingency that compared the effectiveness of incorporating auditory or visual feedback to improve student on-task behavior of three students in public elementary school classrooms. The study also explored whether incorporating student choice into the feedback would enhance the outcomes for student behavior. The results indicated that the interdependent group contingency intervention was successful in increasing the on-task behavior of all three participants. The results also indicated that while both auditory and visual feedback were effective in increasing on-task behavior of all three students, two of the students engaged in slightly higher levels of on-task behavior when auditory feedback was used. When students were given the option to choose which type of feedback would be used, two of the three students favored auditory feedback over visual feedback, and on-task behaviors maintained for all three participants. These results have implications for the use of auditory feedback and choice in the classroom setting as part of a group contingency.
Introduction

Within classroom settings, problem behavior in students is one of the biggest obstacles to academic success (Lane, 2007; Nelson, 1996). Of these, off-task behavior is one of the most common problem behaviors reported by classroom teachers (Harrison, Vannest, Davis, & Reynolds, 2012). This behavior is often defined as inattention to current classroom activity, out of seat without permission, talking to teacher or other students without permission, failure to follow teacher directions, or not using classroom materials as intended (Theodore, Bay, & Kehle, 2004; Wills, Iwaszuk, Kamps, & Shumate, 2014). Off-task behavior is important to address because it is strongly associated with poor academic achievement, even more so than aggression (Hinshaw, 1992). When students do not adhere to classroom expectations, most teachers and staff rely on the use of reactive procedures such as verbal reprimands, detention, and loss of privileges, rather than working to proactively prevent the inappropriate behaviors from occurring (Anderson & Kincaid, 2005) even though punitive consequences are ineffective in reducing future problem behavior (Anderson & Kincaid, 2005; Sprague et al., 2001).

In contrast, studies have shown that making behavioral expectations clear, actively supervising and interacting with students (Colvin et al., 1997), teaching and modeling desired behavior (Lohrmann & Talerico, 2004), and reinforcing desired behaviors (Cariveau & Kodak, 2017) are successful in decreasing problem behavior in multiple school settings. Therefore, schools should focus on using ongoing, proactive strategies to prevent occurrences of problem behavior and increase occurrences of desired, appropriate behavior. In order to produce lasting behavior change, appropriate behavior must be reinforced with consistency (Cooper, Heron, &
Heward, 2007). However, it is often not feasible for a single teacher to implement individual response contingencies for all students in the classroom (Gresham & Gresham, 1982). Furthermore, teachers must maintain busy schedules and juggle many responsibilities in their classrooms on a day to day basis, often making it difficult for them to implement complex behavior programs with fidelity. To address these logistical issues of implementing behavior change programs within classroom settings, many teachers have implemented group contingencies (Little, Akin-Little, & O'Neill, 2015).

The use of group contingencies is practical within a classroom setting because they allow a teacher to implement a single response contingency with an entire group of students rather than applying separate contingencies to each individual student. This is more feasible for teachers to implement when the student-teacher ratio is high. Group contingencies can be designed in ways that fit into a teacher's already established routine (Gresham & Gresham, 1982; Wills et al., 2010) making it easier for a teacher to implement the intervention with fidelity. Furthermore, group members are encouraged to cooperate with one another and encourage each other to reach a common goal, thus promoting a positive classroom culture (Williamson, Williamson, Watkins, & Hughes, 1992).

There is a large quantity of research demonstrating the efficacy of group contingencies specifically in academic settings (e.g., Alric, Bray, Kehle, Chafouleas, & Theodore, 2007; Lohrmann & Talerico, 2004; McKissick, Hawkins, Lentz, Hailey, & McGuire, 2010). Theodore et al. (2004) compared the efficacy of the three types of group contingencies (independent, dependent, and interdependent contingencies) in decreasing the disruptive behavior of three adolescents. Results indicated that all three types of group contingencies dramatically decreased disruptive behaviors in the classroom setting. Similarly, Ennis, Blair, and George (2016)
demonstrated that the three types of group contingencies and a randomized group contingency were equally effective in decreasing class-wide disruptive behavior and increasing on-task behavior. Cariveau and Kodak (2017) demonstrated the efficacy of a dependent group contingency with students enrolled in a summer reading program. Levels of classroom academic engagement increased when the group contingency was implemented, and the results were maintained during follow-up sessions. Christ and Christ (2006) revealed that an interdependent group contingency was effective in decreasing disruptive classroom behaviors such as out of seat, off-task vocalizations, and off-task behavior. Little, Akin-Little, and O’Neill (2015) reviewed 50 studies exploring the use of group contingencies with children over the last 30 years. Their analysis indicated that all three types of group contingencies were effective in decreasing problem behavior of students from various age groups in many different settings.

Whereas all three types of group contingencies have been shown to be effective, interdependent group contingencies possess distinct advantages over dependent and independent contingencies (Skinner, Cashwell & Dunn, 1996). Because everyone must participate, the responsibility of engaging in appropriate behavior is spread evenly amongst the entire class. Everyone is encouraged to engage in the appropriate behavior in order to receive reinforcement, and classmates must cooperate with one another so that reinforcement can be reached. Interdependent group contingencies are highly efficient and effective behavioral interventions that encourage students to take a collaborative approach to increasing appropriate behaviors in the classroom. In addition, research demonstrates that teachers are likely to rate interdependent group contingencies favorably (Christ & Christ, 2006).

When pre-corrective behavioral interventions, such as group contingencies, are implemented within a classroom setting, it is essential for students to receive continuous
feedback on their levels of performance. Research suggests that continuous teacher feedback is a vital component to student success (Hattie & Timperley, 2007) and that teachers should focus on providing more feedback to their students on a regular basis to promote ongoing progress toward goals (Voerman et al., 2012). Research suggests that providing performance feedback is an effective method of reducing problem behavior (Cortez & Malian, 2013; Lingo, Jolivette, & Barton-Arwood, 2009). Furthermore, the delivery of continuous feedback concerning both behavioral and academic performance can increase overall engagement in classroom activities (Sutherland, Wehby, & Copeland, 2000).

Yet, there is a lack of research that explores the ways teachers provide feedback during group contingencies. In some group contingency studies, students were not given any information regarding their progress towards reaching the reinforcement criterion and were only informed of whether or not the criterion had been reached. Therefore, students were often unable to track their progress towards reaching the reinforcement criterion (e.g., Cariveau & Kodak, 2017; Heering & Wilder, 2006; McKissick et al., 2010). When group contingency interventions did incorporate feedback, it was most often in the form of either oral or visual feedback.

Teachers can provide feedback in a classroom setting by verbally communicating to the students about their progress towards a behavior goal (Lingo et al., 2009). For example, Wills et al. (2014) used oral feedback within a group contingency designed to increase on-task behavior in a classroom setting. If the group was observed engaging in on-task behavior, the teacher immediately let the group know whether they had earned a point towards a back-up reinforcer. If the children did not earn a point, the teacher provided corrective feedback. Delivering oral feedback is a simple, relatively effortless way for teachers to reliably provide feedback to students. However, not all teachers provide feedback that is behavior specific (Voerman et al.,
2012), and sometimes coaching from a facilitator or consultant is necessary to ensure that teachers are delivering behavior-specific praise in an effective manner (Duchaine, Jolivette, & Fredrick, 2011). Additionally, teachers must remain aware of their own non-verbal behavior (i.e., tone, affect, facial expression) when delivering verbal praise.

Teachers can also use visual displays within their classrooms to allow students to keep track of their progress towards a behavior goal (Lingo et al., 2009). Christ and Christ (2006) implemented a classroom group contingency intervention that used an automated scoreboard to visually display student progress towards a specified goal. If no disruptive behavior occurred within a 2-min interval, the teacher pressed a button on a device that would add a point to the digital scoreboard on display for all students to see. Visual feedback is useful because it provides students with a way to keep track of their ongoing progress. However, general distraction from tasks is a commonly reported behavior of children when using the visual feedback (Harrison et al., 2012). When a visual display such as a digital scoreboard is displayed at the front of the classroom, students may be prone to diverting their attention away from their current task while they look at the visual display. This could potentially lead to off-task behavior.

To address the concerns raised from the use visual and verbal feedback, classrooms could utilize an auditory feedback component of a behavior management program; using auditory feedback could address some of the concerns that arise when verbal or visual feedback is used in a classroom. When using auditory feedback, teachers can immediately deliver an auditory stimulus when progress towards a goal has been met. Researchers have used a variety of auditory stimuli including clickers and sound applications on smart phones to indicate to the learners that they have met a specified criterion (Persicke, Jackson & Adams, 2014; Quinn, Miltenberger, & Fogel, 2015). Importantly, the sound should be easy to deliver so that it can be administered
immediately following a specified target behavior. The efficacy of auditory feedback has been demonstrated in a variety of settings. For example, Persicke, Jackson, and Adams (2014) used auditory feedback to decrease the toe-walking behavior in a child with autism. Similarly, Quinn et al. (2015) demonstrated the efficacy of an auditory stimulus in increasing fluency of dance movements in four dance students. Participants were told that when they heard the auditory stimulus, it would indicate they had performed the dance skill correctly. These examples demonstrate that an auditory stimulus is an effective intervention that can decrease problem behaviors and increase desired behaviors.

Given that the efficacy of auditory feedback is well supported in various settings with various age groups, it is logical to propose that auditory feedback may also be an effective classroom behavior intervention. Altman and Blair (2017) used an auditory feedback intervention to decrease instances of problem behavior in three elementary school students during classroom transitions. The authors worked with classroom teachers to create a task analysis of success points that the students would be expected to perform during each transition (e.g., stand up, push in chair, line up with class). When the selected student engaged in a success point, the teacher delivered auditory feedback using a cell phone soundboard that emitted different sounds (e.g., applause). The auditory feedback intervention successfully decreased the students’ problem behavior during transition times. However, there is a sparsity of research that examines the use of auditory feedback in classroom settings. Furthermore, the current literature does not report the outcomes of using auditory feedback within a classroom group contingency.

As incorporating feedback into behavioral interventions is an effective method of increasing appropriate behavior in a classroom setting, incorporating student preference or choice into classroom activities also leads to improvement in student behavior (Romaniuk &
Miltenberger, 2001; Shogren, Faggella-Luby, Bae, & Wehmeyer, 2004). Morgan (2006) reviewed 15 studies that examined the effects of student preference or choice making on problem behavior. The analysis revealed that incorporating student preferences or choices into activities increased academic engagement and decreased problem behavior in the majority of studies reviewed. Furthermore, on-task behavior was more likely when the teacher used a preference assessment rather than relying on student choice alone without a preference assessment. Future research should consider incorporating student choice, based on preference assessment results, into behavioral interventions as a way to increase efficacy.

Current literature has clearly demonstrated the effectiveness of group contingency interventions in increasing on-task behavior in classroom settings. Research also supports the efficacy of providing ongoing performance feedback to students regarding behavioral goals. However, as discussed above, research has yet to examine the use of auditory feedback within a group contingency. Similarly, more research is needed to evaluate the effects of incorporating student choice into group contingency interventions on classroom behavior. Therefore, the purpose of the current study was to examine the outcomes of incorporating auditory feedback and student choice into an independent group contingency in a small group of students in elementary classrooms and sought to answer the following research questions:

(a) Will there be a difference in improvement of student on-task behavior when using auditory feedback vs. using visual feedback in implementing an interdependent group contingency?

(b) Will the interdependent group contingency with visual or auditory feedback be more successful in improving on-task behavior when students are given choices on the feedback type?
Method

Participants and Setting

The current study involved students and their respective teachers in two public general education elementary school classrooms. Two 2nd-grade teachers were recruited to participate in the study based on the following criteria: (a) serves students in K-5th grades in either a general education or special education classroom, (b) interested in implementing a class-wide group contingency to manage problem behavior in their classroom, and (c) nominated at least one student in their classroom needing additional behavior support. Teachers who were currently implementing a group contingency in their classrooms were excluded from the study to avoid confounding variables.

Three 2nd-grade students were targeted in the study based on the following criteria: (a) between the ages of 5 and 11, (b) being served in a general education or special education classroom, (c) communicates with vocal language, (d) follows 2- to 3-step directions, and (e) engages in off-task behavior during at least 25% of a potential target academic time period. Children who attended school less than 80% of the days during the 2016-2017 school year were not eligible to participate. Additionally, students with dangerous problem behavior such as self-injury, physical aggression, or property destruction (this excluded small materials such as paper and pencils) were not eligible to participate.

Jake was an 8-year old Caucasian boy served in a 2nd-grade classroom. Jake had an Individualized Education Plan (IEP), being classified as having an Emotional Behavior Disorder
(EBD). In addition to behavioral intervention support, Jake was receiving speech and occupational therapy services during the school day due to difficulties in language and fine motor skills. Jake's home language was English. Jake was nominated to participate due to his high levels of disruptive behavior during writing. His classroom teacher reported that Jake had difficulty completing writing assignments and would engage in off-task behavior during this academic time period. Jake often left his seat to ask his teacher questions or would sit at his desk and fidget with classroom materials (e.g., pieces of paper, pencils, pens) instead of appropriately completing his assigned writing task. When his off-task behavior occurred, his teacher used verbal redirections to manage his behavior. Jake’s teacher was a 28-year old female teacher with seven years of teaching experience. She held a Bachelor of Science degree in Education and was in the first year of a Master’s degree program in Applied Behavior Analysis at the time the study was conducted. She held endorsements in Exceptional Student Education and English as a second Language (ESL).

Sam was an 8-year old White Hispanic boy who was also served in Jake’s 2nd-grade classroom. Sam had an IEP with a classification of speech impairment and was receiving speech therapy services at school. Sam's home language was English. Sam was nominated to participate due to his high levels of off-task behavior in all subject areas. During whole group instruction and independent work, Sam would often turn and talk to the peers next to him, call out without teacher permission to speak, fidget with toys such as fidget spinners and tops that he would hide in his pockets, tip backwards in his chair, or leave his assigned area to wander around the classroom.

Rob was an 8-year old Hispanic boy served in a 2nd-grade classroom. Rob had an IEP and received Tier 3 academic services in math and reading and English for Speakers of Other
Languages (ESOL) services. Rob's home language was Spanish. Rob was nominated to participate due to his high levels of off-task behavior in all subject areas. During whole group instruction, Rob would frequently divert his eye gaze away from the current task and look around the room or fidget with his clothing. During independent work, Rob would often take excessive amounts of time to transition from one task to another, wander around the classroom, or talk to peers instead of engaging in current assigned task. When his off-task behavior occurred, his teacher used verbal redirections to manage his behavior. Rob's teacher was a 25-year old female with two years of teaching experience. She held a Bachelor of Education degree.

The study was conducted at a public elementary school located in a suburban area of Florida, serving students in K-5th grade. The intervention was implemented within a general education classroom setting during typical instructional or independent work activities (i.e., math, writing). A target classroom routine was selected for each participant based on which academic routine his teacher identified as being the most problematic. Problematic academic time periods were defined as those periods during which each target student’s off-task behavior was most likely to occur. For Sam and Rob, the targeted academic time period was math; for Jake, the targeted academic time period was writing. Prior to implementation of the intervention, the participating classroom teachers used ClassDojo as their primary classroom behavior management system. ClassDojo is a free online application which is designed to track student behavior and which is used as a communication system by teachers to notify parents in real-time regarding their child's behavior in the classroom. The app allows teachers to award points to a child's profile when a child is observed engaging in positive behaviors (e.g., ‘being respectful’, ‘working hard’) or take away points when the child engages in behaviors that need work (e.g., ‘talking out of turn’, ‘unsafe behavior’). Both participating classroom teachers continued to
deliver and remove ClassDojo points at the same level throughout baseline, intervention, and follow-up phases.

**Recruitment Procedures**

The principal investigator (PI) distributed recruitment flyers (Appendix A) that explained the study purpose and inclusion criteria for participation. The flyer included the PI's contact information for teachers to contact the PI directly if they were interested in participating. Once two teachers were identified to participate, the PI obtained informed consent from the participating teachers by asking them to complete and return a written consent form. Teachers were given two weeks from the date they received the consent form to complete and return it to the PI. Following this, participating teachers sent home parental permission forms with all students in their respective classrooms. Parents and legal guardians were given two weeks from the date they received the permission form to complete and return it to school. Students who returned a signed consent form were asked to give verbal assent to participate in the study. Any student who returned a signed consent form and verbally assented to participate, but was not selected as a target participant, was eligible to participate in the preference assessment and social validity portions of the study.

**Measurement**

**On-task behavior.** The primary dependent variable was on-task behavior. Operational definitions of on-task behavior were developed following participant selection to ensure that the topographies and definitions matched the specific intervention goals of the participants. On-task behavior was defined as sitting appropriately with eyes on current assigned task. The definitions of on-task behavior were incompatible with the off-task behavior in which the participating students typically engaged. Rob's definition of sitting appropriately varied slightly from Sam and
Jake's, based on teacher preference and expectations within the classroom. Definitions were individualized as shown in Table 1.

Table 1. Operational Definitions of On-Task Behavior for Each Participant

<table>
<thead>
<tr>
<th>On-Task Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All:</strong> Student's eye gaze is directed toward current assigned task (e.g., if a worksheet, student is looking at the worksheet; if student is instructed to look at whiteboard, student should be looking at the board). If whole group or individual instruction towards target student is given, student's eye gaze shifts to speaking teacher. Non-examples include: looking at peer, looking around room, looking at floor, looking at teacher when teacher is not instructing target student. Student is sitting in assigned area during work time. During carpet time, student is sitting on carpet, facing instructor. At desk, student is sitting in chair with all chair legs on ground. Student only leaves assigned area when given permission by teacher as part of the current task; out of seat behavior during a transition will not be counted as on-task behavior.</td>
</tr>
<tr>
<td><strong>Sam, Jake:</strong> At desk, both feet must be on the floor. At carpet, student's feet must be in front of him. Non-example: one or both feet underneath bottom.</td>
</tr>
<tr>
<td><strong>Rob:</strong> Sitting appropriately in seat or at carpet can include having one or both feet underneath bottom.</td>
</tr>
</tbody>
</table>

Data for on-task behavior were collected for each participant two to five times per week for a maximum of 30-min during the targeted academic time period (i.e., math, writing). Data were collected during the same academic time period throughout baseline, intervention, and follow-up phases. Data were collected using a 10-s momentary time sampling recording system. That is, during the targeted academic time period, the observers recorded whether or not on-task behavior occurred at the end of each 10-s interval. Data were collected using a pencil or pen, data collection sheets (Appendix B), and an electronic timing device to signal the end of each interval within the observation period.

**Treatment integrity.** Before beginning the study, the participating teachers were trained on the intervention procedures to encourage implementing the intervention with integrity. The PI
used an 11-12-item, yes/no checklist (Appendix C) that included a step-by-step task analysis for the teachers to follow during each condition of intervention implementation, and teachers were trained to implement the intervention using this task analysis. During all intervention sessions, the PI and research assistants (when present) collected treatment integrity data in the form of a checklist. The implementation steps of the checklists included: (1) reminding students of target behavior and modeling target behavior before first interval begins, (2) allowing the students to vote for auditory or visual feedback (in student choice condition only), (3) playing three sounds using the soundboard app and allowing the students to vote for a sound to be used that day or showing the students three tokens and allowing the students to vote for the token to be used that day (depending on the condition), (4) administering or showing the chosen sound or the token before the first interval begins to remind students of what to listen or look for, (5) reminding students of how many times they need to hear the sound or how many tokens they need in order to receive the back-up reinforcer, (6) informing students when the first interval begins, (7) scanning the room within 10-s of when the timer goes off, (8) administering the sound or putting a token on the board if all students are engaging in target behavior, (9) notifying the students when they have reached their goal for a back-up reinforcer or when the observation period ends, (10) ending the session once the class has reached their goal for the back-up reinforcer or once the observation period ends, (11) pulling a strip of paper out of the reward jar to identify the back-up reinforcer the students earned, and (12) delivering the back-up reinforcer to all students before the end of the current school day if the student reached the criterion. Due to overlap in data collection sessions, some steps of the treatment integrity checklist (i.e., allowing students to vote, administering the sound/token before the interval began, delivery of back-up reinforcer before the end of the school day) were sometimes recorded based on student or teacher report.
The treatment integrity was assessed for all intervention sessions across teachers. The integrity data indicated that both teachers implemented the intervention with a high degree of fidelity with a mean integrity score of 95.3% (range, 72% to 100%) across sessions and student participants. Implementation fidelity was 80% or higher during all but two sessions. Following these two sessions, the PI provided a verbal reminder after the data collection session of the steps of the intervention that were not completed.

**Social validity.** Following the last intervention phase, social validity was assessed with participating teachers and students. For teachers, an adapted version of the Intervention Rating Profile (IRP-15; Martens, Witt, Elliot, & Darveaux, 1985) was used, which was specifically designed for use in schools. The questionnaire consisted of 15 items that teachers were asked to score using a 6-point Likert type scale (1 indicating strongly disagree, 6 indicating strongly agree). The scale assessed the degree to which teachers rated the intervention as acceptable, effective, and easy to use within a classroom setting. This questionnaire also included two open-ended questions. The first allowed teachers to voice any particular likes, dislikes, or suggestions about the intervention. The second asked teachers to indicate which type of feedback (auditory vs. visual) they preferred using and why (Appendix D). The student version consisted of 5 items rated on a 5-point Likert type scale. The scale assessed the degree to which students enjoyed using the intervention. The student version also included two open-ended questions. The first asked students to specify what they did and did not like about using the intervention. The second asked students to indicate which type of feedback they preferred receiving and why (Appendix E). The PI individually guided each student through answering the questions by reading the questions and answer choices out loud to the student and recording the student's answers for
them. Students who returned a signed parental consent form and verbally assented to participate in the study were asked to complete the student social validity survey.

**Experimental Design and Procedures**

**Experimental design.** A multiple baseline across classrooms design with an embedded alternating treatments design was used to evaluate the outcome of the intervention. Experimental phases included baseline (A), group contingency with visual or auditory feedback (B), group contingency with student choice (C), and follow-up. The start of the first intervention phase was staggered across students, and baseline probes were conducted in the first phase of intervention to demonstrate experimental control.

**Baseline.** In the baseline condition, the teacher managed classroom behavior as usual using current school-wide and class-wide behavior management systems, including ClassDojo. Data were collected two to five days per week, and observation periods were a maximum of 30-min each. Prior to data collection during this phase, the participating teachers each collaborated with the PI to create an operational definition of the on-task behavior they hoped to see the participating student(s) engage in more often during problematic academic periods.

**Preference assessments.** At the end of baseline phase, a preference assessment was conducted in each target classroom to choose potential reinforcers to be used during the group contingency phases. Each teacher and the PI met briefly at the teacher’s convenience (approximately 10-min) to create the list of preference assessment items. The PI created a list of 8 items each teacher identified as being preferred by the students (Appendix F). Potential reinforcers included tangible items (i.e., candy, snacks), activities (i.e., Go-Noodle video, dance party, extra recess time, play a game), or privileges (i.e., take shoes off during class). The PI provided items that were not readily available in the school setting (i.e., candy, snacks). Once the
and PI created the list of items, students who returned a signed parental consent form and verbally assented to participate in the study were asked to complete the preference assessment during a time in the school day that the teacher designated as appropriate. The PI explained to the students that they would be starting to play a new game soon that would allow them an opportunity to earn rewards, and that the teacher was interested in what the class would like to work for. The PI asked the students to circle their top three choices independently (to avoid influence from other peers).

Immediately following the preference assessment on potential reinforcers, a second preference assessment was conducted to choose potential auditory and visual stimuli to be used as feedback types during the intervention. The teacher and PI chose six pictures to make tokens with (i.e., cartoon characters, shapes, objects) and six sounds (e.g., "harp", "laser beam", "game show winner") from a smart phone soundboard app. A list of the auditory and visual stimuli was distributed to each student (Appendix G). Before the students voted, the PI played each of the six sounds out loud. The PI then asked the students to circle their top three pictures and top three sounds. The PI asked the students to circle their choices independently (to avoid influence from other peers). Collectively, the preference assessments took approximately 4 min for each student (2 min for instructions, 2 min to choose top items on each list). Once the preference assessment was conducted, the PI counted which items received the most votes on each list.

Using the most voted for items on the reinforcer preference assessment, the PI wrote the top 5 items on slips of paper and placed them in a jar. When the intervention was implemented, the teacher selected a new slip from the jar each day the group contingency was in place to determine which reinforcer the children worked for on that day. The results of the preference assessment on auditory and visual stimuli were used to determine which stimuli would be used.
as feedback during the intervention. In addition, the PI ensured that at least one reinforcer, one visual stimulus, and one auditory stimulus were selected as preferred by the target student(s).

**Teacher training.** To train teachers on how to implement the group contingency, the PI constructed a PowerPoint presentation that explained the rationale of group contingency interventions and how to implement each step of both intervention conditions (Appendix H). The PI met with each teacher individually at their convenience to go over the PowerPoint training material. After the PI reviewed the training material with each teacher, each teacher was given an opportunity to ask any questions regarding implementation. Following this, the PI modeled correct implementation of each condition by asking the teacher to role-play a student. The teacher was then given the opportunity to role-play correct implementation of the intervention while the PI role-played student behavior. After the teacher was given an opportunity to role-play, the PI provided positive and corrective feedback on her performance. Training concluded once the teacher was able to correctly perform all steps of the intervention. The entire training session took about 15 min for each teacher.

**Student training.** On the first day of data collection for the group contingency phase, the teacher briefly explained the intervention to the students using a script (Appendix I). To increase student buy-in, the script used age-appropriate language to explain the contingency as a "game". The teacher explained and modeled the behavior that would be expected for all students to engage in to receive auditory or visual feedback (depending on the condition). The teacher explained that she would be scanning the room at specified intervals to ensure that all students were engaging in the target behavior. The teacher also explained to the students that they must all be observed engaging in the target behavior to receive auditory or visual feedback. The students were informed that hearing the selected sound five times or receiving five tokens on the
board indicated that the class had reached their goal for that interval. The students were given an opportunity to ask questions at the end of the explanation. Once the script was read, students were selected to model examples and non-examples of the target behavior. In addition, the PI created a poster to be placed in the front of the classroom each day of the intervention to remind the students of the rules and behavior expectations during the intervention.

**Intervention.** During intervention, the teacher continued implementing classroom management strategies used during baseline (i.e., ClassDojo). To implement the interdependent group contingency intervention, the targeted academic time period was broken up into smaller, 3-min fixed intervals. The appropriate interval was determined based on baseline levels of on-task behavior and teacher preference. Prior to beginning each intervention session, the teacher allowed the students to vote for which auditory or visual stimulus would be used during the intervention each day (depending on the condition). The teacher either showed the students three different sets of tokens or played three different sounds from the smart phone soundboard application, which were identified based on the preference assessment. Per each classroom's request, students could also vote for a ‘random’ option. If the students voted for random, the teacher would randomize the sound or token administered throughout that day's intervention period. To vote, students were asked to put their heads down, close their eyes, and raise their hand to vote for which stimulus they wanted to use that day (e.g., Pikachu, Fly Guy, Power Rangers, or a random combination of all three). In order for the effect of student choice to be reflected in data collection, the PI instructed the teacher to always implement the sound or token for which the target student voted. Even though all students participated in the voting process, only the target student's vote counted, and the target student's vote did not always correspond with the sound or token for which the majority of the class voted. To remind the students of what
to look or listen for during the intervention, the teacher showed the students the chosen token or played the chosen sound.

At the beginning of the specified classroom time period, the teacher reminded the students of the game rules and the target behaviors that all students were expected to engage in while the contingency was in place. Then, the teacher began each session by notifying the students when the first interval began. The teacher carried around a small digital timer that vibrated to indicate the end of each 3-min interval. At the end of each 3-min interval, the teacher visually scanned the room within 10 s of the timer going off to ensure that all students were engaging in the target behavior. Visually scanning the room took about 5 s each time. If all students were observed engaging in on-task behavior, the teacher provided visual or auditory feedback, depending on the condition. Classroom activities during the targeted time periods varied; sometimes, the class engaged in whole group instruction, while other times the class was expected to be engaging in independent seat work. When student's eye gaze was expected to be directed towards the teacher during whole group instruction, the students looked at the teacher delivering auditory or visual feedback. However, during independent seat work, the students were not expected to look at the teacher when feedback was being delivered. When visual or auditory feedback was delivered, the teacher did not immediately provide any verbal feedback, but would occasionally deliver comments throughout the session such as, "You have all earned two tokens, let's keep working hard so we can earn another one" to serve as a reminder about the game. The teacher followed these steps at the end of each interval until the students reached their goal for the day or until the intervention period ended.

If the students earned the back-up reinforcer, the teacher pulled a strip of paper from the reward jar and notified the students of which back-up reinforcer they had earned for the day. The
back-up reinforcer was delivered before the end of the current school day. During the first phase of the intervention, the PI informed the teacher each day whether auditory or visual feedback would be used. This was determined using an alternating pattern (i.e., auditory, visual, auditory, visual). As a demonstration of experimental control, baseline probes were also conducted during the first phase of intervention. During baseline probes, the teacher was instructed not to conduct the intervention.

**Group contingency with visual feedback.** Visual feedback was provided using Velcro tokens on a token board, hung by a magnet on the classroom whiteboard. At the end of each interval, the teacher placed one of the tokens onto the token board if the class met the criterion for reinforcement (i.e., all students were observed engaging in the target behavior at the end of the 3-min interval). The tokens were created by the PI and included pictures of cartoon characters that were identified as being preferred by the students based on the results of the stimuli preference assessment (e.g., Spongebob, Power Rangers, Pikachu). The PI created the tokens by printing pictures on cardstock, cutting out and laminating the pictures, and attaching Velcro to the back of each token.

**Group contingency with auditory feedback.** Auditory feedback was provided using a smartphone soundboard application called ‘Sound Effects’. Teachers were given the option to use the PI's smartphone if they chose, but both teachers chose to download the application on their own personal smartphone or tablet. At the end of each interval, the teacher played that day's chosen sound if the students met criterion for reinforcement (i.e., all students were observed engaging in the target behavior at the end of the 3-min interval). The sounds used during the intervention were identified as being preferred by the students based on the results of
the stimuli preference assessment (e.g., ‘magic’, ‘harp’, ‘game winner’, ‘laser beam’). The PI kept track of how many times auditory feedback had been delivered.

**Group contingency with student choice.** This intervention phase was conducted in the same format as the previous group contingency phase, with one additional step. Prior to the start of each session, students were given the opportunity to vote on whether auditory or visual feedback would be used each day. To vote, all students were asked to close their eyes, put their heads down, and raise their hand to vote for tokens or sounds to be used for that day. In order for the effect of student choice to be reflected in data collection, the PI instructed the teacher to always implement the type of feedback that the target student voted for. Even though all students participated in the voting process, only the target student's vote counted. The teachers then followed the same task analysis to implement the group contingency intervention as described previously.

**Follow-up.** Follow-up data were collected two and three weeks following the last phase of intervention. Teachers were notified prior to the observations to be reminded that they were not be required to implement any of the group contingency procedures, but could do so if they chose. The teacher and student behaviors were observed to examine whether the teachers continued to implement the group contingency and whether improvements in student behavior maintained during the 2- and 3-week follow-ups.

**Interobserver Agreement**

Interobserver agreement (IOA) was assessed for 40.5% of sessions across all phases and participants. Before collecting data in the classroom, the PI trained a research assistant by simultaneously collecting data while observing the target student. The research assistant, who was a student of a Master’s program in Applied Behavior Analysis, had to score at least 90%
IOA before being eligible to collect baseline data. To calculate IOA, the research assistant independently and simultaneously collected observational data on on-task behavior and teacher treatment integrity. IOA for on-task behavior was calculated by dividing the number of intervals with agreements by the total number of intervals with agreements and disagreements and multiplying by 100%. IOA for treatment integrity was calculated by dividing the number of steps with agreements by the total number of implementation steps and multiplying by 100%. Table 2 displays the percentage of sessions in which IOA was assessed for each participant and experimental condition.

IOA for Sam's on-task behavior averaged 98% and was assessed during 37.5% of sessions across all phases. IOA for Rob's on-task behavior averaged 97.7% and was assessed during 40.7% of sessions across all phases. IOA for Jake's on-task behavior averaged 98.1% and was assessed during 43.4% of sessions across all phases. Implementation fidelity IOA was assessed for 36.7% of intervention sessions and averaged 98.3% across all phases and participants.

Table 2. Interobserver Agreement

<table>
<thead>
<tr>
<th></th>
<th>Sam</th>
<th></th>
<th></th>
<th>Rob</th>
<th></th>
<th></th>
<th>Jake</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>OT</td>
<td>TF</td>
<td>%</td>
<td>OT</td>
<td>Imp</td>
<td>%</td>
<td>OT</td>
<td>TF</td>
</tr>
<tr>
<td>Baseline</td>
<td>40</td>
<td>99</td>
<td>NA</td>
<td>43.8</td>
<td>98.3</td>
<td>NA</td>
<td>33.3</td>
<td>100*</td>
<td>NA</td>
</tr>
<tr>
<td>GC</td>
<td>25</td>
<td>97</td>
<td>100</td>
<td>40</td>
<td>97.5</td>
<td>97.7</td>
<td>40</td>
<td>97.7</td>
<td>98.7</td>
</tr>
<tr>
<td>Baseline Probe</td>
<td>50</td>
<td>98*</td>
<td>NA</td>
<td>50</td>
<td>97*</td>
<td>NA</td>
<td>100</td>
<td>97.5</td>
<td>NA</td>
</tr>
<tr>
<td>GC w/ choice</td>
<td>42.8</td>
<td>98</td>
<td>92</td>
<td>33.3</td>
<td>98.8</td>
<td>100</td>
<td>33.3</td>
<td>99.5</td>
<td>100</td>
</tr>
<tr>
<td>Follow-up</td>
<td>50</td>
<td>98*</td>
<td>100*</td>
<td>50</td>
<td>96*</td>
<td>NA</td>
<td>50</td>
<td>96*</td>
<td>100*</td>
</tr>
</tbody>
</table>

*Note. The percentage of sessions with IOA assessment for each participant and experimental condition are provided. Average IOA scores are also provided. % = the percentage of observed sessions for which a secondary observer recorded data; GC = Group contingency; OT = On-task; TF = Treatment fidelity; NA = Not applicable. * Calculation based on only one data point.
Results

On-Task Behavior

Figure 1 displays percentages of on-task behavior during targeted instructional times for all three student participants across both classrooms. All participants engaged in low levels of on-task behavior during baseline. Once the interdependent group contingency intervention was implemented, on-task behavior increased for all participants in both visual and auditory feedback conditions. However, two of the three participants demonstrated higher levels of on-task behavior when auditory feedback was used than when visual feedback was used. When baseline probes were conducted, on-task behavior returned baseline levels for two of three participants, and near baseline for the third participant. The data also indicate that when the interdependent group contingency intervention was modified to include the student choice on the types of auditory feedback, on-task behavior was maintained at moderate-high levels for all participants. Two follow-up probe data collected two weeks and three weeks after intervention was terminated indicated that one teacher continued to implement the intervention and that increases in on-task behavior maintained for her two students on days she chose to implement the intervention. There were no overlapping data points between baseline and intervention for any of the participants.

During baseline, Jake's on-task behavior averaged 24.6% (range, 19% to 33%). Once Jake's on-task behavior in the baseline phase was stable, the group contingency intervention was introduced. Jake was the first participant to receive the intervention. During the first phase of the
group contingency intervention, Jake was marked on-task for 73% of intervals, on average (range, 60% to 85%), a 48.4% increase when compared to Jake's average on-task behavior during baseline. When auditory feedback was used during the first phase of the group contingency intervention, Jake's on-task behavior averaged 69%. When visual feedback was used during this phase of the intervention, Jake's on-task behavior averaged 77%. Two baseline probes were conducted for Jake during the first phase of the intervention. Jake was marked on-task for 40% of intervals during both baseline probes, indicating a slight increase from baseline level but still well below intervention level. Once each data path showed a stable trend, the student choice component was added to the intervention during Jake's targeted academic period. During the choice phase, Jake's on-task behavior averaged 85.5% (range, 80% to 88%), indicating a 16.5% increase from the first phase of the intervention and a 60.9% increase from baseline. On-task behavior for both auditory and visual feedback showed a stable trend during this phase, with 87% of intervals marked on-task on the one session auditory feedback was chosen, and an average of 85.2% of intervals marked on-task during the five sessions visual feedback was chosen. During the follow up-phase, Jake's teacher implemented the intervention during 50% of sessions. When the intervention was in place during the follow-up phase, Jake was marked on task for 85% of intervals, remaining stable with the intervention phases.

In baseline, Sam was marked on-task for 41.4% of intervals, on average (range, 29% to 56%). Once the first phase of the group contingency intervention was introduced, Sam was marked on-task for 72.8% of intervals (range, 60% to 85%), a 31.4% increase when compared to Sam's average on-task behavior during baseline. When auditory feedback was used during the first group contingency phase, Sam's on-task behavior averaged 77.2%, while Sam's on-task behavior when visual feedback was used averaged 68.5%. When two baseline probes were
conducted, Sam's on-task behavior averaged 27% (range, 23% to 31%), a decrease from baseline level. In the student choice phase, Sam's on-task behavior averaged 73% (range, 63% to 81%). While slightly variable, Sam's levels of on-task behavior during the choice phase of the intervention were the same as those of the first phase of the group contingency. When the choice component was implemented during Sam's target routine, auditory feedback was chosen for five of the sessions, while visual feedback was chosen for two of the sessions. When auditory feedback was chosen, Sam's on-task behavior averaged 70.8%, whereas his on-task behavior averaged 78.5% when visual feedback was chosen. During the follow-up phase, Sam's teacher implemented the intervention during 50% of sessions. When the intervention was in place during the follow-up phase, Sam was marked on-task for 62% of intervals, decreasing slightly from intervention phases but remaining 20.6% higher than baseline average.

During baseline, Rob's on-task behavior averaged 22% (range, 3% to 38%). Once the group contingency was implemented, Rob's on-task behavior increased to an average of 62.5% (range, 49% to 73%), a 40.5% increase when compared to average in baseline. When auditory feedback was used, Rob's on-task behavior averaged 64.2%. When visual feedback was used, Rob's on-task behavior 60.8%. Two baseline probes were conducted for Rob, during which his on-task behavior decreased to an average of 33% (range, 28% and 38%), remaining stable with baseline level. When the choice component of the intervention was introduced, Rob's on-task behavior averaged 70.5% (range, 67% to 80%). During the choice phase for Rob, visual feedback was chosen once, during which Rob's on-task behavior was marked for 67% of intervals. Auditory feedback was chosen during the remaining five sessions, during which Rob's on-task behavior averaged 71.2%. Rob's teacher discontinued the use of the intervention during
the follow-up phase, and Rob's on-task behavior decreased to an average of 45.5%, remaining higher than initial baseline but decreasing in level when compared to intervention sessions.

**Social Validity**

Table 3 displays the results of the student social validity survey. Four of Jake’s class students completed the student social validity survey, while 10 of Rob's class students completed the survey. The overall average rating of all items across all students on the student social validity survey was 4.5 out of 5. All but one student reported that they ‘liked’ or ‘loved’ participating in the intervention. The student that rated the intervention as a 1 stated that he did not like having to close his eyes when he voted to select which sound or token to use, but otherwise did not mind participating. Students reported that they liked the rewards that could be earned, they enjoyed having the opportunity to choose the sound or token to be used during the intervention, and that they wanted to keep using the intervention to earn rewards. Students reported that they enjoyed the intervention because they "liked voting for sound or tokens" and "liked the rewards they could earn". Of the 14 students who completed the survey, seven of those students (50%) reported that they preferred the use of auditory feedback in comparison to visual feedback. Students who favored auditory feedback reported that they enjoyed the sounds that were used and preferred not having to look up at the board. Students who favored visual tokens reported that they liked the characters on the tokens and liked being able to easily see how many they had earned.
Table 3. Student Social Validity Survey Results

<table>
<thead>
<tr>
<th></th>
<th>Jake’s &amp; Sam’s Class Mean</th>
<th>Rob's Class Mean</th>
<th>Total Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I liked playing the game.</td>
<td>4.8</td>
<td>4.2</td>
</tr>
<tr>
<td>2.</td>
<td>I want to keep playing this game to earn rewards in class.</td>
<td>4.8</td>
<td>4.3</td>
</tr>
<tr>
<td>3.</td>
<td>I liked the rewards that we could earn.</td>
<td>4.8</td>
<td>4.4</td>
</tr>
<tr>
<td>4.</td>
<td>I liked getting to choose the token or sound used during the game.</td>
<td>5.0</td>
<td>4.3</td>
</tr>
<tr>
<td>5.</td>
<td>What rating would you give your experience with the game?</td>
<td>4.8</td>
<td>4.2</td>
</tr>
</tbody>
</table>

Mean: 4.8          4.3          4.5

Table 4 displays the results of the teacher social validity survey. The overall average rating of all items across both teachers on the teacher social validity survey was 5.6 out of 6. Teachers reported that the intervention was an appropriate and beneficial method of increasing appropriate behavior in their classroom. In addition, both teachers reported that they would suggest the intervention to other teachers. Anecdotally, one teacher reported that she had already begun recommending the intervention to fellow colleagues. Both teachers reported that they enjoyed letting the students vote for whether tokens or sounds would be used. Both teachers reported that they enjoyed using auditory feedback over visual feedback because it was "simpler" and "easier to do quickly".
Table 4. Teacher Social Validity Survey (Modified IRP-15) Results (6-point scale)

<table>
<thead>
<tr>
<th></th>
<th>Rob's Class</th>
<th>Jake's and Sam's Class</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>This was an acceptable intervention for the problem behavior engaged in by the targeted students in my class.</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>2.</td>
<td>Most teachers would find this intervention appropriate for behavior problems.</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>3.</td>
<td>This intervention proved effective in changing the overall problem behavior and academic engagement for targeted students in my class.</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>I would suggest use of this intervention to other teachers.</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>5.</td>
<td>The off-task behavior was severe enough to warrant use of this intervention.</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>6.</td>
<td>Most teachers would find this intervention suitable for the behavior problems in their class.</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7.</td>
<td>I would be willing to use this intervention with other students.</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>8.</td>
<td>This intervention did NOT result in negative side effects for children in my class.</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>9.</td>
<td>This intervention would be appropriate for a variety of children and classrooms.</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>10.</td>
<td>The intervention was consistent with those I have used in classroom settings.</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>11.</td>
<td>This intervention was a fair way to handle the problem behavior in my classroom.</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>12.</td>
<td>This intervention was reasonable for the behavior problems in my classroom.</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>13.</td>
<td>I liked the procedures used in this intervention.</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>14.</td>
<td>This intervention was a good way to increase appropriate behaviors in my classroom.</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>15.</td>
<td>Overall, this intervention was beneficial for the students in my classroom.</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

Mean 5 5.8 5.6
Figure 1. Percentage of intervals of on-task behavior across participants and conditions.
Discussion

This study compared the use of auditory and visual feedback in an interdependent group contingency designed to increase on-task behavior of three second grade students in a public elementary school. The results indicate that although both auditory and visual feedback were effective in increasing the targeted on-task behavior of all three students, two of the three students engaged in slightly higher levels of on-task behavior when auditory feedback was used. For one student, visual feedback resulted in a slightly higher level of on-task behavior than auditory feedback. This study also examined whether a group contingency with visual or auditory feedback would be more successful in increasing student on-task behavior if students were given choices regarding whether auditory or visual feedback was used. When the student choice component was added to the intervention in the subsequent phase, the increased levels of on-task behavior from the first intervention phase maintained for all three participants.

Even though the student choice component did not result in a further increase in on-task behavior, students reported that they enjoyed having the opportunity to vote on the type of feedback to be used, and teachers reported that they preferred allowing the students the opportunity to vote. Interestingly, the type of feedback which was chosen most often for each participant in the second phase corresponded with the type of feedback that had been the most effective for that student in the first phase. In completing social validity assessments, teachers and students reported that they enjoyed the use of auditory feedback. Both teachers reported that they preferred auditory feedback because it was easier to deliver than visual feedback, indicating
that the use of auditory feedback may have a good contextual fit for teachers to implement in the classroom environment. Several students also reported that they found it easier to listen for sounds than to divert their attention from their task to a token board.

The current study expands on the previous literature in several ways. A large collection of studies has supported the efficacy of using interdependent group contingencies in classroom settings that have incorporated verbal and visual feedback components (e.g., Christ & Christ, 2006; Wills et al., 2014). Similarly, several studies have explored the efficacy of using auditory feedback to increase appropriate behavior in a variety of non-academic settings (e.g., Persicke et al., 2014, Quinn et al., 2015). However, the current study is one of few studies that have specifically explored the use of auditory feedback in a classroom setting. In addition, this study is the first to explore the use of auditory feedback as a component of a group contingency.

Additionally, this study provides further support that adding a student choice component to behavioral interventions is a socially valid method of increasing student buy-in within an intervention (Kern et al., 1998; Jolvette, Wehby, Canale, & Massey, 2001). Additionally, the results of this study indicate that teacher preference should be taken into account when determining how group contingency interventions should be implemented (Donaldson, Matter, & Wiskow, 2018; Ennis et al., 2016). The interdependent group contingency intervention used in this study is a multi-component intervention that consisted of peer-mediated intervention, feedback, and differential reinforcement of low-rate behavior in which students could not access the back-up reinforcer if the entire class did not reach the goal for the day (i.e., hearing the selected sound five times or receiving five tokens). To have all these components be implemented effectively as designed, both student and teacher preferences should be considered in choosing the right kinds of feedback and reinforcers.
The current study provides further support for the use of interdependent group contingencies as an evidence-based class-wide or Tier 2 interventions in general education classroom settings (Ennis et al., 2016). Furthermore, this study suggests that the use of auditory feedback can be used as an effective alternative to more commonly used methods of feedback such as token boards and verbal redirection. The teachers who participated in this study recommended the use of auditory feedback to other teachers, suggesting that more teachers would be likely to incorporate the use of auditory feedback into their own classroom management strategies.

The results of this study inform several directions for future research. Target participants in this study engaged in mild to moderate off-task behaviors in the classroom, such as calling out, leaving assigned area, and taking eyes off current assigned task. Future studies could examine the effects of a group contingency intervention that incorporates auditory feedback to increase on-task behavior of students who are engaging in more severe problem behaviors. The currently study only compared auditory feedback with visual feedback. Future studies could compare the use of auditory feedback with verbal feedback, as the two feedback types are both received through an auditory channel. The current study only examined the use of auditory feedback in 2nd-grade general education classrooms. Future studies could explore the efficacy of auditory feedback with other populations, such as upper elementary or middle school students, and students with autism or other developmental disabilities.

The current study explored the efficacy of a group contingency intervention in place every day of the week for approximately six weeks. Both participating teachers reported that they used the group contingency intervention each day during the six-week period, even on days when data collection was not occurring. However, in the follow-up phase, one teacher
discontinued implementation completely, and another teacher continued to only implement the intervention occasionally. This brings into question whether it is feasible to implement a group contingency every day for a longer period of time, such as an entire school year. It is also not known whether the group contingency would maintain effectiveness if implemented every day over a long period of time. Future research could explore whether a group contingency such as the one in the current study could maintain effectiveness if implemented over a longer period of time. One teacher noted that adding variety to the intervention, such as changing the target behavior based on the needs of the classroom on a particular day, might keep the students more interested in the game, rather than implementing the game the same way for many consecutive weeks. Future research could also explore whether adding variety to the intervention (e.g., changing the reinforcers, changing the auditory/visual stimuli, changing the target behavior) could enhance the intervention's effectiveness over a long period of time.

Some limitations to this study should be noted. First, due to the limited number of participants, the better outcomes of auditory feedback were demonstrated in only two participants, which limits us to conclude that auditory feedback was more effective than visual feedback in increasing on-task behavior. Second, some teacher integrity data were collected based on teacher or student report. Time constraints prevented the PI and research assistant from being able to observe all of the implementation steps each day. Future studies could ensure that observational fidelity data are collected for all steps of the intervention for each participant on each day. Time constraints also required the teacher to implement the group contingency intervention each day, which may have resulted in target students becoming satiated on the backup reinforcers. Towards the end of the intervention phase, one target student who was initially enthusiastic about the intervention was observed making comments such as "I don't care
about the rewards”, indicating that satiation may have been occurring. Furthermore, only two
teachers were recruited to participate in the study, which resulted in one teacher having to
implement the intervention with the same group of students twice each day. These students
having multiple opportunities per day to earn the reinforcer could have further contributed to
satiation. Future studies could prevent satiation by offering a wider variety of back-up
reinforcers, increasing the requirement to earn back-up reinforcement, or only implementing the
group contingency intervention a few times a week rather than every day. Lastly, it should be
noted that the choice phase showed an initial decrease in on-task behavior for Sam. Sam's teacher
noted that she had anecdotally noticed a change in Sam's behavior following a big change in his
home life, indicating that extraneous variables may have had an impact on his on-task behavior.

Despite the mentioned limitations, the results of the current study support the use of
auditory feedback as a component of a classroom behavior management intervention. Various
uses of auditory feedback are currently being examined throughout behavior analysis literature.
This research study provides new evidence for the use of auditory feedback in a classroom
setting while providing further support for an already well-supported behavioral intervention.
Auditory feedback is a convenient and effective way to provide feedback to students regarding
their behavioral goals. Future research should continue to extend upon these findings to provide
further support for its use in classroom settings.
References


Appendices
PARTICIPANTS NEEDED FOR RESEARCH STUDY:

Incorporating Auditory Feedback into a Classroom Group Contingency

**Purpose:** This study will compare the efficacy of incorporating visual or auditory feedback (i.e., a token board vs. a sound administered on a smart-phone app) into a classroom group contingency. A group contingency involves setting a criterion of expected behaviors that all students are expected to meet. The auditory feedback component is expected to help students maintain track of their progress towards their behavior goal. Many studies have demonstrated that group contingencies are effective methods of **increasing on-task behavior and decreasing off-task behavior** (Little, Akin-Little, & O’Neill, 2015).

**Students eligible to participate:**

- between the ages of 5-11
- may or may not be diagnosed with a disability
- may be served in a general education or exceptional student education setting
- could benefit from an intervention designed to increase on-task behavior

If you have questions or believe you have student(s) who may benefit from this intervention, please contact:

Beth Giguere, Master's student in Applied Behavior Analysis at University of South Florida

Email: bgiguere@mail.usf.edu
Appendix B: Data Collection Sheet

Interval Recording Sheet

Date: ___/___/___ Start time: _______   End time: _______ Observer: ___________________________

Class: _____________________      Academic Period: _________________

Clearly mark (+ or -) if the child engaged in defined on-task behavior at the end of the 10-s interval.

<table>
<thead>
<tr>
<th></th>
<th>0:00</th>
<th>0:10</th>
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</table>

On-task Behavior: # of int. = _____ (___%)

IOA: On-task Behavior: # of Agreements ____/# of Intervals____ = ____%
## Appendix C: Treatment Integrity Checklist

<table>
<thead>
<tr>
<th>Implementation Step</th>
<th>Completed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Teacher pulled a strip of paper out of the reward jar to identify back-up reinforcer</td>
<td>Yes/No</td>
</tr>
<tr>
<td>2. Teacher verbally reminded students of the target behavior and modeled the target behavior before the first interval began</td>
<td>Yes/No</td>
</tr>
<tr>
<td>3. Teacher allowed students to vote for whether auditory or visual feedback would be used (student choice phase only)</td>
<td>Yes/No</td>
</tr>
<tr>
<td>4. Teacher showed the students three sets of students and allowed students to vote on the tokens to be used. Teacher then used the tokens chosen by the students throughout the intervention</td>
<td>Yes/No</td>
</tr>
<tr>
<td>5. Teacher showed tokens to students before the first interval as a reminder of what to look for</td>
<td>Yes/No</td>
</tr>
<tr>
<td>6. Teacher verbally reminded students how many tokens they needed on the board in order to receive the back-up reinforcer</td>
<td>Yes/No</td>
</tr>
<tr>
<td>7. Teacher informed students when the first interval began</td>
<td>Yes/No</td>
</tr>
<tr>
<td>8. Teacher scanned room within 10-s of the end of each interval</td>
<td>#Yes___</td>
</tr>
<tr>
<td>9. Teacher put token on board at the end of each interval if ALL students were engaging in target behavior</td>
<td>#Yes___</td>
</tr>
<tr>
<td>10. Teacher notified students if they reached the goal for back-up reinforcer or if intervention period ended</td>
<td>Yes/No</td>
</tr>
<tr>
<td>11. Teacher ended the intervention once the class reached behavior goal or once observation period ended</td>
<td>Yes/No</td>
</tr>
<tr>
<td>12. Teacher delivered previously selected back-up reinforcer to students before the end of the day</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>

**Total Yes:**  
**Percentage of Completed Steps:**
Appendix D: Teacher Social Validity Survey

Adapted IRP-15

Adapted from the IRP-15 Copyright, 1982. Brian K. Martens & Joseph C. Witt

Please circle the number that best describes your agreement or disagreement with each statement using the scale below.

1= Strongly disagree 2= Disagree 3= Slightly disagree 4= Slightly agree 5= Agree 6= Strongly agree

1. This was an acceptable intervention for the problem behavior engaged in by targeted students in my class.
   
   1 2 3 4 5 6

2. Most teachers would find this intervention appropriate for behavior problems in addition to those described.
   
   1 2 3 4 5 6

3. This intervention proved effective in changing the overall problem behavior and academic engagement for targeted students in my class.
   
   1 2 3 4 5 6

4. I would suggest the use of this intervention to other teachers.
   
   1 2 3 4 5 6

5. The off-task behavior was severe enough to warrant use of this intervention.
   
   1 2 3 4 5 6

6. Most teachers would find this intervention suitable for the behavior problems in their class.
   
   1 2 3 4 5 6

7. I would be willing to use this intervention in the classroom setting with other students.
   
   1 2 3 4 5 6

8. This intervention did not result in negative side effects for children in my class.
   
   1 2 3 4 5 6

9. This intervention would be appropriate for a variety of children and classrooms.
   
   1 2 3 4 5 6

10. This intervention was consistent with those I have used in classroom settings.
    
    1 2 3 4 5 6

11. This intervention was a fair way to handle the behavior in my classroom.
    
    1 2 3 4 5 6

12. This intervention was reasonable for the behavior problems in my classroom.
13. I liked the procedures used in this intervention.

14. This intervention was a good way to increase appropriate behavior in my classroom.

15. Overall, this intervention was beneficial for the students in my classroom.

16. If you had any specific likes/dislikes/suggestions regarding the intervention, please describe them using the space below. Your comments could help researchers modify the intervention for future studies.

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

17. Did you prefer using auditory or visual feedback during the intervention? Why did you prefer using this type of feedback?

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________
Appendix E: Student Social Validity Survey

(Adapted from IRP-15)

Please answer these questions about the game you have been playing in class to earn rewards.

1. I liked playing the game.
   1 Strongly disagree  2 Disagree  3 Neutral  4 Agree  5 Strongly agree
2. I want to keep playing this game to earn rewards in class.
   1 Strongly disagree  2 Disagree  3 Neutral  4 Agree  5 Strongly agree
3. I liked the rewards that we could earn.
   1 Strongly disagree  2 Disagree  3 Neutral  4 Agree  5 Strongly agree
4. I liked getting to choose the token or the sound used during the game.
   1 Strongly disagree  2 Disagree  3 Neutral  4 Agree  5 Strongly agree
5. What rating would you give your experience the game?
   5 I loved it  4 I liked it  3 I didn’t care  2 I did not like it  1 I hated it
6. What did you like about the game? What did you not like about the game?
7. Did you like using the sounds or the tokens better during the game and why?
Appendix F: Back-up Reinforcer Preference Assessment

Please circle 5 items you would most like to earn at school:

Extra recess time  Extra inside recess  Take shoes off
Snacks  Pick a Go-noodle  Candy
Dance Party  Pick a game
Appendix G: Stimuli Preference Assessment

Please circle the 3 pictures you like best:

![Elephant and Pig](image1)
![Cat with Glasses](image2)
![Pikachu](image3)
![Lion](image4)
![Bird](image5)
![Panda](image6)

Please circle the 3 sounds you like best:

Game winner
Magic
Laserbeam

Lion roar
Harp
Bark
Appendix H: Teacher Training PowerPoint

- **What is an interdependent group contingency?**
  - All students are held to the same behavioral expectation
  - All students must meet the expectation in order to get the reward
  - Well supported in research as an effective way to increase on-task behavior in the classroom

- **Teacher feedback**
  - Providing continuous feedback to students about their behavioral goals increases classroom engagement and reduces problem behavior
  - Three types of feedback commonly used in classrooms: oral, auditory, visual

- **Brief overview: This study will**
  - Compare the effectiveness of using two different types of feedback in a group contingency (visual vs. auditory)
  - Explore whether incorporating student choice into the intervention will increase outcomes

- **Data collection**
  - PI will come in and collect data on target student's behavior 30 min, 2-5 days/week
  - Another research assistant will occasionally collect data alongside the PI

- **Before starting intervention each day:**
  - PI will tell you whether you will use tokens or sound
  - Remind students of target behavior and model target behavior
  - Allow students to vote for token/sound
  - Show students token/sound to remind them what to look for/listen for
  - Remind students how many tokens/sounds they need to earn reward

- **To run intervention:**
  - Start timer, tell students it has begun
  - When timer goes off, scan room within 10s
  - If all students are engaging in target behavior, put up token or play sound
  - Repeat until goal is reached or intervention period ends
  - If goal is reached, pull strip of paper from reward jar
  - Deliver selected reward before the end of the day

- **Group contingency with student choice**
  - Same as phase 2, except students will vote on whether tokens or sound is used each day (heads down, hands up)

- **Any questions?**
- **Let's try it!**
Appendix I: Student Training Script

"Today we are going to begin playing a new game. When we play this game, you will have the opportunity to earn a reward such as candy, snacks, a dance party, a go noodle, or extra recess. In order to earn the reward, you will all need to be sitting appropriately with your eyes on your task during writing. During writing, I am going to look around every once in a while to make sure you are all sitting appropriately with your eyes on your task. If I can see that ALL of you are doing this, I will press a button on my phone that will play a sound. That sound means you are all following the rule! If you hear that sound 5 times during writing, it means that you have won your reward! It is VERY important to remember that you must ALL be sitting appropriately with your eyes on your task in order to hear the sound. If even one student is not doing this, you will not hear the sound! So it is important to encourage each other to follow the rule for all of writing so that you can all receive the reward at the end of the day! If you hear the sound 5 times, I will pull a piece of paper out of this jar. The paper I select will tell us which reward you earned. Does anyone have any questions?

Teacher will then ask students to model examples/non-examples of targeted on-task behavior.
Appendix J: USF IRB Approval Letter

August 24, 2017

Beth Giguere

ABA-Applied Behavior Analysis  Tampa, FL 33612

RE:  Expedited Approval for Initial Review
IRB#: Pro00031857
Title: Incorporating Auditory Feedback and Student Choice into an Interdependent Group Contingency to Improve On-Task Behavior

Study Approval Period: 8/23/2017 to 8/23/2018

Dear Dr. Giguere:

On 8/23/2017, the Institutional Review Board (IRB) reviewed and APPROVED the above application and all documents contained within, including those outlined below.

Approved Item(s):
Protocol Document(s):
Protocol Version 1 8.21.17

Please note, no research related activities can begin until a letter of support from the study site/school district is submitted and approved through an amendment to this protocol.

Consent/Assent Document(s)*:
Parental Permission V1 8.21.docx.pdf
Teacher Consent V1 8.20.docx.pdf
Student Verbal Assent Script
*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent documents are valid until the consent document is amended and approved. The Student Verbal Assent is not a stamped form.

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110. The research proposed in this study is categorized under the following expedited review category:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Study involves children and falls under 45 CFR 46.404: Research not involving more than minimal risk.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval via an amendment. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) calendar days.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

Kristen Salomon, Ph.D., Vice Chairperson

USF Institutional Review Board
Appendix K: School District of Manatee County Approval Letter

SCHOOL DISTRICT OF MANatee County

August 18th, 2017

Dear Ms. Giguere,

The School District of Manatee County has agreed to participate in your research proposal. A copy of this letter must be available to all participants at the designated school through which your research is being conducted. This is to assure them your research has been approved by the district. Approval is given for your research under the following conditions:

1) The designated school for which your research will be conducted must be approved and supervised by an ESE Behavior Specialist.

2) Participation is to be on a voluntary basis. That is, participation is not mandatory and you must advise all participants that they are not obligated to participate in your study.

3) If the principal agrees the school will participate, it is up to you to find out what rules the school has for allowing people on campus and you must abide by the schools’ check-in policy. You will not be allowed on any school campus without first following the school’s rules for entering campus grounds.

4) Parent permission must be obtained for all student involved in your research. You must indicate in your letter to the parent all the types of data you will be collecting (i.e. race, gender, FSA scores, etc.). You must have this consent before you begin your research of data.

5) Confidentiality must be assured for all. That is, all data must be aggregated such that the participants cannot be identified. Participants include the district, principals, administrators, teachers, support personnel, students and parents.

6) Data collection can not occur while the students are testing (i.e. FSA, iReady, Benchmark Assessments, ELL, etc.). It is up to you to find out what the testing schedule is for the participants and schedule data collection accordingly.

7) This approval will expire at the end of the 2017-2018 school year. You will have to contact us at the time if you feel your research approval should be extended.

8) Your proposal indicates that you will come into contact with students. You must be fingerprinted and drug tested and you will not be allowed to do your research until this process has been completed.

Good luck with your research,

Wylence Herring-Cayase
ESE Director

Karen Mills
Behavior Specialist
PRACTICUM SUPERVISOR

Darla Parry
Behavior Specialist

Sara Barnes
Behavior Specialist