Function-Based Intervention to Support the Inclusion of Students with Autism

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Abstract: Seven-year-old triplets with autism displayed off-task behavior that threatened their continued placement in a general education first-grade classroom. A descriptive Functional Behavioral Assessment (FBA) was conducted for each student. Data from structured interviews and direct observations were used to identify the functions of their off-task behaviors and to design a comprehension function-based intervention. Task analyses of the students’ replacement behavior provided empirical data for deciding whether each student needed specific instruction to independently perform the replacement behavior. The intervention was systematically implemented during typical classroom activities for five weeks and follow up data were collected for an additional three weeks. The intervention improved each student’s behavior and the effects maintained during follow up. Social validity ratings by all staff members were high.

As more children are being diagnosed with autism spectrum disorder (ASD), the number of these children primarily educated in general education classrooms has increased. For instance, the percentage of students with an ASD, ages 6 through 21, included in a general education class for more than 80% of the school day rose from 14% in 1996 to 31% in 2005 (US DOE, 2007). Although many of these students have the cognitive abilities to learn the academic content presented in a general education setting, they also are at-risk of developing problem behaviors given their difficulties with social interactions, communication, and change. Unfortunately, these students’ challenging behaviors can interfere with their success and threaten their continued placement in general education classrooms (Neitzel, 2010; Conroy, Asmus, Sellers, & Ladwig, 2005; Williams, Johnson & Sukhodolsky, 2005).

In school settings, the use of function-based intervention is considered best practice to address the challenging behaviors of all students. Researchers have repeatedly demonstrated its use across grade levels to effectively decrease a variety of problem behaviors and increase appropriate replacement behaviors with at-risk typically developing students (Lane, Weisenbach, Phillips, & Wehby, 2007; Liaupsin, Umbreit, Ferro, Urso, & Upreti, 2006; Wood, Umbreit, Liaupsin, & Gresham, 2007), students with emotional and behavioral problems (Kern, Delaney, Clarke, Dunlap, & Childs, 2001; Turton, Umbreit, Liaupsin, & Bartley, 2007), students with cognitive delays (Sasso et al., 1992; Frea & Hughes, 1997), as well as students with ASD (Chandler, Dahlquist, Repp, & Feltz, 1999; Mueller, Wilczynski, Moore, Fusilier, & Trahant, 2001; O’Neill & Sweetland-Baker, 2001). Function-based interventions have been successfully implemented in a variety of school and classroom settings.

Researchers have also reported successful interventions supporting the inclusive placement of students with cognitive delays (Blair, Liaupsin, Umbreit, & Kweon, 2006; Duda, Dunlap, Fox, Lentini, Clarke, 2004; Umbreit, 1996), behavioral disorders (Blair, Umbreit, Bos, 1999), ADHD (Umbreit, 1995), and learning disabilities (Todd, Horner, Sugai, 1999). However, few researchers have investigated the use of function-based interventions to support the inclusion of students with an ASD in general education classrooms. Al-
though some studies have been conducted with children with ASD in preschool settings (Wood, Ferro, Umbreit, & Liaupsin 2011; Blair, Fox, & Lentini, 2010), only one has examined this approach with a student diagnosed with an ASD in a general education classroom. Blair, Umbreit, Dunlap, and Jung (2007) examined the usefulness of function-based intervention as a tool to support the inclusive placement of a 6-year old kindergarten student diagnosed with both mental retardation and autism in a general education classroom in South Korea. Researchers found the teacher and assistant’s successful implementation of the intervention enabled the student to remain in the inclusive class.

As more high-functioning students with an ASD participate in general education classrooms, there is a need to identify evidence-based practices to support and maintain their inclusion in the least restrictive environment (Buschbacher & Fox, 2003). Additional research on the efficacy of function-based intervention is needed to provide teachers an effective strategy to help children with ASD reach their full potential in inclusive classrooms (Harrower & Dunlap, 2001; Frea & Hughes, 1997).

A key element in function-based intervention is to identify an appropriate replacement behavior (Sugai et al., 2000). When designing intervention components, one must determine whether the student can already perform the replacement behavior or whether it needs to be taught directly. Unfortunately, research has provided little direction about how to empirically verify whether a student can perform a particular replacement behavior prior to intervention.

The primary purpose of this study was to examine the effectiveness of function-based intervention with three high-functioning students with autism whose challenging behaviors put them at risk for removal from their inclusive first-grade classroom. A secondary purpose was to investigate the use of task-analysis as a tool in determining whether a student can perform a replacement behavior prior to function-based support. The study was conducted in three phases. A descriptive functional behavioral assessment (FBA) was conducted in Phase 1. The FBA included structured interviews and direct observations that were used to identify the function(s) of the target behavior. In Phase 2, a function-based intervention was systematically developed for the participants. In Phase 3, the intervention was implemented in the classroom during the most problematic naturally occurring activities for each student.

**Method**

**Participants and Setting**

Participants were Sam, Ron, and Joe, seven-year-old male triplets diagnosed with ASD who attended a first-grade classroom in an urban public elementary school. The participants’ IEP team members initiated a referral to the school district’s behavior team with concerns regarding each student’s off-task behaviors and the staff’s abilities to support them in the general education setting. The class consisted of 18 students, a certified teacher, a part-time teaching assistant, and two teaching assistants who were assigned to support the triplets throughout their school day. Each participant performed at grade level in reading and math, as indicated by both standardized and curriculum-based measures. In addition, each participant received special education services in the areas of written expression (three days a week for 50 min), and speech therapy (twice a week for 30 min).

The typical morning schedule alternated between whole-group instructional activities, small group activities, and individual seatwork. Five tables were arranged with three or four students assigned per table. As students arrived each morning, they were expected to complete an independent activity (worksheet or journal entry) at their seats. Then, the teacher had all students sit at the carpet area for morning activities and to introduce or review the upcoming center activities. Next, the students were assigned to one of four centers to work on a math or language arts activity. When finished, the students returned to the carpet area to review what they had learned and receive directions for the next scheduled center activities. Once again, the students would be assigned to a center to work independently or with a partner until lunch recess. Each day, the students were assigned to a different center and, on Fridays, the students...
either finished assignments they had not completed during the week, or were allowed to read silently.

Behavioral Definitions

For Sam and Ron, the target behavior was off-task, defined as failing to start an assignment or stopping work on an assignment for more than 10 s, whining/crying, inappropriate interaction with peers, or using materials other than specified by the teacher.

Joe’s off-task behaviors included refusing or failing to start an assignment, or stopping work on an assignment for more than 10 s, whining/crying, leaving seat (e.g., under or on the table), throwing materials, or using materials other than specified by the teacher. For all three students, the replacement behavior (dependent variable) was on-task, defined as performing the steps necessary to complete class assignments independently, working quietly, and raising a hand to participate or get assistance.

Phase 1: Functional Behavioral Assessment

Procedure

A functional behavioral assessment was conducted for each student to identify the antecedent conditions that set the occasion for their off-task behaviors, and the consequences that maintained these behaviors. Data were collected through a structured interview and direct observations in the classroom. This information was then analyzed to determine the function(s) of each student’s target behaviors and the situations in which intervention was needed.

Staff Interview. A structured interview was completed with the two teaching assistants assigned to support the participants. The interview followed the Preliminary Functional Assessment Survey (Dunlap et al., 1993), a 22-item survey designed to gather information about the student’s behaviors of concern and the environmental conditions that contributed to their occurrence.

Structured observations. A-B-C data (Bijou, Peterson, & Ault, 1968) were collected simultaneously for each participant for seven days over a five-week period. Each observation lasted approximately two and a half hours during the morning’s naturally occurring activities.

Task analysis assessment. To help determine whether the participants could perform the replacement behavior independently, the replacement behavior (on-task) was task analyzed into 11 steps (See Table 1). As the students participated in naturally occurring morning center activities, data on whether each participant performed the steps of the task analysis independently (I), or was verbally prompted (VP) was collected by marking an “I” or “VP” after each step. The percentage of steps in the task analysis that each participant completed independently was determined for three sessions. This information was used to select the appropriate intervention method.

Identification of function. The function(s) of each student’s off-task behavior was determined by analyzing the FBA data using the Function Matrix (Umbreit, Ferro, Liaupsin, & Lane, 2007), a visual tool that assists users in determining whether the student is gaining access to something (positive reinforcement) or escaping/avoiding something (negative reinforcement), or both. The user then identifies more specifically whether the student is

### Table 1

<table>
<thead>
<tr>
<th>Task Analysis Steps:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Goes to seat or correct center within 1 min of teacher prompt</td>
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<tr>
<td>2. Gets materials to complete the task, if needed</td>
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<tr>
<td>3. Writes name and date on assignment within 1 min</td>
</tr>
<tr>
<td>4. Begins the first step of assignment within 1 min</td>
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<tr>
<td>5. Works quietly</td>
</tr>
<tr>
<td>6. Remains in seat or designated area</td>
</tr>
<tr>
<td>7. Requests help appropriately (raise hand and/or asks aides), if needed</td>
</tr>
<tr>
<td>8. Interacts with materials/peers appropriately (as directed by teacher)</td>
</tr>
<tr>
<td>9. Follows the steps needed to complete the assignment</td>
</tr>
<tr>
<td>10. Puts materials needed to complete the assignment</td>
</tr>
<tr>
<td>11. Moves to the next activity when prompted by teacher within 1 min</td>
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</tbody>
</table>
gaining or escaping attention, tangibles/activities, or sensory consequences.

Results

Results of the interviews, direct observations, Function Matrix analyses, and task analysis assessment are presented for each student.

Ron. The teaching assistants were most concerned with Ron’s tantrums, which included throwing and whining or crying. They reported these tantrums occurred at least once a day, were more likely during morning activities, and might enable Ron to escape work. When upset, they would try to calm Ron or remove him from class. They believed his problem behaviors occurred across all the staff and were unaware of any specific events that might cause the problem behaviors to occur.

Ron cried several times during the A-B-C observations. These occurred when he (a) wanted to participate in another center other than the one he was assigned, or (b) when the teacher chose other students for activities such as being line leader, coming to the board, or having the “listening bear” at their seat. The most frequent consequence in these situations was that the classroom teacher tried to console him by explaining why she had made her decision. On some occasions, she allowed him up to the board or worked with him individually to stop his whining/crying. During center activities, Ron generally did not start the assignment or would stop working. Instead, he played with his materials or talked with classmates. In every case, the teacher or assistant approached him to provide assistance to begin or continue the assignment. Ron also frequently left his seat to approach the teacher or interact with a classmate. Whenever Ron approached the teacher, she interacted with him by looking at his sheet, answering a question, or letting him know what else he needed to do to complete the activity.

Results of the three task analysis assessments indicated Ron completed an average of only 52% (range = 29–67%) of the steps of the replacement behavior independently. Using the Function Matrix, the function of Ron’s off-task behavior was to gain attention/assistance from the teacher and assistants.

Sam. The teaching assistants were most concerned about Sam’s tantrums, which they described as crying, throwing, and kicking. As with Ron, the staff reported these behaviors occurred at least once a day and might be motivated by escape from work. The staff responded by either trying to calm Sam down or removing him from class. They were not aware of any specific events that triggered his problem behaviors.

During the A-B-C observations, Sam whined or cried frequently when (a) the teacher selected other students to participate in the group discussion, (b) when Ron began to cry, and (c) when another student took a marker Sam wanted during center time. In all instances, the teacher either explained why he did not need to be upset, or allowed him to participate. When the other student took the marker Sam wanted, the teacher gave Sam another one. During morning centers, Sam often failed to start or stopped working on an assignment, stared for several minutes, interacted with peers, or played with his materials. In response to these instances, an adult approached and prompted him to get back on-task or provided assistance to complete the assignment.

Results of the three task analysis assessments indicated that Sam independently completed an average of only 54% (range = 50–57%) of the steps of the replacement behavior. Using the Function Matrix to interpret the collected data, the function of Sam’s off-task behaviors was to gain attention and assistance from the teacher and assistants.

Joe. Both teacher assistants considered Joe’s behaviors the most challenging. They were concerned with his tantrums (screaming, being disrespectful, throwing, refusing to work, and leaving class without permission). They reported that these behaviors occurred at least twice per day and were more likely in the morning during centers. They believed Joe became upset when he did not want to work or when he preferred to do something else and was not allowed. As with Ron and Sam, the assistants either tried to calm him down or removed him from class when the behavior escalated. The assistants noted that none of the participants exhibited challenging behaviors while working on preferred activities.
During the A-B-C observations, Joe frequently refused to begin or complete assignments, and instead played with small items in his pockets. In every case, the teacher or assistant approached and asked him to put away the item, took it away, or attempted to engage him in the assigned activity. Joe was occasionally redirected to the activity if an adult worked with him individually. Other times, Joe continued to refuse and cried, whined, and crawled under his table. When this occurred, the assistant attempted to get Joe to participate in the activity, or the teacher reduced his assignment so he would stop crying. If that was unsuccessful and Joe continued to disrupt the class environment, he was removed from the class. When the activity ended, Joe would move to the next activity.

Results of the three task analysis assessments indicated that he independently completed an average of only 48% (range = 44–57%) of the steps of the replacement behavior. Using the Function Matrix to interpret the collected data, the functions of Joe’s off-task behavior were to simultaneously gain attention and avoid doing his work.

Phase 2: Function-Based Intervention

In Phase 2, the FBA and task analysis data were used to design a function-based intervention for Ron, Sam, and Joe. The resulting intervention was then implemented for five weeks.

Procedure

A function-based intervention was developed using the systematic process described by Umbreit et al. (2007). This process begins by answering two questions: (a) “Can the individual perform the replacement behavior?” and (b) “Do the antecedent conditions represent effective practice?” The answers to these questions lead to four possible outcomes. Each outcome identifies which of three intervention methods, individually or in combination, is appropriate for a given situation.

Each intervention method includes three common components — antecedent conditions are adjusted to increase the likelihood the student will exhibit the replacement behavior, and reinforcement is provided when the replacement behavior occurs and is withheld (extinction) when the target behavior occurs. The intervention methods differ in the ways specific antecedent and consequent variables are adjusted depending on the different conditions that are occasioning and reinforcing a target behavior.

Intervention Design

If the student cannot perform the replacement behavior, or does not perform it fluently, but the antecedent conditions represent effective practice, then Method 1, Teach the Replacement Behavior is used. To answer the first question in the Decision Model, the task analysis assessment provided empirical data demonstrating that none of the participants were able to independently perform all steps of the replacement behavior. Observational data indicated that the overall classroom conditions reflected effective practices (Question 2), so Method 1: Teach the Replacement Behavior, was selected for all three students. The resulting function-based intervention is presented in Table 2. The required components of the method are presented in the left-hand column; the specific modifications that were made to address each required component are presented in the right-hand column.

First, the students were taught to use visual instruction to complete activities independently. Drawings of common steps in classroom activities were made and placed in a binder on strips of Velcro. Before each center activity, the assistants set up each participant’s visual instructions by placing the necessary pictures of each step in the activity in vertical order with Velcro on top of the binder. An example might include “write name and date, count, write, and put materials away.” As the participants completed each step in the activity, they were taught to move each picture from the “Do” column on the right of the binder to the “Finished” column on the left. Also, the participants were taught to raise their hands to request assistance or interact with the adults.

When the intervention was first implemented, the adults modeled hand-raising by standing in close proximity to the participants when they were off-task to prompt the appropriate response if the students had a question or needed adult assistance. In addition, to
address the escape function for Joe, a table was designated as a “taking time” area in the class. All students in the class were told that, if they were angry or frustrated, they could go to that area to take a break until they were calm and ready to return. The teacher and other adults modeled how to take time appropriately and the participants role-played how and when to use the break area. Before each center activity the assistants (a) reviewed the steps in the activity with each student, (b) reminded them to raise their hand if they needed help, or to take time if needed, and (c) reminded them they would earn an “I did it!” card (token) if they were on-task for 80% of observed intervals during the activity.

The second intervention component required providing reinforcement for the replacement behavior. During center activities, participants were verbally praised at least once every two min while they were performing the replacement behavior. In addition, a token reinforcement system was used. If the student met the on-task criterion (80%), he received a token that could be exchanged for 3 min of a preferred activity (snack, scooter board, social time with staff).

The final intervention component required an extinction procedure for occurrences of the target behavior. The teacher and assistants were taught to remind students to raise their hand if they needed help or to go to the break area, and to otherwise ignore participants’ off-task behaviors (attention-extinction). If off-task behavior prevented finishing an assignment, students were required to complete it during lunch recess (escape-extinction).

Phase III: Function-Based Intervention Implementation Design

This phase of the study took place over nine weeks that included one week of baseline conditions, five weeks of intervention, and three weeks of follow up. A withdrawal design with staggered reversal conditions across students was used to test the effects of the function-based intervention. After the FBAs were completed, baseline data were obtained and the intervention was started for all three participants at the same time. Use of a multiple baseline design was considered, but rejected; given the level of disruption to the classroom environment, withholding the intervention from any of the participants was neither practical, nor appropriate. Once each student met the plan’s criterion to exhibit the replacement behavior at least 80% of observed intervals for five consecutive sessions, the return-to-baseline and reinstatement of intervention conditions were individually staggered for each participant.

In Phase 3, the classroom teacher and assistants were taught to implement the intervention within the context of the naturally occurring activities and routines in the classroom. For the first three days of the intervention, the first author and an instructional specialist

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**TABLE 2**

Function-Based Intervention

<table>
<thead>
<tr>
<th>Method Elements: Adjust antecedent conditions so new behaviors are learned.</th>
<th>Intervention Components: • Teach to use visual schedule. • Teach to raise hand. • Remind of expected behaviors before each activity. • Teach to take time when needed. • Provide verbal praise for on-task behavior at least once every two minutes. • After each completed activity, provide a “You did it!” card. Exchange daily to access privileges. • Ignore whining and crying. • Remind to raise hand before providing adult assistance. • Remain in from recess until class assignments are completed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide reinforcement for the replacement behavior.</td>
<td>Withhold the consequences that previously reinforced the target behavior.</td>
</tr>
</tbody>
</table>
from the district’s behavior team modeled correct implementation of the intervention. The staff then assumed responsibility for implementing the plan. Thereafter, the first author or instructional specialist answered questions, reminded staff of what they should do next, and shared treatment integrity data with the staff to provide feedback on how well they were implementing the intervention.

Behavioral Definitions and Measurement

The behavioral definitions used in Phase 1 were used again in Phase 3. Data on the replacement behavior were collected daily; data on treatment integrity were collected approximately once every three sessions. Each session lasted 7–20 min depending on the natural length of the activity and was usually conducted during the first morning center activity.

On-task behavior was measured using a 30-s whole-interval recording method. Treatment integrity data were collected using a 13-step checklist of the intervention components (Table 3). During the center activity, the first author completed the checklist by marking whether each intervention component was observed or not applicable. The percentage of correct implementation was obtained by dividing the number of observed intervention components by the total number of applicable intervention components, and multiplying the result by 100%.

Inter-observer agreement (IOA) data were collected by having a second observer independently record data on the replacement behavior. Depending on the student, IOA data were collected for 33–50% of the baseline sessions, 35–44% of the intervention sessions, 0–100% of the reversal sessions, and 33% of the maintenance sessions.

IOA was assessed using the exact interval-by-interval method (Kazdin, 1982). Each interval scored identically was considered an agreement. IOA was calculated by dividing the number of agreements by the total number of intervals and multiplying by 100%. IOA data

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TABLE 3

Treatment Integrity Form

<table>
<thead>
<tr>
<th>Intervention Components:</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before center and individual seat work activities, the visual schedule is set up to show the sequence of steps needed to complete the activity.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before center and individual seat work, the steps needed to complete the activity are reviewed with the student, and he is asked if he has any questions.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before all activities, the student is reminded to raise hand to participate, request help, or go to the taking time table.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The student is praised or prompted to move the picture on his visual schedule from “do” column to “done” column as he completes each step.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>The student is praised for exhibiting replacement behaviors at least once every 2 min.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If earned, the student receives a token at the end of the activity.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>The student is allowed to exchange tokens for a choice of privileges at least once every 90 minutes.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>If the student is off-task for more than 1 min, the student is reminded to request help.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>If the student whines or cries, he is reminded to remain calm or take time until ready to return.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>The student is praised for taking time and receives a token for taking time when needed.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>If whining/crying continues after reminder, the student is removed from room to an area outside of class.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>While outside, the assistant does not interact with the student other than to remind him when he is calm and in the seat he will be ready.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student stays in from recess to complete missed work due to target behaviors.</td>
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<td></td>
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</tbody>
</table>
for the replacement behavior were collected during 42% of Ron’s sessions, 44% of Sam’s sessions, and 40% of Joe’s sessions. IOA averaged 92% (range = 75–100%) for Ron, 95% (range = 74–100%) for Sam, and 95% (range = 79–100%) for Joe.

Social Validity

The teacher and two classroom assistants completed a social validity checklist at the end of the intervention phase. Each staff member independently completed a five-question rating scale developed by the first author to assess whether the intervention was warranted, acceptable, and beneficial for the classroom in question (for a copy of the survey items, contact the first author). Each item was rated on a 4-point Likert-type scale (4 = Strongly Agree; 1 = Strongly Disagree). Scores could range from 5–20, with higher scores indicating higher social validity.

Task Analysis Assessment

The task analysis method used initially to help determine whether the participants could perform the replacement behavior independently was used again once the participants were exhibiting the replacement behavior an average of 80% of observed intervals. Multiple probes were conducted within and across conditions for each student. The percentage of steps each participant completed independently was determined by dividing the number of steps performed independently by the total number of steps, and multiplying the result by 100%.

Results

Figure 1 shows clear functional relationships between the intervention and each student’s level of on-task behavior. In each case, on-task levels were low during baseline conditions, increased during the intervention conditions, and were maintained during the follow-up period. Specifically, Ron’s on-task behavior averaged 42% (range = 0–68%) during baseline and increased to an average of 85% (range = 28–100%) during intervention. During a single return to baseline condition, his on-task behavior decreased to 47%. Because staff op-posed withdrawing the intervention any longer, it was immediately reinstated. Ron’s on-task behavior increased to an average of 96% (range = 89–100%) during the final intervention phase and maintained at an average of 93% (range = 89–100%) during follow-up.

Sam’s on-task behavior averaged 48% (range = 18–79%) during the initial baseline phase compared to 87% (range = 50–100%) during the initial intervention phase. Mean on-task levels decreased to 21% (range = 0–37%) when the intervention was withdrawn, increased to 94% (range = 82–100%) when the intervention was reinstated, and maintained at 98% (range = 95–100%) during follow-up.

Joe’s on-task behavior averaged 50% (range = 17–73%) during the initial baseline condition compared to 90% (range = 28–100%) during the first intervention condition. Mean on-task levels decreased to 37% (range = 29–47%) when the intervention was withdrawn, increased to 77% (range = 50–100%) when the intervention was reinstated, and maintained at 100% during follow-up.

During intervention and follow up, mean treatment integrity was 99% (range = 88–100%) for Sam and Ron, and 95% (range from 88–100%) for Joe. Treatment integrity was also computed during the withdrawal phase and was zero for all three interventions, demonstrating that no intervention elements were in place during withdrawal. On the social validity ratings, all three staff gave the intervention full credit (20/20).

Figure 2 shows the percentage of steps in the task analysis that each participant completed independently across all conditions. During the initial intervention phase, these data were collected after each student demonstrated the replacement behavior an average of 80% of observed intervals. For Ron, the percentage averaged 93% (range = 80–100%) during the initial intervention phase, decreased to an average of 27% when the intervention was withdrawn, and increased to an average of 94% (range = 90–100%) when the intervention was reinstated. During follow-up, Ron completed an average of 97% of the task analysis steps independently (range = 91–100%).

Sam averaged 98% (range = 91–100%) during the initial intervention phase. The per-
percentage decreased to 45% (range = 27–64%) when the intervention was withdrawn, an increased to 93% (range = 90–100%) when the intervention was reinstated. During follow-up, Sam completed 100% of the task analysis steps independently in all three sessions.

For Joe, the percentage of task analysis steps performed independently averaged 91% (range = 55–100%) during the initial intervention phase, decreased to an average of 40% (range = 36–45%) when the intervention was withdrawn, and increased an average of 100% once the intervention was reinstated. During follow-up, Joe completed an average of 97% (range = 91–100%) of the steps independently.

Figure 1. Levels of on-task behavior and treatment integrity for Ron, Sam, and Joe.
Discussion

This study investigated the effectiveness of function-based intervention and task analysis in supporting the continued inclusion of three high-functioning students with autism whose behavior put them at risk for removal.

Figure 2. Task analysis assessment for Ron, Sam, and Joe.
from their general education class. Implementation of the intervention resulted in behavioral improvements for each participant that were maintained during follow up. It is noteworthy that high levels of on-task behavior were obtained even though data were collected using the whole-interval method, which provides the most conservative estimate of on-task behavior. The intervention also received high social validity ratings from the staff responsible for its implementation.

This study extends the research supporting the effectiveness of function-based intervention for the inclusion of students in the least restrictive environment (e.g., Blair et al., 2006; Todd et al., 1999; Umbreit, 1995, 1996). In this case, the interventions were implemented with high functioning students with ASD in a general education setting. Following initial modeling, the intervention was implemented by the classroom staff, primarily by two classroom instructional assistants. The study is also the first to examine the use of task analysis as a tool in intervention design.

During the FBA process, an attention function was identified for all three participants because their off-task behavior resulted in gaining attention and assistance from the teaching staff. The results of Joe’s FBA, however, also identified an escape function because, unlike his brothers, Joe often refused to complete tasks despite receiving assistance from the teaching staff. Even though the FBA indicated the additional behavioral function for Joe, a single, comprehensive function-based intervention was developed for all three participants. To address the escape function for Joe, a break area in the class was designated and the participants were taught to go to that area when necessary. Although this intervention component was not necessary for Ron and Sam, its inclusion did not interfere with their intervention’s overall success. From a practical standpoint, the uniform intervention was much easier for staff to implement consistently, and thus may have facilitated the high levels of treatment integrity that were observed.

In this study, task-analysis was used to determine whether the participants could perform the replacement behavior prior to the intervention. The results indicated that none were able to perform the on-task steps independently. This information was then used directly in the identification of key antecedent intervention components. Practitioners may assume that a student can perform all elements of the replacement behavior when, in fact, he or she cannot and needs to be taught these skills directly. Task analysis provided empirical evidence that aided intervention design; it also provided ongoing evidence about changes in the student’s abilities to perform the replacement behavior as the result of intervention. The fact that each student’s step completion level dropped during the reversal condition suggested ongoing support might be needed for these behaviors to come under the control of naturally available reinforcers.

The escape-extinction procedure used in this study required the student to stay in from lunch recess to complete any work that was unfinished because of off-task behavior. Because of the loss of some recess time, this practice could be considered an aversive procedure. Fortunately, the escape-extinction procedure was used only occasionally during the early stages of the first intervention phase. In addition, when it was used, the student typically completed the assignment within a couple of minutes and then went to the remainder of recess. Nevertheless, in future studies, it would be important to explore alternative escape-extinction procedures that are less likely to incur potentially aversive properties.

Certain limitations should be noted. First, this is the first study of function-based intervention with high-functioning students with autism in a general education classroom. Despite the intervention’s success, it was applied with only three students. Replications are needed to better establish the general efficacy of the function-based process when applied in this way and for this purpose. Second, this is the first study to examine the potential of using task analysis as an aide in intervention design. Despite its usefulness in this study, more research on its potential applications, limitations, and alternatives is needed.

Third, the teaching staff who participated in this study were receptive to the process and willing to implement the intervention. In addition, they expressed appreciation for the training and implemented the intervention with consistently high levels of fidelity. A less
favorable result may have been obtained with staff who were less receptive and enthusiastic. Fourth, the social validity scale used in this study was devised by the first author. Although it closely resembled the content and structure of published scales, no standardization or psychometric data are available to support its use.

Finally, during the first reversal condition for Ron, only one data point was obtained because of the staff’s hesitancy to withdraw the intervention and create disruptions to the classroom environment. Even though his on-task level dropped dramatically during that session and increased dramatically when the intervention was reinstated the next day, one data point is not sufficient to independently establish a functional relationship. The fact that this same pattern was also seen on multiple days of data collection with Sam and Joe lends credibility to the intervention’s effects.

This study demonstrated the efficacy of function-based intervention in providing teachers with effective strategies to support the inclusion of students with autism who have the cognitive skills to learn grade-level content, but whose behavior problems threaten their continued placement in general education. Implementation of the function-based intervention enabled the participants not only to remain in the general education environment, but also to function more independently in that environment, thereby facilitating the true intent of inclusion.

References


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