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Abstract

Activity transitions are difficult for many children with developmental disabilities, leading to problem behavior and decreased instructional time in schools. Assessing the function of transition-related problem behavior, especially in the school setting, requires special attention. Functional analysis methodology has been employed and can demonstrate functional relations. However, functional analyses may not always capture the naturally occurring contingencies or detect idiosyncratic variables. Thus, the current study examined the concurrent validity and treatment utility of assessing transition-related problem behavior descriptively. Two boys with autism (8 and 11-years-old) and one boy with Down syndrome (6-years-old) participated. All sessions were conducted at an outpatient behavior analysis clinic. Descriptive assessments occurred during natural transitions with caregivers and results were used to design functional analysis test conditions that mimicked the components of the natural transitions. Based on the outcomes from the descriptive assessments and functional analyses, function-matched interventions were developed and evaluated in a reversal deign for each child. Treatment consisted of signaling reinforcement in the post-transition activity and differentially reinforcing independent transitions in the absence of problem behavior. In general, outcomes from the functional analyses confirmed that the variables identified in the descriptive assessment were functionally related to each child's problem behavior. Additionally, function-matched interventions were effective at reducing problem behavior for all children. The benefits of assessing transition-related problem behavior both descriptively and experimentally are discussed.

Keywords: transitions, problem behavior, functional behavior assessment

LINKING DESCRIPTIVE ASSESSMENT TO FUNCTIONAL ANALYSIS AND TREATMENT OF TRANSITION-RELATED PROBLEM BEHAVIOR

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Linking Descriptive Assessment to Functional Analysis and Treatment of Transition-Related Problem Behavior

Transitioning from one activity to another in a timely fashion and in the absence of problem behavior is difficult for many children, especially those with cognitive, language, or behavioral disabilities (Schmitt, Alper, Raschke, & Ryndak, 2000). Not only are transitions difficult for many children, but it has been estimated that preschool and primary-grade school students spend up to 25% of their school day transitioning between activities (Schmitt et al., 2000). Transition-related problem behaviors in the school setting have the potential to impede the development of peer relations and interfere with a student's ability to learn by reducing instructional time thereby leading to both social skill and academic deficits (Sterling-Turner & Jordan, 2007). Additionally, timely problem free transitions are a necessary safety skill as prolonged transitions in emergencies may put both the student and teacher at risk (Sowers, Rusch, Connis, & Cummings, 1980). Therefore, it is crucial that accurate assessment and effective treatment of transition-related problem behavior occurs in the school setting.

The assessment of problem behavior in the school setting often occurs within a process termed functional behavior assessment. Functional behavior assessments involve systematic identification of environmental variables that contribute to the occurrence and maintenance of problem behavior (Sugai, Lewis-Palmer, & Hagan-Burke, 2000). According to the Individuals with Disabilities Education Improvement Act (IDEA 2004) schools are required to conduct a functional behavior assessment when a child is removed from their current placement for more than 10 school days for behavior that is determined to be a manifestation of the child's disability (20 U.S.C. §1415(k)(1)(F)(i)). Additionally, IDEA (2004) states that a functional behavior assessment should be considered when a student displays problem behavior that interfere with their own learning and/or that of others (20 U.S.C. § 1414 (d)(3)(B)(i)). Given that transition-related problem behavior is common for children with disabilities, may interfere with their ability to learn, and has the potential to prompt a removal from the child's current placement, school personnel may be required to conduct functional behavior assessments in such cases.

Although there is a wealth of literature pertaining to the functional assessment of problem behavior, assessing transition-related problem behavior warrants special attention. First, I review findings from basic operant research on pausing behavior in nonhuman organisms during transitions between reinforcement schedules. Findings from basic research highlight key environmental variables that contribute to transition-related behavior and used to inform experimental analyses of transition-related problem behavior in humans. Current experimental assessment procedures have shown value by demonstrating functional relations, but their use in school settings is limited. Therefore, I review the limitations of these procedures next and discuss more commonly used assessment procedures in school settings (i.e., descriptive assessments). After describing recent advances in descriptive assessment techniques, I describe how these procedures can be adapted to capture unique variables associated with transition-related problem behavior. Lastly, I suggest the need for modified assessment procedures and describe a study that evaluated the utility of such procedures.

Basic Research on Transitions

In basic operant research, switching between two schedules of reinforcement defines a transition. For example, Powell (1969) evaluated transitions in pigeons between fixed-ratio schedules of reinforcement that delivered small (2.5 s of access to food) versus large (4 s of access to food) magnitude reinforcers. Typically, basic research studies on transitions between reinforcement schedules evaluate pausing behavior following the completion of a fixed-ratio schedule. Pausing is a phenomena that occurs between changes in various schedules of reinforcement (e.g., fixed-interval and fixed-ratio, Ferster & Skinner, 1957; Variable-Ratio, Schlinger, Blakely, & Kaczor, 1990; Variable-Interval, Shull, 2004). Felton and Lyon (1966) define pausing between ratio schedules as a period of no responding that occurs immediately after reinforcement, and has been termed the post-reinforcement pause. Results from basic studies highlight key elements that influence pausing behavior and in turn may be informative for understanding transition-related problem behavior.

Powell (1969) found that shorter pauses occurred in the presence of a stimulus signaling a larger upcoming reinforcer, whereas longer pauses occurred when the stimulus signaled a smaller upcoming reinforcer. These findings suggested an inverse relation between subsequent reinforcer magnitude and pausing. Furthermore, Powell demonstrated that discriminative stimuli (e.g., colored lights) associated with the upcoming activity could influence pause duration.

Lowe, Davey, and Harzem (1974) further evaluated the role of discriminative stimuli during transitions in rats by randomly presenting small and large reinforcer magnitude conditions without discriminative stimuli signaling the upcoming condition. Lowe and colleagues found a direct relation between previous reinforcer magnitude and pausing. Specifically, after delivery of a large reinforcer, a long pause ensued, as compared to the pause duration after delivery of a smaller reinforcer. Thus, Lowe and colleagues found that the previous reinforcer magnitude influenced pausing behavior.

Perone and Courtney (1992) further evaluated variables that influence behavior during transitions using procedures similar to those by Powell (1969) and Lowe et al. (1974). Specifically, the authors evaluated whether pausing was the result of the previous or upcoming magnitude of reinforcement in pigeons. Four types of transitions were evaluated based on the magnitude of reinforcement delivered in each component; (1) small to large reinforcer, (2) large to small, (3) small to small, and (4) large to large under both mixed and multiple schedules of reinforcement.

During the mixed-schedule condition, a single color illuminated the response key throughout the entire session, so that the upcoming component was not associated with a distinct stimulus. Pausing during the mixed schedule therefore directly related to the past reinforcer. Pigeons were more likely to stop responding (i.e., pause) for a greater duration following delivery of a large reinforcer. During the multiple schedule condition, different colored lights were associated with the magnitude of the upcoming reinforcer, signaling the upcoming components. During this condition, the past reinforcer *and* the upcoming reinforcer determined pausing. Pauses were longer when the signaled upcoming reinforcer was small. However, similar to results from the mixed-schedule condition, pausing continued to be longer after delivery of a large reinforcer.

Overall, Perone and Courtney (1992) found that when the stimulus signaled a small upcoming reinforcer, the previous reinforcer had dominant control over pausing. That is, pause duration was greater after a large reinforcer than after a small reinforcer. However when an upcoming large reinforcer was signaled, pauses were generally shorter regardless of the size of the previous reinforcer. Thus results from Perone and Courtney (1992) suggest that pausing is a function of the upcoming condition, the past condition, and stimuli signaling these conditions.

Findings from basic research have important implications for experimental analyses of transition-related problem behavior in applied settings. In relation to applied research, pausing behavior may be analogous to problem behavior or non-compliance during transitions, the magnitude of reinforcers may be analogous to differential preference of activities associated with the transition, and stimuli (e.g., colored lights) associated with the upcoming reinforcer may be analogous to signals (e.g., picture schedules) associated with the post-transition activity. Along these lines, basic research would suggest that transitioning away from highly preferred activities would be difficult for some children, especially when signals associated with an upcoming low-preferred activity are present. In the following sections, I elaborate on how applied researchers have translated the findings from basic research. More specifically, I discuss how pre- and post-transition activities contribute to the occurrence and maintenance of transition-related problem, and the use of signals in facilitating transitions in children with autism.

Assessment and Treatment of Transition-Related Problem Behavior

Analyses of Pre- and Post-Transition Conditions

Consistent with results from basic research (i.e., Perone & Courtney, 1992), pre- and post-transition conditions (e.g., activity preference or magnitude of reinforcement) and the use of stimuli to signal upcoming transitions (e.g., picture schedules) may affect behavior during transitions. That is to say, that transition-related problem behavior may be a function of the reinforcing properties of the pre-transition activity (i.e., the activity a child is transitioning away from), signaling the upcoming transition, and the availability of reinforcement in the post-transition activity (the activity a child is transitioning to). The role of pre- and post-transition conditions may influence the effectiveness of antecedent-based interventions, and assessing these conditions can be vital in understanding transition-related problem behavior.

Along these lines, a number of studies directly examined the role of pre- and post-transition conditions by implementing a modified functional analysis procedure (e.g., McCord, Thomson, & Iwata, 2001; Waters, Lerman, & Hovanetz, 2009; Wilder, Chen, Atwell, Pritchard, & Weinstein, 2006). In a functional analysis, problem behavior is measured while systematically manipulating antecedents and consequences under controlled conditions (Miltenberger, 2012). Utilizing a multielement design in which test conditions were rapidly alternated across sessions, Iwata, Dorsey, Slifer, Bauman, and Richman (1982) were the first to develop brief (e.g., 5 – 10 min) test and control conditions to identify potential functions of problem behavior. Each test condition was associated with a specific discriminative stimulus (signaling the availability of reinforcement), establishing operation (increasing the value of the reinforcer through deprivation which subsequently affects responding), and continuous schedule of reinforcement (fixed-ratio 1) for problem behavior. These conditions included forms of social-positive (i.e., attention), social-negative (i.e., escape from demands), and automatic (i.e., sensory stimulation) reinforcement that were made contingent on the occurrence of problem behavior. The control condition consisted of access to preferred tangible items and attention for appropriate behavior in the absence of demands. The condition(s) associated with the highest levels of problem behavior compared to the control condition suggests that behavior is sensitive to that type of reinforcement, which in turn may be maintaining problem behavior in the natural environment (Martens & Lambert, 2014).

McCord, Thomson, and Iwata (2001) modified standard functional analysis test conditions by creating conditions that mimicked the components of a transition (i.e., pre-condition, post-condition, and movement between conditions). The authors suspected that each condition had the potential to maintain the self-injurious behavior displayed by two adult males with profound intellectual disabilities. Prior to conducting the functional analysis, preference and avoidance assessments identified preferred and non-preferred activities for use in the functional analysis. From these assessments, the authors were able to arrange a number of specific transition test conditions: (1) activity initiations that involved transitioning from no activity to either a preferred activity or non-preferred activity, (2) activity terminations that involved transitioning from a preferred activity or non-preferred activity to no activity, and (3) transitioning from no activity to no activity. All of these transitions were evaluated when participants were required to change locations (e.g., move approximately 7-10 meters) or not change locations.

If self-injurious behavior occurred during activity initiations, the transition terminated implicating negative reinforcement (i.e., avoidance of the post-transition activity) in the maintenance of self-injurious behavior. If self-injurious behavior occurred during the activity terminations, the transition terminated resulting in access to the pre-transition activity implicating the role of positive reinforcement in the maintenance of self-injurious behavior. Results suggested that avoidance of changing locations maintained self-injurious behavior for both participants. Furthermore, for one participant, avoidance of certain task initiations maintained self-injurious behavior. The present study used a similar transition functional analysis but included additional test conditions that examined variables beyond the components of a transition that may contribute to the occurrence of transition- related problem behavior.

Following the functional analysis, McCord and colleagues conducted a treatment evaluation that systematically introduced increasingly more intrusive interventions. A reversal design for one participant and a multiple-baseline design across transitions (e.g., changing locations and initiating a "pick up" activity) for the other participant were used to evaluate the effects. First, participants were provided with a 2-min verbal warning prior to the transition. For both participants, the advanced warning was ineffective at reducing transition-related problem behavior. Next, the authors implemented a differential reinforcement of alternative behavior procedure. One participant received a highly preferred edible reinforcer contingent on an alternative behavior (i.e., left hand on wheel of wheel chair) that was incompatible with self-injurious behavior, and the other participant received a choice of three preferred reinforcers contingent on completion of the transition in the absence of self-injurious behavior. For both participants, the differential reinforcement procedures were only minimally successful. It was only after the simultaneous implementation of escape extinction (guided compliance with the transition request), response blocking (preventing self-injury), and differential reinforcement that transition-related problem behavior reduced to socially acceptable levels for both participants. These findings corroborate results from the functional analysis and the basic literature by demonstrating that function-based treatments (i.e., extinction and response blocking) related to the pre- and post-transition conditions were most effective at reducing transition-related problem behavior.

Similarly, Waters, Lerman, and Hovanetz (2009) evaluated the transition-related problem behavior of two 6-year-old boys with autism using a functional analysis procedure similar to McCord et al. (2001). Results for these children suggested that avoidance of non-preferred activities (i.e., negative reinforcement) and continued access to preferred activities (i.e., positive reinforcement) maintained their problem behavior. From these results, Waters and colleagues then evaluated the effects of a picture schedule (e.g., pictures depicting the pre- and post-transition activities) and differential reinforcement of other behavior plus extinction, on transition-related problem behavior during preferred to non-preferred transitions. Differential reinforcement of other behavior with extinction involved prompting the participants through the transition via a least-to-most prompting procedure (i.e., extinction) and delivering a preferred edible reinforcer contingent on the absence of problem behavior (i.e., differential reinforcement of other behavior). The picture schedules in isolation were ineffective, but when the authors combined picture schedules with differential reinforcement of other behavior and extinction, transition-related problem behavior decreased for both participants.

In both of the aforementioned studies (McCord et al., 2001; Waters et al., 2009), stimuli used to signal the upcoming conditions were ineffective at reducing transition-related problem behavior. From a basic operant perspective, these findings are not surprising; the basic literature would suggest that signaling an upcoming small reinforcer, or non-preferred task, would be associated with increases in problem behavior. Despite these results, I review research below that has found signals to be effective in reducing transition-related problem behavior under some conditions.

Effects of Signals on Transition-Related Problem Behavior

Flannery and Horner (1994) hypothesized that unpredictable instructional activities evoked escape motivated transition-related problem behavior in two adolescent males with autism. As such, they suggested that eliminating the unpredictability associated with the transition could reduce problem behavior. During treatment, participants were required to transition between activities, and transitions were either signaled (e.g., by modeling or auditory cues) or unsignaled. For both participants, signaled transitions resulted in lower rates of problem behavior than unsignaled transitions. These results led the authors to conclude that environmental cues that signal upcoming events can reduce transition-related problem behavior.

Along the lines of Flannery and Horner's predictability hypothesis, considerable research has focused on the use of antecedent events to signal upcoming transitions. One method for increasing the predictability of transitions involves the use of visual antecedent stimuli, known as picture schedules, to reduce problem behavior during transitions. A picture schedule is a visual aid that depicts the upcoming sequence of events expected to occur. Several studies have provided support for the use of picture schedules. For example, Dettmer, Simpson, Myles, and Ganz (2000) examined the use of picture schedules on the transition-related behavior of two elementary-aged boys with autism in an ABAB reversal design. The authors noted that informal observations and interviews were conducted that confirmed these children had trouble transitioning, however no functional analyses were conducted. For both participants, picture schedules were effective at decreasing transition latency between activities and for one participant, reduction in staff prompting.

Similarly, MacDuff, Krantz and McClannahan (1993) evaluated the utility of picture activity schedules in four boys with autism in a multiple-baseline design across participants. The authors did not conduct any functional assessments and evaluated treatment by examining on-task and on-schedule behavior. Treatment consisted of an intervention package including picture activity schedules and a graduated guidance procedure to facilitate the completion of a series of home-living and recreational tasks. The graduated guidance procedure consisted of most-to-least physical prompting (e.g., hand-over-hand, light touches, shadowing, etc.) in which therapists implemented the least intrusive method necessary to ensure compliance. On-task and on-schedule behavior increased with the intervention package and the authors reported decreases in transition-related problem behavior. Following treatment, on-task and on-schedule behavior maintained in the absence of the graduated guidance procedure, suggesting that the picture activity schedules were effective in maintaining appropriate transition-related behavior.

Other methods for reducing the unpredictability of an upcoming transition have employed videotaped priming techniques. Schreibman, Whalen, and Stahmer (2000) evaluated the effects of a video priming technique to reduce the unpredictability and subsequent problem behavior associated with transitions for three children with autism using a multiple-baseline design across participants. Again, no functional analyses of the children's transition-related problem behavior occurred. For each child, the researchers developed videotapes of the problematic transition. These videos consisted of a first person view of the transition to control for modeling effects. Children viewed the videos prior to initiating the transition as a way of cueing the child to the upcoming transition and increasing its predictability. An irrelevant video condition and a no video condition were also included in the study to control for treatment effects and to assess for generalization, respectively. Results indicated decreases in transition-related problem behavior with use of the video priming technique for all children.

Another somewhat different antecedent method used to treat transition-related problem behavior has been the use of behavioral momentum techniques. B*ehavioral momentum* (Nevin, 1996) is the tendency of a behavior to persist over time once initiated and reinforced. Based on Newton's second law of motion, Nevin suggested that a behavior's resistance to change (momentum) is a product of rate of responding (velocity) and the amount of reinforcement associated with the conditions in which the behavior produced reinforcement in the past (mass). In applied settings, procedures based on the momentum metaphor have been effective at increasing compliance and/or decreasing problem behavior by presenting three commands with a high-probability of compliance (high-p commands) in rapid succession to which compliance is reinforced, followed by a command with a low-probability of compliance (low-p command). The purpose of using a high-p sequence is to increase both rate of responding (velocity) and amount of reinforcement (mass) for engaging in a particular response class (i.e., compliance) under similar conditions. This in turn creates momentum and increases the likelihood that the individual will comply with the low-p command that immediately follows the high-p instruction sequence.

Ardoin, Martens, and Wolfe (1999) effectively implemented a high-p instruction sequence to increase compliance and decrease transition latency utilizing a multielement design with three typical second-grade students. Transitions required students to get in a quiet position, clear off their desks, take out a pencil and their calendar, and return to a quiet position for morning calendar time. The authors then systematically faded the number of high-p commands (e.g., “touch your head”) and successfully transferred stimulus control to the low-p instruction (e.g., “clear your desks”) by itself. This procedure was likely effective due to the principles of behavioral momentum, but the high-p sequence may have also served a discriminative function making the upcoming transition more predictable. Although effective, the authors failed to assess the function of noncompliance prior to the start of the study.

Despite favorable results for the use of antecedent signals (e.g., picture schedules, video priming, high-p sequence) in reducing transition-related problem behavior, functional analysis procedures were lacking in these studies and children’s preferences for the activities involved in the transitions were unclear. For these reasons, it is difficult to determine why signals have been found to be both effective (e.g., Flannery & Horner, 1994) and ineffective (e.g., McCord et al., 2001) in the applied literature. One, it is possible that the antecedent signals reduced the unpredictability of the transitions, as suggested by Flannery and Horner. Second, the antecedents may have served as discriminative stimuli by signaling the availability of reinforcement associated with completion of the transition. Third, antecedents may have functioned as motivating operations. Motivating operations are events that either increase or decrease the value of reinforcers and subsequently affect responding (i.e., Michael, 2000; have both value- and behavior-altering effects). In these studies, antecedent signals may have increased the value of reinforcement associated with completion of the transition and consequently reduced transition-related problem behavior.

Overall, it is likely that the pre- and post-transition conditions and caregiver responses to problem behavior may influence the effectiveness of antecedent signals. However to evaluate these effects, more fine-grained functional assessment procedures are needed. In the following sections, I discuss various assessment methods used to determine the function of transition-related problem behavior.

Assessment of Transition-Related Problem Behavior in Applied Settings

As previously described, adapted functional analysis procedures designed for assessing transition-related problem behavior have a number of strengths. First, the work of McCord and colleagues (2001) was able to establish key variables (i.e., pre- and post-transition conditions and movement) that influence transition-related problem behavior. Second, systematic manipulation of the components of a transition and measurement of behavior allowed for the identification of functional relations.

Despite the benefits of demonstrating functional control over transition-related problem behavior, there are several limitations with the use of functional analysis procedures in school settings. First, functional analyses may be impractical to implement because they take a substantial amount of time and effort to conduct (Miltenberger, 2012). Second, functional analyses run the risk of establishing new behavior functions or strengthening the current function (Mace et al., 1991) by reinforcing problem behavior during the analysis. Third, functional analyses may be unable to capture low-frequency problem behaviors or be inappropriate for use with high-intensity problem behaviors (Paclawskyj et al., 2001). Lastly, the degree to which results from functional analyses generalize to the natural environment and agree with descriptive assessments is dependent on a number of factors: (1) the client's history with types of reinforcement manipulated in the functional analysis, (2) similarities between test conditions and the natural environment, (3) the stability of an individual's reinforcer preference over time, and (4) the stability of the function over time and across settings (Hanley et al., 2003; Martens et al., 2010).

Furthermore, transition functional analyses may not always capture contingencies that occur in the natural setting. For example, in a typical school transition from the playground to the classroom, transition-related problem behavior may evoke a number of other consequences (e.g., teacher or peer attention, access to play items, etc.) besides terminating the transition, allowing escape from the upcoming activity, or continued access to the pre-transition activity. Like so, Flannery and Horner (1994) suggested a number of relevant variables related to transition-related problem behavior including: (1) the sequence of the activities; (2) the duration of the activities; (3) the content of the activities; (4) the location of the activities; (5) individuals associated with the activities; and (6) the consequences associated with the activities. Thus, the assessment of transition-related problem behavior should consider all of the aforementioned variables.

One way to address the limitations of the modified functional analysis while assessing a range of variables likely to influence transition-related problem behavior in applied settings would be to utilize descriptive assessment procedures. Descriptive assessment procedures involve systematically observing and measuring behavior and its consequences in the natural environment and analyzing the resulting patterns. Functional behavior assessments commonly utilize descriptive assessment procedures, which I review in the following section.

Descriptive Functional Behavior Assessment Procedures

Within the context of a functional behavior assessment, descriptive assessment procedures typically begin by observing problem behavior across different antecedent conditions (Erchul & Martens, 2010) referred to as *scatterplot recording* (Touchette, MacDonald, & Langer, 1985). Scatterplot recording examines under what conditions problem behavior is most likely to occur. This can then lead to hypotheses regarding potential motivating operations, as well as indicating the optimal time to engage in sequential recording of behavior and its' consequences (Eckert, Martens, & DiGennaro, 2005). Scatterplot recording is ideal for identifying the context in which the target behavior is most likely to occur, but functional relations cannot be determined.

Another way to determine under what conditions problem behavior is most likely to occur while simultaneously examining consequences is to engage in Antecedent-Behavior-Consequence (A-B-C) recording (Bijou, Peterson, & Ault, 1968). This type of assessment involves recording the occurrence of problem behavior, under what conditions it occurred (antecedents), and what consequence(s) were provided. This process continues until a clear pattern of antecedents and consequences associated with problem behavior emerges (Lee & Miltenberger, 1997).

A-B-C recording is advantageous in that it can provide descriptive information in a systematic manner about the events that surround behavior. For example, Tustin (1995) utilized A-B-C recording procedures to determine possible functions of stereotypy in a 28-year-old male diagnosed with autism. Results suggested that stereotypy was associated with changes between work activities (e.g., packing materials). However, there are a number of limitations with A-B-C recordings outlined by Iwata, Kahng, Wallace, and Lindberg (2000). First, because A-B-C recordings typically do not provide operational definitions for each antecedent and consequence, their reliability is questionable. Second, there is no uniform way to summarize and interpret the data, which may produce subjective and biased conclusions. Third, because data collection only focuses on problem behavior, frequently delivered consequences may follow problem behavior by chance, leading to an inaccurate functional hypothesis (e.g., St. Peter et al., 2005). Finally, A-B-C recordings may not directly align with experimental analyses and over identify functional relations. For example, Mace and Lalli (1991) utilized A-B-C recordings and functional analysis to inform the treatment of bizarre speech in an adult male with moderate intellectual disability. Results from the A-B-C recording suggested two possible functions (attention and escape) during task-related demands, but the functional analysis only supported the attention function.

An alternative and more informative strategy for examining the relationship between behavior and its consequences is to conduct sequential recordings and examine the conditional probability of a consequence given behavior. This is the descriptive assessment method used in the current study. This type of assessment typically involves recording behavior and its' consequences in brief (e.g., 10 s) intervals as they occur in sequence throughout an observation period (Martens et al., 2008). Prior to collecting these data, specific problem behavior(s) and consequences are defined so that behavior categories (e.g., problem behavior and all other behavior) are mutually exclusive and consequences represent the four broad categories of reinforcement (i.e., social-positive, social-negative, automatic positive or negative). Following data collection, conditional probabilities are calculated. Those consequences that are contingent on problem behavior indicate potential maintaining variables (Martens et al., 2008). The results of conditional probability analyses have been shown to align with functional analysis test conditions under some circumstances (Martens, Gertz, Werder, & Rymanowski, 2010). In the following section, I outline the calculation of these conditional probabilities.

As an example, Repp and Karsh (1994) utilized conditional probabilities in determining the function of problem behavior in two children with developmental disabilities. Results from the descriptive observations revealed that for one student, problem behavior occurred during transitions, followed by teacher attention 43% of the time and escape 0% of the time. For the other student, problem behavior occurred during group instruction, followed by teacher attention 40% of the time and escape 0% of the time. These data led the authors to hypothesize an attention function for both children, despite the fact that problem behavior was most likely to occur in demand (e.g., transition) situations. Treatment consisted of differential reinforcement of alternative behavior by providing attention for appropriate behavior and ignoring problem behavior, and was effective at reducing each student's problem behavior.

This study is important for two reasons. First, unlike the previously described treatment studies targeting transition-related problem behavior, a hypothesized function of problem behavior based on patterns in descriptive assessment data informed treatment. Second, treatment focused on the manipulation of consequences rather than antecedent variables. Nonetheless, assessment procedures still failed to examine all conceptually relevant variables (e.g., preference of activities, signaling of the upcoming transition, etc.). Since Repp and Karsh (1994) and Tustin (1995), there have been several methodological advances in the collection and interpretation of observational data to identify potential functions of problem behavior. In the following section, I review these advances in analyzing descriptive assessment data, describe the procedures used in the current study, and discuss how to interpret results from these types of assessments.

Advances in Functional Assessment Methodology

Analyzing the Data from Sequential Recordings

Sequential recording methods often examine conditional probabilities, however the methods for analyzing these data has differed. Thus far, there have been four main analytic strategies reported in the literature used to analyze this type of data (Martens et al., 2008). Below I outline these strategies.

Conditional Probabilities

The first approach examines the conditional probabilities of each consequence given the occurrence of behavior. A conditional probability measures the likelihood that two events (e.g., behavior and consequence) both occur in the same predesignated interval of time (McComas et al., 2009). Conditional probabilities are computed by taking the number of event pairings (behavior and consequence) divided by the total number of behavior occurrences or intervals. McComas et al., (2009) state that one particular class of conditional probabilities, termed transitional probabilities, take into account the sequential nature of these events and provides an indication of contiguity or the extent to which a consequence follows behavior. Transitional probabilities are calculated similarly to conditional probabilities except that the sequential order of events is preserved. This value can then be interpreted as an estimate of the reinforcement schedule for that particular behavior and can be calculated across consequences. From this perspective, Martens et al. (2008) suggests that any consequence following problem behavior may function as a reinforcer, but those consequences that follow behavior most often, and therefore have the highest conditional probabilities, are more likely to be maintaining the behavior. Throughout the remainder of this review, the term conditional probability will refer to a probability in which the sequential order of events is preserved.

A number of studies have utilized this type of analysis (Lalli, Browder, Mace, & Brown 1993; Mace & Lalli, 1991; Repp & Karsh, 1994). For example, Lalli and colleagues (1993) examined the conditional probabilities of teacher responses (i.e., attention, tangible, or escape) given the occurrence of problem behavior (i.e., self-injury or aggression) for three students with profound intellectual disabilities. Analyses of the descriptive data revealed that the conditional probabilities for teacher attention given problem behavior were the highest, potentially indicating the richest schedule of reinforcement. Thus, the authors hypothesized an attention function for these students, in addition to escape for one of the students.

Conditional versus Background Probabilities

A second analytic approach involves comparing the conditional probabilities of consequent events (the likelihood of the event given the occurrence of the behavior) to their background or base rate probabilities (likelihood of the event independent of the behavior). To demonstrate this analysis, Vollmer, Borrero, Wright, Van Camp, and Lalli (2001) collected and analyzed descriptive assessment data for 11 individuals with developmental disabilities. The authors calculated conditional probabilities by summing the instances of reinforcement (e.g., attention) that occurred following problem behavior and dividing that by the total number of problem behaviors that occurred. They also calculated background probabilities in a similar manner except they substituted 50 random points in time for the occurrence of problem behavior, resulting in a response-independent probability.

Conditional and background probabilities were then compared to identify positive, negative, and neutral contingencies between behavior and its consequences. Positive contingencies occurred when the conditional probability of a consequence given problem behavior exceeded the background probability of the consequence. Negative contingencies occurred when the conditional probability of a consequence was lower than the background probability of the consequence. Neutral contingencies occurred when the conditional probability of a consequence was similar to the background probability of the consequence. Vollmer et al. (2001) concluded that events with positive contingencies might serve as reinforcers for these individuals, whereas consequences with negative or neutral contingencies would not likely serve as reinforcers.

Proportion-of-Consequence Given Antecedent Events

Lerman and Iwata (1993) demonstrated a third method for analyzing descriptive assessment data. In addition to calculating conditional probabilities of consequent events, the authors calculated conditional probabilities given various antecedent conditions, while accounting for the proportion of consequences preceded by problem behavior. When calculating these conditional probabilities, the authors took the number of behavior-consequence pairs divided by the number of times the *consequence* occurred across varying antecedent conditions. Accordingly, this value reflects the proportion of consequences that occurred immediately following problem behavior, as opposed to the proportion of behavior immediately followed by the consequence (Martens et al., 2008). The authors suggested that by including conditional probabilities related to antecedent events and accounting for the proportion of consequences, this would increase the likelihood of identifying the most functionally relevant behavior-environment relations.

Each of the previously described methods for analyzing sequential data are associated with corresponding strengths and weaknesses. Engaging in sequential recording and subsequently calculating conditional probabilities are superior to A-B-C recordings because they provide a way to systematically analyze and interpret the data. Additionally, categories of problem behavior and consequences are operationally defined and mutually exclusive removing subjectivity that may occur with narrative A-B-C recordings. However, conditional probabilities based solely on the occurrence of problem behavior and their consequences may lead to false positives in identifying functional relations because one cannot evaluate the degree of contingency. That is, it is unknown whether or not the consequence only follows problem behavior (*dependent*), more often follows problem behavior than in its absence (*contingent*), or just sometimes follows problem behavior (*contiguous*; Vollmer et al., 2001). Thus, any nonzero value obtained from this method suggests a positive contingency.

For these reasons, comparing conditional probabilities to background probabilities is superior. Using this method, one can determine if a consequence is more likely to follow problem behavior than occur independent of behavior, illustrating a statistical contingency (Martens et al., 2008). Despite this benefit, background probabilities are independent of behavior and therefore whether the consequence is more likely to follow problem behavior than in its absence is unknown. From an operant perspective, Hammond (1980) defined a contingency as the difference between the conditional probability of reinforcement given behavior and the conditional probability of reinforcement given the absence of that behavior. As such, utilizing background probabilities does not allow one to detect operant contingencies.

Finally, the proportion-of-consequence given antecedent events strategy is favorable because one can detect the antecedent conditions that influence problem behavior. Nonetheless, Martens and colleagues (2008) state that the resulting conditional probabilities using a proportion-of-consequence approach yields no information about the probability of a consequence given the absence of problem behavior. This in turn may lead to inaccurate decisions about the contingencies occurring in the natural environment. Overall, none of the aforementioned methods allows one to examine an operant contingency.

Contingency Space Analysis

More recently, Martens et al. (2008) proposed an analytic method for evaluating descriptive assessment data, termed *contingency space analysis* (CSA). This method addresses the limitations of other analytic approaches by directly examining operant contingencies. The current study employed CSA.

Martens et al. (2008) identified contingent relations between behavior and environmental events by calculating two conditional probabilities; (1) the probability of a consequence given the target behavior and (2) the probability of a consequence given the absence of the target behavior. Examining each of these mutually exclusive behavior categories, calculating conditional probabilities for each, and plotting them in coordinate space can then reveal contingencies between behavior and environmental events. To demonstrate the utility of this method, Martens et al. (2010) collected and analyzed descriptive assessment data for three children with autism and compared results from the descriptive assessments to results from functional analysis test conditions that both mimicked and differed from the natural environment.

The authors collected data by using a modified partial-interval recording procedure. That is, they recorded the presence or absence of problem behavior during each interval. If no problem behavior occurred by the end of the interval, data collectors recorded any teacher responses (e.g., attention) as following the absence of problem behavior. If problem behavior occurred during any part of the interval, data collectors recorded problem behavior as well as any teacher responses that followed in the same interval. By doing so, Martens and colleagues (2010) were able to preserve the sequential order of events. They calculated joint probabilities (i.e., the probability of a consequence given the target behavior and the probability of a consequence given the absence of the target behavior) for each observation session. The authors then plotted these joint probabilities in contingency space to examine the degree of contingency for each consequence on problem behavior.

Following the descriptive analyses, two functional analyses were conducted, one by each child's teacher and one by an experimenter. The teacher functional analysis consisted of conditions that mimicked the child's natural environment. Sessions occurred in the child's classroom, conducted by their female classroom teacher, and involved stimuli and consequences that naturally occurred in the child's environment. The experimenter functional analysis consisted of contrived conditions that differed from the teacher functional analysis. That is, conditions contained different tasks, demands, and verbal statements delivered by a female experimenter conducted in an isolated room in the school. For two of the three children, results from the descriptive assessment were consistent with results from the functional analysis implemented by the teachers. This finding suggests that results from contingency space analyses are likely to correspond with functional analyses when conditions mimic the natural environment and may be useful in identifying potential reinforcers.

Purpose of the Current Study

Given that school personnel may now be required by law (IDEA, 2004) to complete functional behavior assessments and transition-related problem behaviors have the potential to require functional assessment procedures in schools, adequate assessment methods are needed. To date, studies examining transition-related problem behavior have employed indirect assessment methods (e.g., Functional Assessment Interview; Flannery & Horner, 1994), A-B-C recordings (Tustin, 1995), and conditional probabilities (Repp & Karsh, 1994) to assess possible functions of transition-related problem behavior. However, the accuracy of these procedures was not directly evaluated by comparing them with experimental methods that demonstrate functional (i.e., experimental) relations.

Other studies examining the function of transition-related problem behavior have employed functional analysis methodology that separate a transition into its component steps (McCord et al., 2001; Water et al., 2009) and evaluate the role of those components in maintaining transition-related problem behavior. These studies provided an excellent method for demonstrating functional relations, but may not always capture naturally occurring contingencies. Specifically, Flannery and Horner (1994) suggested that when determining the function of transition-related problem behavior one should assess the sequence, duration, content, consequences of activities, environmental cues, and alternative consequences (i.e., attention) provided for transition-related problem behavior.

To date, no known research has assessed transition-related problem behavior while accounting for all of these variables. In addition, there is a lack of research on the utility of descriptive assessment methods in identifying the environmental correlates of transition-related problem behavior for determining function and informing treatment. Therefore, the purpose of the current study was threefold.

First, I developed a descriptive method for assessing transition-related problem behavior based on the strategies of contingency space analysis. I hypothesized that the resulting descriptive data would suggest at least one function(s) of transition-related problem behavior for each participant. I also hypothesized that descriptive assessments would in some cases uncover idiosyncratic variables (e.g., attention, tangibles, environmental cues, etc.) contributing to and potentially maintaining transition-related problem behavior. Second, I supplemented standard functional analysis conditions (McCord et al., 2001) with additional test conditions that evaluated naturally occurring contingencies revealed from the descriptive assessments. I hypothesized that results of the descriptive assessments and functional analysis test conditions would identify the same type(s) of reinforcement potentially maintaining transition-related problem behavior (i.e., would exhibit concurrent validity). Third, I designed function-matched interventions from the resulting assessment data for each participant, and hypothesized that these function-matched interventions would be effective at reducing transition-related problem behavior.

Method

Participants and Setting

Participants were three school-aged boys who engaged in transition-related problem behavior at home and school as reported by their primary caregiver. We recruited all participants from an outpatient behavior analysis clinic in Central New York. Prior to the start of the study, we obtained Syracuse University institutional review board approval and children's primary caregivers provided consent for their child to participate.

Trevor (pseudonym) was an 11-year-old boy diagnosed with autism functioning in the moderate to severe range of intellectual disability. Trevor was able to follow simple two-step commands and communicated using two-word phrases and physical gestures. Trevor was referred to the outpatient behavior analysis clinic for the treatment of aggression, self-injury, and disruptions that occurred at home, school, and in the community. He attended the program five days a week for one-hour appointments.

Heath (pseudonym) was an 8-year-old boy diagnosed with autism functioning in the moderate to severe range of intellectual disability. Heath was also able to follow simple two-step commands and communicated through unintelligible vocalizations, a speech-generating device on an I-Pad, and a picture communication system. Heath was referred to the outpatient behavior analysis clinic for the treatment of aggression and disruptions that occurred at home, school, and in the community. He attended the program five days a week for one to two hour appointments.

Sawyer (pseudonym) was a 6-year-old boy diagnosed with Down syndrome functioning in the mild to moderate range of intellectual disability. Sawyer was able to follow simple two-step commands and communicated using two to three word phrases. He was referred to the outpatient behavior analysis clinic for the treatment of non-compliance and disruptions that occurred at home, school, and in the community. He attended the program five days a week for one-hour appointments.

All sessions took place at the outpatient behavior analysis clinic, in 3 m by 3 m therapy rooms equipped with one-way observation windows for data collection purposes. During all sessions, a table, two chairs, relevant activity materials, and one experimenter were present in the room. During the descriptive assessments, a caregiver was also present. Data collectors and experimenters were trained behavior therapists who worked at the clinic.

Response Definitions and Measurement

For all children, *compliance* was defined as completing the activity described in the instruction within the same 10-s interval in which an instruction was provided (descriptive assessment) or following either a vocal or model prompt (functional analyses and treatment evaluations). We defined *non-compliance* as the failure to complete the activity described in the instruction within the same 10-s interval (descriptive assessment) or after the delivery of both verbal and model prompts (functional analyses and treatment evaluations). Non-compliance was included as problem behavior for all children.

Trevor's problem behaviors also included *aggression, disruption,* and *self-injurious behavior.* Heath's problem behaviors also included *aggression, disruption,* and *spitting.* Sawyer's problem behavior also included *disruptions.* We defined *aggression* was as making forceful contact or attempting to make forceful contact with the experimenter or caregiver from a distance greater than 6 inches. Instances of aggression included hitting with an open or closed fist, foot, or limb (e.g., hitting, kicking, punching, pinching, scratching, grabbing, pushing). We defined *disruption* as making forceful contact with furniture or walls from a distance of 6 inches or greater, swiping materials, or throwing materials (e.g., banging objects, throwing items, pushing over furniture, swiping items off the table, or destroying materials). We defined s*elf-Injurious behavior* as making forceful contact with oneself from a distance of 6 inches or greater. Instances of self-injurious behavior consisted of hitting oneself in the buttocks, chest, or head with an open or closed fist. Lastly, we defined *spitting* as visible saliva passing through the plane of the lips with an audible thrust of air.

Additionally, during the descriptive assessment procedure, we measured engagement with each activity involved in the transitions. We defined *engagement (pre-transition or post-transition)* with an activity as the child's body being within 0.5 m of the activity and looking at the materials, or at least one hand touching any part of the activity for at least 1 s. We examined the percentage of intervals in which engagement occurred across the different activities to allow for an estimate of preference (e.g., Roane, Vollmer, Ringdahl, & Marcus, 1998).

There were also five caregiver responses to child behavior that we measured during the descriptive assessments procedures. The first category of caregiver behavior was *attention,* defined as any instance of verbal or physical interaction with the child (e.g., praise or descriptive statements, physical guidance, rubbing the child's back). The second category was *escape,* defined as allowing the child to avoid the upcoming activity in the transition by not repeating the command or prompting compliance. The third caregiver category was *tangible,* defined as any instance that the caregiver provided any type of tangible item to the child or allowed the child to regain access to the pre-transition activity. The fourth category was *no consequence,* defined as no interaction directed toward the child during the interval. The fifth category was *commands,* defined as a request to transition to a new activity or engage in a particular response directed at the child. A special notation (e.g., *) was scored to indicate the initial transition command, so that this key command could be differentiated from other commands that occurred during the transition.

Materials and Procedures

Observers were equipped with a clipboard, recording sheet (see Figure 1), and a MotivAider® electronic cueing device for signaling the onset of 10-s recording intervals during the descriptive assessment procedures (Phase I). During functional analysis and treatment evaluation procedures (Phases II and III), observers were equipped with laptop computers containing the DataPal software program, which was used for data collection purposes. The DataPal program allows behaviors to be assigned to keys and tracked by frequency or duration. The output produced by this program shows at what point during the session keystrokes occurred, denoting occurrence of a frequency behavior or the beginning and end of a bout for duration behaviors. Additionally, the experimenter and observers were given protocols that listed the steps for each functional analysis test condition (Phase II) and treatment conditions (Phase III) that observers used to assess procedural integrity.

During descriptive assessments, each caregiver identified transitions from free play to academic demands to be particularly problematic. For Trevor, play items included an I-Pad equipped with youtube, two toy trucks, two dinosaurs, and a toy xylophone. Academic materials included a color matching task, tracing worksheets, and markers. For Heath, play items included an I-Pad equipped with youtube. Academic demand materials included colored blocks for stacking, sorting, and color identification via pointing. For Sawyer, play materials included a transformer, alligator piano, purple pin art, and a purple dinosaur. Academic materials included worksheets and flash cards for letter and number identification. These same activites were utilized during functional analyses and treatment evaluations (play items only). During the treatment evaluation, additional I-Pads (Trevor and Heath) and toys (Sawyer; Elmo, pig car, green dinosaur, and green pin-art) were used as reinforcers.

Observers were trained on the recording device (i.e., pencil and paper descriptive data collection or computer based functional analysis data collection) by either watching videos of situations that approximated the sessions or live sessions with the children during standard functional analyses conducted prior to the start of the study. We trained each observer to a 90% agreement criterion across three consecutive videos or sessions for both descriptive assessment and functional analysis sessions.

General Procedures

Phase I: Descriptive assessment. During Phase I of the study, we conducted three observations for each child. Observers collected data on children's transition-related problem behavior, caregiver behavior, and child engagement with activities. The observers sat at least 1 m from the child, remained as unobtrusive as possible, and ignored any attempts made by the child to interact. Data were collected using a modified 10-s partial interval recording procedure described below. These procedures occurred prior to implementing the functional analysis procedures in Phase II.

The observations occurred during a transition reported to be problematic by the child's caregiver. All caregivers reported that when they asked their children to stop playing with their preferred items and come do homework, their children would become non-compliant and engage in problem behavior. Caregivers were instructed to conduct the transition as they typically would. Observers recorded engagement using a partial-interval recording procedure during pre- and post-transition activities. That is, during any interval that the child engaged with either activity the observer scored engagement for that interval. Following the observations, percent engagement was calculated by summing the number of intervals that engagement occurred and dividing it by the total number of intervals the child was in that particular activity. We then compared the resulting data across activities to provide an estimate of relative preference.

Data collection began in the pre-transition activity, occurred for at least 2 min before the transition command occurred, and continued until the child had been in the post-transition activity for a minimum of 2 min or failed to transition within 2 min. Observers collected data on caregiver commands by scoring each occurrence of a command and making a special notation for the occurrence of the initial transition command. Data were collected on the presence or absence of problem behavior during each interval throughout the observation, while keeping the temporal order of child behavior and caregiver consequences intact (Martens et al., 2008; 2010). During each interval, recordings were made in three steps. First, at the beginning of each signaled interval observers noted the absence of problem behavior by placing an "O" in the behavior column. If no problem behavior occurred during that particular interval, any caregiver response to the child's other behavior during that same interval was scored. If the caregiver did not interact with the child at all during the interval, the caregiver category of *no consequence* was scored. If problem behavior occurred at any point during the interval, observers placed a slash through the "O" and recorded any caregiver responses to the child's problem behavior. Third, for the coding of escape, observers noted when a command was given but not complied with and recorded escape in every interval that the caregiver did not repeat the command or prompt compliance (e.g., with physical guidance) until the next caregiver interaction. Once the caregiver repeated the command, prompted compliance, or interacted with the child in any other way, escape was no longer recorded and attention was scored.

The goals of this phase were to: (a) describe patterns of responses to each child's transition-related problem behavior, (b) identify the consequences that followed problem behavior, and (c) identify key environmental correlates that occasioned problem behavior. We calculated two conditional probabilities for each consequence based on the observational data during the time from the initial transition prompt to the end of the observation; (a) the probability of the consequence occurring in the same interval given problem behavior, and (b) the probability of the consequence occurring in the same interval given the absence of problem behavior. Next, we plotted these joint probabilities in coordinate space with a diagonal line to identify the degree to which each consequence was contingent on problem behavior (e.g., Martens et al., 2008; 2010). The probability of each consequence given problem behavior is on the y-axis, and the probability of each consequence given the absence of problem behavior is on the x-axis. The diagonal line represents where points would be plotted given equal probability values (i.e., the unity diagonal). These conditional probabilities can range from 0 to 1, and the values approximate the reinforcement schedule for both problem behavior or the absence of problem behavior. For example, a .50 conditional probability would approximate a variable-ratio 2 schedule.

Martens and colleagues (2008) outlined the interpretations of joint probabilities plotted in coordinate space, which I describe here. Points that fall above the unity diagonal represent consequences that are more likely to occur given the occurrence of transition-related problem behavior. These consequences are contingent to some degree on transition-related problem behavior and therefore may be potential reinforcers for transition-related problem behavior. Points that fall below the unity diagonal represent consequences that are more likely to occur given the absence of transition-related problem behavior. These consequences are contingent on behavior exclusive of transition-related problem behavior and therefore not likely to be potential reinforcers for transition-related problem behavior. Points that fall on or near the unity diagonal would represent consequences that occur independent of transition-related problem behavior. Points that fall on either axis would suggest a dependent relation between the consequence and either transition-related problem behavior (y-axis) or its absence (x-axis). Points on or near the origin would suggest infrequent delivery of consequences, whereas points falling further away from the origin would suggest more frequent delivery of those consequences.

For each consequence, we calculated an operant contingency value (Martens, Gertz, Werder, Rymanowski, & Shankar, 2014) by subtracting the conditional probability of the consequence given the absence of problem behavior from its probability given the presence of problem behavior and retaining the sign. We then hierarchically ranked each consequence based on its operant contingency value. The most likely function(s) of (i.e., potential reinforcers for) transition-related problem behavior were those consequences with larger, positive operant contingency values (i.e., that were plotted above the unity diagonal, closer to the y-axis, and further away from the origin). Position relative to the y-axis took precedent over position from the origin. In the following section, I describe how we compared these rankings with functional analysis outcomes.

Phase II: Functional analysis. During Phase II, we conducted a brief functional analysis similar to that described by Waters et al. (2009). We converted the data on problem behavior into a percentage of transitions with problem behavior for each child and condition. Latency to the first occurrence of problem behavior following the transition command was also reassured. Each test condition in the functional analysis consisted of a 2 min pre-transition activity, the transition itself, and a 2-min post-transition activity. Each test condition was implemented a minimum of three times. Activities were the same as in Phase I.

During the *tangible* (positive) condition, the child had free access to toys for 2 min in a neutral location. After the 2 min had elapsed, the experimenter instructed the child to stop engaging with the pre-transition activity (e.g., "All done playing with [activity name]") and move to a table and chair in a neutral location approximately 1.5 m away (e.g., "It's time to go sit at the table"). If problem behavior occurred at any point following the transition command, the experimenter terminated the transition and allowed the child to continue engaging with the pre-transition activity for another 2 min. If the child failed to comply within 5 s of the transition command, a model prompt was provided (e.g., the therapist modeled standing up, putting down materials, walking over to the table, and sitting down). If the child failed to initiate the transition within 5 s from the model prompt, the experimenter terminated the transition and allowed the child to continue engaging with the pre-transition activity for another 2 min. The experimenter never implemented physical guidance because we considered non-compliance as a target problem behavior and thus chose to reinforce this class of behaviors. If the child complied in the absence of problem behavior, the experimenter allowed the child to sit quietly for 2 min at the neutral location with no other materials present.

During the *escape* (negative) condition, the child sat alone not engaged with any activity in a neutral location for 2 min. After the 2 min had elapsed the experimenter prompted the child to get up and go to the post-transition activity (e.g., "Okay, it's time to go sit at the work table") approximately 1.5 m away. If problem behavior occurred at any point following the transition command, the experimenter terminated the transition and allowed the child to resume sitting alone at the table for another 2 min. If the child failed to comply within 5 s, a model prompt was provided. If the child failed to initiate the transition within 5 s from the model prompt, the experimenter terminated the transition and allowed the child to resume sitting alone at the table for another 2 min. If the child complied in the absence of problem behavior, the experimenter provided prompts and guidance as necessary to engage in the post-transition activity for 2 min.

We also implemented a *control* condition for comparative purposes. During this condition, the child sat alone not engaged with any activity in a neutral location for 2 min. After the 2 min had elapsed the experimenter prompted the child to get up and go to a post-transition activity (e.g., "Okay, it's time to go play") approximately 1.5 m away. The post-transition activity was suspected to be high-preferred based on engagement data from the descriptive assessment and the experimenter provided near continuous attention. Again, if problem behavior occurred at any point following the transition command the experimenter terminated the transition and allowed the child to resume sitting alone in the neutral location. If the child failed to comply within 5 s, a model prompt was provided. If the child failed to initiate the transition within 5 s from the model prompt, the experimenter terminated the transition and allowed the child to resume sitting alone in the neutral location for another 2 min. If the child complied in the absence of problem behavior, the experimenter allowed the child to engage in the post-transition activity for 2 min.

Based on resulting descriptive assessment data collected during Phase I of the study, we also included an *attention* (positive) condition for Trevor and Heath. We did not implement this *attention* condition with Sawyer because his caregiver delivered attention independent of transition-related problem behavior. During the *attention* (positive) condition, the experimenter provided near continuous attention to the child in a neutral location for 2 min. After the 2 min had elapsed the experimenter prompted the child to get up and go to the post-transition activity (e.g., "Okay, it's time to go sit at the table") approximately 1.5 m away. The post-transition activity consisted of the child sitting alone in the absence of experimenter attention. If problem behavior occurred following the transition command, the experimenter terminated the transition and allowed the child to resume sitting in the neutral location with continuous attention provided. If the child failed to comply within 5 s, a model prompt was provided. If the child failed to initiate the transition within 5 s from the model prompt, the experimenter terminated the transition and allowed the child to resume sitting in the neutral location with continuous attention provided. If the child complied in the absence of problem behavior, the experimenter allowed the child to sit quietly in the post-transition activity for 2 min.

The various test conditions were rapidly alternated in a multielement fashion, similar to McCord et al. (2001), and the percentage of transitions with problem behavior was recorded. We also extracted the latency to the first occurrence of problem behavior following the transition command from the raw data. The transition condition(s) associated with the highest percentage of transitions with problem behavior and shortest latency to problem behavior indicated the most likely function(s) of the transition-related problem behavior when differentiated from the control condition.

To further evaluate the relative effects of each test condition (i.e., positive, negative, and attention) on the latency to problem behavior, we calculated the non-overlap of all pairs (NAP) effect size statistic between each test condition and the control. We calculated the NAP statistic as in Parker and Vannest (2009) by comparing the overlap of each control data point with each test condition data point. Overlaps were assigned a value of 1, non-overlaps were assigned a value of 0, and ties were assigned a value of 0.5. We then summed overlaps and ties and subtracted from the total number of paired comparisons ($N_{\text{baseline data points}}$ x $N_{\text{intervention data points}}$). We then converted the resulting NAP values to a percentage of all paired comparisons. According to recommendations by Parker and Vannest, NAP values of 65% or lower indicate weak effects, 66% to 92% indicate moderate effects, and 93% to 100% strong effects.

As a way to evaluate the concurrent validity of descriptive assessments and functional analyses, we hierarchically ranked each potential function (i.e., condition) based on the percentage of transitions associated with problem behavior and latency to problem behavior for all children. We then compared the functional analysis rankings with the rankings of the operant contingency values from the descriptive assessments. To examine the degree to which the two methods converged, we calculated Spearman's rank-order correlation coefficients. A strong and positive coefficient indicates convergence of the two assessment methods. In addition, we identified the two reinforcers for each child that maintained the highest levels of problem behavior in the functional analyses (i.e., 6 total) and computed the percentage of these that were among the top two potential reinforcers in the descriptive assessments.

Phase III: Treatment evaluation. All caregivers reported that transitioning away from preferred activities was most common at home and problematic at both home and school. Moreover, because leaving a preferred activity was the first step in completing the transition observed during the descriptive assessments, we chose to target a transition from a preferred activity to a neutral table during the treatment evaluation.

Each child's baseline was identical to the *tangible* functional analysis condition in which the child spent 2 min in a preferred pre-transition activity, was prompted (verbal and model) to move to a neutral table, and was provided with continued access to the pre-transition activity contingent on problem behavior. We used the same preferred activities as previously described for each child's pre-transition activities. Each session consisted of three transitions. This allowed us to calculate a percentage of transitions with problem behavior for each session for which we used as the primary dependent variable for all phase change decisions. For all three children, treatment was matched to the function of their problem behavior and consisted of differential reinforcement of an alternative behavior (DRA) with extinction (EXT) and signaled reinforcement in the post-transition activity. Specifically, if the child transitioned without problem behavior, we delivered praise and a preferred toy (DRA). A second toy was visible on the post-transition table as a visual signal. If the child failed to transition and engaged in problem behavior, we guided compliance (EXT). Guided compliance was reinforced only with access to a preferred toy but no praise.

Treatments were similar for both Heath and Sawyer, and were evaluated in an ABAB design. Prior to the start of a transition, the experimenter provided a verbal warning (e.g., "You can play with your toys on the floor and when it comes time to go to the table if you put down your toys and have a seat, then you can play with your other toys"). Transitions began with 2 min of free access to an I-Pad (Heath) or toys (Sawyer; described above) on the floor. A second I-Pad or other toys were on the table of the post-transition activity serving as a visual signal of upcoming reinforcement. We identified other post-transition toys for Sawyer via a paired-choice preference assessment (Fisher et al., 1992). The top four toys (Elmo, pig car, green dinosaur, and green pin-art) served as reinforcers in the post-transition activity.

After 2 min had elapsed in the pre-transition activity, the experimenter delivered a verbal prompt (e.g., “All done playing, put down your toys and come have a seat at the table.”). If the child complied by putting down the toys in the pre-transition activity, moving to the table, and sitting down in the absence of problem behavior, praise was delivered (“Nice job coming to the table!”) and the child was given access to an I-Pad or toys (DRA) for 2 minutes in the post-transition activity. If the child failed to disengage with the pre-transition activity following the verbal prompt the experimenter provided a model prompt by demonstrating disengagement, walking to the post-transition activity, and sitting down. Again, if the child complied following the model prompt, the experimenter delivered praise and provided access to an I-Pad or toys in the post-transition activity. If the child still failed to comply, non-compliance was scored and disengagement with the pre-transition activity was guided (EXT). That is, the experimenter removed either the I-Pad or toys. If guided disengagement was required, the experimenter withheld praise but granted access to the I-Pad or toys to ensure that the child would contact this contingency.

For Trevor, treatment was evaluated in an ABCDCACAC design with a drop out component analysis (Ward-Horner & Sturmey, 2010) conducted in the final treatment phase. That is, we systematically removed individual treatment components in the final treatment phase to evaluate their necessity.

The initial treatment phase for Trevor was similar to that for Heath and Sawyer. Prior to the start of a transition, the experimenter issued a verbal warning (e.g., "You can play with your toys on the floor. When it comes time to go to the table, if you put down your toys and have a seat, then you can play with the I-Pad at the table; if you don't, then you can't play with your toys and I will have to help you to your seat."). Transitions began with 2 min of free access to an I-Pad and other toys (described above) on the floor. A second I-Pad was on the table in the post-transition activity serving as a visual signal of upcoming reinforcement. After 2 min had elapsed in the pre-transition activity, the experimenter delivered a verbal prompt (e.g., "All done playing, put down your toys and come have a seat at the table."). If Trevor complied by putting down the toys in the pre-transition activity, moving to the table, and sitting down in the absence of problem behavior, praise was delivered ("Nice job coming to the table!") and Trevor was given access to an I-Pad (DRA). If Trevor failed to disengage with the pre-transition activity following the verbal prompt the experimenter provided a model prompt. Again, if Trevor complied following the model prompt we delivered an I-Pad and praise in the post-transition activity. If Trevor still failed to comply, data collectors scored non-compliance and the experimenter physically guided him to the table (EXT). Physical guidance consisted of removing the pre-transition activity and guiding Trevor from the floor to a seated position at the table. If physical guidance was required or problem behavior occurred during the transition, the experimenter withheld praise but granted access to the green I-Pad to ensure that Trevor would contact this contingency.

Because Trevor did not respond during initial treatment sessions, we implemented additional training and treatment components. Following three consecutive sessions (i.e., 9 transitions) in which Trevor remained non-compliant or engaged in problem behavior, we made access to the I-Pad in the post-transition activity contingent on compliance. That is, Trevor had to independently transition to the post-transition activity in the absence of problem behavior following a verbal or model prompt to gain access to the I-Pad in the post-transition activity.

Following another three consecutive sessions in which Trevor failed to comply, we conducted transition training trials. Training consisted of 10 trial sessions that consisted of 30 s in the pre-transition activity, the transition itself, and 30 s in the post-transition activity. We implemented a progressive time delay procedure (Miltenberger, 2012). Progressive time delay procedures gradually increase the amount of time between the initial instruction (e.g., “All done playing with the iPad, come have a seat at the table.”) and the controlling prompt (e.g., physical guidance) that evokes the correct behavior. This procedure facilitates a transfer of stimulus control from the controlling prompt to the initial instruction (i.e., the transition command).

We began with a 0-s delay by immediately implementing physical guidance following the transition command. The delay to physical guidance was then increased from 0 s to 5 s. Following the 5-s delay physical guidance was staggered such that we guided disengagement with the pre-transition activity (i.e., restricted access to the I-Pad and other toys) at 5 s and at 10 s physically guided Trevor to sit at the table. Lastly, 5 s after the transition command an additional vocal prompt (e.g., “All done with the I-Pad”) was provided, at 10 s disengagement was guided, and at 15 s Trevor was guided to sit at the table. We discontinued training was after four consecutive sessions of at least 80% compliant transitions.

After transition training, we reinstated the previous treatment phase that occurred just prior to training, as described above. Following a reversal with baseline, we systematically dropped out treatment components to examine their necessity. Following three consecutive compliant transitions in the absence of problem behavior, we withheld differential praise. Then after another three consecutive compliant transitions in the absence of problem behavior, we removed physical guidance.

We evaluated the relative effectiveness of treatment by visually inspecting the graphed data looking for clear and immediate differences in level, trend, and variability between baseline and treatment. In addition, we calculated the NAP effect size statistic between the final baseline and treatment phases to supplement visual inspection.

Interobserver Agreement (IOA) and Procedural Integrity

To evaluate IOA, two trained observers independently collected data for a minimum of 33.3% of observations in all phases. We calculated exact IOA for all descriptive observations, as well as for frequency behaviors during the functional analyses and treatment evaluation. Each observation or session was broken down into 10-s intervals. For each interval, observers either agreed or disagreed on the occurrence or frequency of behavior. The number of intervals in which agreement was divided by the total number of intervals and multiplied by 100, yielding a percentage agreement. Percentage agreements were then average across sessions to attain an IOA score.

We collected reliability data for 66% of descriptive observations for Trevor. The mean IOA for each target response was as follows: problem behavior 96%, attention 89% (range, 78% - 100%), escape 93% (range, 85% - 100%), tangible 100%, commands 89% (range, 78% - 100%), engagement in the pre- and post-transition activities 100%. For the functional analysis, we collected IOA data on 42% of the sessions. Interobserver agreement for all problem behaviors was 93% (range, 88% - 98%). During the transition training, IOA was collected during 100% of transition trials and yielded 100% agreement for the level of prompting required.

During the treatment evaluation, IOA was collected during 60% of transition trials. Interobserver agreement for all problem behavior was 99% (range, 92% - 100%).

We collected reliability data during 100% of descriptive observations for Heath. The mean IOA for each target response was as follows: problem behavior 97% (range, 96% - 100%), attention 99% (range, 96% - 100%), escape 94% (range, 85% - 100%), tangible 98.7% (96% - 100%), commands 91% (range, 81% - 96%), engagement in the pre-transition activity 93% (range, 88% - 100%), engagement in the post-transition activity 99% (range, 96% - 100%). For the functional analysis, we collected IOA data on 33% of the sessions. Interobserver agreement for all problem behaviors was 99% (range, 96% - 100%). During the treatment evaluation, IOA was collected during 58% of transition trials. Interobserver agreement for all problem behavior was 92% (range, 85% - 96%).

We collected reliability data during 66% of descriptive observations for Sawyer. The mean IOA for each target response was as follows: problem behavior 98% (range, 96% - 100%), attention 100%, escape 93% (range, 92% - 93%), tangible 100%, commands 95% (range, 92% - 96%), engagement in the pre-transition activity 98% (range, 96% - 100%), engagement in the post-transition activity 94% (range, 92% - 100%). For the functional analysis, we collected IOA data on 89% of the sessions. Interobserver agreement for all problem behaviors was 99% (range, 92% - 100%). During the treatment evaluation, IOA was collected during 71% of transition trials. Interobserver aggreement for all problem behavior was 99% (range, 98% - 100%).

Step-by-step protocols were developed for the functional analyses and treatment evaluations to assess procedural integrity. We assessed procedural integrity during 100% of the functional analysis sessions. Procedural integrity was 100% across all conditions and sessions for Trevor and Sawyer. Procedural integrity was 99% (range, 86% - 100%) across all conditions and sessions for Heath. We also assessed procedural integrity during 100% of treatment sessions and was 100% across all children and conditions.

Results

Descriptive Assessment

Descriptive behavior-consequence data identified two potential reinforcers for each child. We plotted the mean joint probabilities for each consequence in coordinate space on the left side of Figure 2 for each child. Each child engaged with the pre-transition activities during 100% of the intervals suggesting the activities were preferred. As shown in the figure, following the transition command, caregivers provided near continuous attention for all children. Sawyer received attention that was independent of his behavior, which included neutral statements (e.g., "you look like you're having fun"), praise (e.g., "nice job working"), and commands ("have a seat"). For Trevor and Heath, attention was more likely to follow problem behavior than in its absence. Heath received attention in the form of neutral statements and commands; whereas Trevor's caregiver repeated the transition command (e.g., "come have a seat") but never provided any other form of attention or guided compliance. Both escape and tangible were delivered contingent on Sawyer's problem behavior (i.e., more often followed problem behavior), and were dependent on Trevor and Heath's problem behavior (i.e., never followed appropriate behavior). For all children, caregivers provided escape on a richer schedule than tangible. Thus, these data suggest that escape was most likely maintaining problem behavior with a mean operant contingency value of .83 followed by tangible with a mean of .55. Attention was not a likely candidate as a potential reinforcer for either Sawyer or Trevor because it was provided independent of their behavior (0.0 and .11) and on near continuous schedules. The contingency space analysis did identify attention as a third potential reinforcer for Heath (.50).

Although none of the caregivers provided idiosyncratic consequences for problem behavior or delivered warnings (e.g., verbal warnings or picture schedule) to their child, caregivers did signal the upcoming activity by placing demand materials on the table in their child's line of sight.

Functional Analysis

Because caregivers signaled each transition by displaying the upcoming activity, we designed all functional analysis test conditions to mimic these conditions such that the upcoming activity was visible. That is, in the *tangible* and *attention* conditions, we positioned an empty table and chair in the child's line of sight with the therapist remaining in the pre-transition location. Likewise, for the *escape* condition we placed the demand materials in the child's line of sight on the table in post-transition location. Each child displayed problem behavior in all test conditions, and never engaged in problem behavior in the control condition.

The right side of Figure 2 shows the percentage of transitions with problem behavior across conditions for each child. For Trevor, problem behavior occurred during 100% of transitions in the *tangible* and *attention* conditions and 66% of transitions in the *escape* condition. Although attention was not identified as a likely reinforcer candidate in the descriptive assessment, attention did favor problem behavior slightly. For this reason, we decided to include an *attention* condition in Trevor's functional analysis. For Heath, problem behavior occurred during 100% of transitions in the *tangible* and *escape* conditions and 66% of transitions in the *attention* condition. For Sawyer, problem behavior occurred during 100% of transitions in the *tangible* and *escape* conditions. We did not implement an *attention* condition with Sawyer because descriptive assessments did not implicate attention as a potential maintaining variable.

Figure 3 displays the latency to problem behavior during the functional analysis for each child. The findings were identical to the percentage of transitions with problem behavior, just displayed differently. For Trevor, the average latency to problem behavior in the attention condition was 9.7 s (7.5 s – 11.5 s). His average latency to problem behavior in the *tangible* condition was 17.5 s (9.6 s – 21.6 s). The average latency to problem behavior in the *escape* condition was 35.7 s (10.2 s – 61.0 s). In one *escape* session Trevor complied and never engaged in problem behavior, thus we excluded this point when calculating the mean. These results suggest that Trevor's problem behavior was multiply maintained by tangible, attention, and less so by escape. There was 100% NAP for the *tangible* and *attention* conditions and 83% for the *escape* condition when compared to the *control* condition.

For Heath, average latency to problem behavior was 15.9 s (14.6 s – 17.2 s) in the *tangible* condition and 16.6 s (15.1 s – 18.7 s) in the escape condition. Under these conditions, latency to problem behavior was rapid and stable across sessions. In the *attention* condition, the average latency to problem behavior was 56.3 s (18.0 s – 94.6 s) and displayed a downward trend indicating that problem behavior occurred more quickly across sessions. In one *attention* session Heath complied and never engaged in problem behavior, thus we excluded this point when calculating the mean. These results suggest that Heath's transition-related problem behavior was maintained by tangible, escape, and less so by attention. There was 100% NAP for the *tangible* and *escape* conditions and 83% for the *attention* condition when compared to the *control* condition

For Sawyer, the average latency to problem behavior in the *tangible* condition was 15.2 s (13 s – 19.2 s) and 15.1 s (14 s – 16 s) in the *escape* condition. Suggesting that Sawyer's transition-related problem behavior was maintained by both tangible and escape with 100% NAP for all test conditions when compared to the *control* condition.

We evaluated the level of agreement between descriptive assessments and functional analyses by hierarchically ranking each potential function according to their respective assessment procedures and calculating Spearman's rho. We used the operant contingency values to rank functions identified during the descriptive assessments. For the functional analyses, we used the percentage of transitions with problem behavior. However, if more than one test condition produced the same percentage of transitions with problem behavior, we used latency to problem behavior to rank those functions. For Trevor, Spearman's rho was -1.0, suggesting a perfect negative relationship. Spearman's rho was 0.5 for Heath and 1.0 for Sawyer, suggesting a moderate and perfect positive relationship, respectively. Additionally, based on these rankings descriptive assessments identified the same top two reinforcers as the functional analyses for Saywer and Heath (*escape* and *tangible*), and one of the top two reinforcers for Trevor (*tangible*). Thus, of the six top reinforcers identified in the functional analyses (i.e., top two reinforcers for each child), five reinforcers were also identified in the descriptive analyses yielding a hit rate of 83%.

Treatment Evaluation

Figure 4 displays the percentage of transitions with problem behavior for all children. For Trevor (top panel of Figure 4), an average 86.6% (range, 0% - 100%) of transitions occasioned problem behavior across the three baseline conditions. During the initial treatment phase, problem behavior persisted with an average of 88.7% (range, 66% - 100%) of transitions occurring with problem behavior. When we added physical guidance, problem behavior continued to occur during an average of 83.3% (range, 33% - 100%) of sessions. There was little to no differentiation between the initial baseline and treatment phases suggesting that Trevor was not making adequate treatment gains. Therefore, we suspended treatment temporarily following session 10 and conducted transition training.

Figure 5 displays the results of Trevor's transition training. During training, we initially implemented physical guidance immediately following the transition command and guided all transitions. We then implemented physical guidance 2 s following the transition command. At 2 s, Trevor began transitioning independently with an average of 36.7% (range, 10% - 100%) of transitions completed independently. We then delayed physical guidance to 5 s and independent transitions continued to occur at a similar level (M = 32.4%; range, 0% - 70%). In the next phase, we guided disengagement with the pre-transition activity 5 s following the transition command and implemented physical guidance at 10 s. Under this arrangement, we reduced physical guidance to near zero levels with an average of 3% (range, 0% - 20%) of transitions requiring physical guidance. However, an average of 54% (range, 20% - 90%) of transitions required guided disengagement and displayed a downward trend throughout the phase. Likewise, independent transitions increased to an average of 43% (range, 10% - 70%). Finally, we delivered a vocal prompt 5 s after the transition command, guided disengagement at 10 s, and physical guidance at 15 s. Here the use of guided disengagement remained low and variable, an average of 11.7% (range, 0% - 40%) of transitions required guided disengagement and 0% required physical guidance. Independent transitions increased further and occurred at high and variable levels with an average of 83.3% (range, 60% - 100%) occurring independently following either the initial transition command or the vocal prompt.

After training trials were completed, we reinstated treatment plus physical guidance (session 11 of the top panel of Figure 4) and immediately reduced the percentage of transitions with problem behavior to zero. Each return to baseline was associated with immediate increases in the percentage of transitions with problem behavior, whereas each return to treatment resulted in immediate reductions in the percentage of transitions with problem behavior. In the final treatment phase, we systematically removed praise and then physical guidance; treatment gains maintained with 100% of transitions occurring independently in the absence of problem behavior. During the final baseline and treatment phases, NAP was 100% indicating strong treatment effects even in the absence of physical guidance and differential attention.

For Sawyer (middle panel of Figure 4), 90.3% (range, 66% - 100%) of transitions during baseline were associated with problem behavior. With the implementation of treatment, the percentage of transitions with problem behavior immediately reduced with an average of 44.8% (range, 0% - 100%) of transitions occurring with problem behavior. The reductions in the first implementation were moderate and stable. During the second implementation of treatment, the percentage of transitions with problem behavior initially reduced to near zero levels, trended upward, and then stabilized with a moderate reduction from baseline. Even though problem behavior did not completely suppress during treatment, Sawyer transitioned to the post-transition activity 88% (range, 66% - 100%) of the time in the absence of physical guidance. Thus, during the final baseline and treatment phases NAP was 79% when examining percentage of transitions with problem behavior and 100% when examining percentage of completed transitions in the absence of physical guidance suggesting moderate to strong treatment effects, respectively.

For Heath (bottom panel of Figure 4), 100% of transitions during baseline were associated with problem behavior. Following the implementation of treatment, the percentage of transitions with problem behavior immediately reduced and stabilized with an average of 29.3% (range, 0% - 66%) of transitions occasioned by problem behavior. Similar to Sawyer, although we did not eliminate problem behavior during treatment, Heath transitioned to the post-transition activity 100% of the time in the absence of physical guidance. During the final baseline and treatment phases, NAP was 100% for the percentage of transitions with problem behavior indicating strong treatment effects.

Discussion

A descriptive method for assessing transition-related problem behavior, based on the strategies of contingency space analysis, was developed and evaluated with three children with developmental delays who exhibited transition-related problem behavior. I hypothesized that descriptive assessments would identify variables suspected to have a functional relation with each child's problem behavior. Moreover, I suspected that descriptive assessments would detect variables not typically evaluated in functional analyses of transition-related problem behavior (e.g., McCord et al., 2001). To this end, I designed functional analysis test conditions that mimicked the components of the transitions observed with caregivers during the descriptive assessments and examined agreement between the two procedures. I hypothesized that the two procedures would agree and that functional analysis outcomes would confirm that the variables detected in the descriptive procedures were functionally related to each child's problem behavior. Lastly, I designed function-matched interventions based on assessment results and hypothesized that they would be effective at reducing each child's transition-related problem behavior.

Descriptive Assessment

Descriptive assessments identified two potential reinforcers for each child's problem behavior and perhaps a third for Trevor and Heath. Results suggested that positive reinforcement in the form of continued access to the pre-transition activity (tangible) and negative reinforcement in the form of escape from the post-transition activity (escape) were potential maintaining variables for all children. Descriptive assessments also implicated positive reinforcement in the form of attention for Heath and possibly Trevor. These results support the first hypothesis in that descriptive assessments would identify variables suspected to be maintaining each child's problem behavior. Descriptive assessments also revealed that caregivers signaled the transitions by visually displaying the upcoming activity. Lending support to my second hypothesis, the descriptive assessments were able to identify a unique variable (i.e., signals) associated with these children's transition-related problem behavior under natural conditions.

Functional Analysis

One goal of the current study was to evaluate the utility of a modified descriptive assessment procedure in determining the function of transition-related problem behavior. To this end, we conducted brief transition functional analyses that mimicked the natural contingencies observed during descriptive assessments. That is, transitions in the functional analyses were signaled, similar to what we observed with caregivers, and isolated each consequence. As such, each test condition (i.e., *tangible, escape,* and *attention* for Trevor and Heath; *tangible* and *escape* for Sawyer) occasioned problem behavior supporting the notion that descriptive procedures would be useful in informing functional analysis test conditions.

Along these lines, functional analyses conducted by McCord et al. (2001) included test conditions with and without a location change. For both of their participants, when movement between activities was required, problem behavior occurred leading the authors to conclude that problem behavior was maintained by avoidance of having to change locations. While this may have been the case, it is unclear if transitions were signaled or not. Based on the descriptions of their methods it appears that when transitions did not require a location change, the upcoming activity was unknown to the participants. Conversely, when transitions required movement it is possible that the participants were able to see the upcoming activity, signaling the transition. Although not adequately described in the methods, if this was the case it is possible that seeing the upcoming activity created a signaled transition. Even in the movement condition with location change, in which the participants were asked to transition from no activity to no activity, the presence of an empty table and chair in a different location may have provided a signal to these individuals. Thus, it is unclear if the signal (i.e., seeing the upcoming activity), the location change, or both were responsible for the occurrence of these individual's transition-related problem behavior.

More recently, Retzlaff, Parthum, Pitts, and Hughes conducted a study with pigeons that directly examined the aversive properties of signals associated with various transitions (e.g., rich to lean transitions). The authors directly examined the effects of signaling the transitions by allowing the pigeon to engage in an alternative response (i.e., pecking a specific key) that removed the stimulus associated with the current transition (i.e., signal). The results showed that pigeons were most likely to engage in the alternative response during transitions that signaled an upcoming lean component and even more so when pigeons were transitioning away from a rich component (i.e., signaled rich to lean transition). These findings indicate that escape from the signal associated with the rich to lean transition was enough to maintain these birds alternative responding and suggests that the signals themselves were aversive. Therefore, it is possible that signaling an upcoming less preferred activity during transitions may evoke behavior maintained by avoiding that activity or the signal itself, which was not clearly evaluated in McCord et al. (2001).

In the current study, all transitions in the functional analyses were signaled including the control condition. Our control condition was designed for comparative purposes. However, if the child would have engaged in problem behavior (which never occurred) the transition would have been terminated. Thus if problem behavior was simply maintained by escape from the location change, we would have also expected problem behavior to occur under these conditions. Having said that, the current study did not isolate movement by having children transition from no activity to no activity and should be noted as a limitation. We chose to not include this condition because natural transitions always required movement. Future researchers should examine transition-related problem behavior across signaled and unsignaled transitions that both require and do not require a location change. Nonetheless, the current study was able to utilize descriptive data to inform functional analysis test conditions that aligned with the naturally occurring transitions.

For each child during the functional analyses, two of the test conditions were always associated with problem behavior. These results indicate that *escape* and *tangible* were most likely maintaining Heath and Sawyer's problem behavior. For Trevor, *tangible* and *attention* were the most likely candidates. For Sawyer and Heath, the calculations of Spearman's rho provided validity evidence for the modified descriptive assessment. For Trevor this was not the case. Both procedures identified the same functional reinforcers (i.e., tangible, escape, and possibly attention); they just disagreed on the ranking of those reinforcers. Of these six top functional reinforcers identified in the functional analyses, descriptive assessments identified five as being the most likely candidates as functional reinforcers. Therefore, descriptive assessments identified 83% of the top two reinforcers identified in the functional analyses for each child supporting my third hypothesis that this approach would exhibit concurrent validity.

Additionally, and as previously noted, functional analyses often take extended periods of time. For example, the functional analysis conducted by McCord et al. (2001) took approximately 550 minutes. In contrast, the descriptive assessment in the current study took approximately 15 – 20 minutes and the brief functional analyses took approximately 40 – 50 minutes, for a total of 55 – 70 minutes per child. Thus using descriptive procedures to inform experimental analyses may be an alternative and more efficient model in determining the function of transition-related problem behavior.

Treatment Evaluation

Beyond the identification of functional relations, we also examined the treatment utility of these assessment procedures by matching treatments to function. In general, we were able to reduce the percentage of transitions with problem behavior and increase the percentage of transitions that occurred in the absence of physical guidance for all children, supporting my fourth and final hypothesis. During treatment, tangible items and praise were delivered contingent on completion of the transition (i.e., DRA) targeting the social positive functions. Likewise, delivering preferred tangible items, praise, and removal of academic demand materials in the post-transition activity addressed the escape functions. That is, we altered the aversive properties of the post-transition activity such that the value of escape from the post-transition activity was reduced likely functioning as an abolishing operation. By providing verbal (i.e., pre-session explanation of the contingencies) and visual signals (i.e., tangible items place on table), it is likely that we further reduced the aversive properties of the transitions and made them more predictable. As such, these signals would also appear to have functioned as an abolishing operation. Finally, physical guidance (Trevor) and guided disengagement (all children) disallowed escape from the transition and continued access to the pre-transition activity (i.e., extinction). Guiding disengagement also likely functioned as a motivating operation, which I will discuss in detail below.

For Trevor and Heath, strong effects (NAP values > 93%) were observed in terms of the percentage of transitions with problem behavior and moderate effects (NAP values > 66%) for Sawyer. For all children, when examining the percentage of transitions that were completed in the absence of physical guidance we found strong treatment effects (NAP values > 88%). So even though children did not always comply following the initial transition command, each child moved to the post-transition activity without requiring physical guidance the vast majority of the time. From a social validity standpoint, simply restricting access to the pre-transition activity is a straightforward treatment component that in turn appears to aid in the facilitation of independent transitioning. The current study did not formally evaluate the social validity of the treatment procedures, however based on caregiver report, having their child transition in the absence of physical guidance was acceptable. Future researchers should examine the acceptability of removing the pre-transition activity as a component in the treatment of transition-related problem.

Even so, Trevor's transition training data highlight the value of restricting access to the pre-transition activity. We first delivered matched tangible items in the post-transition activity. This was ineffective at decreasing the percentage of transitions with problem behavior even when we implemented physical guidance. Consequently, we conducted transition training as a way to transfer stimulus control from the physical guidance procedures (i.e., controlling prompt) to the transition command. Here we first reinforced guided compliance and then gradually increased the time between the transition command and physical guidance. This facilitated the transfer of stimulus control to the transition command by differentially reinforcing compliance in the presence of the command and not in its absence. However, it is noteworthy that when we implemented guided disengagement during transition training, independent transitions rapidly emerged. This would suggest that disengagement was a critical step in the transition process for Trevor; once disengaged, the remaining steps in the transition were more likely to occur. Moreover, we always implemented guided disengagement with Sawyer and Heath, which may have negated the need for transition training with these children.

Recently Sullivan, Martens, Morley, and Long (2017) evaluated the effects of guiding disengagement in two young boys with autism during preferred to non-preferred activity transitions. Here the authors interrupted the pre-transition activity by briefly guiding disengagement and allowing the child to resume the activity prior to issuing the initial transition command. Results indicated that by signaling the upcoming transition and briefly interrupting the pre-transition activities, transition latency and problem behavior reduced beyond the use of signals alone. The authors suggested that the brief interruptions likely functioned as an abolishing operation, temporarily reducing the reinforcing value of the pre-transition activity. In the current study, we restricted access to the pre-transition activity, which likely also reduced the value of the pre-transition activity helping to facilitate independent and problem-free transitions. At the same time, restricting access to the pre-transition activity also appeared to have an evocative effect by increasing the value of the post-transition activity during treatment. We delivered tangible items contingent on transitioning to the post transition-activity, therefore, removal of the pre-transition activity also likely increased motivation to access the tangible items in the post-transition activity evoking the remaining steps in the transition.

Furthermore, by examining the contrast of reinforcement schedules between the pre- and post-transition activities we can further explain the effects of treatment. Basic research has suggested that pausing in nonhuman animals during transitions between schedules of reinforcement is a function of both the pre- and post-transition conditions and signals indicating the upcoming schedule of reinforcement (Perone & Courtney, 1992). By guiding disengagement with the pre-transition activity and signaling the availability of reinforcement in the post-transition activity, we contrived a transition that has been associated with lower pause durations in nonhumans (i.e., signaled lean-to-rich transitions).

Conceptualizing pausing as analogous to transition-related problem behavior, we were able to translate basic findings in the current study. We observed elevated levels of transition-related problem behavior during baseline (i.e., a signaled rich-to-lean transition), and when we implemented treatment problem behavior decreased. Treatment in the absence of guided disengagement created a signaled rich-to-rich transition (i.e., leaving a preferred activity and transitioning to another preferred activity). Findings from the basic literature would suggest that pause durations, or transition-related problem behavior, during a signaled rich-to-rich transition would be lower than during a rich-to-lean transition. Because we scored problem behavior when guided disengagement occurred, we were able to evaluate the effects of treatment prior to guiding disengagement by examining the percentages of transitions with problem behavior. This was indicative of the effects of altering the transition from a rich-to-lean (i.e., baseline) transition to a signaled rich-to-rich transition (i.e., treatment in the absence of guided disengagement) that resulted in at least moderate reductions in problem behavior for all children.

However, we would still expect higher pause durations, or transition-related problem behavior, during a signaled rich-to-rich transition than during a signaled lean-to-rich transition (Perone & Courtney, 1992). As we implemented guided disengagement, we again changed the transition; now to a signaled lean-to-rich transition. Under these conditions, findings from basic research would predict that transition-related problem behavior would decrease beyond what we observed during the signaled rich-to-rich transitions. By extracting data on the completion of the transition following guided disengagement, we were able to examine whether or not children would complete the transition. Once we contrived a signaled lean-to-rich transition by guiding disengagement, placing preferred toys in view on the post-transition table, and reinforcing problem-free transitions with 2-min of access to these toys, the children independently moved to the post-transition activity without any further assistance. This finding highlights the effects of treatment on the percentage of transitions completed in the absence of physical guidance, aligning with the predictions made from the basic literature.

From this perspective, a limitation of the current study is that the nature of the transition was changed from baseline to treatment. For example, one may conceptualize the transition during treatment as a signaled rich-to-rich or lean-to-rich transition and the transition in baseline as a signaled rich-to-lean transition (as described above). However, as with all behavioral treatments, the contingency changes from baseline to treatment were dependent on the child's behavior. That is, the transition during treatment was still one in which the child had to leave a preferred activity and go to a table (i.e., rich-to-lean), but contingent on the child's behavior we altered the transition to favor appropriate behavior and reduce problem behavior. The primary limitation here is that we did not conduct schedule thinning. The current study simply sought to evaluate initial treatment effects based on the resulting functional assessment data. Future researchers should evaluate the ways in which treatments for transition-related problem behavior can be faded so that reductions in problem behavior maintain when preferred tangible items are not immediately available in the post-transition activity.

Along these same lines, a recent translational investigation of transitions with two boys with autism has suggested that the time it takes to transition between activities is attributable to the aversive properties of the contrast between schedules (Jessel, Hanley, & Ghaemmaghami, 2016). For one participant, Jessel and collegues arranged a room divided into quadrants. Each quadrant was associated with a particular color on the floor, signaling a specific schedule of reinforcement (i.e., rich or lean). Rich quadrants had highly preferred activities available and lean quadrants had less preferred activities. For the other participant, a transition to and from rich and lean contexts was arranged. Here the authors asked the participant to move back and forth between sorting tasks. In the rich context, the sorting task was a specific color (i.e., signal) and compliance was reinforced on an FR-1 schedule with preferred edible items. In the lean context, the sorting task was a different color and compliance reinforced on an FR-5 schedule of reinforcement with less preferred edible items. Results suggested that signaled lean-to-rich transitions were associated with the lowest transition durations and signaled rich-to-lean with the highest transition durations, translating basic findings in children with autism.

The results from Jessel et al. (2016) highlight the view that additional variables, not directly examined in traditional functional analyses, may contribute to transition-related problem behavior. As an example, suppose problem behavior reliably occurs during a specific transition, but the child never actually regains access to the pre-transition activity or avoids the upcoming activity. In situations such as these one must consider the evocative control of contextual changes in reinforcement schedules (Jessel et al., 2016), as well as idiosyncratic caregiver behavior that may alter the richness of these schedules. Given this possibility, the current descriptive assessment procedures would be applicable for assessing idiosyncratic caregiver behavior as well as reinforcement schedules during the pre-and post-transition activities. Future researchers may utilize conditional probabilities to estimate schedules of reinforcement for both problem behavior and its absence. By examining these values across the pre- and post-transition activities, one could determine the contrast of reinforcement schedules that produce problem behavior during transitions. From there, one may arrange these schedules in an experimental fashion to confirm that the contrast of schedules would be sufficient to evoke problem behavior.

Overall, results of the current study suggest that descriptive assessment data analyzed in contingency space can accurately identify potential reinforcers for transition-related problem behavior (i.e., 83% of reinforcers identified). This approach demonstrates concurrent validity with functional analysis test conditions and utility in designing function-matched interventions for reducing problem behavior. However, a few additional limitations are worth noting.

Limitations

First, there were only three participants, all with developmental disabilities, for whom problem behavior during transitions was a referral concern. Thus, replication across settings (e.g., school) and with additional participants that exhibit different forms of transition-related problem behavior is warranted. Even though caregivers conducted natural transitions, additional variables that would be present in a school (e.g., peers, activity schedules, teachers) were absent in the current study. Second, we chose to evaluate treatment during transitions from a preferred activity to no activity because, (1) it was shown to evoke problem behavior and (2) reported to be problematic in both the home and school settings for all children. However, given that these children's transition-related problem behavior was multiply controlled, treatment effects may have differed if evaluated under different baseline conditions (e.g., preferred to non-preferred transition). Future researchers should examine the interaction between the multiple functions to evaluate treatments under more difficult conditions.

Third, although descriptive assessments identified 83% of the top reinforcers identified in the functional analyses, the two procedures did not perfectly align as evidenced by the resulting Spearman's rho values. One reason as to why the two procedures did not directly align may have been be due to the brevity of the procedures. We only conducted three to four descriptive observations and only three transitions per condition in the functional analyses that always required a location change. We chose to keep both assessment procedure brief for efficiency and required movement because naturalistic transitions reported to be problematic also required movement. However, lengthier analyses may have provide additional information related to the function of these children's transition-related problem behavior. Fourth, we only conducted two functional analysis test conditions with Sawyer. We chose not to include an *attention* condition because attention was not identified as a potential reinforcer in the descriptive assessment. However, it unknown if attention alone would have been sufficient to maintain problem behavior or if the descriptive assessment procedures were able to accurately rule out attention as a maintaining variable.

Finally, additional training was required for Trevor before we observed reductions in the percentage of transitions with problem behavior. It appeared that guiding disengagement was a key component in treatment, which we did not initially implement with Trevor. We did implement full physical guidance, which included guided disengagement, however full physical guidance may have been aversive enough to evoke problem behavior during the initial treatment sessions. Additionally, Trevor's caregiver rarely followed through with their transition commands and thus the command likely lacked control over his behavior thereby requiring additional training to transfer stimulus control. It will be important for future researchers to examine the need for transition training and its usefulness in treating transition-related problem behavior.

Summary

Overall, the current study demonstrated the utility of the modified descriptive procedure in the assessment of transition-related problem behavior. Given that transition-related problem behavior may lead to functional behavior assessments in the school setting, we wanted to develop an efficient assessment procedure that would have utility in this setting. Although functional analyses have been conducted in school settings (e.g., Martens et al., 2010), their use with transition-related problem behavior is limited and may be difficult for school personnel to conduct. For example, in a school setting the child would be removed from their typical routine and each component of the transition would be contrived and assessed during a functional analysis. In opposition, the descriptive procedures can be conducted during naturally occurring transitions and would not interfere with the student's routine. Thus, the results from the current study suggest that the modified descriptive procedure is capable of detecting naturally occurring contingencies that maintain transition-related problem behavior, highlighting its potential treatment utility in schools.

Furthermore, we were able to use data from the descriptive procedure to inform functional analyses of transition-related problem behavior and confirm that these variables were functionally related to each child's problem behavior. Although the current study provides evidence that descriptive and experimental procedures identified the same top functional reinforcers, the purpose was not to suggest that descriptive procedures were superior to experimental procedures. The purpose was to demonstrate the utility of the descriptive procedures by using the data to inform functional analyses that mimicked the components of naturally occurring problematic transitions. By hypothesizing function and detecting idiosyncratic variables via descriptive assessments, we were able to set up meaningful functional analysis test conditions that efficiently determined function.

In conclusion, the current evaluation was able to provide evidence for the utility of a modified descriptive assessment procedure in identifying the function of transition-related problem behavior. We were able to successfully link results from the modified descriptive assessment procedure to functional analyses and develop function-matched interventions that ultimately facilitated independent and problem-free transitions.

Transition: Free play to reading center with movement

Time	Command	Signal		Behavior		Engagement pre-transition activity	Engagement post-transition activity	Attention	Tangible	Escape	N/C	Other
:10												
:20												
:30												
:40												
:50												
1:00												
1:10												
1:20												
1:30												
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4:50												
5:00												

Figure 1. Example of descriptive assessment data sheet.

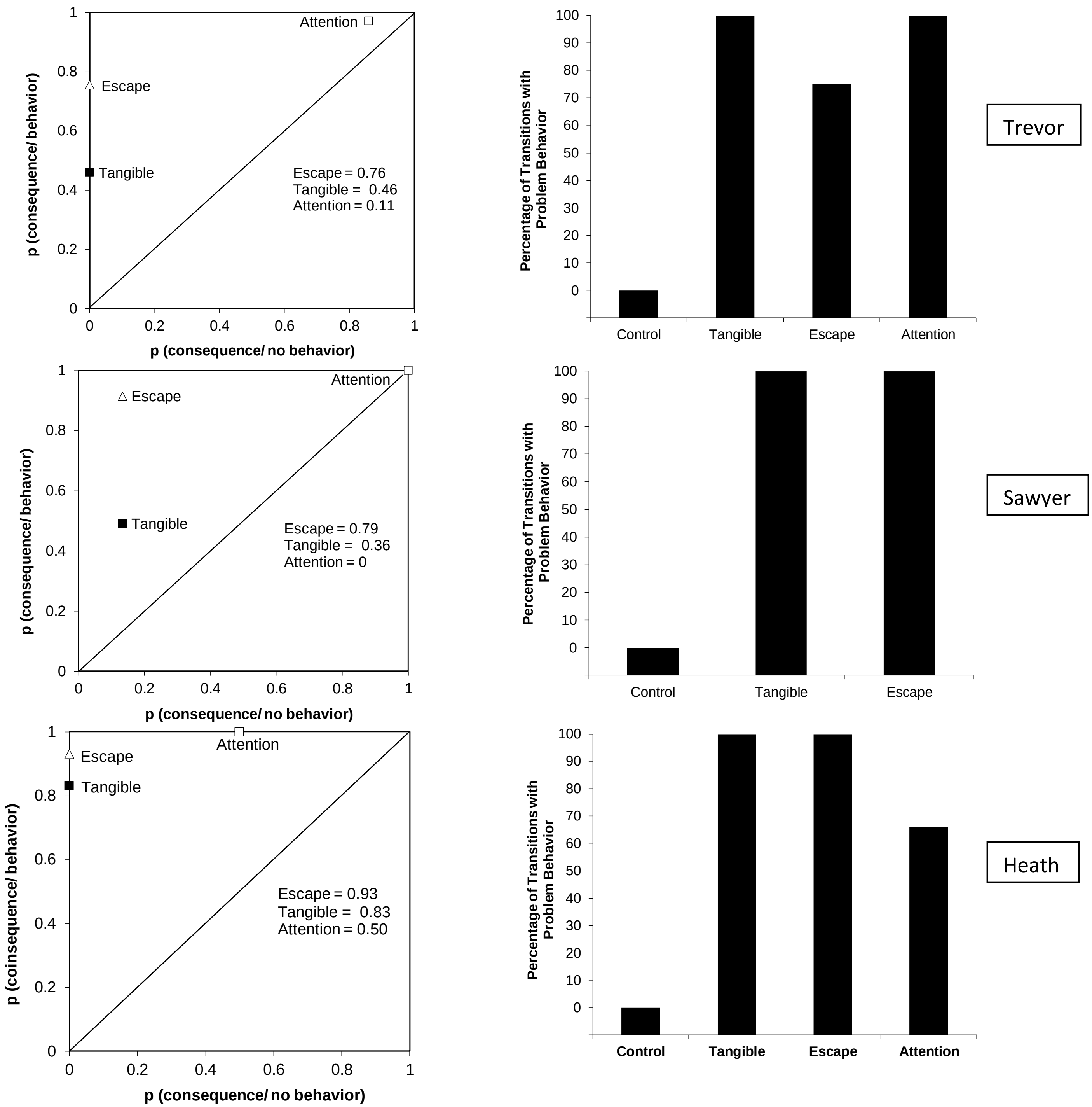

Figure 2. Contingency space analyses (left side) and percentage of transitions with problem behavior across functional analysis test and control conditions (right side) for Trever, Sawyer, and Heath.

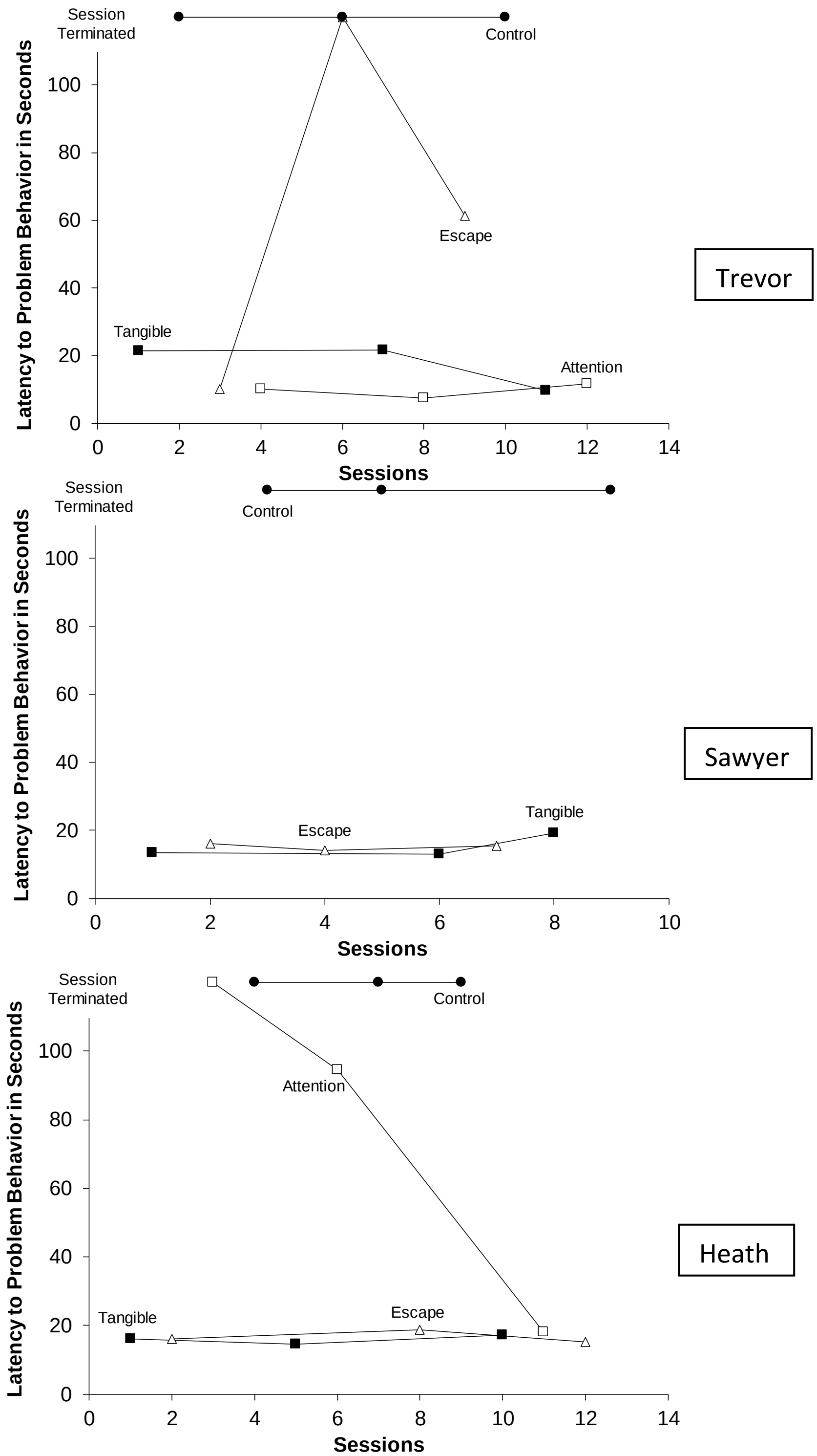

Figure 3. Latency to problem behavior during transition functional analyses for Trevor, Sawyer, and Heath. Values plotted above the y-axis indicate that the session was terminated and no problem behavior occurred.

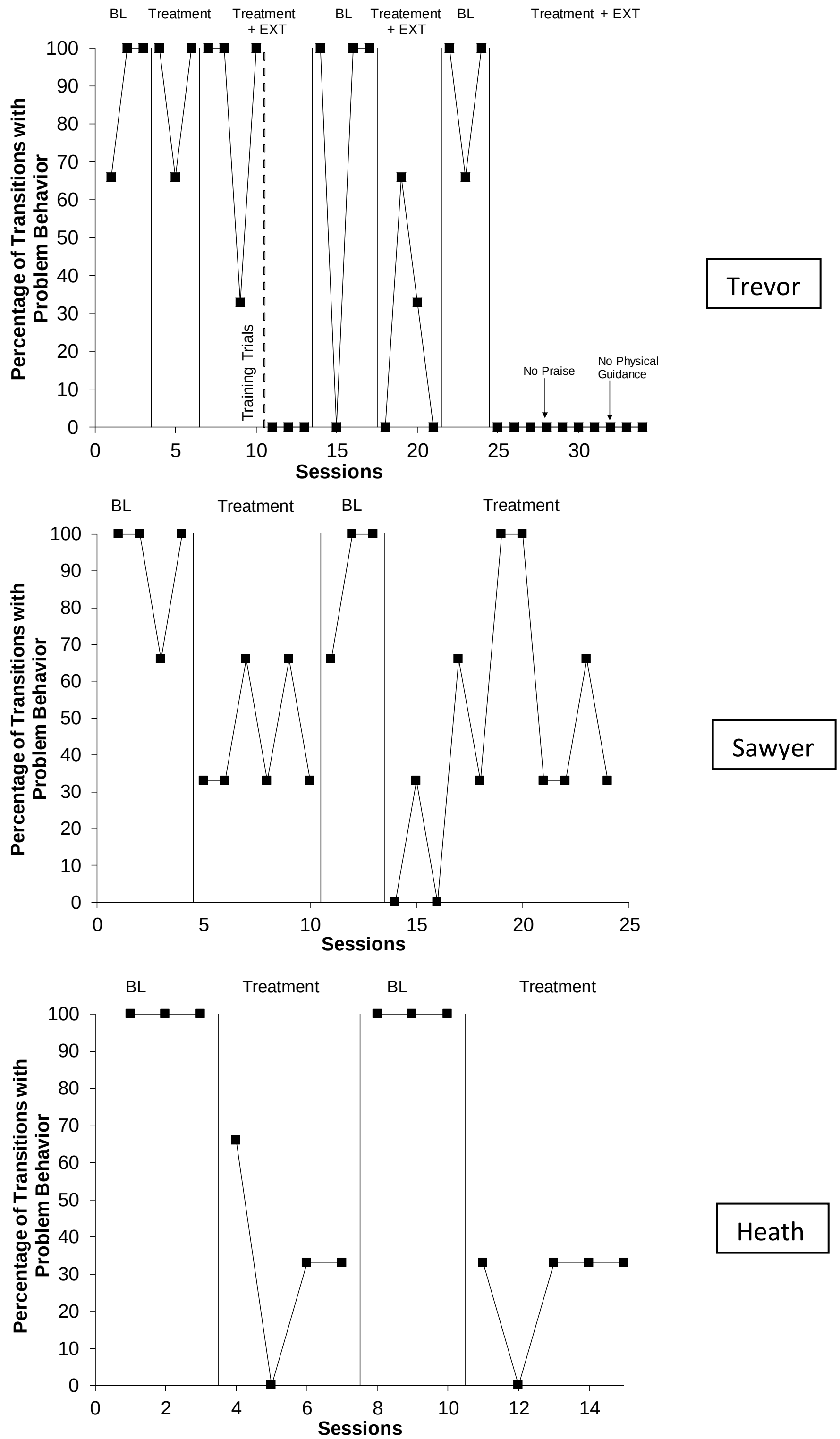

Figure 4. Percentage of transitions with problem behavior for Trevor, Sawyer, and Heath.

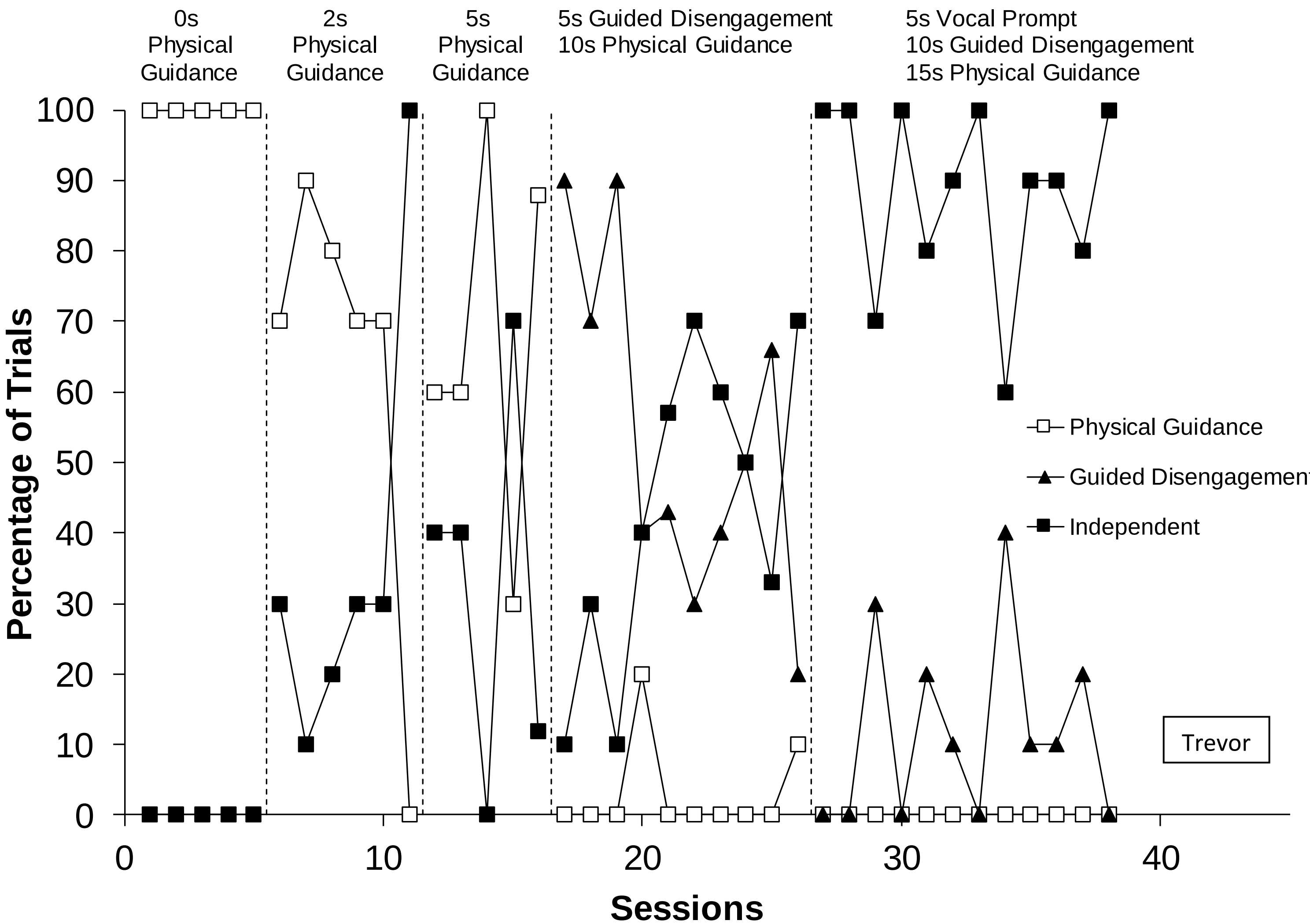

Figure 5. Transition training trials depicting the percentage of transitions that occurred independently, required guided disengagement, or required physical guidance for Trevor.

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Curriculum Vitae

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Education:

2011	B.S., West Virginia University, Psychology. Advisor: Claire St. Peter, Ph.D. Honors Thesis: Evaluating Transitions for Students with Challenging Behavior
2014	M.S., Syracuse University, School Psychology (APA, NCATE accredited, NASP approved) Advisor: Brian K. Martens, Ph.D. Thesis: Reducing Transition Latency and Transition-Related Problem Behavior in Children by Altering the Motivating Operations for Task Disengagement
2017 (expected)	Ph.D., Syracuse University, School Psychology (APA, NCATE accredited, NASP approved) Advisor: Brian K. Martens, Ph.D. Dissertation: Linking Descriptive Assessment to Functional Analysis and Treatment of Transition-Related Problem Behavior

Employment:

2014 - present	Adjunct (non-tenure track), Syracuse University, Communication Sciences and Disorders
2015 - present	Behavior Therapist, Upstate Golisano's Family Behavior Analysis Program.

Clinical and Practical Experiences:

2012 **Social Skill Training Assistant**, Upstate Medical University, Syracuse, NY, under the supervision of Kevin Antshel, Ph.D. Duties entailed: Assisted with a 10 week, group-based CBT intervention, designed to improve social functioning in children experiencing social difficulties, provided direct instruction and modeling of appropriate social communication and social problem-solving, and facilitated dyad-based skill practice.

2012 - 2013 **Behavior Therapis**t, at the Kelberman Behavior and Feeding Program, Syracuse, NY, under the supervision of Henry Roane, Ph.D. BCBA-D, Nicole DeRosa, Psy.D. BCBA-D, and Heather Kadey, M.S. BCBA. Duties entailed: Conducted behavioral assessments for children and adolescents with behavioral and/or feeding disorders, implemented behavioral interventions, collected data, wrote protocols, graphed data, conducted parent training sessions, and wrote both progress and billing notes for clients.

2013 **Psycoeducational Assessment**, Psycoeducational Clinic, Syracuse, NY under the supervision of Michelle Storie, Ph.D. and Laura Spencley, Ph.D. Duties entailed: Conducted two comprehensive psycoeducational evaluations as part of a diagnostic assessment team. Administered the WISC-IV and NEPSY-II and implemented academic interventions.

2013 **Applied Behavior Analysis Practicum**, Huntington Elementary School, Syracuse, NY, under the supervision of Brian Martens, Ph.D. and Kristi Cleary, Ph.D. Duties entailed: Conducted comprehensive functional behavior assessments. Developed interventions and implemented them in the classroom. Trained teachers to implement behavior plans with high levels of integrity. Consulted with administrators, teachers, social workers, and parents. Attended weekly supervision with classmates.

2013 **Socio-Emotional Assessment Practicum**, Syracuse University, under the supervision of Lawrence Lewandowski, Ph.D. Duties entailed: Conducted a comprehensive socio-emotional assessment of a 9-year-old boy. Gained experience administering the WISC-IV, ASRS, BASC-2, CAT, Conners, FAM-III, PIC-2, SSiS, and the Vineland-II.

2013 **Direct Academic Assessment Practicum**, Huntington Elementary School, Syracuse, NY, under the supervision of Seth Aldrich, Ph.D., and. Kristi Cleary, Ph.D. Duties entailed: Assessed individual students, 1st – 5th grade, using curriculum-based measurement. Developed and implemented individualized interventions with students. Consulted with teachers on students' needs and progress. Attended weekly group supervision.

2013 - 2014 **Psychological Evaluator** for the SPICE (Special Preschool Inclusive Classroom Environment) program at Elmcrest, Syracuse, NY, under the supervision of Leah Phaneuf, Ph.D. Duties entailed: Lead a multi-disciplinary team in conducting initial preschool evaluations. Gained experience administering the WPPSI-IV, Vineland-II, BASC-2, M-CHAT, and Bayley-III. Presented results from the evaluations at the Committee on Preschool Special Education meetings. Engaged in behavioral consultation with teachers. Designed, implemented, and monitored behavior intervention plans.

2014 **Consultation Practicum**, Elmcrest School, Syracuse, NY, under the supervision of Brian Martens, Ph.D., Lawrence Lewandowski, Ph.D., and Candace Werder, Ph.D. Duties entailed: Providing consultative services for teachers of students with challenging behavior. Conducted teacher interview (Problem Identification Interview, Problem Analysis Interview, and Problem Evaluation Interview) to assess the nature and scope of presenting problems. Designed and implemented behavior intervention plans. Facilitated the creation of a School-Based Intervention Team for determining the course of action for students referred for behavior problems.

2014 - 2015 **Parent Training Assistant**, Syracuse University, under the supervision of Kevin Antshel, Ph.D. Duties entail: Assist in a twelve-week, group-based intervention (i.e., The Incredible Years Parenting Program) to improve parenting skills for parents with children experiencing behavioral difficulties.

2014 - 2015 **School Psychologist Extern**, at the BOCES (Board of Cooperative Educational Services) program, Liverpool, NY, under the supervision of Dominique Ricciardelli, Psy.D., and Lawrence Lewandowski, Ph.D. Duties entail: Conducting functional behavior assessments for students with challenging behavior. Engaging in consultative services for teachers across the district. Providing individual cognitive behavioral therapy for students with emotional disturbances. Leading a social skills group for students with developmental disabilities.

2015 - 2016 **Predoctoral Internship,** at the Family Behavior Analysis Clinic, Syracuse, NY, under the supervision of Henry Roane, Ph.D. BCBA-D Nicole DeRosa, Psy.D. BCBA-D, and Heather Kadey, M.S., BCBA. Duties entailed: Conducted behavioral assessments for children and adolescents with behavioral and/or feeding disorders, designed and implemented behavioral interventions, provided caregiver training, consulted with school districts, and supervised staff.

Professional Service:

2012 - present	Guest Reviewer *Journal of Applied Behavior Analysis, Journal of Behavioral Education, Journal of School Psychology, School Psychology Review*
2013 - 2014	Junior Student Representative, Syracuse University
2013 - 2014	Co-President, Psychology Action Committee, Syracuse University
2014 - 2015	Senior Student Representative, School Psychology Program, Syracuse University
2014 - 2015	Student Representative to NCATE Unit Coordinating Committee, Syracuse University

Research Experience:

2008 - 2009	Research assistant under the supervision of Tracy Morris, Ph.D. Duties entailed: Confederate work during a social interaction task. Data collector and coding of behavior.
2010 - 2011	(Honors Thesis) Examining features of the environment that may contribute to problem behavior during transitions in children with developmental disabilities. This study was an applied replication of the 1992 study conducted by Perone and Courtney.
2010 - 2011	Research assistant under the supervision of Claire St. Peter, Ph.D. BCBA-D. Duties entailed: Data collection and coding of behavior. Work in elementary school settings with typical developing children as well as those with developmental disabilities.
2011 - 2012	Research assistant under the supervision of Dr. Tanya Eckert. Formative Assessment and Instrumentation Procedure for Reading (FAIP-R). Duties entailed: Supervision of undergraduate research assistants in the administration of Curriculum- Based Measurement in Reading (CBM-R). Measures used: Dynamic Indicators of Basic Early Literacy Skills (DIBLES), AIMSweb, Test of Silent Reading Efficiency and Comprehension (TOSREC)
2011 - present	Research assistant under the supervision of Brian Martens, Ph.D. Duties entail: Behavioral observation, data collection, and observational training. Work in pre-school setting with children with developmental disabilities, as well as in elementary schools with typically developing children.
2012 - 2013	(Master's Thesis) Examining common classroom techniques used to facilitate transitions for students diagnosed with ASD and evaluate an

intervention designed to reduce student challenging behavior and transition time.

2012 - present	Research assistant under the supervision of Henry Roane, Ph.D. BCBA-D, Nicole DeRosa, Psy.D. BCBA-D, and Heather Kadey, M.S. BCBA. Duties entail: Behavioral observation, data collection, procedural implementation, literature review, writing, and graphing. Work in clinical setting with children and adolescents with developmental disabilities.
2013 - 2015	Research Assistant under the supervision of Tanya Eckert, Ph.D. Duties entail: Data analysis and interpretation of a performance feedback intervention aimed to improve writing fluency and promote generalization.

Teaching Experience:

2011	Teaching Assistant Behavior Modification Psychology 474, West Virginia University. Duties entail: Guest lectures and tutoring.
2011 - 2012	Teaching Assistant Foundations of Human Behavior Psychology 205, Syracuse University. Duties entailed: Lectured and facilitated discussions for four recitation sections per week, each with approximately 20 students. Created lectures, provided interactive group activities, and led discussions. Graded quizzes and papers while maintaining students' grades. Held weekly office hours and proctored exams.
2014 - 2015	Course Instructor, Behavior Disorders in Children (PSY 445), under the supervision of Tanya Eckert, Ph.D. Duties entail: Developing and presenting bi-weekly lectures for one section of undergraduate students. Develop and grade quizzes, assignments, and exams.
2014 - present	Course Instructor, Introduction to Research Methods in Speech Language Pathology and Audiology (CSD 659). Duties entail: Developing and presenting weekly lectures for one section of graduate students. Develop and grade quizzes, assignments, and exams.
2017 - present	Course Instructor, Behavior Analysis for Patients with Communication Disorders (CSD 600). Duties entail: Developing and presenting weekly lectures for one section of graduate students. Develop and grade quizzes, assignments, and exams.

Publications:

Sullivan, W.E., Martens, B. K., Morley, A., & Long, S. (2017). Reducing Transition Latency and Transition-Related Problem Behavior in Children by Briefly Altering the Motivating Operations for Task Disengagement. *Psychology in the Schools.*

Martens, B. K., Lambert, T. L., **Sullivan, W. E.,** Magnuson, J. D., Morley, A. J., Sallade, S. J., & Baxter, E. L. (2016). Choice in transition: Replication and extension to preschool children in a naturalistic setting. *Journal of the Experimental Analysis of Behavior*, *105*, 307-321.

Martens, B. K., & **Sullivan, W. E.** (commentary authors, 2014). Differential reinforcement of independent over prompted responding based on reinforcer quality can reduce prompt dependency, but an efficient reinforcer assessment is a must. *Evidence-Based Communication Assessment and Intervention, 8,* 13 – 17.

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Professional Presentations:

Sullivan, W. E., Saini, V., DeRoasa, N. M., Roane, H. S. (2016, October). *Recurrent responding: resurgence, extinction-induced variability, and application.* Presented at the annual convention of the New York State Association of Behavior Analysis, Albany, NY.

Sullivan, W. E., Roane, H. S., & Falcomata, T. S. (2016, May). *A behavior economic analysis of self-control: The influence of unit price of self-control and impulsive responding.* Presented at the annual convention of the Association of Behavior Analysis International, Chicago, IL.

Baxter, E. L., **Sullivan, W. E.,** DeRosa, M. N., Roane, H. S. (2016, October). *Effects of mand proficiency and mand preference on functional communication training outcomes.* Presented at the annual convention of the New York State Association of Behavior Analysis, Albany, NY.

Silkowski, E., **Sullivan, W. E.,** Saini, V., DeRoasa, N. M., Roane, H. S. (2016, October). *An evaluation of the measurement of preference on identification of effective reinforcers.* Presented at the annual convention of the New York State Association of Behavior Analysis, Albany, NY.

DeRosa, N., Roane, H. S., **Sullivan, W. E**., & Diaz, J. D. (2014, May). *The effect of varing duration of exposure to establishing operation on functional communication training outcomes.* Presented at the annual convention of the Association of Behavior Analysis International, Chicago, IL.

Sullivan, W. E., Kadey, H. J., Roane, H. S., Diaz, J. C., & Merrow, J. M. (2012, October). *An evaluation of chewing and swallowing in a child diagnosed with autism.* Presented at the annual convention of the New York State Association of Behavior Analysis, Saratoga Springs, NY.

Garza, I., **Sullivan, W. E.,** DeRosa, N. M., Roane, H. S. (2016, October). *Mitigating the effects of integrity errors during functional communication training*. Presented at the annual convention of the New York State Association of Behavior Analysis, Albany, NY.

Baxter, E. L., **Sullivan, W. E.,** DeRosa, N. M., Roane, H. S. (2016, October). *Use of probabilistic reinforcement to increase compliance during activity transitions*. Presented at the annual convention of the New York State Association of Behavior Analysis, Albany, NY.

Sullivan, W. E., Martens, B. K., Morley, A. J., & Long, S. J. (2016, February). *Reducing Transition Latency and Transition-Related Problem Behavior in Children by Altering the Motivating Operations for Task Disengagement*. Poster presented at the National Association of School Psychologists annual conference, New Orleans, LA.

Martens, B. K., Mullane, M. P., **Sullivan, W. E.**, Morley, A. J., & Long, S. J. (2016, February). *Gains in Oral Ready Fluency across Different Word Overlap Conditions*. Poster presented at the National Association of School Psychologists annual conference, New Orleans, LA.

Sullivan, W. E., DeRosa, N., Roane, H. S., & Bishop, J. (2016, April). *Examination of extinction-induced resurgence and response variability.* Presented at Upstate Medical University's annual pediatric research platform presentations, Syracuse, NY.

Sullivan, W.E., Mullane, M. P., DeRosa, N. M., Phaneuf, L., & Roane, H. S. (2015, October). *Examination of Assessment and Treatment Practices in Residential Placements.* Presented at the annual convention of the New York State Association of Behavior Analysis, Albany, NY

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2008 - present	Golden Key International honors society
2010	Psi Chi International Honor's Society of Psychology, West Virginia University
2011	Phi Beta Kappa Honors Society
2011 - 2016	Psychology Department Travel Award, Syracuse University
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