Testing a Model for Assessment and Intervention Decision-Making for Students with Co-Occurring Behavior Problems and Reading Difficulties in the Classroom: Exploring the Relative Effects of Antecedent Intervention Strategies

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Dedication

To the kids who may otherwise “fall through the cracks”: may practitioners and researchers in the schools find the conditions under which you will have ongoing academic and behavioral success.

Abstract

Many students exhibit co-occurring behavior problems and reading difficulties in the classroom and interventions to address these issues have been shown to be increasingly less effective after third grade. A practical model was created for this project to assist researchers and practitioners in assessment and intervention decision-making. Six first-grade students with behavior problems and reading difficulties participated in this study. First, an experimental analysis was employed with each participant to determine function of problem behavior. Second, a reading assessment was administered to hypothesize why each experienced reading difficulties (i.e., due to a performance deficit or a skill deficit). Third, a multielement design tested the relative effects of antecedent interventions matched and mismatched to hypothesis for reading difficulties on the off-task behavior and reading accuracy for students who have problem behavior maintained by attention versus escape and exhibit reading difficulties in the classroom. Results from the experimental analysis revealed three participants with attention-maintained problem behavior and three participants with escape-maintained problem behavior and the reading assessment revealed that all six participants exhibited skill deficits. Participants received sessions of antecedent attention and the use of an instructional strategy immediately followed my independent reading in their classroom. Results revealed idiosyncratic patterns of responding for each participant, with response covariation (i.e., low levels of off-task behavior concurrent with high levels of reading accuracy) occurring for two of six participants when the antecedent intervention strategy was matched to the reason for reading difficulties. The findings suggest that under some

conditions, interventions that directly address reading difficulty may have potential to concurrently decrease problem behavior and increase reading accuracy for students with co-occurring behavior problems and reading difficulties in the classroom.

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CHAPTER I

INTRODUCTION

General Problem

Behavior problems and reading difficulties commonly co-occur. Taken separately, both are pressing concerns in schools. The 2001 reauthorization of The Elementary and Secondary Education Act as the No Child Left Behind Act (NCLB) makes this point salient. With the purpose of "ensuring that all children have a fair, equal, and significant opportunity to obtain a high-quality education and reach, at minimum, proficiency on challenging state academic achievement standards and assessments," (NCLB, 2003), much time and many resources in research and in practice have been devoted to this national agenda. Thus, early intervention in reading difficulties has been a priority in schools. However, test results from the National Center for Education Statistics (2005, 2009, 2013) show only very modest growth in reading proficiency over time, with 31% of the nation's fourth graders testing at proficient levels in 2005, 33% in 2009, and 35% in 2013. Clearly, with 65-69% of fourth graders not meeting proficient levels, it remains critical that researchers and practitioners are able to identify and implement instructional strategies that may assist in addressing this problem. Academic difficulties in basic skills such as reading are particularly detrimental to students and may hinder further progress throughout formal education experiences and after.

Behavior problems also present significant challenges to teachers and interventions to reduce behavioral problems in the classroom represent another focus in research and practice (Skiba, Peterson, & Williams, 1997; Sterling-Turner, Robinson, &

Wilczynski, 2001). In a comprehensive review of the literature, Forness, Freeman, Paparella, Kauffman, and Walker (2012) estimated that about 12% of school-age youth have moderate to significant emotional, social, and/or behavior needs at some point throughout their school years.

When behavior problems and academic difficulties are experienced concomitantly, academic needs tend to be overlooked, perhaps due to the saliency of behavioral disruptions in the classroom (Morgan Farkas, Tufis, & Sperling, 2008). After all, students cannot be expected to learn academic material without first engaging in instruction. The prevalence of students with co-occurring behavior problems and academic difficulties has been reported as between 10% and 25% (American Psychiatric Association, 2000) and as high as 50% (Glassberg, Hooper, & Mattison, 1999). Co-occurring behavior problems and academic difficulties are associated with a host of negative outcomes, including grade retention, dropout, delinquency, unemployment, and incarceration (Hinshaw, 1992; Nelson, Benner, Lane, & Smith, 2004). In addition, research has shown that interventions for behavior problems and academic difficulties become increasingly less effective after third grade (Walker & Severson, 2002). Clearly, there is an urgent need to intervene early when students show initial signs of behavior problems and academic difficulties. Thus, it is imperative that assessment methodologies not only identify students with behavior problems and academic difficulties at an early age, but also that these assessments inform effective interventions.

Behavior Analysis

Behavior analysis provides a conceptual and empirical framework for assessment and intervention for social problems like those created by behavior problems and academic difficulties (Skinner, 1953). From a behavior analytic standpoint, all behavior is a function of the interaction between an individual and his/her environment (Baer, Wolf, & Risely, 1968). Maladaptive behaviors such as behavior problems and academic difficulties are maintained by the contingencies operating within an individuals' environment, and thus have the ability to change in response to changes in the environment.

The Three-Term Contingency

A closer examination of the variables that influence behavior problems and reading difficulties is necessary because these variables provide the foundation for all assessment and intervention technologies within the behavior-analytic framework. A behavioral contingency refers to the relations between behavior and its controlling variables (Cooper, Heron, & Heward, 2007). There are three general elements in a behavioral contingency: (1) antecedents, (2) behavior, and (3) consequences.

Antecedents. Antecedents are stimulus or environmental conditions that occur or exist before behavior. Antecedents can be broken down into two categories, motivating operations and discriminative stimuli. Motivating operations are environmental events that alter the value of a reinforcer and increase or decrease the frequency of behaviors that have previously been associated with that reinforcer (Michael, 1982). For example, a difficult academic task can operate as an establishing operation by increasing the value of

escape from academic task demands as a reinforcer and increasing the probability of behaviors that have previously been reinforced with escape from those task demands. In contrast, an instructional strategy can operate as an abolishing operation by decreasing the value of escape from difficult academic task demands as a reinforcer and decreasing the probability of behaviors that have previously been reinforced with escape from academic task demands.

Discriminative stimuli are changes in the environment in the presence of which a particular behavioral response are likely to result in reinforcement (Cooper et al., 2007). For example, presentation of a difficult academic task may serve as a discriminative stimulus, increasing disruptive behavior by signaling the availability of reinforcement in the form of escape from the demands (e.g., being sent out of the room for disrupting class). However, altering motivating operations can affect the effects the discriminative stimuli have on behavior. Using the examples above, by abolishing the reinforcing effects of escape from demands via prior instruction in the academic task, escape-maintained academic tasks no longer operate as a discriminative stimulus for behaviors associated with escape.

Behaviors. Behavioral responses refer to any behavior occurring as a function of the relevant antecedents and consequences as part of the three-term contingency. For example, disruptive behavior is a behavioral response, preceded by a discriminative stimulus (e.g., presentation of a difficult academic task) and contingently reinforced (e.g., with escape from the demand).

Consequences. All behaviors, whether desirable or problematic, occur as a function of the consequences they produce (Skinner, 1953). Consequences refer to environmental events that follow a behavioral response and produce a change in the likelihood of the behavior occurring in the future. There are two types of consequences: reinforcement and punishment. Although punishment undoubtedly influences behavior, it only reduces the future frequency of behavior. In contrast, reinforcement strengthens behavior. When a behavior is reinforced, the likelihood of that behavior occurring again in similar situations increases. Both positive reinforcement and negative reinforcement increase the future frequency of behavior.

Positive reinforcement occurs when the delivery of a stimulus increases the future frequency of behavior in similar situations (Cooper et al., 2007). Common forms of positive reinforcement in school settings include social sources such as praise and contingent access to preferred activities. For example, contingent on emitting desirable behavior, a student is provided with praise and/or access to a preferred activity (e.g., computer game). Negative reinforcement occurs when the removal of a stimulus increases the future frequency of behavior in similar situations (Cooper et al., 2007). The purpose of negatively reinforced behavior is to escape or avoid a stimulus that is considered aversive. For example, a student may engage in problem behavior (e.g., disruption, out of seat) that results in the removal or avoidance of difficult task demands. The most commonly identified functions of problem behavior in school settings are negative reinforcement (i.e., escape or avoidance) and socially mediated positive reinforcement (e.g., praise; Broussard & Northup, 1995).

Co-Occurring Behavior Problems and Academic Difficulties: The Interrelationship

A great deal of information about academic and behavior problems can be examined by analyzing the controlling variables that contribute to them. However, a background of the research documenting the interrelationship between behavior problems and academic difficulties is also warranted in order to further understand the basis of this project. A significant body of research documents the relationship between behavior problems and academic difficulties and proposes potential causal models to explain this interrelationship (Barriga et al., 2002; Hinshaw, 1992; McEvoy & Welker, 2000; Patterson, Reid, & Dishion, 1992). One model maintains that academic difficulties occur first (McEvoy & Welker). According to this model, a pre-existing tendency to struggle academically coupled with task demands in school lead to behavior problems. Students with academic difficulties are less likely to gain reinforcement for successful completion of academic tasks and may subsequently act out behaviorally because it produces reinforcement. In another response, difficult task demands in school may trigger problem behaviors that function to escape or avoid these stimuli that are considered aversive. Another causal model insists that behavior problems come first (Patterson et al.). According to this model, disruptive behavior interferes with academic engagement. Students with behavior problems are more likely to be inattentive during instruction or be sent out of the classroom during instruction for exhibiting disruptive behavior. Thus, students with behavior problems miss out on instructional time and fall behind academically. Both causal models are plausible and which is operating likely depends on many idiosyncratic factors in the environment.

Response Covariation

Determining which problem came first may not be important for practical purposes. Moreover, response covariation may provide a behavior-analytic explanation for the interrelationship between behavior problems and academic difficulties and can subsequently provide implications for intervention. Response covariation occurs when a change in the rate of one behavior response results from a change in the rate of another response (Kasdin, 1982; Lalli, Kates, & Casey, 1999; Parrish, Cataldo, Kolko, Neef, & Engel, 1986). Response covariation has been systematically explored as it relates to replacing a problem behavior with an appropriate target behavior. For example, in functional communication training (FCT; Carr & Durand, 1985), participants are taught an appropriate replacement behavior (i.e., a verbal response) to replace escape-maintained problem behavior. Response covariation is observed when there is an inverse relationship between the problem behavior and the appropriate replacement behavior. With regard to co-occurring behavior problems and academic difficulties, there may be an inverse relationship between behavior problems such as disruptive behavior and academic variables such as academic engagement. As disruptive behavior decreases, academic engagement tends to increase. Thus, targeting one of these for intervention may have collateral effects on the other. In fact, existing research documents the effects of interventions that address one problem (i.e., interventions that focus on improving academic performance [e.g., Lane, Little, Redding-Rhodes, Phillips, & Welsh, 2007], interventions that focus on improving behavior [e.g., Ayllon and Roberts, 1974]) has collateral effects on the other. However, no research studies have attempted to directly

compare interventions that focus on improving academic performance versus interventions that focus on improving behavior directly within the same participant, thus providing an impetus for this project.

Purpose

Students may exhibit problem behaviors for a variety of reasons. Some students exhibit problem behaviors because it produces positive reinforcement. Students with problem behavior maintained by positive reinforcement (i.e., *attention-maintained* problem behavior) tend to engage in problem behavior because it results in reinforcement in the form of attention from teachers and/or peers. Conversely, some students exhibit problem behavior because it produces negative reinforcement. Students with problem behavior maintained by negative reinforcement (i.e., *escape-maintained* problem behavior) tend to engage in problem behavior because it produces escape and/or avoidance of aversive task demands.

Likewise, students may exhibit reading difficulties for a variety of reasons. In some instances, reading difficulties are due to a *performance deficit* (Lentz & Shapiro, 1986). Students with performance deficits possess the requisite skills to perform a task, but the reinforcement contingencies in their environment do not support performing the task (Daly, Witt, Martens, & Dool, 1997; DiGennaro Reed & Jenkins, 2013). In other instances, reading difficulties are due to a *skill deficit* (Lentz & Shapiro). Students with skill deficits lack the requisite skills to perform a task (Daly et al.; DiGennaro Reed & Jenkins). Identifying whether reading difficulties are due to a performance deficit or a skill deficit is important because it directly informs the development of intervention

strategies. The goals of interventions for performance deficits may be to arrange environmental contingencies to incentivize active participation in instruction (e.g., providing antecedent attention for students who tend to engage in attention-maintained problem behavior, providing choices for students who tend to engage in escape-maintained problem behavior), whereas the goals of interventions for skill deficits may be to teach new skills via the use of instructional strategies (Daly et al., 1997; DiGennaro Reed & Jenkins, 2013; Skinner, Davis, & Pappas, 2005).

For students with co-occurring behavior problems and reading difficulties, the only research that exists to explore the effects of school-based interventions on response covariation (i.e., decreases in problem behavior concomitant with increases in variables related to academic performance) have limited their participants to students who exhibit problem behavior in the classroom setting because it produces negative reinforcement. However, with estimates as high at 50% of students experiencing both reading and behavior problems (Glassberg et al., 1999), there are undoubtedly students with attention-maintained problem behavior who also experience reading difficulties. The interplay between function of problem behavior and hypothesis for reading difficulties has not been systematically studied. Since the maintaining function of problem behavior and the hypothesis for reading difficulties may be idiosyncratic, this project focused on problems that require an individualized approach to problem analysis and intervention. Working research questions for this project were: For students who experience co-occurring behavior problems and reading difficulties, does it matter whether interventions are matched to the function of problem behavior and hypothesis for reading difficulties?

Moreover, can these intervention strategies lead to decreases in problem behavior concomitant with increases in variables related to reading performance (i.e., response covariation)? The purpose of this project was to critically review the literature on assessment and intervention for students with co-occurring behavior problems and reading difficulties, outline the methodology used to assess the relative effects of antecedent interventions matched and mismatched to hypothesis for reading difficulties on the off-task behavior and reading accuracy for students who have problem behavior maintained by attention versus escape and exhibit reading difficulties in the classroom, describe the results of these analyses, and discuss the results in terms of their limitations, directions for future research, and implications for practice.

Research Questions

1. For participants who exhibit attention-maintained problem behavior during reading and reading difficulties hypothesized to be related to a skill problem, which intervention is more effective: (a) antecedent attention or (b) instructional strategy?
2. For participants who exhibit escape-maintained problem behavior during reading and reading difficulties hypothesized to be related to a skill problem, which intervention is more effective: (a) antecedent attention or (b) instructional strategy?

CHAPTER II

LITERATURE REVIEW

Assessment and Intervention for Students with Co-Occurring Behavior Problems and Academic Difficulties

Part 1: Assessment

There are many approaches to assessment, both for problem behavior and for reading difficulties, that can be utilized for students with persistent patterns of co-occurring behavior problems and reading difficulties and have research to support their effectiveness. These assessments commonly treat behavioral and academic concerns as separate issues. However, some research has been done on assessments that consider the role of task difficulty in contributing to co-occurring behavior problems and reading difficulties. I will review assessments for problem behavior, assessments for reading difficulties, and assessments that consider the role of task difficulty in contributing to co-occurring behavior problems and reading difficulties.

Assessments for Problem Behavior

Functional behavior assessment. Functional behavior assessment (FBA) is commonly used in schools to identify variables that maintain problem behavior and develop behavior intervention plans (Asmus, Vollmer, & Borrero, 2002). The purpose of FBA is to determine the function, or intent of problem behavior for an individual (Vollmer & Northup, 1996). Carr (1977) discussed four possible contingencies that maintain problem behavior: social positive reinforcement (attention), social negative reinforcement (escape), automatic positive reinforcement (sensory), and automatic

negative reinforcement (e.g., pain attenuation). Carr emphasized that the function problem behavior serves an individual is more important than the topography of the behavior. For instance, problem behavior for two individuals may appear the same (e.g., self-injurious behavior in the form of hitting head on desk), but have entirely different functions for two individuals. One individual may emit self-injurious behavior because it produces positive reinforcement (e.g., attention from the teacher) while another individual may emit self-injurious behavior because it produces negative reinforcement (e.g., escape/avoidance of an undesirable task). Although these behaviors appear similar on the surface, their maintaining functions are quite different. When the conditions that maintain problem behavior are known, interventions can be designed to withhold reinforcement for the problem behavior and instead teach and/or reinforce functionally equivalent appropriate behavior (Carr & Durand, 1985). In fact, research has consistently shown that function-based interventions are more effective in reducing occurrences of problem behavior than interventions that are not matched to behavior function (Ingram, Lewis-Palmer, & Sugai, 2005; Newcomer & Lewis, 2005).

In schools, a FBA often involves gathering and analyzing information about a student's problem behavior using a variety of descriptive methods. Indirect methods can include reviews of student records, interviews with teachers, and completing rating scales and screening tools regarding presenting problem behaviors. One method for attaining information for an indirect functional assessment that is commonly used in schools is via a structured interview such as the Functional Assessment Interview Form (FAI; O'Neill, Horner, Albin, Storey, & Sprague, 1997). The FAI is designed to gather information from

caregivers about problem behavior and the circumstances under which it occurs. Direct descriptive methods often involve directly observing a student in his/her classroom environment to ascertain possible functions of problem behavior (i.e., recording antecedent-behavior-consequence relationships). However, these indirect and direct descriptive methods yield correlational information regarding function of problem behavior (Gresham, Watson, & Skinner, 2001).

Extended functional analysis. Functional analyses conducted in analogue settings based on the procedures described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994) are often considered a "gold standard" in functional analysis technology (Wacker, Berg, Harding, & Cooper-Brown, 2004). This type of functional analysis involves exposing an individual to conditions that are likely to evoke problem behavior by directly manipulating environmental events in a multielement single-subject experimental design (Vollmer & Northup, 1996). Analogue functional analysis procedures often involve repeatedly exposing participants to randomly alternating 15 min test conditions until clear patterns emerge regarding function of problem behavior.

In a functional analysis based on procedures outlined by Iwata et al. (1982/1994), four experimental conditions are generally arranged: *control*, (free play), *attention*, *escape*, and *alone*. The *control* condition (free play) serves as a baseline, where the individual has unlimited access to toys, materials, and attention. The *attention* condition involves an individual playing with toys and being ignored by an adult unless they display problem behavior. Only when the individual displays problem behavior, the adult provides attention in the form of a reprimand (e.g., "don't do that, you may get hurt").

This condition tests social positive reinforcement in the form of attention as a maintaining function of problem behavior. In an *escape* condition, an individual is presented with a difficult task. Upon each occurrence of problem behavior, the task is taken away for about 30 s and then re-presented. This condition tests social negative reinforcement in the form of escape as a maintaining function of problem behavior. An individual is observed alone in a room with no toys, materials, or social interaction in the *alone* condition. If the individual emits high levels of problem behavior in this condition, automatic positive reinforcement (sensory reinforcement) may maintain problem behavior. The ability of analogue functional analyses to experimentally determine functional relationships among contingencies, the stimuli associated with these contingencies, and problem behavior offers a major advantage over descriptive assessments that merely yield correlational results (Sasso et al., 1992).

Although considered a “gold standard”, extended functional analyses have also been critiqued for some notable disadvantages (Bloom, Iwata, Fritz, Roscoe, & Carreau, 2011). One critique is that they expose individuals to conditions that are set up to produce problem behavior, thereby creating additional risk of harm. However, in a comprehensive literature review, Hanley, Iwata, and McCord (2003) argued that the benefits of treatments derived from functional analysis results outweigh potential risk of harm. Analogue conditions in functional analyses have also been criticized for being unable to accurately represent the natural environment (Bloom et al., 2011), thus compromising ecological validity. However, in a comparison of experimenter-led functional analysis, teacher-led descriptive assessments (i.e., direct observation), and teacher-led functional

analysis, Sasso et al. (1992) found that each analysis yielded similar results. Sasso et al. concluded that, for the participants in the study, analogue conditions were comparable to direct observations in the natural environment. To consider ecological validity in a functional analysis, Hanley et al. (2003) recommended teachers be involved in the functional analysis process, setting and materials found in the natural environment be used in functional analysis conditions, and results from descriptive assessments conducted prior to functional analysis be used to set up conditions. Another critique of functional analysis is the impracticality and time-consuming nature of conducting them in schools. Few school professionals have the time and resources to expose individual students to repeated 10-15 min test conditions.

Brief functional analysis. Brief functional analysis (BFA) offers a solution to the time-consuming critique while maintaining the rigor of an experimental design, thus allowing for causal claims to be made regarding function of problem behavior. Northup et al. (1991) adapted extended functional analysis conditions for individuals with severe aggressive behavior by exposing individuals to one or two 5 min test conditions, followed by a contingency reversal. Conditions were similar to those described in Iwata et al. (1982/1994), only shortened in length to 5 min. In the contingency reversal phase, the condition in which the individual displayed the highest levels of aggressive behavior was presented again but the consequence (e.g., attention, escape from task) was provided contingent on the occurrence of appropriate behavior. The addition of this phase in the BFA offered the added advantage of showing intervention effects.

Research has lent support for the use of BFA as a viable alternative to extended functional analyses. In a review of results for 79 individuals in an outpatient clinic, Derby et al. (1992) found that BFA identified function of problem behavior in about half of cases. Given that BFA may only take about 30 total min to complete, results from Derby et al. (1992) are promising. Additionally, Kahng and Iwata (1999) found 77% correspondence between BFA and extended functional analyses when each were compared in 50 cases and concluded that one brief exposure to each contingency may be sufficient to determine the function of problem behavior. A recent review of the literature on the effectiveness of BFA for typically developing children in schools yielded nine high-quality studies and found sufficient evidence to support its use with this population (Gardner, Spencer, Boelter, DuBard, & Jennett, 2012).

Overall, it seems that BFAs offer distinct advantages for use in schools. Brevity of analyses seem especially important, considering that students with persistent patterns of co-occurring behavior problems and reading difficulties will require assessments in both academic and behavior domains. However, BFA has also been found to have some important weaknesses. For example, Derby and colleagues (1992) found that BFAs failed to identify a behavioral function in about 50% of cases. Sometimes, this may be because participants do not engage in problem behavior during test conditions. Thus, an alternative analysis for participants with inconclusive BFA results may be needed in these cases.

Concurrent operants analysis. A concurrent operants analysis (COA) may provide an alterative to BFA for cases in which participants do not engage in problem

behavior during test conditions. Harding et al. (1999) utilized COA procedures by presenting participants with two concurrent choice options and determining the relative influence of those options on the time they allocate to a choice activity. Harding et al. presented participants with two concurrent choice options in the following arrangements: (1) attention with preferred toys versus alone with non-preferred items; (2) attention with neutral items versus alone with preferred toys; (3) attention with demands and preferred toys versus alone with neutral items; (4) attention with demands and neutral items versus alone with preferred toys; and (5) attention with demands and preferred toys versus alone with preferred toys. Participants' relative preference for attention, access to preferred toys, and escape from demands was measured by his/her time allocated to choice activity across sessions. As such, Harding et al. determined the most preferred reinforcer, and therefore the most likely function of problem behavior for each participant. Results showed that for both participants in the study, attention and access to preferred toys were the most preferred reinforcers because they most often allocated time in choice activity toward activities that included attention and access to preferred toys, even when demands were present.

Berg et al. (2007) directly compared functional analysis and COA and found that the same reinforcers were identified for problem behavior (i.e., in a functional analysis) and appropriate behavior (i.e., in a COA) for three of four participants, providing evidence that COA "may be a viable procedure for identifying treatment components to reduce problem behavior when functional analysis is difficult to implement or is otherwise contraindicated" (Berg et al., p. 550). Similarly, Casey et al. (2013) directly

compared results from three behavioral assessments: (1) indirect functional assessments (O'Neill et al., 1997); (2) BFA (Northup et al., 1991); and (3) COA (Harding et al., 1999) for six participants in order to determine whether a COA would identify the same behavioral function as a BFA. In addition, Casey et al. was interested in whether results from COAs were more reliable than indirect functional assessment results for participants who exhibited little to no problem behavior during the BFA and thus yielded inconclusive BFA results. They found that while the results of indirect functional assessments failed to match any results of BFAs for any participants, results from COAs matched results from BFAs for all three participants with whom a behavioral function was identified in a BFA. They concluded that results from COAs may be more accurate depictions of behavioral function than results from indirect functional assessments for participants who yield inconclusive BFA results because they exhibit little to no problem behavior during BFA sessions. Thus, these studies provide preliminary evidence that when participants exhibit little to no problem behavior in BFA sessions, COAs may be used as an alternative method to determine function of problem behavior.

Assessments for Academic Performance

Curriculum-based assessments. Curriculum-based assessment (CBA) is a type of informal academic assessment that evaluates a student's academic skills based on the curriculum directly available in the environment and is built on the assumption that "one should test what one teaches" (Shapiro, 2011, p. 18). CBA can be either a general outcome measure or a subskill-mastery measure (Fuchs & Deno, 1991). A general outcome measure is often a rate-based measure that tests a variety of skills and assesses

growth over time within a curriculum (Shapiro, 2011). A common example of a general outcome measure is oral reading fluency (i.e., curriculum-based measurement; CBM; Deno, 1985). A primary goal of CBM is to measure growth over time. Lack of growth over time on a general outcome measure such as CBM can suggest that an instructional modifications or intervention is needed, but do not necessarily specify what modifications or interventions should be given.

In contrast, a subskill-mastery measure assesses specific skills within a curriculum and permits determination of instructional modifications or interventions that may be needed to teach skills. While the metric to assess performance within a curriculum in a general outcome measure is rate (e.g., words read correctly in 1 min), a wide range of specific skills (e.g., reading accuracy, math computational errors) can be used as metrics in a subskill-mastery measure.

Curriculum-based assessment for instructional design (CBA-ID; Gickling & Havertape, 1981) is an example of a subskill-mastery measure. CBA-ID can be utilized to choose appropriate intervention strategies and to measure specific skills taught during an intervention (Burns, Dean, & Klar, 2004; Burns, Codding, Boice, & Lukito, 2010). In a CBA-ID that measures reading accuracy, a student reads a passage aloud for 1 min. The administrator calculates reading accuracy by dividing errors by words read correctly. Gickling and Armstrong (1978) utilized CBA-ID to define differing levels of reading accuracy as frustration level, instructional level, and independent level. Frustration level is defined as text read with less than 93% accuracy; instructional level is defined as text

read with 93-97% accuracy; independent level is defined as text read with above 97% accuracy.

Brief experimental analysis. Brief experimental analysis (BEA) has emerged as a functional analysis of academic deficits (Daly et al., 1997; McComas et al., 1996). In a BEA, variables related to academic performance (i.e., instructional strategies or interventions) are systematically manipulated and their relative influence on an academic response (e.g., words read correctly, reading accuracy) is measured, thus identifying variables related to academic performance (Martens, Eckert, Bradley, & Ardoin, 1999). Because each instructional strategy is designed to increase academic responding, the condition with the greatest improvement in academic responding can be targeted for intervention, providing an inherent link between assessment and intervention. BEA has been applied to analysis and intervention for reading difficulties in the areas of reading fluency (e.g., Daly, Bonfiglio, & Mattson, 2005), as well as spelling and reading comprehension (McComas et al., 1996).

Academic and Behavioral Assessments Considering the Role of Task Difficulty

Most assessments in schools treat behavior problems and academic difficulties as separate issues. However, these problems commonly co-occur. A proactive and efficient method of assessment for students with co-occurring behavior problems and reading difficulties may be to consider the role of task difficulty in contributing to behavior problems and reading difficulties.

Low demand/high demand assessments. Literature exists to support assessments that consider the role of task difficulty for students with co-occurring

behavior problems and reading difficulties. Some studies only analyze the effects of differing levels of task difficulty (low demand versus high demand) on problem behavior (Center, Dietz, & Kaufman, 1982; DePaepe, Shores, & Jack, 1996). The remaining studies consider the roles of both task difficulty and attention in antecedent-based functional analyses to hypothesize the maintaining function of problem behavior (Carr & Durand, 1985; Meyer, 1999; Moore & Edwards, 2003).

Studies with task difficulty analysis only. Center et al. (1982) explored the effects of a mismatch between student skill level and task difficulty on the problem behavior of 12 students ages eight to twelve years old with EBD. The independent variable in this study, task difficulty, had two levels: low demand tasks and high demand tasks. Low demand tasks were defined as math tasks completed with above 60% accuracy and high demand tasks were defined as math tasks completed with less than 40% accuracy. Results clearly indicated a functional relationship between tasks that were too difficult and problem behavior for eight of 12 students. This investigation was among the first to identify a mismatch between student skill level and the instructional demand of academic tasks contributing to problem behavior during academic tasks and noted that "if a student is already having behavior problems in the classroom, a mismatch between ability level and task demand level may well aggravate the behavior problems and the academic problems," (Center et al., 1982, p. 359).

DePaepe et al. (1996) extended the analysis in Center et al. (1982) to measure the effects of low demand versus high demand tasks on disruptive and on-task behaviors of two students ages nine and 12 with EBD. As in Center et al. (1982), the independent

variable in this study had two levels: low demand tasks and high demand tasks. However, low demand and high demand tasks were defined differently. Low demand tasks were defined as a set of math problems that were completed in a curriculum-based measurement (CBM) initial assessment with greater than 90% accuracy and high demand tasks were defined as a set of math problems that were completed in the CBM initial assessment with 75% or less accuracy. Results indicated higher rates of disruptive behavior during difficult task conditions and lower rates of disruptive behavior during easy task conditions.

Studies with an antecedent functional analysis. Carr and Durand (1985) systematically manipulated antecedent variables and measured effects on aggressive and self-injurious behaviors of four students ages seven to 14 with developmental disabilities. There were two independent variables in the analysis portion of this study, adult attention and task difficulty. Task difficulty had two levels: low demand tasks (defined as receptive labeling and match-to-sample tasks with previously demonstrated mastery for each participant) and high demand tasks (defined as vocabulary tasks used in the classroom that previously produced many errors for each participant). Cooper et al. (1990) replicated the analysis in Carr and Durand (1985) by utilizing the same independent variables (adult attention and task difficulty) and extended procedures to measure effects on on-task behaviors of eight typically developing children ages four to nine referred to an outpatient clinic for severe behavior problems. As in Carr and Durand (1985), task difficulty had two levels: low demand tasks and high demand tasks. However, low demand tasks and high demand tasks were defined differently. Low demand tasks were

defined as academic tasks at one to two grades below the participants' grade level and were reported as being easy by teachers and parents. High demand tasks were defined as academic tasks at one to two grades above the participants' grade level and were reported as being difficult by teachers and parents.

Meyer (1999) replicated the analysis in Carr and Durand (1985) and extended procedures to measure the off-task behavior of four students in first and third grades with mild disabilities (LD and EBD) and teacher-reported problem behavior during instruction. Task difficulty had two levels in this study: low demand tasks and high demand tasks. Once again, low demand tasks and high demand tasks were defined differently. Low demand tasks were defined as tasks that students could complete with higher than 90% accuracy and high demand tasks were defined as tasks that participants could complete with approximately 50% accuracy.

Finally, Moore and Edwards (2003) conducted an antecedent functional analysis that manipulated social attention and task difficulty and measured effects on the problem behavior of four students ages seven to 17 without disabilities who exhibited escape-maintained problem behavior during instruction in the general education classroom. Levels of task demands were defined differently in this investigation as well. Low demand tasks were defined as tasks that could be completed correctly at least 85% of the time and high demand tasks were defined as tasks that could be completed correctly less than 50% of the time.

Frustration, instructional, and independent level assessments. Utilizing assessments for reading performance reviewed previously, such as CBA-ID, may offer a

solution to the common theme found in this review that low demand/high demand assessments employ arbitrarily selected criteria for defining low demand and high demand tasks. Because CBA-ID defines differing levels of reading accuracy, this type of assessment methodology also considers the role of task difficulty in contributing to co-occurring behavior problems and reading difficulties. Burns (2004) suggested that CBA-ID could be used not only to identify academic skills concerns, but also to identify sources of problem behavior because evidence from prior studies shows reductions in problem behaviors when student skill level and the demand level of academic tasks are matched.

Some research exists to support the efficacy of CBA-ID to determine frustration, instructional, and independent levels of reading accuracy in contributing co-occurring behavior problems and reading difficulties. Gickling and Armstrong (1978) investigated the effects of reading at frustration (defined as text read with less than 93% accuracy), instructional (defined as text read with between 93-97% accuracy), and independent (defined as text read with above 97% accuracy) on the on-task behavior, task completion, and comprehension of eight students in first and second grade. When students were reading at their frustration level, mean percentages of on-task behavior, task completion, and task comprehension were consistently below 50%. Mean percentages of task completion and task comprehension were nearly 100% when students were reading text at their independent levels, but on-task behavior remained around 50%. Conversely, all three dependent variables (on-task behavior, task completion, and task comprehension) were consistently around a mean percentage of 90-100% when students were reading text

at their instructional level. Although this study compellingly showed that reading at the instructional level was associated with high rates of on-task behavior, task completion, and task comprehension, the methodology utilized was outdated by current standards of experimental rigor in educational research. Gickling and Armstrong presented results averaged across students, did not return to baseline conditions, and did not counterbalance or randomize the sequence of conditions.

Treptow, Burns, & McComas (2007) replicated and extended the procedures in Gickling and Armstrong (1978) utilizing current experimental design standards. Treptow et al. tested the effects of reading passages at the frustration, instructional, and independent levels on on-task behavior and comprehension utilizing a single-subject multielement design with counterbalanced conditions. Three third grade students were administered CBA-ID to determine their frustration, instructional, and independent reading levels and then asked to read from randomly selected Read Naturally (Read Naturally, 2003) passages at each of these levels during reading instruction. As with Gickling and Armstrong (1978), results indicated that on-task behavior was highest for all students when reading text at the instructional level.

Performance versus skill deficit assessment. VanDerHeyden and Witt (2008) offered an assessment to determine whether students exhibit reading problems because they have a performance deficit or because they have a skill deficit. This assessment has a strong empirical basis in the literature on CBA and BEA (Daly et al., 1997; Lentz & Shapiro, 1986) and proposes that students may have reading difficulties either because they *won't do* a task (i.e., are exhibiting a performance deficit) or because they *can't do* a

task (i.e., are exhibiting a skill deficit). This assessment also provides a link between behavior problems and reading difficulties, as determining whether a student is having reading difficulties due to a performance deficit or skill deficit has implications for whether a behavioral intervention or reading intervention is warranted. First, a baseline measure of reading performance is gathered. Then, the student is told that they can earn an incentive if they can beat their previous score. The experimenter determines whether the student is exhibiting a performance deficit or a skill deficit by comparing the two scores. If the student gains 15% or higher in accuracy, he/she is hypothesized to exhibit a performance deficit because in the presence of the incentive, he/she was able to perform the task with a higher degree of accuracy. However, if the student gains less than 15% accuracy, he/she is hypothesized to exhibit a skill deficit because even in the presence of the incentive, he/she was unable to perform the task with a significantly higher degree of accuracy.

Summary. Proactive and efficient methods of assessment for reading difficulties for students with persistent patterns of co-occurring behavior problems and reading difficulties may be to (1) consider the role of task difficulty and (2) determine whether difficulties are likely to be the result of a performance deficit or a skill deficit. The accumulation of studies on low demand/high demand assessments show that occurrences of problem behavior are higher when students perform high demand tasks (Carr & Durand, 1985; Center et al., 1982; Cooper et al., 1990; DePaepe et al., 1996; Meyer, 1999; Moore & Edwards, 2003). However, definitions of low demand tasks and high demand tasks in these studies vary greatly between studies and are arbitrarily determined.

In contrast, studies utilizing Gickling and Armtrong's (1978) definitions of frustration, instructional, and independent levels of reading accuracy have shown that reading at the frustration level (i.e., a high demand task) is associated with low levels of on-task behavior. Gravois and Gickling (2002) suggest that co-occurring behavior problems and reading difficulties are sometimes the result of a mismatch between task demands and student skill level. If a task is too difficult (i.e., is read at the frustration level with less than 93% accuracy), students may become frustrated, which can lead to behavior problems.

For students with co-occurring behavior problems and reading difficulties, it is also important to consider whether problem behavior is due to a frustration level task (i.e., a skill deficit) or due to a problem with motivation (i.e., a performance deficit). Utilizing a performance versus skill deficit assessment based on the methodology proposed by VanDerHeyden and Witt (2008) is empirically grounded in research on CBA and BEA (Daly et al., 1997; Lentz & Shapiro, 1986) and offers a bridge between assessment and intervention, as determining the reason for reading difficulties provides implications for intervention.

Part 2: Intervention

A body of literature exists that implements instructional modifications or interventions for students with co-occurring behavior problems and reading difficulties. All of these studies involve some form of behavior assessment. Some studies also involve an analysis of academic performance. Also, all of these studies utilize either: (a) modifications to instruction (e.g., shortening tasks, using manipulatives to assist in

problem completion, offering choice of task sequence) or (b) an analysis of an instructional intervention (e.g., preteaching spelling words, vocabulary words, or math tasks, implementing a research-based intervention program) in their investigations. In addition, some studies measured effects of instructional modifications or instructional interventions on dependent variables related to *both* academic performance and problem behavior, while others measured effects of instructional modifications or interventions on dependent variables related to *only* problem behavior. This collection of studies is divided into sections according to type of intervention (i.e., instructional modification, instructional intervention). Finally, all of these studies limit participants to those hypothesized to exhibit problem behavior because it produces negative reinforcement (i.e., escape from academic demands). Each type of intervention will be critically reviewed, with particular attention to the differing methods of behavior assessment, differing methods of assessment of academic performance or lack of attention to academic performance, and dependent variables measured (i.e., academic performance and problem behavior versus problem behavior only).

Instructional Modifications

Kern, Childs, Dunlap, Clarke, and Falk (1994) evaluated the effects of instructional modifications on the on-task behavior of one 11-year-old student with EBD and problem behavior during instruction. This study involved: (1) an FBA; (2) development of hypotheses regarding curricular variables associated with problem behavior and analysis of the presence and absence of each hypothesis on on-task

behavior; (3) testing the effects of an intervention using instructional modifications on on-task behavior.

First, an FBA that consisted of direct observation of the student in the classroom and teacher interview. Direct observations revealed that the student only engaged in problem behavior when there were academic demands present. Results from the FBA identified escape from instruction as the potential function of the student's problem behaviors. Next, researchers developed five hypotheses regarding the specific instructional variables that appeared to be related to escape-maintained problem behavior (e.g., handwriting tasks, long tasks, drill and practice math work). A reversal design was used to analyze the effects of the presence and absence of these hypotheses on on-task behavior. Data indicated that the presence of each of the instructional modifications hypothesized resulted in higher percentages of intervals of on-task behavior than when these modifications were absent.

After that, a multiple baseline across academic subjects (spelling, English, and math) tested the effects of a treatment package using components of the instructional modifications found to increase on-task behavior. Kern et al. (1994) found immediate change in level and variability after implementing the instructional modifications in all three academic subjects. Intervals of on-task behavior changed from a mean of 62% during baseline conditions to a mean of 89-93% during intervention. The robust effects of instructional modifications to increase on-task behavior for this student with co-occurring behavior problems and reading difficulties and hypothesized escape-maintained problem behavior during instruction is evident in this study, as data from baseline conditions

compared to intervention were clearly differentiated across three settings. However, researchers utilized a combination of instructional modification components with the student in each setting, so the effects of any one modification on on-task behavior cannot be differentiated from the others.

McComas, Hoch, Paone, and El-Roy (2000) tested the effects of instructional modifications on the destructive behavior and compliance with tasks for three students ages eight to nine years old with developmental disabilities and Autism Spectrum Disorder (ASD), all of whom displayed escape-maintained problem behavior during academic tasks. Researchers recognized that features of task demands that set the occasion for escape-maintained problem behavior were idiosyncratic to each student. Therefore, an individual analysis of the features of task demands (i.e., motivating operations) that set the occasion for problem behavior was warranted.

To determine the idiosyncratic features of task demands that evoked escape-maintained problem behavior, this study involved: (1) a functional analysis; (2) motivating operations hypothesis generation; and (3) an motivating operations analysis to test the effects of instructional modifications based on the hypothesized motivating operation for escape-maintained problem behavior on destructive behavior and compliance with task demands.

First, functional analyses (based on procedures outlined by Iwata et al., 1982/1994) were conducted and data showed that all three students engaged in problem behavior because it produced negative reinforcement (i.e., escape from task demands). After that, hypotheses regarding the specific motivating operation that set the occasion

for escape-maintained problem behavior were generated for each student. This step consisted of direct observations of each student during instruction, in which researchers recorded sequences of antecedents to problem behavior, the topography of problem behavior, and the consequence for problem behavior as well as interviews with the teacher. Researchers hypothesized that one student engaged in escape-maintained problem behavior to avoid difficult tasks, one student to avoid teacher-determined tasks, and one student to avoid repeating tasks.

Next, hypotheses were confirmed with a motivating operation analysis. For this analysis, an instructional strategy hypothesized to reduce the reinforcing effects of escape from instruction were presented and removed via a multielement design with counterbalanced conditions. Methods of instruction were chosen based on the hypothesized motivating operation that was idiosyncratic to each student (i.e., the use of an instructional strategy, choice of task sequence, and non-repeated tasks). Data revealed that problem behavior was lower and compliance with task demands was higher in conditions with the instructional modification (i.e., the use of an instructional strategy, choice of task sequence, non-repeated tasks) compared to conditions with no instructional modification for each student.

Particularly of note, results showed near zero levels of destructive behavior and high levels of compliance with tasks in instructional strategy conditions for the student who engaged in problem behavior to escape difficult tasks. Specifically, this student's data revealed that, "in some cases, instructional strategies can produce not only improvements in academic performance but also reductions in destructive behavior in the

classroom," (McComas et al., 2000, p. 490). The addition of an instructional strategy reduced the difficulty of the task, thereby reducing the reinforcing effects of escaping the task. However, the nature of the instructional strategy (student was prompted to use manipulatives to solve math problems) is an instructional modification rather than an intervention to teach new skills. Although the student increased compliance with tasks, it remains unclear whether an instructional intervention that teaches new skills, thereby reducing the demand level of the task and reducing the reinforcing value of escape, would concurrently increase academic performance and decrease problem behavior.

Instructional Analyses

Lalli et al. (1999) tested the effects of an instructional analysis to teach unknown spelling words on the correct academic responding and problem behavior of two students ages 10-11 with mild developmental disabilities and high rates of aggressive behavior during spelling instruction. Based on teacher interviews and direct observations of students during instruction, researchers hypothesized that these students displayed problem behavior primarily to escape difficult spelling tasks. Teaching unknown spelling words was hypothesized to reduce the aversiveness of tasks and decrease problem behavior. Researchers were particularly interested in whether increases in academic responding would covary with decreases in problem behavior after the instructional intervention was implemented. This study involved: (1) a functional analysis; and (2) an intervention to teach unknown spelling words measured via a pre- and post-test training sequence.

First, a functional analysis was conducted to test escape from spelling instruction as the primary function of problem behavior for each student. The functional analysis consisted of a play condition, an initial assessment, and a replication assessment. In the play condition, the student was given access to preferred toys. In the initial assessment condition, math, writing, and spelling tasks were given to students in separate sessions and percentage of intervals with aggressive behavior were recorded. Teachers removed task materials contingent on each occurrence of aggressive behavior and then re-presented tasks. In the replication assessment conditions, the conditions with the highest and lowest percentages of intervals with aggressive behavior (spelling and play, respectively) were repeated for each student. Functional analysis results clearly indicated that escape from spelling tasks maintained problem behavior for both students.

Then, an instructional analysis to teach unknown spelling words that consisted of match-to-sample, constructed-response, and oral naming spelling sessions were conducted with each student daily in 10 min sessions. Problem behavior during each session and correct academic responding during each pre- and post-test were measured in a total of 10 analysis sessions for each student. Results indicated that problem behavior was high and correct academic responding was low before unknown spelling words were taught, while problem behavior was low and correct academic responding after intervention that taught unknown spelling words. Results from this instructional analysis demonstrated that decreasing rates of problem behavior covaried with academic improvements for both students.

Lee, Sugai, and Horner (1999) also used an instructional analysis when they tested the effects of preteaching math skills on the off-task behavior and correct academic responding of two nine year old students with EBD and co-occurring behavior problems and academic difficulties. This study involved: (1) an FBA; (2) an analysis of the effects of low demand and high demand tasks on off-task behavior and correct academic responding; and (3) an analysis of the effects of preteaching high demand math tasks on off-task behavior and correct academic responding.

First, researchers conducted a descriptive FBA that consisted of teacher interviews, review of records, and direct observations in the classroom. Researchers hypothesized that both participants engaged in problem behavior because it produced negative reinforcement (i.e., escape from difficult task demands). Then, a within-subject reversal design was used to examine the effects of low demand versus high demand math tasks on occurrences of off-task behavior. Low demand tasks were defined as math tasks that were completed with higher than 90% accuracy on a pretest and high demand tasks were defined as math tasks that were completed with lower than 33% accuracy on a pretest. Low demand and high demand math tasks were presented to each student in 10 min independent math work sessions and results clearly indicated that both students had higher percentages of off-task behavior and lower percentages of correct academic responding in sessions with high demand tasks compared to the condition in which low demand tasks were presented.

Last, an alternating treatments design was used in an instructional analysis to assess the effects of preteaching high demand math skills on the occurrence of off-task

behavior and correct academic responding. This analysis consisted of the following phases: (1) instruction in a set of high demand math tasks; (2) student performing the set of high demand math tasks independently; (3) instruction in another set of high demand math tasks; (4) student performing the set of high demand math tasks independently. Instruction in each set of high demand math tasks was briefly explained as "individualized component skills instruction" (Lee et al., 1999; p. 198). Results from the instructional analysis revealed that preteaching math skills reduced occurrences of off-task behavior and increased correct academic responding during independent work sessions.

Lee et al. (1999) documented the covarying relationship between academic and behavior problems in an analysis of the effects of low demand and high demand tasks on off-task behavior and correct academic responding and showed the collateral effects of an instructional intervention to increase academic performance while simultaneously reducing occurrences of off-task behavior. However, this study also contains arbitrary definitions of low demand and high demand tasks. Also, the instructional intervention itself is not explained clearly, precluding investigations to replicate results.

In a related study, Burke, Hagan-Burke, and Sugai (2003) assessed the effects of preteaching vocabulary words on the task engagement of one third grade student with co-occurring behavior problems and reading difficulties (student reported as having LD and problem behavior during reading instruction). This study involved (1) an FBA; (2) an analysis of the effects of reading tasks with comprehension versus reading tasks without

comprehension (i.e., decoding tasks) on task engagement; and (3) an analysis of the effects of preteaching vocabulary words on task engagement.

First, researchers conducted a descriptive FBA that included teacher and student interviews, review of records, and direct observations in the classroom. Since results from these sources revealed that problem behavior mostly occurred during reading instruction for this student, researchers closely examined reading performance assessments and found that while the student had oral reading fluency (ORF) scores considered at grade-level and average in his general education classroom (according to CBM measures administered in fall, winter, and spring) results from a comprehension assessment revealed that the student's comprehension skills were far below his peers. Thus, Burke et al. (2003) hypothesized that the student engaged in problem behavior primarily to escape reading tasks with comprehension.

Next, an alternating treatments design was used to analyze the effects of reading tasks with and without comprehension on the student's task engagement. There were four conditions in this analysis, each with two or three replications: (1) decoding tasks; (2) comprehension tasks; (3) decoding tasks with access to adult and peer attention; and (4) comprehension tasks with access to adult and peer attention. Adult and peer attention was paired with each of the reading tasks to rule out attention as a possible variable that maintained problem behavior. Data revealed that, regardless of access to adult and peer attention, the student had high levels of task engagement in decoding conditions and low levels of task engagement in comprehension conditions. For this student, decoding tasks

seemed to represent low demand tasks while comprehension tasks seemed to represent high demand tasks.

Finally, researchers assessed the effects of an intervention to preteach vocabulary words on the student's task engagement during reading instruction. The student was individually instructed for 25 min per day in vocabulary words that would appear in the next day's reading lesson. Researchers observed the student during reading class on days in which he was pretaught vocabulary words and days in which he was not pretaught vocabulary words in an alternating treatments design. High levels of task engagement were observed during reading instruction with comprehension tasks when vocabulary words were pretaught (mean = 98%) compared to low levels of task engagement when vocabulary words were not pretaught (mean = 38%). This study extended results from Lee et al. (1999) to show an instructional intervention focusing on the content area of reading was successful in increasing task engagement for a student with co-occurring behavior problems and reading difficulties and hypothesized escape-maintained problem behavior during instruction. However, there was no measurement of concurrent increases in academic performance. Therefore, it is unknown whether the preteaching intervention was successful in teaching comprehension skills as well as increasing task engagement.

Recently, Sanford and Horner (2012) tested the effects of a reading intervention program matched to instructional level on the problem behavior and academic engagement of four students in second and third grade with co-occurring behavior problems and reading difficulties and hypothesized escape-maintained problem behavior during instruction. This study involved (1) an FBA (and functional analysis for two

students); (2) an analysis of reading performance in the curriculum; and (3) an analysis of the effects of instructional level placement in reading intervention program on problem behavior and academic engagement.

First, a descriptive FBA that included teacher interviews, review of records, and direct observations in the classroom was conducted. Based on the FBA, researchers hypothesized that all four students engaged in problem behavior primarily to escape difficult academic tasks. In addition to the descriptive FBA, two students also participated in a functional analysis with 12-15 randomized 1 min trials of attention and escape conditions (conditions were similar to those outlined in Iwata et al., 1982/1994) to confirm that problem behavior was maintained by escape.

Next, researchers analyzed each student's reading performance in Reading Mastery (Science Research Associates, 2002), the reading curriculum that was used before and during intervention to determine whether students were reading at their frustration (defined in this study as less than 90% accuracy) or instructional (defined in this study as 90-94% accuracy) level. This analysis revealed that reading performance for all four students was in the frustration level prior to implementing the intervention.

After that, researchers utilized a non-concurrent multiple-baseline across participants design to test the effects of a reading intervention matched to students' instructional level on the problem behavior and academic engagement. Sanford and Horner (2012) found that compared to baseline conditions (when students were reading curricular materials at their frustration level), implementing the intervention (altering the

difficulty of reading material to students' instructional level), resulted in decreases in problem behavior and increases in academic engagement for all students.

Overall, this study supports the efficacy of interventions that alter task difficulty on behavior improvement during instruction and provides further documentation that proactive instructional interventions reduce problem behavior. Interestingly, instead of a high demand/low demand assessment that has been utilized in many other related investigations, this study used frustration, instructional, and independent level terminology to place students in the reading curriculum and measure success of the intervention. However, this study did not use the same operational definitions of frustration, instructional, and independent reading levels that have been previously explored in research (e.g., Gickling & Armstrong, 1978; Treptow et al., 2007). Moreover, improvements in academic performance were not measured as a primary dependent variable. Researchers noted that students made some gains in oral reading fluency during the intervention but were still performing below peers. It remains unclear what intensity of intervention is necessary to result in academic as well as behavior improvements for students with co-occurring behavior problems and reading difficulties.

Summary

The reviewed studies on instructional modifications and interventions for students with co-occurring behavior problems and reading difficulties have many differences. For one, although all have some component of a functional assessment to identify function of problem behavior, some studies (Burke et al., 2003; Kern et al., 1994; Lee et al., 1999; Sanford & Horner, 2012) utilized primarily descriptive methods to hypothesize function

of problem behavior while others (Lalli et al., 1999; McComas et al., 2000) utilized an experimental functional analysis to experimentally determine function of problem behavior. Because idiosyncratic features of task demands can simultaneously decrease academic performance and increase problem behavior for students with persistent patterns of co-occurring behavior problems and reading difficulties, an analysis of the motivating operations that set the occasion for problem behavior and precludes gains in academic performance may be necessary. Given that identification of the maintaining function of problem behavior (e.g., escape or avoidance of tasks) is needed to determine the operating motivating operations, which will determine the instructional modification or intervention needed to weaken or abolish the reinforcing value of the maintaining function of problem behavior, an experimental functional analysis may be required.

In addition, these studies included a variety of different analyses of academic skills. One study included no systematic analysis of the features of instructional variables that set the occasion for escape-maintained problem behavior, instead moving straight from behavior assessment to an instructional intervention (Lalli et al., 1999). Two studies developed and tested hypotheses regarding the features of task demands that set the occasion for escape-maintained problem based on direct observation and teacher interviews (Kern et al., 1994; McComas et al., 2000). Burke et al. (2003) took a different approach by testing hypotheses regarding the features of task demands that set the occasion for escape-maintained problem based on individual skills assessments (i.e., oral reading fluency and comprehension measures). The remaining studies (Lee et al., 1999; Sanford & Horner, 2012) included an assessment that considered the role of task

difficulty in contributing to escape-maintained problem behavior. Lee and colleagues used arbitrary definitions of high demand and low demand tasks. Sanford and Horner utilized frustration, instructional, and independent level terminology but operationally defined these levels of reading accuracy differently than what has been supported by previous research (i.e., Gickling & Armstrong, 1978; Treptow et al., 2007).

Also, only two studies measured the effects of instructional modifications and interventions on changes in both academic performance and problem behavior (Lalli et al., 1999; Lee et al., 1999). The remaining studies included dependent variables related to academic performance, namely on-task behavior (Kern et al., 1994), compliance with academic tasks (McComas et al., 2000), task engagement (Burke et al., 2003), and academic engagement (Sanford & Horner, 2012). While one may hypothesize that increases in academic behavior (e.g., on-task behavior, compliance, task engagement, academic engagement) may lead to improvements in academic performance, they do not actually measure gains in academic performance. To determine whether an instructional intervention can concurrently increase academic performance and decrease problem behavior for students with persistent patterns of co-occurring behavior problems and reading difficulties, it is important include dependent variables directly related to *both* problem behavior and reading performance.

Lastly, all of the reviewed studies limited selection of participants to those with problem behavior hypothesized to be related to escape. However, there are undoubtedly students with attention-maintained problem behaviors who also experience reading difficulties. The conditions under which instructional interventions are successful for

students with behavior problems hypothesized to be related to both attention and escape remain unclear.

Potential Patterns of Responding for Students with Co-Occurring Behavior Problems and Reading Difficulties

Overall, the literature on assessment and intervention for students with co-occurring behavior problems and reading difficulties suggest that students may exhibit problem behavior for at least two reasons (i.e., *attention-maintained* problem behavior and *escape-maintained* problem behavior) and students may exhibit reading difficulties for at least two reasons (i.e., due to a *performance deficit*, due to a *skill deficit*). Thus, assessments for problem behavior and reading difficulties may identify students with at least four patterns of responding: (1) attention-maintained problem behavior and a performance deficit; (2) escape-maintained problem behavior and a performance deficit; (3) attention-maintained problem behavior and a skill deficit; and (4) escape-maintained problem behavior and a skill deficit. Efficient and empirically based assessment methodologies can identify students with these patterns of responding. The next logical step may be to identify interventions that have potential to produce response covariation (i.e., reductions in problem behavior concomitant with increases in reading performance). Antecedent interventions seem an appropriate first step in selecting appropriate interventions for students with these patterns of responding. Therefore, a practical model (see Figure 1) was created for this project to assist researchers and practitioners in assessment and intervention decision-making for students with co-occurring behavior problems and reading difficulties. The relative effects of antecedent interventions

matched and mismatched to hypothesis for reading difficulties on the off-task behavior and reading accuracy for participants who have problem behavior maintained by attention versus escape and exhibit reading difficulties in the classroom were tested to evaluate the efficacy of this model.

Rationale for Antecedent Intervention Strategies

Antecedents are environmental events that precede responding (Cooper et al., 2007). Antecedent interventions are set up so that environmental events that tend to precede problem behavior are eliminated or changed in order to prevent problem behavior from occurring and maximize reinforcement contingencies for appropriate behavior. There are advantages to antecedent interventions, including (1) the proactive nature of antecedent interventions to prevent problem behavior from occurring and (2) the instructional benefits of maximizing opportunities for student academic success by correcting and eliminating environmental contributions to problem behavior that may impede academic engagement (Kern & Clemens, 2007). Indeed, existing research supports many antecedent intervention strategies for students who exhibit co-occurring behavior problems and reading difficulties. In particular, these intervention strategies can be categorized by those employed for students who exhibit performance deficits and those employed for students who exhibit skill deficits.

Antecedent Intervention Strategies for Performance Deficits

Some students who exhibit reading difficulties may have the requisite skills to perform the task but lack the motivation to perform the task (VanDerHeyden & Witt, 2008). Choice is often suggested as an antecedent intervention strategy (Daly et al., 1997;

Skinner et al., 2005). Many studies support the effectiveness of choice on decreasing problem behavior and increasing on-task behavior (e.g., Dunlap et al., 1994; Jolivette Wehby, Canale, & Massey, 2001; Kern, Mantegna, Vorndran, Bailin, & Hilt, 2001; Ramsey, Jolivette, Patterson, & Kennedy, 2010). One study compared choice as an intervention strategy across behavioral function (i.e., attention versus escape) and found that while choice was an effective intervention for students with escape-maintained problem behavior, choice had little effect on reducing occurrences of problem behavior for students who exhibited problem behavior maintained by attention (Romanuik et al., 2002). It seemed that choice was matched to the escape function of problem behavior and mismatched to the attention function of problem behavior. By offering a choice, students may be able to escape tasks they find undesirable, thereby abolishing the reinforcing effects of escape. However, choice may not be fully effective for decreasing attention-maintained problem behavior because the operant function of the problem behavior has not been addressed. These students may require an intervention strategy that includes attention.

Providing antecedent attention is one way to allow students with attention-maintained problem behavior an appropriate way to access attention. One study exists that compares the effects of antecedent attention as an intervention strategy for students with attention- versus escape-maintained problem behavior (McComas, Thompson, & Johnson, 2003). Although antecedent attention was shown to be an effective intervention for students with attention-maintained problem behavior, it had little effect on reducing occurrences of problem behavior for students who exhibited problem behavior

maintained by escape. It seemed that in this study, antecedent attention was matched to the attention function of problem behavior and mismatched to the escape function of problem behavior.

Evidence of the effects of antecedent attention and choice as intervention strategies to reduce occurrences of problem behavior matched and mismatched to function of problem behavior is limited to these two studies. These studies compared antecedent attention and choice interventions with antecedent ignore conditions and no-choice conditions, respectively. A logical extension of the literature on the effectiveness of these antecedent interventions that are matched and mismatched to function of problem behavior may be to directly compare these two intervention strategies.

As such, this project proposed to compare the effects of antecedent attention and choice interventions on reducing occurrences of problem behavior and increasing reading accuracy for individual students who are hypothesized to have reading difficulties due to a performance deficit and exhibit problem behavior maintained by attention versus escape. I hypothesized that participants who engaged in attention-maintained problem behavior would display lower occurrences of problem behavior in antecedent attention conditions and higher occurrences of problem behavior in choice conditions. For students who engaged in escape-maintained problem behavior, I hypothesized that occurrences of problem behavior would be lower in choice conditions and higher in antecedent attention conditions. The influence of these interventions on reading accuracy was to be exploratory in nature and a priori hypotheses were proposed. This was to be the first project to compare antecedent attention, an intervention shown to be effective with

participants who engage in attention-maintained problem behavior, and choice, an intervention shown to be effective for participants who engage in escape-maintained problem behavior, directly across functions.

Antecedent Intervention Strategies for Skill Deficits

Some students who exhibit academic performance problems are hypothesized to lack the requisite skills to perform a task. Implementing instructional strategies to teach necessary skills to perform a task are often suggested as intervention strategies (e.g., Daly et al., 1997; DiGennaro Reed & Jenkins, 2013; Skinner et al., 2005). Instructional strategies can be considered an antecedent variable because a dimension of the task demand has been altered. For students with co-occurring behavior problems and reading difficulties, instructional strategies have been shown to be effective in reducing problem behavior (Burke et al., 2003; Kern et al., 1994; McComas et al., 2000; Sanford & Horner, 2012) and in concurrently reducing problem behavior and improving academic performance (Lalli et al., 1999; Lee, Sugai, & Horner, 1999). However, these studies have included only students who engage in problem behavior primarily because it produces negative reinforcement (i.e., escape-maintained). The effects of instructional strategies on reducing occurrences of problem behavior and increasing academic performance for students who engage in problem behavior during instruction primarily because it produces positive reinforcement (i.e., attention-maintained) has not been studied.

Interventions consisting of an instructional strategy to increase reading skills may also be fully effective for decreasing attention-maintained problem behavior because the

operant function of the problem behavior has been addressed when an interventionist delivers attention during an instructional strategy. Providing antecedent attention is another way to allow students with attention-maintained problem behavior an appropriate way to access attention. However, this type of intervention strategy does not address reading difficulties hypothesized to be related to a skill deficit. On the other hand, students who engage in escape-maintained problem behavior during instruction may not require the addition of antecedent attention to address the operant function of problem behavior. For these students, gaining the requisite skills necessary to perform an academic task with an instructional strategy may abolish the reinforcing effects of escape, therefore addressing the operant function.

Thus, this project tested the relative effects of antecedent interventions matched and mismatched to hypothesis for reading difficulties on the off-task behavior and reading accuracy for students who have problem behavior maintained by attention versus escape and exhibit reading difficulties in the classroom hypothesized to be related to a skill deficit. I hypothesized that participants who engaged in attention-maintained problem behavior would display low occurrences of off-task behavior in both instructional strategy and antecedent attention sessions because the operant function of problem behavior was addressed in both conditions. However, I hypothesized that these participants would display higher levels of reading accuracy in instructional strategy sessions relative to antecedent attention sessions because a skill deficit hypothesis for reading difficulties was only addressed in the instructional strategy condition. I hypothesized that participants who engaged in escape-maintained problem behavior

would display lower occurrences of off-task behavior in instructional strategy sessions and higher occurrences of problem behavior in antecedent attention sessions because the operant function of problem behavior was only addressed in the instructional strategy condition. I also hypothesized that these participants would display higher levels of reading accuracy in instructional strategy sessions relative to antecedent attention sessions because a skill deficit hypothesis for reading difficulties was only addressed in the instructional strategy condition. This was the first project to experimentally examine the effects of antecedent attention versus the use of an instructional strategy directly across behavioral function.

Instructional Strategy Selection

Haring and Eaton (1978) developed an instructional hierarchy that can be used as a model for selecting appropriate measures of reading performance for a given skill deficit. According to Haring and Eaton, four levels of skill development must be considered when selecting interventions: acquisition, fluency, generalization, and adaption. When a new skill is being developed, the first step is to acquire the skill with an acceptable level of accuracy. For instance, reading accuracy may be an appropriate measure for an instructional strategy intended to teach students new words. The next step is for the student to become fluent in the skill. For example, after the student can accurately produce the word, words read correctly per minute may be an appropriate for the next level of instructional strategy intended to teach students to fluently read words. Next, if the student is capable of engaging in the skill in novel situations, the generalization level of learning is said to occur. Adaptation is the final level of the

hierarchy in which the student becomes able to modify the skill in different situations. In this project, I used Haring and Eaton's instructional hierarchy to determine the appropriate measures of reading performance for each participant's individual skill deficits.

Statement of Purpose

The purpose of this project was to test the effectiveness of a practical model for assessment and intervention decision-making for students with co-occurring behavior problems and reading difficulties. In particular, I was interested in exploring the relative effects of interventions matched and mismatched to hypothesis for reading difficulties on the off-task behavior and reading accuracy for students who have problem behavior maintained by attention versus escape and exhibit reading difficulties in the classroom. Figure 1 provides an outline of the practical model used for this project.

First, I used two types of functional analysis methodologies to hypothesize the most likely function of problem behavior for each participant. For participants who engaged in overtly disruptive behavior, a brief functional analysis was used, whereas a concurrent operants analysis was used for participants not likely to engage in problem behavior during functional analysis sessions. I used consequence-based methods to determine function of problem behavior in order to permit an analysis of motivating operations that set the occasion for problem behavior and preclude gains in reading performance. Attention and escape conditions were tested for each participant because they have been found to be the most commonly identified functions of problem behavior in school settings (Broussard & Northup, 1995).

Second, I administered a performance versus skill deficit assessment, based on procedures developed by VanDerHeyden and Witt (2008), to hypothesize the most likely reason that each participant experienced reading difficulties. I used this assessment because it is empirically grounded in the CBA and BEA literature (Daly et al., 1997; Lentz & Shapiro, 1986) and provides a direct link to intervention selection. I also used Gickling and Armstrong's (1978) definitions of frustrational (i.e., below 93% accuracy) and instructional (i.e., 93% accuracy and above) levels of reading accuracy when hypothesizing whether each participant exhibited a performance deficit or a skill deficit.

Third, I experimentally tested the relative effects of interventions matched and mismatched to hypothesis for reading difficulties on the off-task behavior and reading accuracy of the participants in the study. Unlike previous research that tested the effects of instructional interventions on improving problem behavior and academic performance, I did not limit participants to those who exhibit escape-maintained problem behavior. After all, many students who exhibit attention-maintained problem behavior also have reading difficulties. I was primarily interested in exploring whether it mattered if interventions were matched or mismatched to the hypothesis for reading difficulties for students who experience co-occurring behavior problems and reading difficulties. I measured variables related to both problem behavior and reading performance to test which interventions, if any, lead to response covariation (i.e., reductions in problem behavior concomitant with increases in reading performance).

Research Questions

This project was guided by the following general research question: What are the relative effects of antecedent interventions matched and mismatched to hypothesis for reading difficulties on the off-task behavior and reading accuracy for students who have problem behavior maintained by attention versus escape and exhibit reading difficulties in the classroom?

The following specific research questions were used to answer the general research question:

1. For participants who exhibit attention-maintained problem behavior during reading and reading difficulties hypothesized to be related to a skill problem, which intervention is more effective: (a) antecedent attention or (b) instructional strategy?
2. For participants who exhibited escape-maintained problem behavior during reading and reading difficulties hypothesized to be related to a skill problem, which intervention is more effective: (a) antecedent attention or (b) instructional strategy?

CHAPTER III

METHOD

Phases

This study was implemented in three phases: (1) experimental analysis phase, (2) performance versus skill deficit assessment phase, and (3) intervention analysis phase.

Participants

Participants were six students in first grade in two public schools in a large urban district in the upper Midwest. The approximate enrollment of students in School 1 was 400 and 100% of students received free and reduced lunch services. Racial makeup of students attending School 1 were 86% African American, 4% Asian American, 3% Hispanic American, 3% Native American, and 4% White American. The approximate enrollment of students in School 2 was 400 and 96% of students received free and reduced lunch services. Racial makeup of students attending School 2 were 11% African American, 5% Hispanic American, 79% Native American, and 4% White American. The inclusion criteria were (a) the classroom teacher nominated the student due to a history of engaging in problem behavior and/or off-task behavior (e.g., putting head down, talking to peers, coloring, refusing to read, yelling or swearing, leaving classroom, throwing task materials, clearing desk of task materials) during independent reading tasks, (b) the student displayed reading difficulties (see Table 1 for reading assessment data), and (c) the student's parent/guardian provided informed consent for his/her child to participate in the study.

Kobe was a 7-year old African American boy with no known disabilities who attended first grade at School 1. He received reading instruction from his classroom teacher and a collaborative teacher who worked on beginning reading skills and comprehension with students who were reading below grade-level standards. According to school-wide reading assessments (see Table 1) including curriculum-based measures (CBM; Deno, 1985), and Fountas and Pinnell benchmark assessment (F&P; Heinemann, 2009), teachers reported Kobe's reading skills at a mid-Kindergarten level when he began participating in the study in February 2014. Kobe's teachers reported problem behavior during independent reading included vocalizing a refusal to read, pushing task materials away from desk, talking to peers, and leaving the classroom.

Micah was a 6-year old Native American boy with no known disabilities who attended first grade at School 2. He received reading instruction by his classroom teacher. According to school-wide reading assessments (see Table 1), Micah's teacher reported his reading skills at a mid-Kindergarten level when he began participating in the study in April 2014. Micah's classroom teacher reported problem behavior during independent reading involved asking for help or going to teacher's table when directed to read independently, talking to peers, making noises and faces at desk, and wandering around the room.

Gabriella was a 6-year old African American girl with no known disabilities who attended first grade at School 2. She received reading instruction from her classroom teacher. According to school-wide reading assessments (see Table 1), her teacher reported Gabriella's reading skills at an early first grade level when she began

participating in the study in April 2014. Gabriella's classroom teacher reported problem behavior during independent reading included talking to peers, tattling on other students, and coloring on task materials.

Trenton was a 7-year old African American boy with no known disabilities who attended first grade at School 1. He received reading instruction from his classroom teacher and a collaborative teacher who worked on beginning reading skills and comprehension with students who were reading below grade-level standards. According to school-wide reading assessments (see Table 1), teachers reported Trenton's reading skills at an early first grade level when he started participating in the study in January 2014. Trenton's teachers described his problem behavior during independent reading as vocalizing a refusal to read, pushing task materials away from desk, scribbling on, tearing up, or clearing task materials from desk, talking to peers, and leaving the classroom.

Jasmine was a 6-year old African American girl with no known disabilities who attended first grade at School 1. She received reading instruction from her classroom teacher and a collaborative teacher who worked on beginning reading skills and comprehension with students who were reading below grade-level standards. According to school-wide reading assessments (see Table 1), teachers reported Jasmine's reading skills at a mid-Kindergarten level when she began participating in the study in March 2014. Jasmine's teachers reported problem behavior during independent consisted of laying her head down on the desk, coloring, and staring out the window.

Donald was a 7-year old Native American boy with no known disabilities who attended first grade at School 2. He received reading instruction from his classroom

teacher. According to school-wide reading assessments (see Table 1), Donald's teacher reported his reading skills at a mid-Kindergarten level when he started participating in the study in April 2014. Donald's classroom teacher described problem behavior during independent reading as asking for help or going to teacher's table when directed to read independently, talking to peers, and wandering around the room.

Interobserver Agreement (IOA) Training

Observers were two doctoral students in School Psychology and Special Education and one professor in Special Education. All observers had coursework and experience in behavioral observation methods, behavioral and academic assessment, and behavioral and academic intervention strategies. In addition, the author (who was the primary experimenter and primary observer for all analyses) conducted a 1-hour training session with each doctoral student observer which consisted of describing the rationale for the project, demonstrating partial-interval recording using the data collection form (see Appendix A), describing each procedural fidelity checklist (see Appendices B-H), and practicing behavioral observation using a training videotape. Training continued until the primary observer (the author) and the secondary observer (the trainee) reached at least 80% agreement on the training videotape. In addition, a 10-minute meeting took place prior to every real-time data collection session, in which the experimenter explained operational definitions for each participant, explained the procedures for the data collection session using the relevant fidelity checklists, and clarified questions from the observers.

Phase 1: Experimental Analysis

The purpose of Phase 1 was to experimentally demonstrate whether participants engaged in problem behavior during reading primarily because it produced positive reinforcement (i.e., *attention-maintained* problem behavior) or primarily because it produced negative reinforcement (i.e., *escape-maintained* problem behavior). The maintaining function determined in Phase 1 permitted a subsequent analysis of relative effects of antecedent interventions matched and mismatched to hypothesis for reading difficulties on the off-task behavior and reading accuracy for students who have problem behavior maintained by attention versus escape. Two types of experimental analyses were used: (1) functional analysis, and (2) concurrent operants analysis. Kobe and Trenton participated in a functional analysis because they engaged in disruptive behavior both in the classroom and when working one-on-one with the experimenter. Micah, Gabriella, Jasmine, and Donald participated in a concurrent operants analysis because either (a) their problem behavior was more characterized as off-task than disruptive and therefore difficult, if not impossible to provide a contingency for a non-behavior (i.e., not being on-task) or (b) the participant was highly engaged and compliant with the experimenter, which suggested that problem behavior was not likely to occur in functional analysis sessions conducted with the experimenter.

Functional Analysis Setting and Materials

Functional analysis sessions were conducted at a table in an empty classroom at the participants' school. Leisure activities chosen by each participant (i.e., access to computer games, coloring pages, and card games) and academic tasks typically used in

the classroom (i.e., phonics worksheets) were used as materials during functional analysis sessions.

Functional Analysis Dependent Variable

Percentage of intervals with problem behavior was the dependent variable for these analyses. Problem behavior was operationally defined for each participant. For Kobe, problem behavior was defined as making vocalizations that are not required to complete the assigned reading task (i.e., making noises, grunting, saying phrases such as: “I can’t do it!”, “I don’t want to!”, “I already did this!”), throwing or pushing task materials away from self, scribbling on task materials, leaving the task area, and playing with objects unrelated to the task. For Trenton, problem behavior was defined as making vocalizations that are not required to complete the assigned reading task (i.e., making noises, grunting, saying phrases such as: “I can’t do it!”, “I don’t want to!”, “I already did some work!”), throwing or pushing task materials away from self, scribbling on task materials, leaving the task area, playing with objects unrelated to the task, and laying head down on table.

Functional Analysis Measurement

The experimenter used partial interval recording with 10 s intervals (see Appendix A) to measure occurrences of problem behavior during each 5 min condition with each participant. Percentage of occurrences of problem behavior was calculated by dividing the number of intervals in which the problem behavior was observed by the total number of intervals in the session and multiplying by 100. A secondary observer concurrently measured occurrences of the problem behavior during 37.5% of functional

analysis sessions for Kobe and 50% of functional analysis sessions for Trenton to calculate IOA. IOA was calculated by dividing the number of agreements by the total number of intervals and multiplying by 100. IOA ranged from 87 to 100% (*M* = 92.3%) for Kobe and from 83 to 100% (*M* = 92.3%) for Trenton.

Functional Analysis Independent Variables and Procedural Fidelity

Free play, attention, and escape conditions were manipulated during the functional analysis. Procedural fidelity was assessed using the Functional Analysis Procedural Fidelity Checklist (see Appendix B). A secondary observer rated the presence or absence of each item on the Functional Analysis Procedural Fidelity Checklist during 37.5% of functional analysis sessions for Kobe and 50% of functional analysis sessions for Trenton to calculate procedural fidelity. Procedural fidelity was calculated by dividing the number of components rated as present on the fidelity checklist by the total number of components implemented and multiplying by 100. Procedural fidelity ranged from 90 to 100% (*M* = 93.7%) for Kobe and from 90 to 100% (*M* = 98.6%) for Trenton.

Functional Analysis Experimental Design

A multielement design was used to compare the effects of free play, attention, and escape conditions on problem behavior. Sessions were presented in a randomized sequence with 2-6 sessions of each condition. The condition that yielded the highest percentage of occurrences of problem behavior was identified as the function that primarily maintains problem behavior.

Functional Analysis Procedure

Procedures for free play, attention, and escape conditions were based to those described by Iwata et al. (1982/1994) and Northup et al. (1991). Given that participants were nominated for inclusion in this study because they exhibited problem behavior during reading, the procedure for the attention condition was adapted slightly. Similar to procedures described in Romaniuk et al. (2002), the attention condition was delivered within the context of instruction. Each session was 5 min in length and conditions repeated in a randomized order until results were differentiated.

Free play. Free play served as a control condition. In free play conditions, participants had unlimited access to leisure items and attention and were not required to perform any academic tasks. The experimenter activated a timer for 5 min. The participant was directed toward leisure items and instructed to play with whatever they want either by themselves or with the experimenter. The experimenter delivered attention at least every 30 s in the form of a general praise statement (e.g., *"Great!"*, *"Nice job!"*). No consequences were delivered for problem behavior.

Attention. In the attention condition, participants were required to complete a reading worksheet. The participant received access to experimenter attention contingent on the occurrence of problem behavior. The experimenter activated a timer for 5 min and instructed the participant to engage in the task with the verbal prompt: *"I am busy and will be working over here. It is time for you to do this worksheet"*. The experimenter ignored the student by reading from a binder containing instructional materials approximately six feet away from the participant. When the participant complied, the

experimenter continued to ignore the participant. When the participant engaged in problem behavior, the experimenter delivered attention for 10 s in the form of a general verbal redirection (e.g., *"Don't do that, you might get hurt", "You need to be on-task", "You need to stop doing that", "That's not appropriate"*) and increased proximity to the participant. The task materials remained in front of the participant while the experimenter delivered attention. After 10 s of experimenter attention, the experimenter prompted the participant to engage in the task with the same verbal prompt.

Escape. In the escape condition, participants were required to complete a reading worksheet. The participant received access to a brief break contingent on the occurrence of problem behavior. The experimenter activated a timer for 5 min and instructed the participant to engage in the task with a verbal prompt: *"It is time for you to do this worksheet"*. When the participant complied, the experimenter delivered a general praise statement (e.g., *"Great job!"*). When the participant engaged in problem behavior, the experimenter gave the verbal statement: *"We can wait until you're ready"*, withdrew the worksheet, and turned away from the participant for 10 s. After 10 s elapsed, the experimenter re-presented the worksheet and prompted the participant to engage in the task with the same verbal prompt.

Concurrent Operants Setting and Materials

Concurrent operants analysis sessions were conducted in each participant's classroom. Leisure activities (i.e., coloring pages, markers, tic-tac-toe game) and books from the classroom library were used as materials during concurrent operants analyses.

Concurrent Operants Dependent Variable

Percentage of intervals in choice activity and percentage of intervals with off-task behavior were the dependent variable for the concurrent operants analyses. Percentage of intervals in choice activity was defined as participant vocal or gestural indication of their choice, physical location in activity after making choice, and physical location in activity after re-statement of choice options. Off-task behavior was defined differently depending on the context during the choice activity. When the participant had access to teacher and peer attention with no demands, off-task behavior was not measured. When the participant was not required to read but was required to be alone in the choice activity (i.e., alone with no demand), off-task behavior was defined as talking to teachers or peers. When the participant was required to read in the choice activity (i.e., teacher attention with demand, peer attention with demand), off-task behavior was defined as laying head on desk, coloring, staring off, looking through materials in or on desk, leaving seat, wandering around the room, talking to teacher or peers about topics unrelated to the task, and making vocalizations that were not part of the assigned task (e.g., saying “this is hard”, “I can’t read this”, “I don’t want to read”). It should be noted that off-task behavior did not occur in any concurrent operants analyses sessions and were therefore not included in the results.

Concurrent Operants Measurement

The experimenter measured percentage of intervals in choice activity and off-task behavior during each 5 min condition of the concurrent operants analysis for each participant using partial interval recording with 10 s intervals (see Appendix A).

Percentage of intervals in choice activity was calculated by tallying which of two choice activities the participant was physically located in during the 10 s interval, adding the total number of intervals in each choice activity with the total number of intervals in the 5 min condition and multiplying by 100. Percentage of occurrences off-task behavior was calculated by dividing the number of intervals in which off-task behavior was observed by the total number of intervals in the condition and multiplying by 100. A secondary observer simultaneously measured intervals in choice activity during 33% of concurrent operants analysis sessions for Micah, 57% for Gabriella, 60% for Jasmine, and 40% for Donald to calculate IOA. IOA was calculated in the same manner as in the functional analyses. IOA was 100% for all participants.

Concurrent Operants Independent Variables

The following conditions were manipulated during the concurrent operants analysis: (1) alone with demand versus free play with teacher and peer attention; (2) alone with no demand versus demand with teacher attention; (3) alone with no demand versus demand with peer attention; (4) alone with no demand versus demand with teacher and peer attention. See Tables 2-5 for an explanation of the order of conditions, concurrent choice options, inference made if chosen by participant, and hypothesized function of off-task behavior for Micah, Gabriella, Jasmine, and Donald, respectively.

Concurrent Operants Procedure

Procedures for concurrent operants analyses were based on those described by Harding et al. (1999). Four conditions were presented in a hierarchical order to hypothesize behavioral function, ultimately resulting in the identification of one function

that most likely maintained off-task behavior. Evidence to hypothesize behavioral function occurred when at least 70% of intervals in the condition were spent in one choice activity. To initiate each condition, the experimenter told the participant that he/she would be given two choices of activities and could engage in whichever activity he/she wished. The participant was also told that he/she could switch activities at any time in the 5 min session and that the experimenter would check-in every 30 s to see if he/she wanted to switch activities. When participant made a choice of activity via vocal or gestural indication of their choice, the experimenter activated a timer for 5 min. Below are descriptions of the four choice conditions:

Condition 1: Demand with no attention (D/NA) versus free play with teacher and peer attention (FP/TPA). This condition functioned as a control condition for the concurrent operants analysis. If the participant chose D/NA, he/she was directed to sit at desk alone with a task demand (e.g., reading a book, completing a worksheet). When a participant chose FP/TPA, he/she had access to playing a game with the teacher and peers. If a participant chose D/NA, the experimenter inferred that teacher and/or peer attention were not valued or aversive and/or that the demand activity was preferred. However, no participant's chose D/NA. When a participant chose FP/TPA, the experimenter inferred that either attention or escape from the demand were reinforcing.

Condition 2: Alone with no demand versus demand with teacher attention (ND vs. TA/D). In the ND choice activity, the participant was instructed to sit alone at his or her desk and did not have to do any reading. In the TA/D choice activity, the participant was instructed to read aloud from instructional-level books with assistance

and praise from his/her teacher. If a participant chose ND, the experimenter inferred that escape from a demand was more reinforcing than teacher attention. If a participant chose TA/D, the experimenter inferred that teacher attention was more reinforcing than escaping a demand.

Condition 3: ND versus demand with peer attention (ND vs. PA/D). The ND choice activity was the same as in Condition 2. In the PA/D choice activity, the participant was instructed to read aloud from instructional-level books with assistance and attention from his/her choice of peer. If a participant chose ND, the experimenter inferred that escape from a demand was more reinforcing than peer attention. If a participant chose PA/D, the experimenter inferred that peer attention was more reinforcing than escaping a demand.

Condition 4: TA/D versus PA/D. This condition was only run for participants who allocated choice activities to TA/D in Condition 2 and PA/D in Condition 3 (Micah and Gabriella). The TA/D choice activity was the same as in Condition 2. The PA/D choice activity was the same as in Condition 3. If a participant chose TA/D, the experimenter inferred that teacher attention was more reinforcing than peer attention. If a participant chose PA/D, the experimenter inferred that peer attention was more reinforcing than teacher attention.

Phase 2: Performance Versus Skill Deficit Assessment

The purpose of Phase 2 was to generate a hypothesis for why the participant was experiencing reading difficulties. When reading difficulty was markedly improved by an incentive, reading difficulty was assumed to be a function of a performance deficit.

Alternatively, if insignificant improvement was observed when an incentive was offered, reading difficulty was assumed to be a function of a skill deficit. The hypothesis for reading difficulties determined in this phase permitted a subsequent analysis of the relative effects of antecedent interventions matched and mismatched to hypothesis for reading difficulties on the off-task behavior and reading accuracy for students who have problem behavior maintained by attention versus escape and exhibit reading difficulties in the classroom.

Setting and Materials

Performance versus skill deficit assessments were conducted at a table in a classroom or hallway within the participants' school. Reading probes and incentive materials were used as materials during this assessment. Reading probes were taken from the Formative Assessment System for Teachers (FAST; Christ et al., 2014) set of assessment tools. The level of reading probes was determined during a consultation with each participant's classroom teacher where the experimenter and the teacher discussed the participants' current reading level. Information from reading assessments (i.e., F & P, CBM; see Table 1), instruction the participant currently engaged in during guided reading with the classroom teacher, and levels currently assigned during independent reading were used to place students in FAST reading passages for the performance versus skill deficit assessment. All participants were placed in Decodable Words and Sight Words 50 (Christ et al., 2014) probes during this assessment. Decodable Words probes contained decodable CVC words and Sight Words probes contained sight words contained in Dolch pre-primer and primer lists (Christ et al.). Incentive materials were also used as materials

during this assessment and included tangible rewards (e.g., stickers, markers and coloring book, pencils, small toy insects, dinosaurs, miniature cars, silly putty) and activity rewards (e.g., access to computer game, basketball in gym, playing a game with the experimenter, sending a positive note home to parent/guardian).

Measurement and IOA

Reading accuracy was measured in this assessment. Reading accuracy was defined as the percentage of words read correctly per minute. While each participant read, the experimenter scored the number of words read correctly and incorrectly on a duplicate probe. Reading accuracy was calculated by dividing the number of words read correctly by the total number of words attempted and multiplying by 100. A secondary observer simultaneously measured reading accuracy during 50% of sessions for each participant to calculate IOA. IOA was calculated in the same manner as in Phase 1. IOA was 100% for all participants.

Assessment Conditions and Procedural Fidelity

The performance versus skill deficit assessment had two conditions: (1) no consequence and (2) incentive. Based on results of these conditions, the experimenter generated a hypothesis for reading difficulties. Procedural fidelity was assessed using the Performance Versus Skill Deficit Assessment Procedural Fidelity Checklist (see Appendix C). A secondary observer rated the presence or absence of each item on the Performance Versus Skill Procedural Fidelity Checklist during 50% of sessions for each participant. Procedural fidelity was assessed and calculated in the same manner as in Phase 1. Procedural fidelity was 100% for all participants.

Procedure

Procedures for administering the performance versus skill deficit assessment were similar to the procedure developed by VanDerHeyden and Witt (2008) and are described below:

No consequence. The participant was seated across a desk or table from the experimenter and was asked to read from three passages for 1 min each. The experimenter administered standardized directions and activated a timer for 1 min. Reading accuracy was calculated for each passage and the median score was used to determine percentage of known words. No consequences were delivered for reading performance.

Incentive. Between one and four days later, the participant returned to the same testing area and was asked to read the same set of reading passages again for 1 min each. During this session, the experimenter placed a bin of incentive materials next to the reading probes and asked the participant to pick an incentive that he/she would like to earn. The experimenter then told the participant that he/she would earn the incentive if he/she beat his/her score from the previous day. If no incentive materials looked appealing to the participant, the experimenter also offered choices for activity rewards (e.g., access to computer game, basketball in gym, playing a game with the experimenter, sending a positive note home to parent/guardian). This session tested whether a reward in the form of social interaction, a work break, and access to tangible items or a preferred activity resulted in an increase in reading accuracy. In particular, the experimenter provided all of the following: (1) undivided one-on one-attention during the assessment;

(2) built-in escape by telling participant that this was the only task he/she had to do with the experimenter that day; and (3) an incentive in the form of a tangible item or preferred activity if he/she beat the score he/she received on the previous day. The experimenter administered standardized directions and activated a timer for 1 min. Reading accuracy was calculated for each 1 min probe and the median score was used to determine percentage of known words. If this score was higher than the median score calculated during the previous no consequence condition, the participant received the incentive. If this score was not higher than the median score calculated during the previous no consequence condition, the experimenter praised the participant for his/her effort.

The experimenter used the results from the assessment conditions to generate a hypothesis for reading difficulties. Protocol for hypothesizing whether participant's exhibited a performance or skill deficit were based on decision rules developed by VanDerHeyden and Witt (2008) and Gickling and Armstrong's (1978) definitions of frustrational, instructional, and independent levels of reading accuracy. If the participant went from reading at the frustrational level (i.e., below 93% accuracy) in the no consequence condition to reading at the instructional level or above (i.e., 93% accuracy and above) in the incentive condition or attained an increase in reading accuracy of 15% or higher, he/she was hypothesized to be exhibiting a performance deficit. This hypothesis would have been generated because in the presence of the incentives, the participant was able to perform a reading task he/she typically performs in the classroom with a higher degree of accuracy. It should be noted that this did not occur with any

participant. If the participant stayed at the frustrational level from the no consequence to the incentive conditions or had an increase in reading accuracy below 15%, he/she was hypothesized to be exhibiting a skill deficit. This hypothesis was generated because even in the presence of the incentives, the participant was unable to perform the reading task with a higher degree of accuracy.

Phase 3: Intervention Analysis

The purpose of Phase 3 was to answer the general research question: What are the relative effects of antecedent interventions matched and mismatched to hypothesis for reading difficulties on the off-task behavior and reading accuracy for students who have problem behavior maintained by attention versus escape and exhibit reading difficulties in the classroom? Results from Phase 1 and Phase 2 of this study identified participants with two patterns of responding (see Figure 1):

1. Participants who exhibited *attention-maintained* problem behavior during reading and reading difficulties hypothesized to be related to a *skill problem*
2. Participants who exhibited *escape-maintained* problem behavior during reading and reading difficulties hypothesized to be related to a *skill problem*

Intervention Analysis for Attention-Maintained Problem Behavior and a Skill Problem Hypothesis

The following specific research question was asked for participants with this pattern of responding: For participants who exhibit attention-maintained problem behavior during reading and reading difficulties hypothesized to be related to a skill problem, which intervention is more effective: (a) antecedent attention or (b) an

instructional strategy? I hypothesized that participants with this pattern of responding would display low occurrences of off-task behavior in both instructional strategy and antecedent attention sessions because the operant function of problem behavior was addressed in both conditions. However, I hypothesized that these participants would display higher levels of reading accuracy in instructional strategy sessions relative to antecedent attention sessions because a skill deficit hypothesis for reading difficulties was only addressed in the instructional strategy condition.

Setting and materials. Antecedent attention and instructional strategy sessions were conducted outside of the participants' classroom. The experimenter and the participant worked alone in a hallway or empty classroom during all antecedent attention and instructional strategy sessions. Reading observation sessions were conducted in the participants' classroom. During reading observation sessions, there were approximately 20 students and two adults (not counting the experimenter and secondary observers) in the classroom. The classroom teacher and a collaborative teacher or classroom aid were delivering small group reading instruction to groups of two to five students while all other students were instructed to sit at their desk and read independently. Leisure activities preferred to the participant were used as materials during antecedent attention sessions (i.e., access to computer game, coloring book/pages with markers and colored pencils, card games). Reading A-Z © books (RAZ), magnetic letters, a whiteboard, and sight word flashcards were used as materials during instructional strategy sessions. RAZ books were used as materials during reading observation sessions in both antecedent attention and instructional strategy conditions.

Dependent variables, measurement, and IOA. The percentage of intervals with problem behavior and reading accuracy during independent reading sessions immediately following antecedent attention and instructional strategy sessions were the dependent variables for this analysis. Problem behavior was operationally defined and measured for each participant in the same manner as in Phase 1. A secondary observer simultaneously measured percentage of intervals with off-task behavior during 25% of intervention analysis sessions for Kobe, 33.3% for Micah, 25% for Gabriella, 33.3% for Trenton, 25% for Jasmine, and 28.6% for Donald to calculate IOA. IOA for problem behavior was calculated in the same manner as in Phase 1. IOA for problem behavior ranged from 94 to 98% (*M* = 96%) for Kobe, from 87 to 100% (*M* = 93.4%) for Micah, from 96 to 100% (*M* = 98.7%) for Gabriella, from 79 to 97% (*M* = 90.5%) for Trenton, from 88 to 100% (*M* = 95.3%) for Jasmine, and from 83 to 92% (*M* = 89.3%) for Donald.

Reading accuracy was defined in the same manner as in Phase 2. While each participant read from his/her RAZ books during the reading observation sessions, the experimenter measured words read correctly and words read incorrectly on reading probes that duplicated the text in the RAZ books. Reading accuracy was calculated in the same manner as in Phase 2. A secondary observer simultaneously measured reading accuracy during 25% of intervention analysis sessions for Kobe, 33.3% for Micah, 25% for Gabriella, 33.3% for Trenton, 25% for Jasmine, and 28.6% for Donald to calculate IOA. IOA for reading accuracy was calculated in the same manner as in Phase 2. IOA for reading accuracy was 100% for Kobe, ranged from 95 to 100% (*M* = 98.8%) for Micah,

from 95 to 99% (*M* = 97.7%) for Gabriella, from 95 to 100% (*M* = 98.8%) for Trenton, from 89 to 96% (*M* = 92.7%) for Jasmine, and from 94 to 99% (*M* = 96.5%) for Donald.

Independent variables and procedural fidelity. Antecedent attention and an instructional strategy were the two independent variables for this analysis. For antecedent attention conditions, procedural fidelity was assessed using the Antecedent Attention Condition Procedural Fidelity Checklist (see Appendix D). For instructional strategy conditions, procedural fidelity was assessed using the Instructional Strategy Condition Procedural Fidelity Checklist (see Appendix E) and procedural fidelity checklists for all instructional strategies used during that session (see Appendix F for the Incremental Rehearsal Procedural Fidelity Checklist, Appendix G for the Sound Boxes Procedural Fidelity Checklist, and Appendix H for the Listen Sentence Preview Procedural Fidelity Checklist). Procedural fidelity was assessed and calculated in the same manner as in Phase 1. A secondary observer rated the presence or absence of each item on the checklists during 25% of intervention analysis sessions for Kobe, 33.3% for Micah, 25% for Gabriella, 33.3% for Trenton, 25% for Jasmine, and 28.6% for Donald. Procedural fidelity was assessed and calculated in the same manner as in Phase 1. Procedural fidelity was 100% for Kobe, ranged from 95 to 100% (*M* = 98.8%) for Micah, was 100% for Gabriella, ranged from 95 to 100% (*M* = 98.8%) for Trenton, and was 100% for Jasmine and Donald.

Experimental design. A multielement design was used to test the effects of antecedent attention and instructional strategy conditions on occurrences of problem behavior and reading accuracy during immediately subsequent independent reading

sessions for each participant. Sessions were presented in a counterbalanced order with 4-7 sessions of each condition.

Procedure. Immediately following both antecedent attention and instructional strategy conditions, the participant returned to the classroom where other students were engaged in independent reading. The experimenter directed the participant to begin independent reading and then she collected direct observation data for 10 min on problem behavior and reading accuracy. The participant and the experimenter entered the classroom and the experimenter instructed the participant to sit at his or her desk and read from three pre-determined RAZ books at their instructional level with the verbal prompt: *"Now it's time to do independent reading in your classroom. Take these books to your seat and read them 5 times each"*. The experimenter did not interact with the participant during reading observation sessions, but was in close proximity to him/her in order to measure occurrences of problem behavior and reading accuracy. If the participant sought help from the experimenter or initiated a social interaction, the experimenter delivered the verbal prompt: *"I cannot help you right now, I am doing some other work. Do your best."* The experimenter walked around the room and pretended to listen to other students read while measuring occurrences of problem behavior and reading accuracy for the participant.

Antecedent attention. The participant engaged in 10 min of continuous social interaction with the experimenter outside of the classroom. The participant chose the social interaction that he/she wanted to engage in with experimenter for that session (i.e., playing a computer game, coloring, playing a card game). Immediately following 10 min

of continuous social interaction, the participant engaged in a 10 min reading observation session in the classroom.

Instructional strategy. The participant was taught instructional strategies to use with the RAZ books assigned for the subsequent reading observation session. The specific instructional strategies taught varied depending on the participant's level of engagement with an instructional strategy (e.g., instructional strategy was discontinued if participant was off-task or refused to engage during sessions), known and unknown words in the assigned RAZ books, and fluency with sounding out words (see Table 6 for a rationale of the specific instructional strategies used for each participant). Following the 10 min instructional strategy session, the experimenter and participant immediately entered the classroom and engage in a reading observation session. Instructional strategy sessions included combinations of the following strategies: Incremental Rehearsal, Sound Boxes, and Listen Sentence Preview.

Incremental rehearsal (IR). IR is a drill and practice strategy that teaches unknown concepts by interspersing unknowns among known concepts at a ratio of 90% known concepts to 10% unknown concepts. This method allows for errorless teaching, many opportunities to respond, and repeated practice. See Appendix F for a detailed explanation of steps in the IR procedure and checklist for procedural fidelity.

Sound boxes (SB). SB is a strategy that practices blending letter sounds to make words by modeling how to sound out words and physically placing letter sounds into boxes to blend CVC words, providing guided practice, giving immediate feedback and

error correction, and allowing repeated practice. See Appendix G for a detailed explanation of steps in the SB procedure and checklist for procedural fidelity.

Listen sentence preview (LSP). LSP is a strategy that provides ample modeling, repeated practice, and immediate corrective feedback for sentence reading. The student reads a sentence with interventionist providing immediate error correction. Then, the interventionist models reading with fluency and expression while the student tracks. After that, the student and interventionist read the passage together. Last, student reads the passage independently. See Appendix H for a detailed explanation of steps in the LSP procedure and checklist for procedural fidelity.

Intervention Analysis for Escape-Maintained Problem Behavior and a Skill Problem Hypothesis

The following specific research question was asked for participants with this pattern of responding: For participants who exhibit escape-maintained problem behavior during reading and reading difficulties hypothesized to be related to a skill problem, which intervention is more effective: (a) antecedent attention or (b) an instructional strategy? The methodology was identical to the methodology used for participants who exhibited attention-maintained problem behavior. Differences occurred in the hypotheses made for participants with this pattern of responding. I hypothesized that participants with this pattern of responding would display lower occurrences of off-task behavior in instructional strategy sessions and higher occurrences of problem behavior in antecedent attention sessions because the operant function of problem behavior was only addressed in the instructional strategy condition. I also hypothesized that these participants would

display higher levels of reading accuracy in instructional strategy sessions relative to antecedent attention sessions because a skill deficit hypothesis for reading difficulties was only addressed in the instructional strategy condition.

Data Analysis

Data were plotted for each analysis in each phase of the study and visually analyzed for changes in level, trend, and variability. Changes in level refer to a discontinuity between the end of one condition and the beginning of the following condition. Changes in trend show systematic increases or decreases over time (Kazdin, 1982). Changes in variability show the amount of or lack of stability within and between conditions (Parsonson & Baer, 1992). In addition to visual analysis, percent of all nonoverlapping data (PAND; Parker, Hagan-Burke, & Vannest, 2007) was calculated for the intervention analysis phase. PAND represents the total number of data points that do not overlap between conditions. PAND was calculated for each analysis by: (1) identifying all overlapping data points, (2) calculating the percentage of overlapping data points by dividing the number of overlapping data points by the total number of data points, and (3) subtracting that percentage by 100.

CHAPTER IV

RESULTS

Experimental Analysis and Performance Versus Skill Deficit Assessment

An experimental analysis and performance versus skill deficit assessment was done with each participant to determine the most likely function of problem behavior and reading difficulties. First, an experimental analysis was implemented to determine whether participants engaged in problem behavior during reading primarily because of the influence of attention (i.e., attention-maintained problem behavior) or primarily because of the influence of escape (i.e., escape-maintained problem behavior). Then, a performance versus skill deficit assessment was given to determine why the participant was experiencing reading difficulties. If reading difficulty was markedly improved by an incentive, reading difficulty would be hypothesized to be a function of a performance deficit. Conversely, if insignificant improvement was observed when an incentive was offered, reading difficulty was hypothesized to be a function of a skill deficit.

Kobe

Figure 2 (top panel) shows the results of the functional analysis for Kobe. Visual inspection shows that attention produced the highest percentage of intervals of problem behavior relative to escape and control conditions. In particular, sessions testing the attention condition revealed a higher level, no trend, and little variability relative to escape and control conditions (PAND = 100%). Problem behavior ranged from 47 to 53% of intervals across attention sessions (M = 50.0%), 0 to 23% of intervals across escape conditions (M = 15.7%), and was consistently at 0% of intervals across control

conditions. These results showed that problem behavior is most likely maintained by attention for Kobe.

Figure 2 (bottom panel) depicts the results of the performance versus skill deficit assessment for Kobe. In the baseline condition, Kobe read with a median reading accuracy of 13% known words. In the read with incentive condition, Kobe read with a median reading accuracy of 24% known words. Because the observed improvement in reading accuracy was less than 15% when an incentive was offered and he was reading below instructional level of 93-97% accuracy (Gickling & Armstrong, 1978), reading difficulty was assumed to be a function of a skill deficit.

Micah

Figure 3 (top panel) shows the results of the concurrent operants analysis for Micah. Time allocation toward escape ranged from 0 to 23% of intervals across ND sessions (*M* = 7.7%). Time allocation toward peer attention ranged from 0 to 100% of intervals across PA/D sessions (*M* = 50%). Time allocation toward teacher attention ranged from 77 to 100% of intervals across TA/D sessions (*M* = 92.3%). In particular, given concurrent choice options of peer attention and teacher attention, Micah consistently allocated his time to choice conditions that included teacher attention, even when these conditions involved a reading task demand. These results showed that teacher attention is the most preferred reinforcer for Micah.

Figure 3 (bottom panel) depicts the results of the performance versus skill deficit assessment for Micah. In the baseline condition, Micah read with a median reading accuracy of 59% known words. In the read with incentive condition, Micah read with a

median reading accuracy of 62% known words. Because the observed improvement in reading accuracy was less than 15% when an incentive was offered and he was reading below instructional level of 93-97% accuracy (Gickling & Armstrong, 1978), reading difficulty was assumed to be a function of a skill deficit.

Gabriella

Figure 4 (top panel) shows the results of the concurrent operants analysis for Gabriella. Time allocation toward escape ranged from 0 to 100% of intervals across ND sessions (*M* = 33.4%). Time allocation toward peer attention ranged from 0 to 33% of intervals across PA/D sessions (*M* = 16.5%). Time allocation toward teacher attention was 100% of intervals across all TA/D sessions. Given concurrent choice options of no demand (escape) and peer attention, Gabriella consistently allocated her time to choice conditions that included escape. However, given concurrent choice options of escape and teacher attention, Gabriella consistently allocated her time to choice conditions that included teacher attention. These results suggested that escape from reading demands was more reinforcing than reading when peer attention was available, but reading when teacher attention was available was more reinforcing than escape from reading demands. Overall, teacher attention appeared to be the most preferred reinforcer for Gabriella.

Figure 4 (bottom panel) depicts the results of the performance versus skill deficit assessment for Gabriella. In the baseline condition, Gabriella read with a median reading accuracy of 85% known words. In the read with incentive condition, Gabriella read with a median reading accuracy of 88% known words. Because the observed improvement in reading accuracy was less than 15% when an incentive was offered and she was reading

below instructional level of 93-97% accuracy (Gickling & Armstrong, 1978), reading difficulty was assumed to be a function of a skill deficit.

Trenton

Figure 5 (top panel) shows the results of the functional analysis for Trenton. Visual inspection shows that escape produced the highest percentage of intervals of problem behavior relative to attention and control conditions. Overall, PAND was 0% due to low levels of problem behavior in the first three sessions, regardless of condition. However, after session four, PAND was 87.5%, with the highest levels of problem behavior occurring primarily in escape conditions. Overall, problem behavior ranged from 7 to 60% of intervals across attention sessions (M = 25.6%), 3 to 80% of intervals across escape sessions (M = 28.3%), and was consistently at 0% across control sessions. However, after session four, problem behavior ranged from 7 to 60% of intervals across attention sessions (M = 24.6%) and 20 to 80% of intervals across escape conditions (M = 36.8%). There was an increasing trend in problem behavior at sessions four through seven, regardless of condition (with exception of the control condition, which remained at zero across all sessions). However, after session nine, the data stabilized, with escape conditions producing higher levels of problem behavior relative to attention conditions. These results suggested that problem behavior was most likely maintained by escape for Trenton.

Figure 5 (bottom panel) depicts the results of the performance versus skill deficit assessment for Trenton. In the baseline condition, Trenton read with a median reading accuracy of 60% known words. In the read with incentive condition, Trenton read with a

median reading accuracy of 67% known words. Because the observed improvement in reading accuracy was less than 15% when an incentive was offered and he was reading below instructional level of 93-97% accuracy (Gickling & Armstrong, 1978), reading difficulty was assumed to be a function of a skill deficit.

Jasmine

Figure 6 (top panel) shows the results of the concurrent operants analysis for Jasmine. Time allocation toward escape was 100% of intervals across all ND sessions. Time allocation toward peer attention was 0% of intervals across all PA/D sessions. Time allocation toward teacher attention was 0% of intervals across all TA/D sessions. In particular, given concurrent choice options of either peer or teacher attention and escape from reading demands, Jasmine consistently allocated her time to choice conditions that included escape. These results showed that escape is the most preferred reinforcer for Jasmine.

Figure 6 (bottom panel) depicts the results of the performance versus skill deficit assessment for Jasmine. In the baseline condition, Jasmine read with a median reading accuracy of 19% known words. In the read with incentive condition, Jasmine read with a median reading accuracy of 20% known words. Because the observed improvement in reading accuracy was less than 15% when an incentive was offered and she was reading below instructional level of 93-97% accuracy (Gickling & Armstrong, 1978), reading difficulty was assumed to be a function of a skill deficit.

Donald

Figure 7 (top panel) shows the results of the concurrent operants analysis for Donald. Time allocation toward escape was 100% of intervals across all ND sessions. Time allocation toward peer attention was 0% of intervals across all PA/D sessions. Time allocation toward teacher attention was 0% of intervals across all TA/D sessions. In particular, given concurrent choice options of either peer or teacher attention and escape from reading demands, Donald consistently allocated his time to choice conditions that included escape. These results showed that escape is the most preferred reinforcer for Donald.

Figure 7 (bottom panel) depicts the results of the performance versus skill deficit assessment for Donald. In the baseline condition, Donald read with a median reading accuracy of 61.5% known words. In the read with incentive condition, Donald read with a median reading accuracy of 50% known words. Because the observed change in reading accuracy was a decline when an incentive was offered, reading difficulty was assumed to be a function of a skill deficit.

Summary

Results from experimental analyses showed that attention was the most preferred reinforcer or the reinforcer that most likely maintains problem behavior for three participants: Kobe, Micah, and Gabriella. Conversely, escape was the most preferred reinforcer or the reinforcer that most likely maintains problem behavior for three participants: Trenton, Jasmine, and Donald. Reading difficulty was assumed to be a function of a skill deficit for all six participants because insignificant improvement in

reading accuracy was observed when an incentive was offered during performance versus skill deficit assessments.

Intervention Analysis

Instructional strategy and antecedent attention sessions were counterbalanced in the intervention analysis phase in order to test the relative effects of antecedent interventions matched and mismatched to hypothesis for reading difficulties on the off-task behavior and reading accuracy for students who have problem behavior maintained by attention versus escape and exhibit reading difficulties in the classroom. However, because all six participants were identified as exhibiting a skill deficit in the performance versus skill deficit assessment, the use of an instructional strategy never represented an intervention that was mismatched to hypothesis for reading difficulties.

For the participants with whom attention was identified as the function that most likely maintains problem behavior (i.e., Kobe) or the most preferred reinforcer (i.e., Micah and Gabriella), antecedent attention was the intervention matched to behavioral function. Instructional strategy was the intervention matched to hypothesis for reading difficulties and the participant received one-on-one experimenter attention during the instructional strategy condition. Therefore, analyses for participants with this pattern of responding were exploratory in nature in order to test which intervention, if either, led to reductions in problem behavior and which intervention, if either, led to increases in reading accuracy.

For the participants with whom escape was identified as the function that most likely maintains problem behavior (i.e., Trenton) or the most preferred reinforcer (i.e.,

Jasmine and Donald), the use of an instructional strategy was the intervention matched to the function of problem behavior and hypothesis for reading difficulties and antecedent attention was the intervention that was truly mismatched to the function of problem behavior and hypothesis for reading difficulties.

Intervention Analysis Results for Attention-Maintained Problem Behavior and a Skill Problem Hypothesis

Kobe. Results of the effects of antecedent attention and instructional strategy interventions on off-task behavior are shown in Figure 8 (top panel). Visual inspection of off-task behavior reveals a primarily undifferentiated pattern of responding (PAND = 0%). Overall, the antecedent attention condition shows an increasing trend in off-task behavior across sessions, while the instructional strategy condition shows a high, stable rate of off-task behavior across sessions, leading to a marked overlap in data. In addition, off-task behavior remained high regardless of condition, ranging from 60 to 100% of intervals across all sessions (M = 85.1%).

Results of the effects of antecedent attention and instructional strategy interventions on reading accuracy are shown in Figure 8 (bottom panel). Visual analysis of the data show that instructional strategy conditions produced higher rates of reading accuracy relative to antecedent attention conditions (PAND = 87.5%). Reading accuracy ranged from 0 to 75% (M = 48.8%) in instructional strategy sessions and was consistently at zero for antecedent attention sessions. It should be noted that reading accuracy was zero in all antecedent attention sessions because Kobe refused to read during all antecedent attention sessions.

Micah. Results of the effects of antecedent attention and instructional strategy interventions on off-task behavior are shown in Figure 9 (top panel). Examination of Micah's off-task behavior reveals an undifferentiated pattern of responding across conditions (PAND = 8.3%). Visual inspection of the data show a low, stable rate of off-task behavior in sessions one through six, regardless of condition, followed by an increasing trend in off-task behavior in sessions seven through 12, regardless of condition. Overall, off-task behavior ranged from 18 to 100% of intervals (*M* = 50.3%) across all sessions.

Results of the effects of antecedent attention and instructional strategy interventions on reading accuracy are shown in Figure 9 (bottom panel). Instructional strategy sessions produced visibly higher rates of reading accuracy relative to antecedent attention sessions (PAND = 100%). Visual inspection of the data reveals a high, stable trend of reading accuracy across all instructional strategy sessions, ranging from 86 to 100% (*M* = 94.2%). In contrast, data show a lower, relatively stable pattern (with the exception of session 10, when Micah refused to read) of reading accuracy across all antecedent attention sessions, ranging from 0 to 85% (*M* = 63.3%).

Gabriella. Results of the effects of antecedent attention and instructional strategy interventions on off-task behavior are shown in Figure 10 (top panel). The instructional strategy condition appears to have produced somewhat lower levels of off-task behavior across sessions relative to antecedent attention conditions (PAND = 33.3%). Visual inspection of off-task behavior reveals a primarily undifferentiated pattern of responding in sessions one through six. However, in sessions seven through 12, clear differentiation

between instructional strategy sessions and antecedent attention sessions became apparent, with lower rates of off-task behavior in instructional strategy sessions relative to antecedent attention sessions. Overall, off-task behavior ranged from zero to 10% of intervals (*M* = 4.8%) for instructional strategy sessions and from zero to 35% of intervals (*M* = 17.8%) for antecedent attention sessions.

Results of the effects of antecedent attention and instructional strategy interventions on reading accuracy are shown in Figure 10 (bottom panel). As with off-task behavior data, visual inspection of reading accuracy data reveals a primarily undifferentiated pattern of responding in sessions one through six. However, in sessions seven through 12, differentiation between instructional strategy sessions and antecedent attention sessions became discernible in the direction hypothesized, with higher rates of reading accuracy in instructional strategy sessions relative to antecedent attention sessions (PAND = 33.3%). Overall, reading accuracy ranged from 85 to 99% (*M* = 94.2%) for instructional strategy sessions and from 73 to 95% (*M* = 85.8%) for antecedent attention sessions.

Summary. Overall, little differentiation in off-task behavior was achieved between instructional strategy and antecedent attention conditions for Kobe and Micah. These results somewhat align with the research question, given that attention was available in both instructional strategy and antecedent attention conditions and attention was hypothesized to most likely maintain problem behavior for Kobe and to be the most preferred reinforcer for Micah. However, it was hypothesized that participants would have low levels of off-task behavior in both conditions and Kobe and Micah's results

reveal high levels of off-task behavior in both conditions. Some differentiation between conditions was achieved in the latter half of the intervention analysis for Gabriella. It should be noted that Gabriella had considerably lower levels of off-task behavior relative to Kobe and Micah across all sessions. It seemed that after session seven, when Gabriella participated in antecedent attention sessions (and as such, was not pre-taught words) she was more likely to engage in off-task behaviors in the subsequent reading observation session. Reading accuracy data followed the same trend, with no differentiation (i.e., high stable rates of accuracy in all sessions, regardless of condition) in the first half of sessions, followed by higher levels of accuracy in instructional strategy sessions after session seven. However, for Kobe and Micah, results show nearly 100% differentiation in reading accuracy data between conditions in the direction hypothesized, with higher reading accuracy in instructional strategy sessions, when participants were pre-taught words with the experimenter before reading independently in the classroom.

Intervention Analysis Results for Escape-Maintained Problem Behavior and a Skill Problem Hypothesis

Trenton. Results of the effects of antecedent attention and instructional strategy interventions on off-task behavior are shown in Figure 11 (top panel). Examination of Trenton's off-task behavior reveals an undifferentiated pattern of responding across conditions (PAND = 16.7%). Visual inspection of the data shows variable rates of off-task behavior across all sessions, regardless of condition. Overall, off-task behavior ranged from 20 to 100% of intervals (M = 62.5%) across all sessions.

Results of the effects of antecedent attention and instructional strategy interventions on reading accuracy are shown in Figure 11 (bottom panel). Visual inspection of reading accuracy data reveals an undifferentiated, variable pattern of responding in sessions one through five. However in sessions six through 12, clear differentiation between instructional strategy sessions and antecedent attention sessions became apparent with high, stable rates of reading accuracy in instructional strategy sessions and lower, variable rates of reading accuracy in antecedent attention conditions. Visual analysis results are supported by summary statistics, revealing that reading accuracy ranged from zero to 100% (*M* = 74.0%) in instructional strategy sessions and from zero to 82% (*M* = 48.8%) in antecedent attention sessions (PAND = 25%).

Jasmine. Results of the effects of antecedent attention and instructional strategy interventions on off-task behavior are shown in Figure 12 (top panel). Examination of Jasmine's off-task behavior reveals a primarily undifferentiated pattern of responding across conditions (PAND = 0%). Visual inspection of the data shows a low, stable rate of off-task behavior in sessions one through six, regardless of condition. There was a marked increase in off-task behavior in session seven, an instructional strategy session. However, in sessions eight through 12, data suggest some differentiation in the direction hypothesized, with substantially lower rates of off-task behavior in instructional strategy sessions relative to antecedent attention sessions. Overall, percentage of intervals with off-task behavior ranged from 2 to 54% (*M* = 18%) for instructional strategy sessions and from zero to 77% (*M* = 29.2%) for antecedent attention sessions.

Results of the effects of antecedent attention and instructional strategy interventions on reading accuracy are shown in Figure 12 (bottom panel). Similar to off-task behavior data, visual inspection of reading accuracy data reveals a primarily undifferentiated pattern of responding in sessions one through six. Data show an increasing trend in reading accuracy in sessions one through four followed by a high stable trend in reading accuracy in sessions five through seven, regardless of condition. However, in sessions eight through 12, differentiation between instructional strategy sessions and antecedent attention sessions became discernible in the direction hypothesized, with higher rates of reading accuracy in instructional strategy sessions relative to antecedent attention sessions. In particular, while reading accuracy remained high and stable during instructional strategy sessions, reading accuracy dropped and remained lower in antecedent attention sessions. Overall, reading accuracy ranged from 70 to 97% (*M* = 87.0%) in instructional strategy sessions and from 56 to 92% (*M* = 78.7%) in antecedent attention sessions (PAND = 16.7%).

Donald. Results of the effects of antecedent attention and instructional strategy interventions on off-task behavior are shown in Figure 13 (top panel). Instructional strategy condition appears to have produced lower levels of off-task behavior relative to antecedent attention conditions (PAND = 16.7%). Visual inspection of off-task behavior data reveals an undifferentiated pattern of responding in sessions one through seven. However, in sessions eight through 14, clear differentiation between instructional strategy sessions and antecedent attention sessions became apparent in the direction hypothesized, with lower rates of off-task behavior in instructional strategy sessions relative to

antecedent attention sessions. Overall, off-task behavior ranged from 9 to 52% of intervals (*M* = 23.1%) in instructional strategy sessions and from 12 to 55% of intervals (*M* = 38.4%) in antecedent attention sessions.

Results of the effects of antecedent attention and instructional strategy interventions on reading accuracy are shown in Figure 13 (bottom panel). As with off-task behavior data, visual inspection of reading accuracy data reveals a primarily undifferentiated pattern of responding in sessions one through seven. However, in sessions eight through 14, differentiation between instructional strategy sessions and antecedent attention sessions became discernible in the direction hypothesized, with higher rates of reading accuracy in instructional strategy sessions relative to antecedent attention sessions. Overall, reading accuracy ranged from 53 to 100% (*M* = 90.6%) in instructional strategy sessions and from 60 to 93% (*M* = 83.7%) in antecedent attention sessions (PAND = 0%).

Summary. Overall, there were no immediate effects in responding for off-task behavior or reading accuracy between instructional strategy and antecedent attention conditions for this group of participants. In terms of off-task behavior, no differentiation was achieved between instructional strategy and antecedent attention conditions for Trenton while nearly 100% differentiation was achieved in the latter half of the intervention analysis for Jasmine and Donald. With respect to accuracy, some differentiation was achieved between instructional strategy and antecedent attention conditions in the latter half of intervention analyses for all three participants in the direction hypothesized, with substantially higher rates of reading accuracy following

instructional strategy conditions relative to antecedent attention conditions. Although delayed, these results somewhat align with the research question, given that the intervention matched to function of problem behavior and hypothesis for reading difficulties (i.e., the use of an instructional strategy) resulted in overall lower rates of off-task behavior and overall higher rates of reading accuracy relative to antecedent attention, the intervention mismatched to function of problem behavior and hypothesis for reading difficulties.

CHAPTER V

DISCUSSION

The purpose of this project was to test the efficacy of a practical model (see Figure 1) to assist researchers and practitioners in assessment and intervention decision-making for students with co-occurring behavior problems and reading difficulties. In particular, this project explored the relative effects of antecedent interventions matched and mismatched to hypothesis for reading difficulties on the off-task behavior and reading accuracy for participants who have problem behavior maintained by attention versus escape and exhibit reading difficulties in the classroom. First, each subject participated in a brief functional analysis or concurrent operants analysis to hypothesize the most likely function of problem behavior. To hypothesize the most likely reason that each participant experienced reading difficulties, I administered a performance versus skill deficit assessment. After that, randomly alternating sessions of antecedent attention and instructional strategy conditions, each immediately followed by a 10 min independent reading session in the classroom were implemented in a multielement design. Overall, the results of these analyses suggest idiosyncratic patterns of results for each participant, with response covariation (i.e., low levels of off-task behavior concurrent with high levels of reading accuracy) occurring over time for at least two of six participants (i.e., Gabriella and Donald). Results from phases 1 and 2 identified participants with two patterns of responding, for which I examined two specific research questions. Below, I discuss the results for all participants in terms of the specific research questions.

Research Question 1: For participants who exhibited attention-maintained problem behavior during reading and reading difficulties hypothesized to be related to a skill problem, which intervention is more effective: (a) antecedent attention or (b) instructional strategy?

Results from phases 1 and 2 identified three participants with this pattern of responding: Kobe, Micah, and Gabriella. I hypothesized that these participants would display low occurrences of off-task behavior in both instructional strategy and antecedent attention conditions because the operant function of problem behavior was addressed in both conditions. Results from the intervention analysis produced largely undifferentiated results in terms of off-task behavior for at least two of these three participants (i.e., Kobe and Micah). Moreover, for these two participants, off-task behavior was elevated in both conditions. Results from Kobe and Micah show high and variable rates of off-task behavior throughout the intervention analysis, regardless of condition.

Conversely, Gabriella's results from the intervention analysis show low, stable rates of off-task behavior in sessions one through six, aligning with the hypothesis. Some differentiation occurred in the latter half of the intervention analysis; with instructional strategy sessions producing considerably lower levels of off-task behavior relative to antecedent attention sessions. This pattern of results for Gabriella seems to indicate that the use of an instructional strategy, which addressed both her hypothesized operant function for problem behavior (i.e., attention-maintained) and her hypothesis for reading difficulties (i.e., a skill deficit) was the intervention most likely to produce the lowest levels of off-task behavior during independent reading in the classroom. It seemed that

after session seven, when Gabriella participated in an instructional strategy session with the experimenter and was pretaught words she subsequently read during independent reading, she was more engaged in reading. As such, an instructional intervention had collateral effects on her behavior in the classroom. This makes sense, as the instructional strategy session addressed both her maintaining reinforcer for problem behavior (i.e., attention) and her hypothesis for reading difficulties (i.e., skill deficit). On the other hand, antecedent attention sessions only addressed her maintaining reinforcer for problem behavior. After session seven, when she received undivided one-on-one attention from the experimenter prior to reading independently in the classroom, she still engaged in higher levels of off-task behavior in the classroom. These results may provide evidence that an instructional intervention may produce response covariation over time.

In terms of reading accuracy, I hypothesized that these participants would display higher levels of reading accuracy in instructional strategy sessions relative to antecedent attention sessions because a skill deficit hypothesis for reading difficulties was only addressed in the instructional strategy condition. In fact, differentiation between conditions occurred for all three participants in the direction hypothesized. This pattern of results for all three participants seems to indicate that the use of an instructional strategy, the only intervention that addressed their hypothesis for reading difficulties (i.e., a skill deficit) is the intervention most likely to produce the highest levels of reading accuracy during independent reading in the classroom.

It should be noted, however, that Kobe's reading accuracy remained in the frustration level (i.e., below 93% accuracy) for all sessions in the intervention analysis,

regardless of condition. However, instructional strategy sessions were the only sessions in which Kobe actually read in the classroom during independent reading. He refused to read following all antecedent attention sessions. Given the research to indicate that academic needs tend to be overlooked for these students when disruptive behaviors are salient (Morgan et al., 2008), getting Kobe to read with the use of an instructional strategy prior to independent reading, even with low accuracy, may represent a successful intervention strategy. Given that the instructional strategy condition addressed both his operant function of problem behavior (i.e., attention-maintained problem behavior) and reading skill deficit, this may be the intervention most likely to produce the highest levels of reading accuracy during independent reading in the classroom. It is possible that with more time using instructional strategies to improve Kobe's reading performance, he may read at his instructional level or higher during independent reading in the classroom.

Indications that the use of an instructional strategy is a viable intervention strategy for Micah and Gabriella are clearer, given that their reading accuracy was most often at the instructional level (M = 94.2% accuracy for both participants) during instructional strategy sessions. Moreover, their reading accuracy was most often at the frustration level (M = 63.3% accuracy for Micah; M = 85.8% accuracy for Gabriella) during antecedent attention sessions. These results provide strong evidence that the use of an instructional strategy prior to independent reading in the classroom may be the best intervention option that is most likely to improve reading accuracy for all of these participants.

Research Question 2: For participants who exhibit escape-maintained problem behavior during reading and reading difficulties hypothesized to be related to a skill problem, which intervention is more effective: (a) antecedent attention or (b) instructional strategy?

Results from phases 1 and 2 identified three participants with this pattern of responding: Trenton, Jasmine, and Donald. I hypothesized that these participants would display lower occurrences of off-task behavior in instructional strategy sessions and higher occurrences of problem behavior in antecedent attention sessions because the operant function of problem behavior was only addressed in instructional strategy conditions. Results from the intervention analysis produced largely undifferentiated results in terms of off-task behavior for all participants in at least the first half of the intervention analysis. Off-task behavior remained undifferentiated and at high levels for Trenton throughout the intervention analysis. However, for Jasmine and Donald, some differentiation between conditions became apparent in the latter half of the intervention analysis in the direction hypothesized, with significantly lower levels of off-task behavior during instructional strategy sessions relative to antecedent attention sessions. These results provide preliminary evidence that for Jasmine and Donald, learning to use an instructional strategy prior to engaging in independent reading in the classroom may have abolished the reinforcing effects of escaping independent reading tasks via off-task behavior. This effect is further substantiated by the fact that conditions were counterbalanced and rapidly alternating (on successive days) and differentiation occurred between instructional strategy and antecedent attention conditions. This provides

evidence that the results derived in instructional strategy sessions were not due to carryover effects. That is, off-task behavior was consistently lower in instructional strategy sessions relative to antecedent attention sessions.

In terms of reading accuracy, I hypothesized that these participants would display higher levels of reading accuracy in instructional strategy sessions relative to antecedent attention sessions because a skill deficit hypothesis for reading difficulties was only addressed in the instructional strategy condition. In fact, differentiation occurred for all three participants in the latter half of the intervention analysis in the direction hypothesized, with higher levels of reading accuracy in instructional strategy sessions relative to antecedent attention sessions. It should be noted, however, that for Trenton and Jasmine, reading accuracy remained almost exclusively at the frustration level (i.e., below 93% accuracy) for all sessions in the intervention analysis, regardless of condition. In addition, Trenton refused to read at times during independent reading following both instructional strategy and antecedent attention sessions. However, in the latter half of the intervention analysis, Trenton tended to read with higher accuracy following instructional strategy sessions, and either refused to read or read with significantly lower accuracy following antecedent attention sessions. This may indicate that the use of an instructional strategy may be a viable intervention option for Trenton. It is possible that with more time using instructional strategies to improve Trenton's reading performance, he may read at his instructional level or higher during independent reading in the classroom. This possibility may be even more likely for Jasmine, given that in the latter half of the intervention analysis, clear differentiation in reading accuracy became apparent, with

higher levels of reading accuracy in instructional strategy sessions relative to antecedent attention sessions.

Donald's results for reading accuracy showed that in the latter half of the intervention analysis, reading accuracy was always at the instructional level or above (*M* = 98% accuracy) during instructional strategy sessions and was always at the frustration level (*M* = 86.3% accuracy) during antecedent attention sessions. Overall, these results provide strong preliminary evidence that the use of an instructional strategy may the most viable intervention option for Donald, because response covariation occurred over time. That is, instructional strategy sessions produced low levels of off-task behavior concurrent with high, instructional level or above, levels of reading accuracy.

Limitations and Directions for Future Research

A number of limitations should be taken into account when interpreting the results of this study. Phase 1 (experimental analysis) of the project had at least two limitations: (1) variable functional analysis results for Trenton and (2) the use of a new technology to determine function of problem behavior (i.e., concurrent operants analysis) for four of six participants. First, although Trenton exhibited the highest overall percentages of intervals with problem behavior in escape conditions; he exhibited high levels of problem behavior in attention conditions as well. Therefore, I could have hypothesized that his problem behavior was most likely multiply maintained (i.e., by both attention and escape). However, because it was educationally and practically important that Trenton receive an intervention quickly, I decided not to undergo more tests for behavioral function. It was clear that Trenton engaged in high levels of problem behavior in his classroom and

experienced reading difficulties. Therefore, the conditions under which problem behavior decreased and reading accuracy increased were vital to determine.

Second, the use of concurrent operants technology to identify function of problem behavior is limited to two studies (Berg et al., 2007; Casey et al., 2013). Thus, the current investigation represents an extension of these works. However, because the COA was not compared to another well-established method for determining behavioral function, but rather as the sole method for determining behavioral function, COA results should be interpreted with some caution. More research should be done on COA to determine whether this methodology can be used to reliably determine behavioral function.

Phase 2 (reading difficulties assessment) had the limitation of being non-experimental. Although I used methods published in the *Best Practices for School Psychology* (VanDerHeyden & Witt, 2008), these methods were only two short assessments of reading performance that took only minutes to complete for each participant. While this method has the strength of being feasible for teachers or support staff to deliver in schools, because it was the method used to determine a central aspect of the project (i.e., the reason for reading difficulties), an experimental method may have been more appropriate in order to maintain the experimental rigor of the project.

Phase 3 (intervention analysis) had at least five limitations: (1) potential for carryover effects; (2) potential for multiple treatment interference; (3) lack of experimental control in reading observation sessions; (4) the Hawthorne Effect; (5) time constraints to deliver each intervention strategy. The purpose for using a multielement design in Phase 3 was to quickly determine whether it mattered if an antecedent

intervention was matched or mismatched to the hypothesis for reading difficulties and which, if either, produced response covariation (i.e., reductions in off-task behavior concomitant with increases in reading accuracy) for students who have problem behavior maintained by attention versus escape and exhibit reading difficulties in the classroom. However, multielement designs tend to have a limitation of producing carryover and sequence effects (Hains & Baer, 1989), which must be considered when interpreting intervention analysis results for each participant. For one, variables in multielement designs must produce immediate effects in order to avoid carryover and sequence effects (Hains & Baer). There is some reason to believe that reading accuracy did not produce immediate effects, since data were undifferentiated for all participants in the first half of the intervention analysis. Although separation between data paths occurred for all participants in the latter half of the analysis in the direction hypothesized (with two of six participants attaining instructional level or above reading accuracy), results should be interpreted with some caution. A variable for reading performance that can produce immediate results should be utilized in future research.

Another important limitation to consider is multiple treatment interference (Campbell & Stanley, 1963) that occurs when the effects one intervention carries over to the other intervention. As such, results derived from one session may not only be due to the intervention delivered in that session, but rather a combination of effects in all sessions. This potential threat may have been remedied or at least accounted for if a baseline measure of off-task behavior were available for each participant. Future research

may also consider adding a continuous baseline to further account for multiple treatment interference.

In addition, the experimenter had little experimental control during reading observation sessions. These sessions were conducted in each participant's general education classroom. While this was done in order to simulate the natural environment as much as possible, it opened up many potential threats to internal validity. For example, history may have affected Trenton's response to functional analysis conditions. Shortly after Trenton began the functional analysis phase, a tragedy occurred with one of the students in his classroom. This outside event may have differentially influenced Trenton's behavior and should be known when interpreting his results. Maturation may have been a potential threat to internal validity for all participants. Each participant's intervention analysis sessions occurred over 13 to 26 school days in which other reading instruction also occurred. Increases in reading accuracy over time may be due to a combination of intervention and regular reading instruction.

A potential threat to external validity should also be considered when interpreting the results of this study. The Hawthorne Effect, in which participants' observed behavior is not representative of their actual behavior because of their knowledge of being watched, may have occurred. The experimenter made efforts to limit the potential for this effect by sitting near other students in the classroom, looking over many students' independent work, and scanning the room, but had to be in close proximity to the participant in order to measure reading accuracy. Future research may consider

videotaping reading observation sessions in order to unobtrusively measure reading accuracy in a natural environment.

Finally, time constraints to deliver intervention strategies should be considered when interpreting the results of this study. Instructional strategy sessions were limited to 10 minutes due to the time allotted for intervention and independent reading in each classroom. More robust results in decreases in off-task behavior and increases in reading accuracy may have been achieved with longer intervention sessions. Future research should seriously consider the time needed to deliver a meaningful reading intervention in order to produce immediate changes in off-task behavior and reading performance in the classroom.

Implications for Research and Practice

The results of this study raise important implications for research and practice. It is imperative that researchers and practitioners determine the conditions under which students with co-occurring behavior and reading problems are successful in the classroom. Independent reading represents a time in the classroom where engagement in the task and accuracy in performing that task are critical. It seemed that the use of an instructional strategy, an antecedent intervention that was matched to the hypothesis for reading difficulties was effective in producing response covariation for at least two of six participants (i.e., Gabriella and Donald).

One interesting finding from the results of this study is that one student for whom the use of an instructional strategy was effective had problem behavior likely maintained by attention (i.e., Gabriella) and one student had problem behavior likely maintained by

escape (i.e., Donald). Thus, determining behavioral function may have been an unnecessary step in the assessment and intervention decision-making process. After all, participants received attention during the instructional strategy, which may have accounted for attention-maintained problem behavior. Participants also gained the requisite skills needed to perform the task via the use of an instructional strategy. This may have addressed an escape function by abolishing the reinforcing effects of escape. These findings are consistent with previous literature on the use of instructional interventions to modify the motivating operations for escape-maintained problem behavior (McComas et al., 2000) and potentially extend these effects to addressing motivating operations for attention-maintained problem behavior, though more research should be done in this area.

These results also have important practical implications for teachers and struggling students, both in terms of classroom management and in terms of improving reading performance. First, having students engaged in independent tasks in the classroom is vital in order for teachers to be able to work one-on-one and in small groups with other students. Students who tend to engage in disruptive or off-task behavior during independent work time pull teachers' focus away from instruction and toward behavioral management. This study used a practical model to identify an antecedent intervention (i.e., the use of an instructional strategy) and showed that it was effective in preventing off-task behavior during independent reading for some participants.

Second, having students engaged in independent tasks that they are able to complete accurately is imperative for improving reading performance. It is important to

note that all of the participants in this study were at the acquisition level of the instructional hierarchy (Haring & Eaton, 1978) within the reading materials they were given in the classroom. As such, the goals of instructional strategy sessions were to improve reading accuracy within these instructional materials and give these students the tools to read words accurately. Indeed, instructional strategy sessions produced reading accuracy levels at the instructional level or higher over time for two of six of the participants in this study. The concurrent decrease in off-task behavior and increase in reading accuracy to the instructional level or above for Gabriella and Donald extend previous research on the importance of reading at the instructional level (Gickling & Armstrong, 1978; Treptow et al., 2007). Reading at the instructional level or above when reading independently is vital in order for students move through the instructional hierarchy and improve reading performance. It was imperative for the students in this study who experienced reading difficulties to make progress in accurately reading materials to their instructional level or above in order to improve reading ability. The results of this study provide preliminary evidence that this may be possible via the use of an instructional strategy immediately prior to independent reading.

Failure to produce these results for most of the participants in this study using the practical model has important implications for practice as well. Antecedent strategies were tested in this investigation because of their potential to prevent problem behavior and maximize opportunities to academic success by correcting and eliminating environmental contributions to problem behavior that may impede academic engagement (Kern & Clemens, 2007). However, for four participants, antecedent interventions failed

to produce response covariation in the classroom. This may have been due to the disruptive nature of off-task behavior for these students. A logical next step may be to move on to consequent-based strategies. A practical recommendation for students who did not respond favorably to antecedent-based methods is to intensify the intervention and utilize consequent-based methods such as differential reinforcement, contingent access to preferred activities, non-contingent attention, and non-contingent breaks, and others. Overall, the take-home messages for this project are that if there is a skill deficit, it should be addressed first, and addressing the skill deficit may also improve behavior in the classroom. If problem behavior persists, as it did for some participants, logical next steps may be to add consequent-based strategies and/or intensify the academic intervention.

Conclusion

With the prevalence of co-occurring behavior problems and academic difficulties reported as between 10% and 25% (American Psychiatric Association, 2000) and as high as 50% (Glassberg et al., 1999), the host of negative outcomes (e.g., grade retention, dropout, delinquency, unemployment, and incarceration; Hinshaw, 1992; Nelson et al., 2004) associated with behavior problems and academic difficulties, and the documented decrease in effectiveness of interventions after third grade (Walker & Severson, 2002), the urgent need to intervene early when students show initial signs of behavior problems and academic difficulties is clear. As such, the purpose of this project was to test the effectiveness of a practical model for assessment and intervention decision-making for students with co-occurring behavior problems and reading difficulties. Overall, it

appeared that the use of an instructional strategy may be an effective antecedent intervention for some students with co-occurring behavior problems and reading difficulties and had the potential to produce response covariation, though results were idiosyncratic. Thus, instructional interventions may be critical to reduce behavior problems and increase reading performance for some students are should be considered in future research and practice.

Table 1. School-wide reading assessment data.

Participant	**Curriculum-Based Measurement (CBM) Score:**	**Fountas and Pinnell Benchmark Assessment (F&P) Score:**
Kobe	2 words per minute	Reading level A
Micah	8 words per minute	Reading level B
Gabriella	22 words per minute	Reading level C
Trenton	11 words per minute	Reading level B
Jasmine	3 words per minute	Reading level A
Donald	9 words per minute	Reading level B

*note: school-wide reading assessment data was gathered in January 2014. Benchmark scores, as determined by the school district, are as follows: 27 words per minute in CBM; reading level G in F&P.

Table 2. Concurrent Operants Analysis Conditions for Micah.

Session	**Condition**	**Concurrent Choice Options**	**Inference if Chosen:**	**Hypothesized Function:**	**Percentage of Choice Allocation:**
1	Condition 1	Option A: Demand with no attention (D/NA)	Teacher and/or peer attention are not valued or are aversive; demand is reinforcing	Non-social reinforcement	0
		Option B: Free play with teacher and peer attention (FP/TPA)	Attention or escape from demand are reinforcing	Attention and/or escape	100%
2	Condition 2	Option A: Alone with no demand (ND)	Escape from demand is more reinforcing than teacher attention	Escape	0%
		Option B: Demand with teacher attention (TA/D)	Teacher attention is more reinforcing than escaping demand	Teacher attention	100%

3	Condition 3	Option A: Alone with no demand (ND)	Escape from demand is reinforcing than peer attention	Escape	0%
		Option B: Demand with peer attention (PA/D)	Peer attention is more reinforcing than escaping demand	Peer attention	100%
4	Condition 4	Option A: Demand with teacher attention (TA/D)	Teacher attention is more reinforcing than peer attention	Teacher attention	100%
		Option B: Demand with peer attention (PA/D)	Peer attention is more reinforcing than teacher attention	Peer attention	0%
5	Condition 2 *repeated condition to confirm hypothesis	Option A: Alone with no demand (ND)	Escape from demand is more reinforcing than teacher attention	Escape	23%
		Option B: Demand with teacher attention (TA/D)	Teacher attention is more reinforcing than escaping demand	Teacher attention	77%

6	Condition 1 *repeated condition to confirm hypothesis	<u>Option A:</u> Demand with no attention (D/NA)	Teacher and/or peer attention are not valued or are aversive; demand is reinforcing	Non-social reinforcement	0
		<u>Option B:</u> Free play with teacher and peer attention (FP/TPA)	Attention or escape from demand are reinforcing	Attention and/or escape	100%

***Hypothesized function of problem behavior = teacher attention**

Table 3. Concurrent Operants Analysis Conditions for Gabriella.

Session	**Condition**	**Concurrent Choice Options**	**Inference if Chosen:**	**Hypothesized Function:**	**Percentage of Choice Allocation:**
1	Condition 1	Option A: Demand with no attention (D/NA)	Teacher and/or peer attention are not valued or are aversive; demand is reinforcing	Non-social reinforcement	0
		Option B: Free play with teacher and peer attention (FP/TPA)	**Attention or escape from demand are reinforcing**	Attention and/or escape	100%
2	Condition 2	Option A: Alone with no demand (ND)	Escape from demand is more reinforcing than teacher attention	Escape	0%
		Option B: Demand with teacher attention (TA/D)	**Teacher attention is more reinforcing than escaping demand**	Teacher attention	100%

3	Condition 3	<u>Option A:</u> Alone with no demand (ND)	**Escape from demand is reinforcing than peer attention**	Escape	100%
		<u>Option B:</u> Demand with peer attention (PA/D)	Peer attention is more reinforcing than escaping demand	Peer attention	0%
4	Condition 2 (repeated to confirm hypothesis)	<u>Option A:</u> Alone with no demand (ND)	Escape from demand is more reinforcing than teacher attention	Escape	0%
		<u>Option B:</u> Demand with teacher attention (TA/D)	**Teacher attention is more reinforcing than escaping demand**	Teacher attention	100%
5	Condition 3 (repeated to confirm hypothesis)	<u>Option A:</u> Alone with no demand (ND)	**Escape from demand is reinforcing than peer attention**	Escape	67%
		<u>Option B:</u> Demand with peer attention (PA/D)	Peer attention is more reinforcing than escaping demand	Peer attention	33%

6	Condition 1 (repeated to confirm hypothesis)	<u>Option A:</u> Demand with no attention (D/NA)	Teacher and/or peer attention are not valued or are aversive; demand is reinforcing	Non-social reinforcement	0
		<u>Option B:</u> Free play with teacher and peer attention (FP/TPA)	**Attention or escape from demand are reinforcing**	Attention and/or escape	100%
7	Condition 2 (repeated to confirm hypothesis)	<u>Option A:</u> Alone with no demand (ND)	Escape from demand is more reinforcing than teacher attention	Escape	0%
		<u>Option B:</u> Demand with teacher attention (TA/D)	**Teacher attention is more reinforcing than escaping demand**	Teacher attention	100%

***Hypothesized function of problem behavior = teacher attention**

Table 4. Concurrent Operants Analysis Conditions for Jasmine.

Session	**Condition**	**Concurrent Choice Options**	**Inference if Chosen:**	**Hypothesized Function:**	**Percentage of Choice Allocation:**
1	Condition 1	Option A: Demand with no attention (D/NA)	Teacher and/or peer attention are not valued or are aversive; demand is reinforcing	Non-social reinforcement	0
		Option B: Free play with teacher and peer attention (FP/TPA)	**Attention or escape from demand are reinforcing**	Attention and/or escape	100%
2	Condition 2	Option A: Alone with no demand (ND)	Escape from demand is more reinforcing than teacher attention	Escape	100%
		Option B: Demand with teacher attention (TA/D)	Teacher attention is more reinforcing than escaping demand	Teacher attention	0%

3	Condition 3	<u>Option A:</u> Alone with no demand (ND)	**Escape from demand is reinforcing than peer attention**	Escape	100%
		<u>Option B:</u> Demand with peer attention (PA/D)	Peer attention is more reinforcing than escaping demand	Peer attention	0%
4	Condition 2 *repeated to confirm hypothesis	<u>Option A:</u> Alone with no demand (ND)	**Escape from demand is reinforcing than teacher attention**	Escape	100%
		<u>Option B:</u> Demand with teacher attention (TA/D)	Teacher attention is more reinforcing than escaping demand	Teacher attention	0%

5	Condition 1 *repeated to confirm hypothesis	<u>Option A:</u> Demand with no attention (D/NA)	Teacher and/or peer attention are not valued or are aversive; demand is reinforcing	Non-social reinforcement	0
		<u>Option B:</u> Free play with teacher and peer attention (FP/TPA)	**Attention or escape from demand are reinforcing**	Attention and/or escape	100%

***Hypothesized function of problem behavior = escape from reading demands**

Table 5. Concurrent Operants Analysis Conditions for Donald.

Session	**Condition**	**Concurrent Choice Options**	**Inference if Chosen:**	**Hypothesized Function:**	**Percentage of Choice Allocation:**
1	Condition 1	Option A: Demand with no attention (D/NA)	Teacher and/or peer attention are not valued or are aversive; demand is reinforcing	Non-social reinforcement	0
		Option B: Free play with teacher and peer attention (FP/TPA)	**Attention or escape from demand are reinforcing**	Attention and/or escape	100%
2	Condition 2	Option A: Alone with no demand (ND)	Escape from demand is more reinforcing than teacher attention	Escape	100%
		Option B: Demand with teacher attention (TA/D)	Teacher attention is more reinforcing than escaping demand	Teacher attention	0%

3	Condition 3	<u>Option A:</u> Alone with no demand (ND)	**Escape from demand is reinforcing than peer attention**	Escape	100%
		<u>Option B:</u> Demand with peer attention (PA/D)	Peer attention is more reinforcing than escaping demand	Peer attention	0%
4	Condition 2 *repeated to confirm hypothesis	<u>Option A:</u> Alone with no demand (ND)	**Escape from demand is reinforcing than teacher attention**	Escape	100%
		<u>Option B:</u> Demand with teacher attention (TA/D)	Teacher attention is more reinforcing than escaping demand	Teacher attention	0%

5	Condition 1 *repeated to confirm hypothesis	<u>Option A:</u> Demand with no attention (D/NA)	Teacher and/or peer attention are not valued or are aversive; demand is reinforcing	Non-social reinforcement	0
		<u>Option B:</u> Free play with teacher and peer attention (FP/TPA)	**Attention or escape from demand are reinforcing**	Attention and/or escape	100%

***Hypothesized function of problem behavior = escape from reading demands**

Table 6. Instructional Strategies Rationale.

Participant	Strategies Used	Rationale for Use of Strategies/Modifications in Strategy Use
Kobe	IR, SB, and LSP in instructional strategy sessions 2 and 3, IR and LSP in sessions 5 and 8	All three strategies were selected for use during sessions 2 and 3 because Kobe struggled with sounding out CVC words, retaining sight words, and reading sentences when presented with instructional level RAZ books. SB was discontinued after session 3 because Kobe appeared distracted by the magnetic letters (i.e., playing, throwing, and putting in pockets). He also showed signs of frustration and refusal (i.e., saying "No, I'm not doing that!", putting head down, turning away from experimenter, leaving the instructional strategy session) when the experimenter pulled out the SB materials. An incentive to "beat the teacher" was added at to instructional strategy sessions 5 and 8 in which Kobe earned points for correctly reading words and then quizzed the experimenter on reading words during IR and LSP instructional strategies.
Micah	IR, SB, and LSP in all instructional strategy sessions	All three strategies were selected for use for all sessions because Micah struggled with sounding out CVC words, retaining sight words, and reading sentences when presented with instructional level RAZ books. Experimenter retained all three strategies throughout all instructional strategy sessions and added the "beat the teacher" incentive for sessions 9 and 12 because Micah showed signs of frustration and refusal (i.e., putting head down, turning away from the experimenter, not responding to verbal prompts) upon beginning instructional strategy sessions.

Gabriella	IR, SB, and LSP in all instructional strategy sessions	All three strategies were selected for use for all sessions because Gabriella struggled with sounding out CVC words, retaining sight words, and reading sentences when presented with instructional level RAZ books. No behavioral concerns during instructional strategy sessions.
Trenton	IR, SB, and LSP in instructional strategy sessions 1 and 4, IR and LSP in sessions 6, 7, 9, and 12	All three strategies were selected for use during sessions 1 and 4 because Trenton struggled with sounding out CVC words, retaining sight words, and reading sentences when presented with instructional level RAZ books. SB was discontinued after session 4 because Trenton showed signs of frustration and refusal (i.e., saying “No, I’m no doing that!”, pushing materials away from self, turning away from experimenter, leaving the instructional strategy session) when presented with the SB materials. An incentive to “beat the teacher” was added at to instructional strategy sessions 6, 7, 9, and 12 during IR and LSP instructional strategies.
Jasmine	IR, SB, and LSP in all instructional strategy sessions	All three strategies were selected for use for all sessions because Jasmine struggled with sounding out CVC words, retaining sight words, and reading sentences when presented with instructional level RAZ books. No behavioral concerns during instructional strategy sessions.

Donald	IR, SB, and LSP in all instructional strategy sessions	All three strategies were selected for use for all sessions because Daniel struggled with sounding out CVC words, retaining sight words, and reading sentences when presented with instructional level RAZ books. No behavioral concerns during instructional strategy sessions.

Figure 1. Practical model for assessment and intervention decision-making.

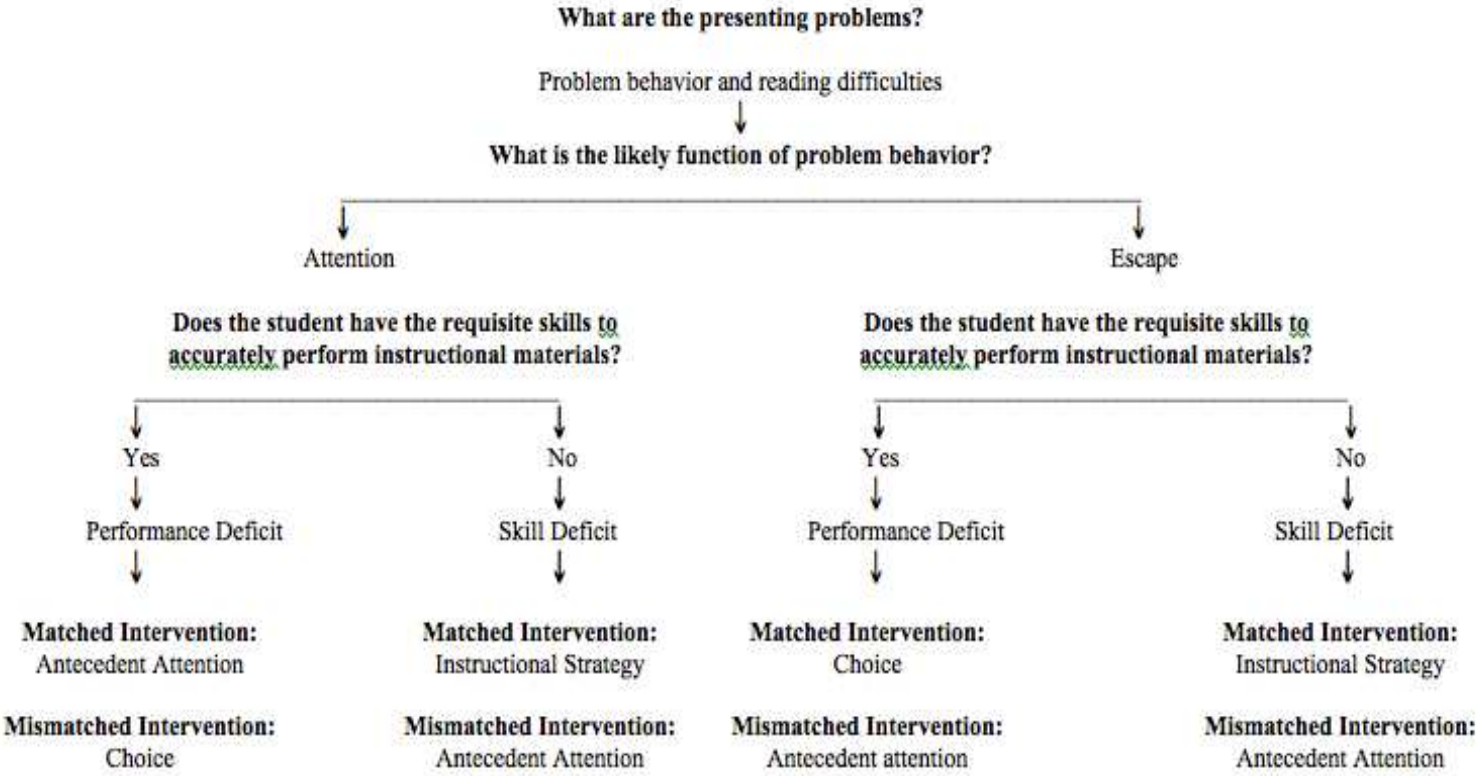
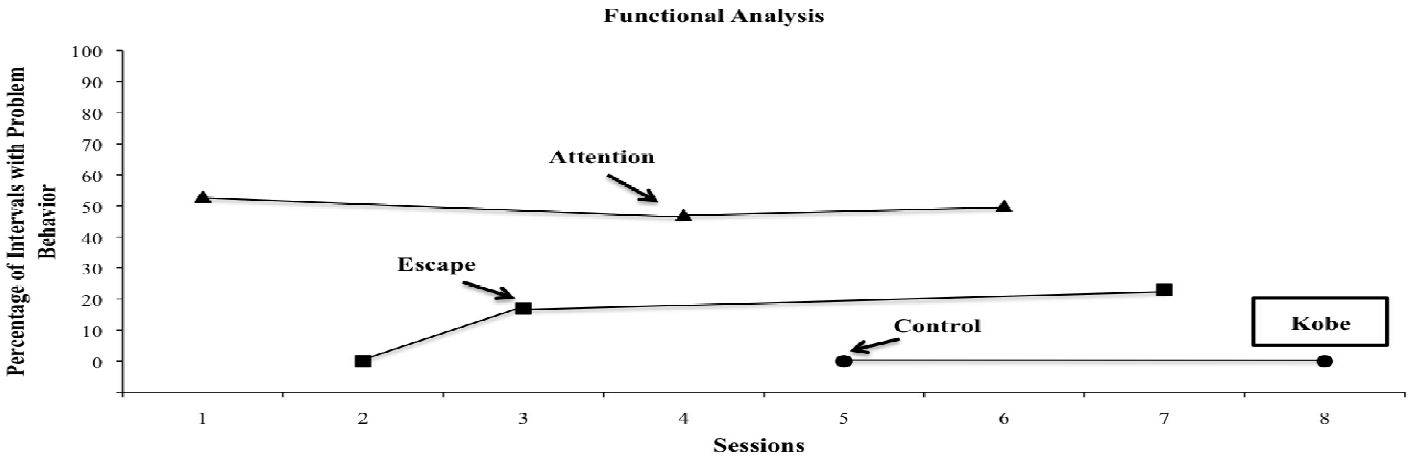


Figure 2

Functional Analysis (top panel) and performance versus skill deficit assessment (bottom panel) results for Kobe.


Functional Analysis
Percentage of Intervals with Problem Behavior
100
90
80
70
60
50
40
30
20
10
0
Attention
Escape
Control
Kobe
1
2
3
4
5
6
7
8
Sessions

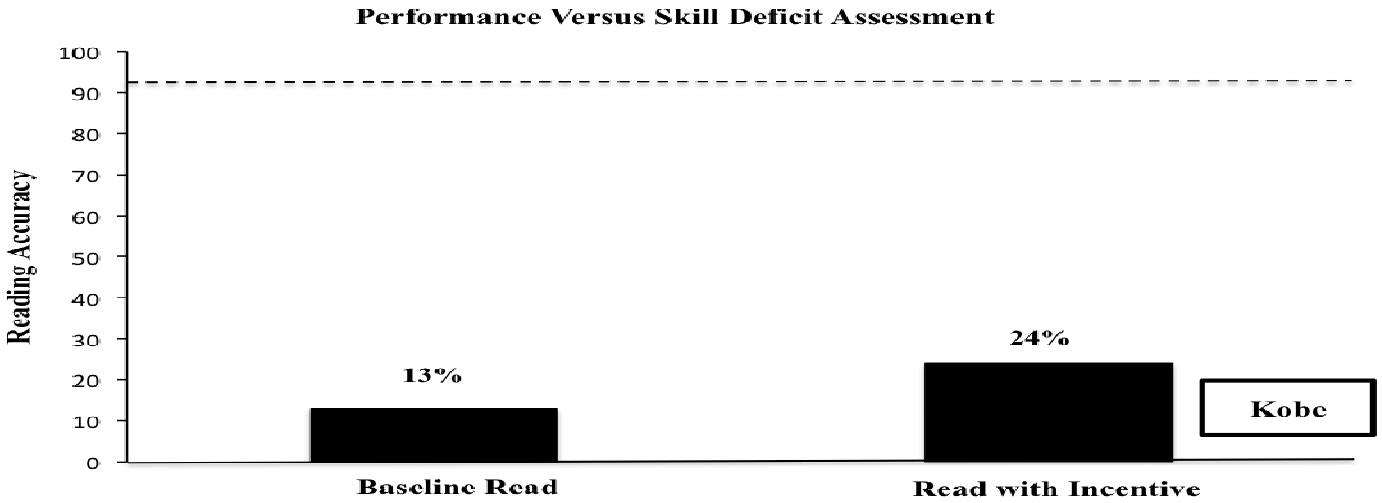
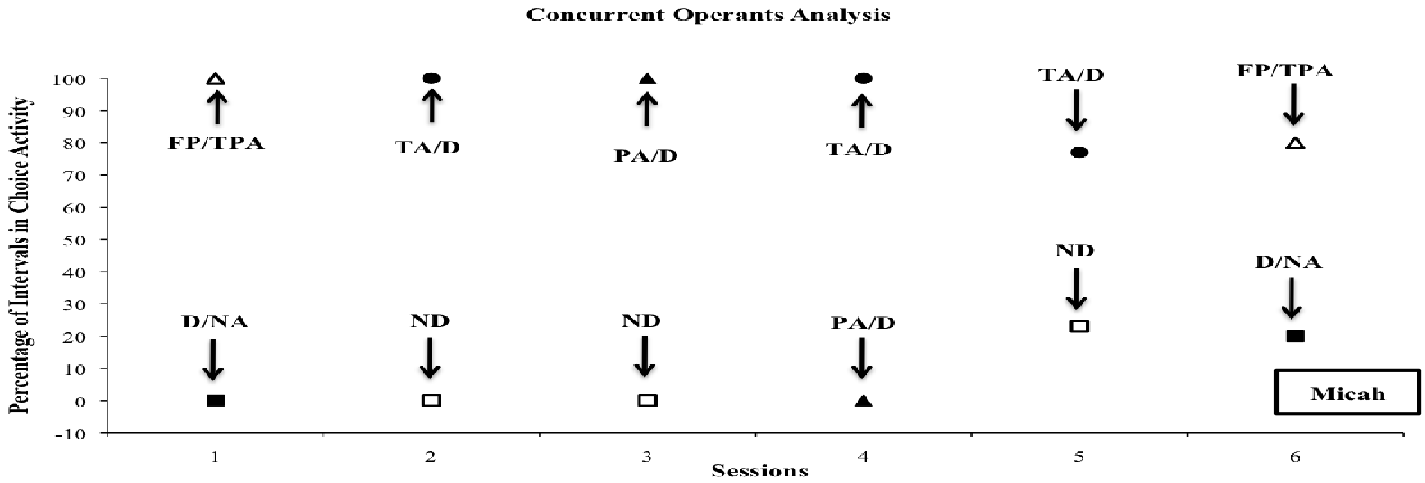

Performance Versus Skill Deficit Assessment
Reading Accuracy
100
90
80
70
60
50
40
30
20
10
0
13%
24%
Kobe
Baseline Read
Read with Incentive

Figure 3

Concurrent operants analysis (top panel) and performance versus skill deficit assessment (bottom panel) results for Micah. D/NA = demand with no attention; FP/TPA = free play with teacher and peer attention; ND = alone with no demand; TA/D = demand with teacher attention; PA/D = demand with peer attention


Concurrent Operants Analysis
Percentage of Intervals in Choice Activity
100
90
80
70
60
50
40
30
20
10
0
-10
FP/TPA
TA/D
PA/D
TA/D
TA/D
FP/TPA
D/NA
ND
ND
PA/D
ND
D/NA
Micah
1
2
3
4
5
6
Sessions

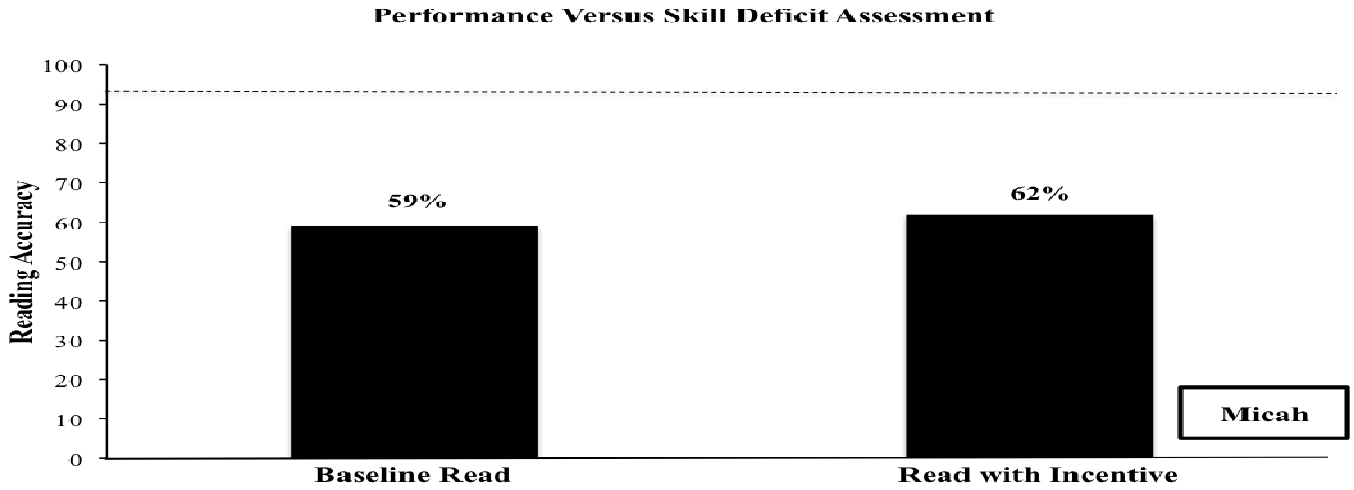
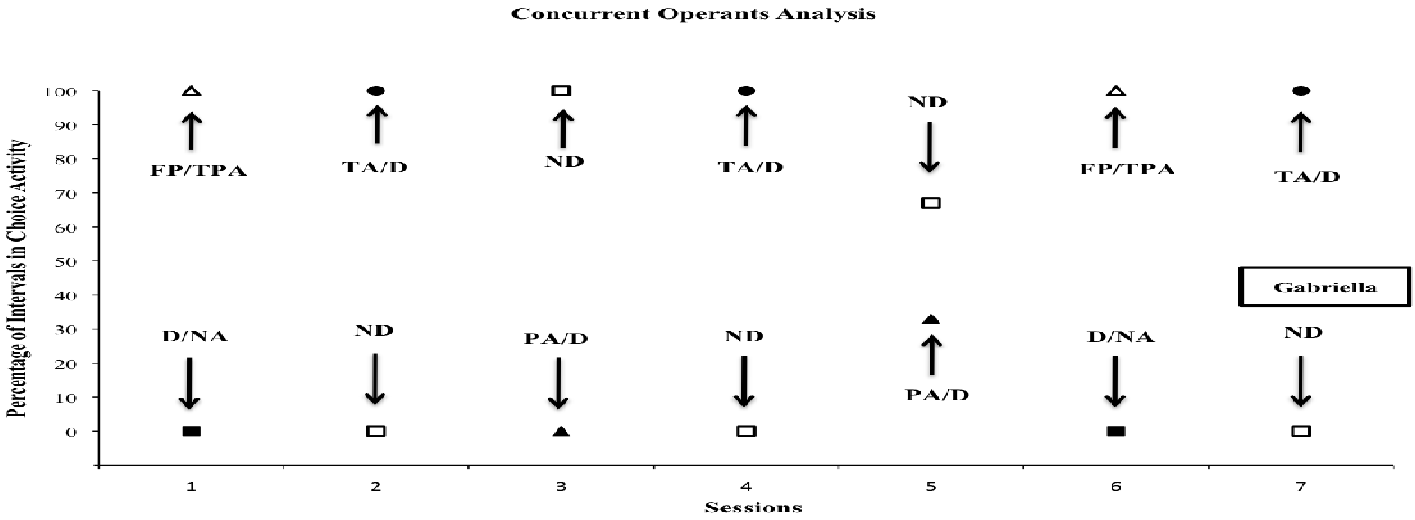

Performance Versus Skill Deficit Assessment
Reading Accuracy
100
90
80
70
60
50
40
30
20
10
0
59%
62%
Micah
Baseline Read
Read with Incentive

Figure 4

Concurrent operants analysis (top panel) and performance versus skill deficit assessment (bottom panel) results for Gabriella. D/NA = demand with no attention; FP/TPA = free play with teacher and peer attention; ND = alone with no demand; TA/D = demand with teacher attention; PA/D = demand with peer attention


Concurrent Operants Analysis
Percentage of Intervals in Choice Activity
100
90
80
70
60
50
40
30
20
10
0
FP/TPA
TA/D
ND
TA/D
ND
FP/TPA
TA/D
Gabriella
D/NA
ND
PA/D
ND
PA/D
D/NA
ND
1
2
3
4
5
6
7
Sessions

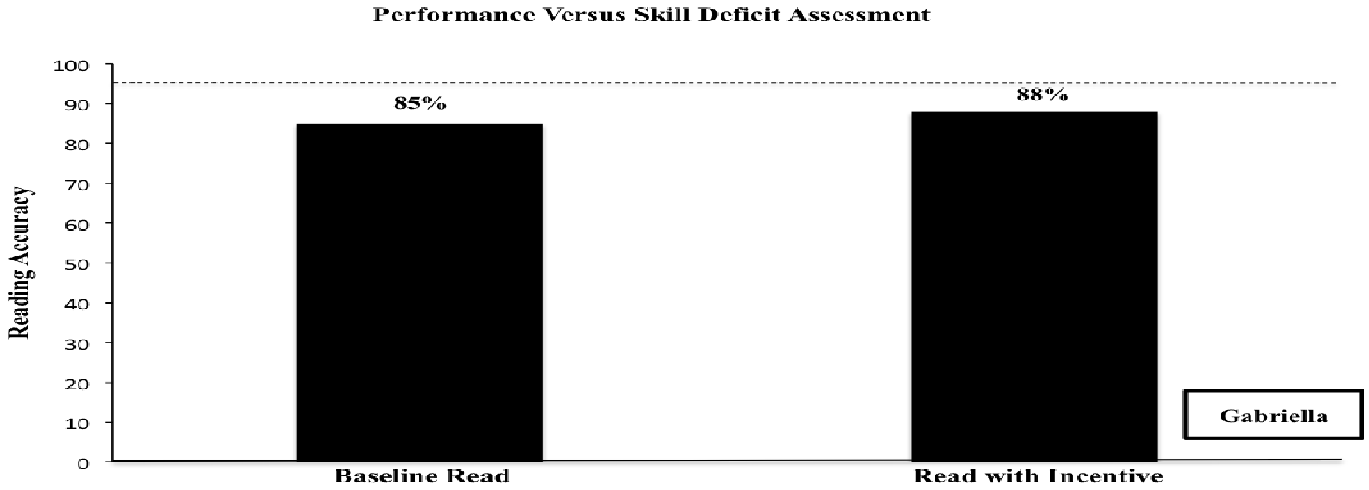
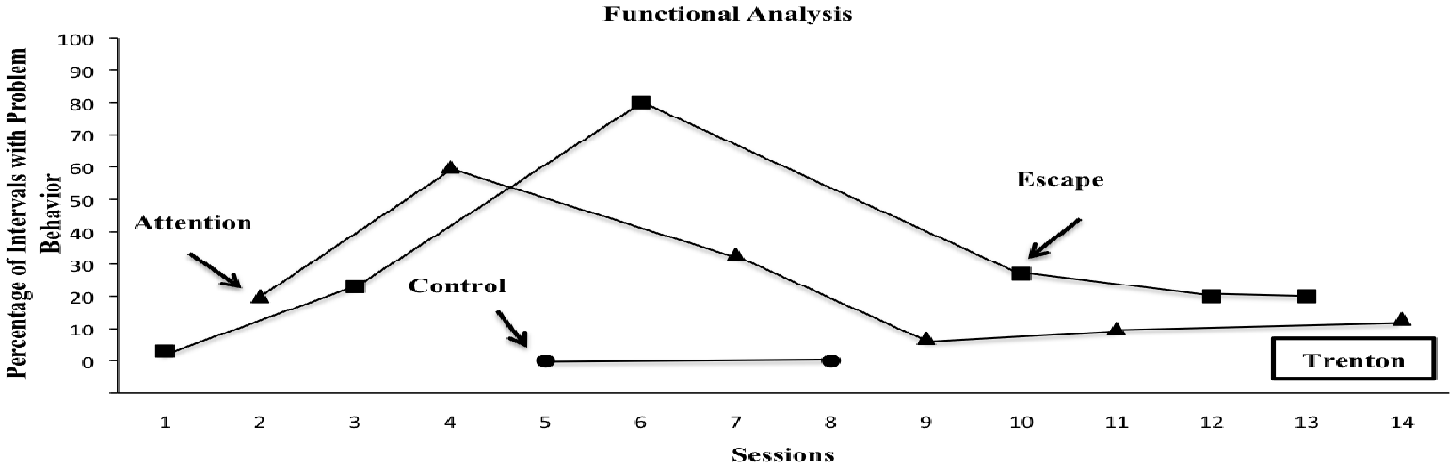

Performance Versus Skill Deficit Assessment
Reading Accuracy
100
90
80
70
60
50
40
30
20
10
0
85%
88%
Gabriella
Baseline Read
Read with Incentive

Figure 5

Functional analysis (top panel) and performance versus skill deficit assessment (bottom panel) results for Trenton.


Functional Analysis
Percentage of Intervals with Problem Behavior
100
90
80
70
60
50
40
30
20
10
0
Attention
Control
Escape
Trenton
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Sessions

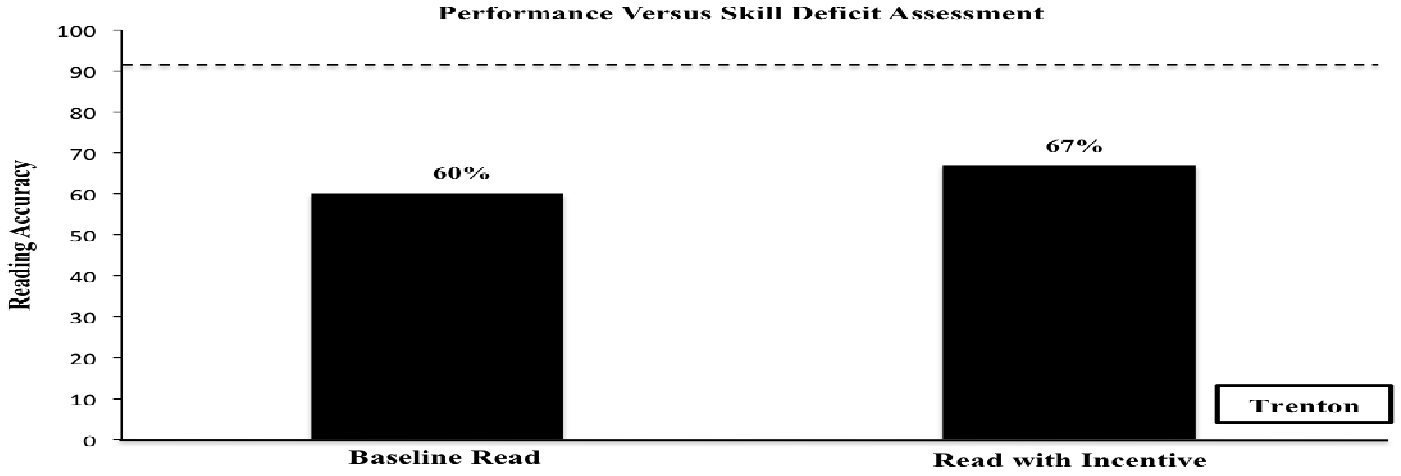
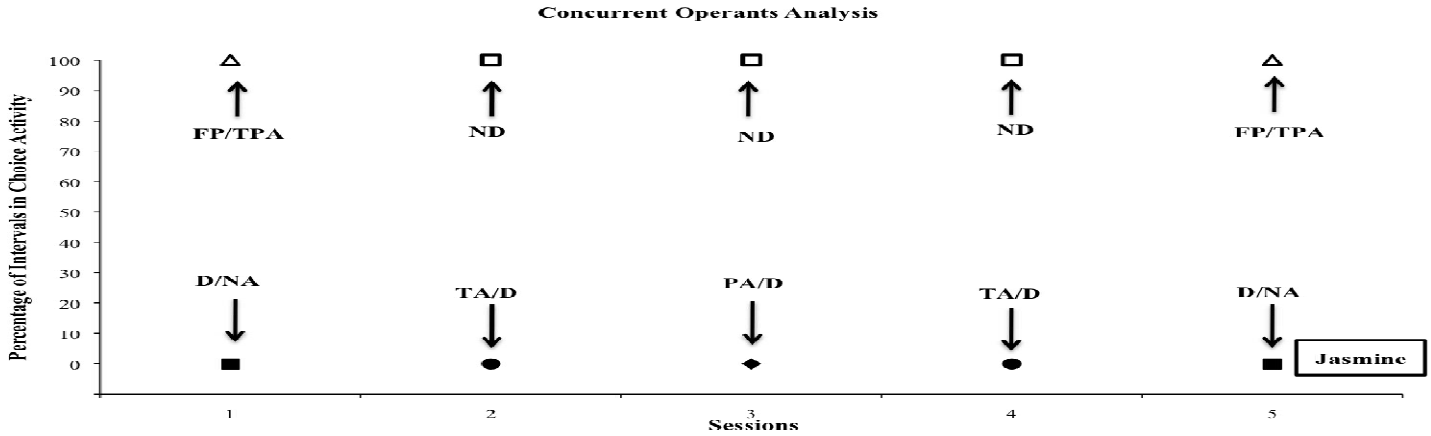

Performance Versus Skill Deficit Assessment
Reading Accuracy
100
90
80
70
60
50
40
30
20
10
0
60%
67%
Trenton
Baseline Read
Read with Incentive

Figure 6

Concurrent operants analysis (top panel) and performance versus skill deficit assessment (bottom panel) results for Jasmine. D/NA = demand with no attention; FP/TPA = free play with teacher and peer attention; ND = alone with no demand; TA/D = demand with teacher attention; PA/D = demand with peer attention


Concurrent Operants Analysis
Percentage of Intervals in Choice Activity
100
90
80
70
60
50
40
30
20
10
0
FP/TPA
ND
ND
ND
FP/TPA
D/NA
TA/D
PA/D
TA/D
D/NA
Jasmine
1
2
3
4
5
Sessions

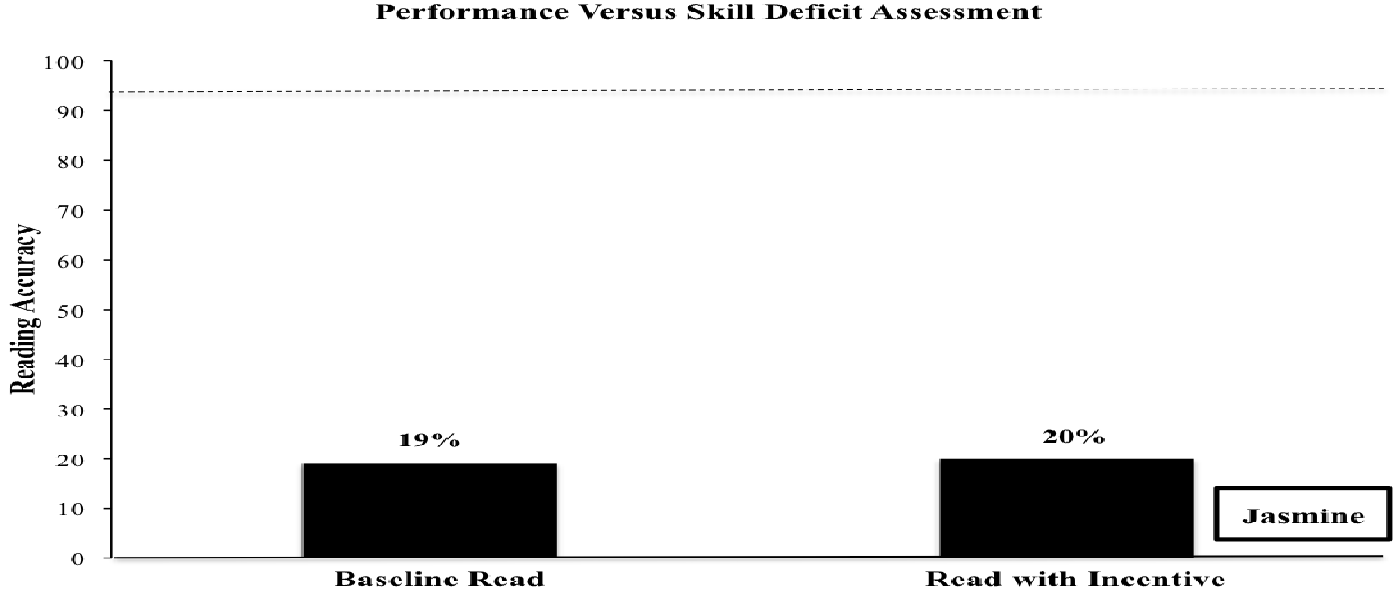
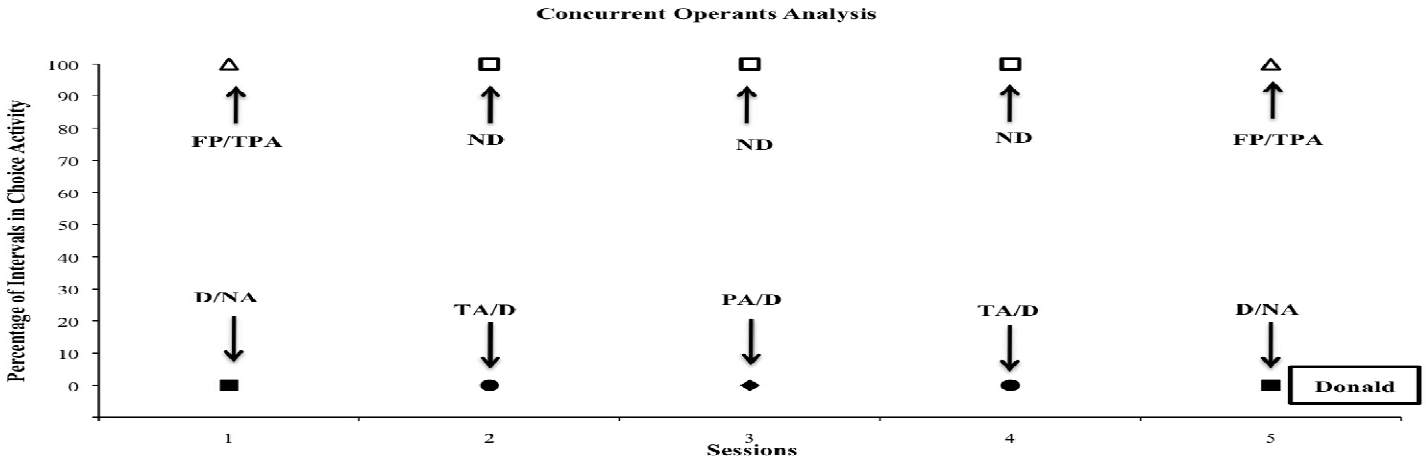

Performance Versus Skill Deficit Assessment
Reading Accuracy
100
90
80
70
60
50
40
30
20
10
0
19%
20%
Jasmine
Baseline Read
Read with Incentive

Figure 7

Concurrent operants analysis (top panel) and performance versus skill deficit assessment (bottom panel) results for Donald. D/NA = demand with no attention; FP/TPA = free play with teacher and peer attention; ND = alone with no demand; TA/D = demand with teacher attention; PA/D = demand with peer attention


Concurrent Operants Analysis
Percentage of Intervals in Choice Activity
100
90
80
70
60
50
40
30
20
10
0
FP/TPA
ND
ND
ND
FP/TPA
D/NA
TA/D
PA/D
TA/D
D/NA
Donald
1
2
3
4
5
Sessions

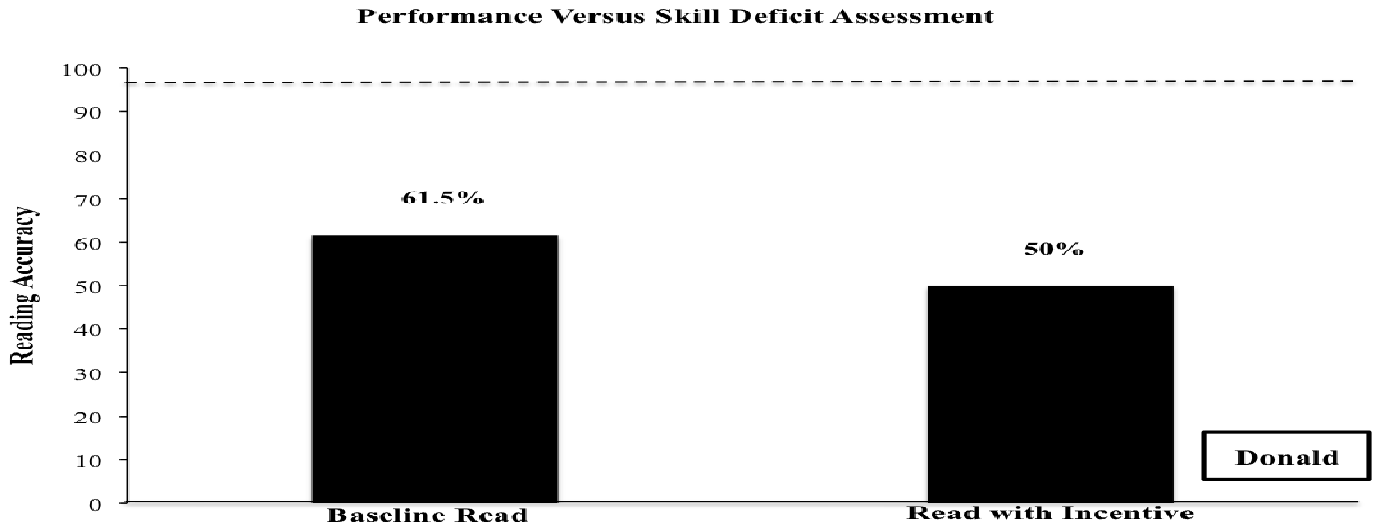

Performance Versus Skill Deficit Assessment
Reading Accuracy
100
90
80
70
60
50
40
30
20
10
0
61.5%
50%
Donald
Basclinc Read
Read with Incentive

Figure 8

Percentage of intervals with off-task behavior (top panel) and reading accuracy (bottom panel) for instructional strategy analysis for Kobe.

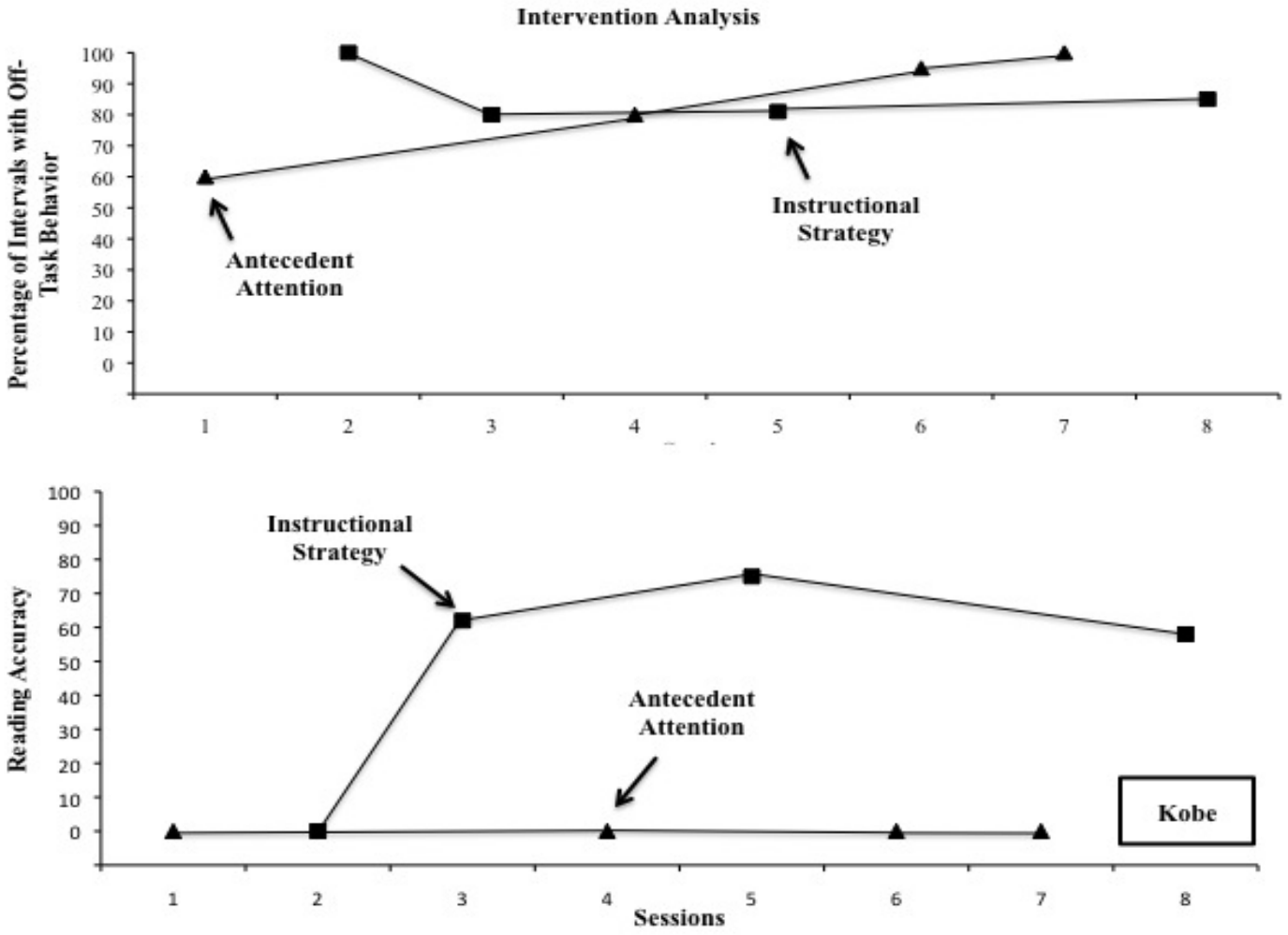

Intervention Analysis
Percentage of Intervals with Off-Task Behavior
100
90
80
70
60
50
40
30
20
10
0
Antecedent Attention
Instructional Strategy
1
2
3
4
5
6
7
8
Reading Accuracy
Instructional Strategy
Antecedent Attention
Kobe
Sessions

Figure 9

Percentage of intervals with off-task behavior (top panel) and reading accuracy (bottom panel) for instructional strategy analysis for Micah.

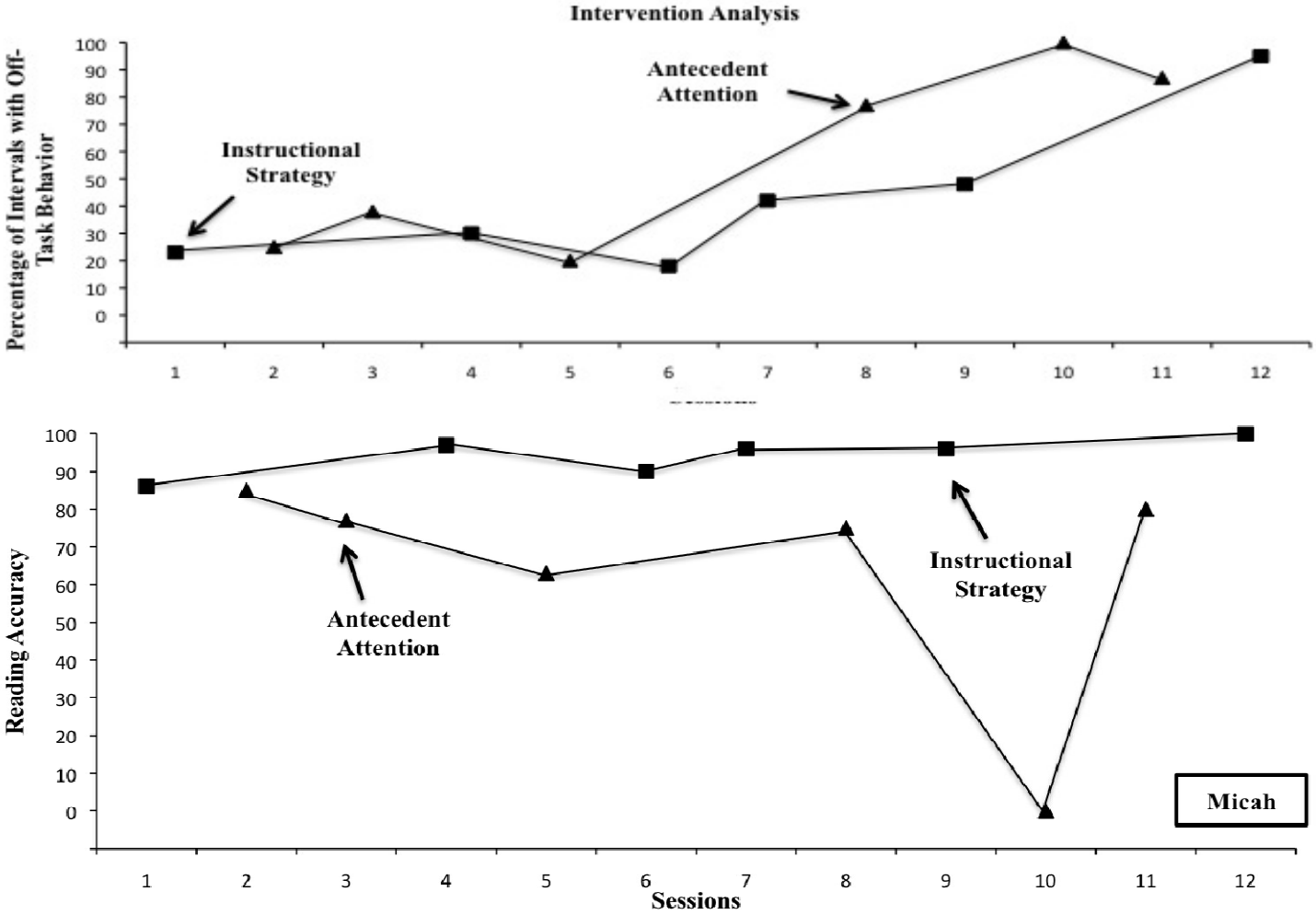

Intervention Analysis
Percentage of Intervals with Off-Task Behavior
Instructional Strategy
Antecedent Attention
Reading Accuracy
Antecedent Attention
Instructional Strategy
Micah
Sessions

Figure 10

Percentage of intervals with off-task behavior (top panel) and reading accuracy (bottom panel) for instructional strategy analysis for Gabriella.

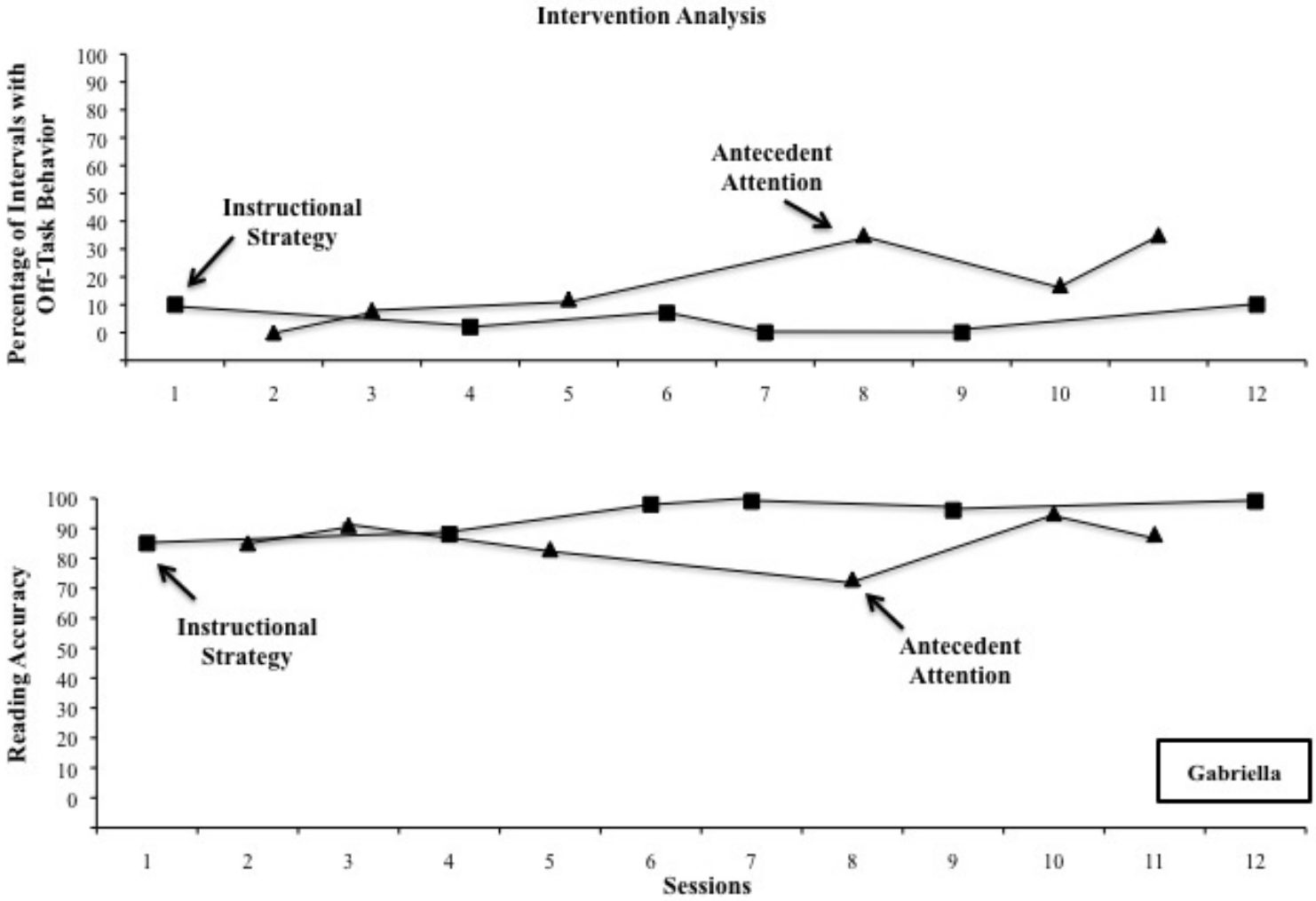

Intervention Analysis
Percentage of Intervals with Off-Task Behavior
100
90
80
70
60
50
40
30
20
10
0
Instructional Strategy
Antecedent Attention
1
2
3
4
5
6
7
8
9
10
11
12
Reading Accuracy
100
90
80
70
60
50
40
30
20
10
0
Instructional Strategy
Antecedent Attention
Gabriella
1
2
3
4
5
6
7
8
9
10
11
12
Sessions

Figure 11

Percentage of intervals with off-task behavior (top panel) and reading accuracy (bottom panel) for instructional strategy analysis for Trenton.

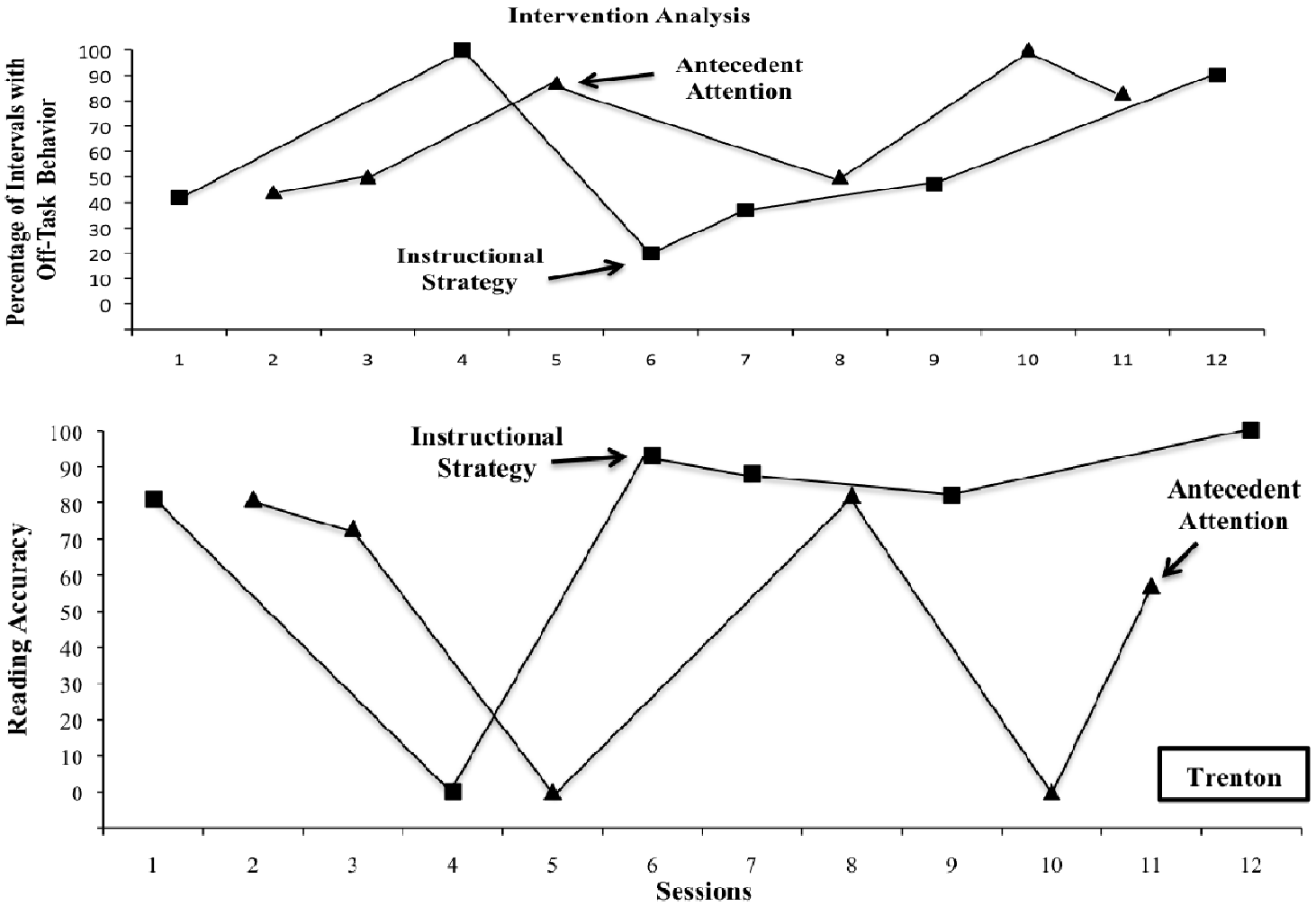

Intervention Analysis
Percentage of Intervals with Off-Task Behavior
100
90
80
70
60
50
40
30
20
10
0
Antecedent Attention
Instructional Strategy
1
2
3
4
5
6
7
8
9
10
11
12
Reading Accuracy
Instructional Strategy
Antecedent Attention
Trenton
Sessions

Figure 12

Percentage of intervals with off-task behavior (top panel) and reading accuracy (bottom panel) for instructional strategy analysis for Jasmine.

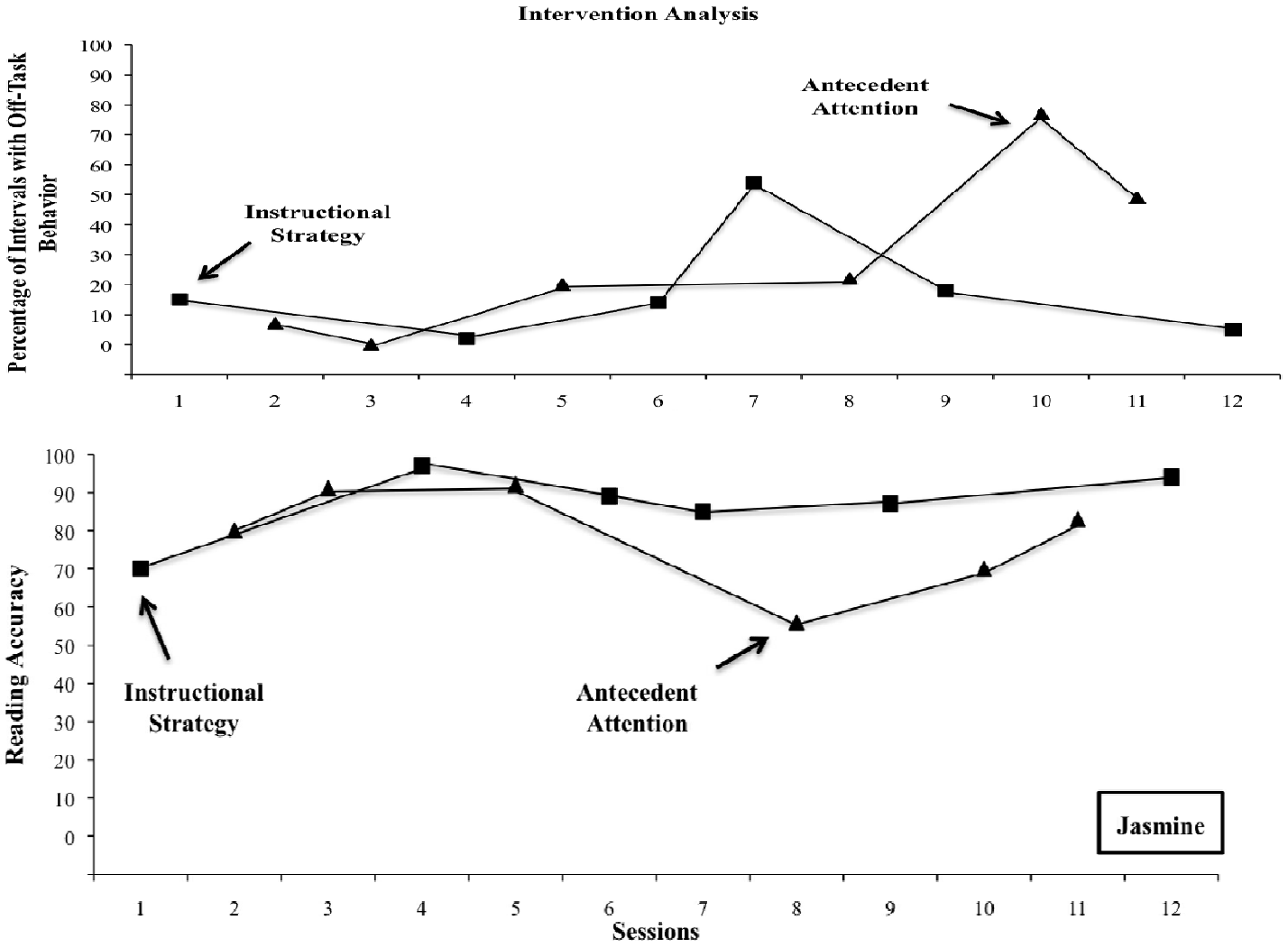
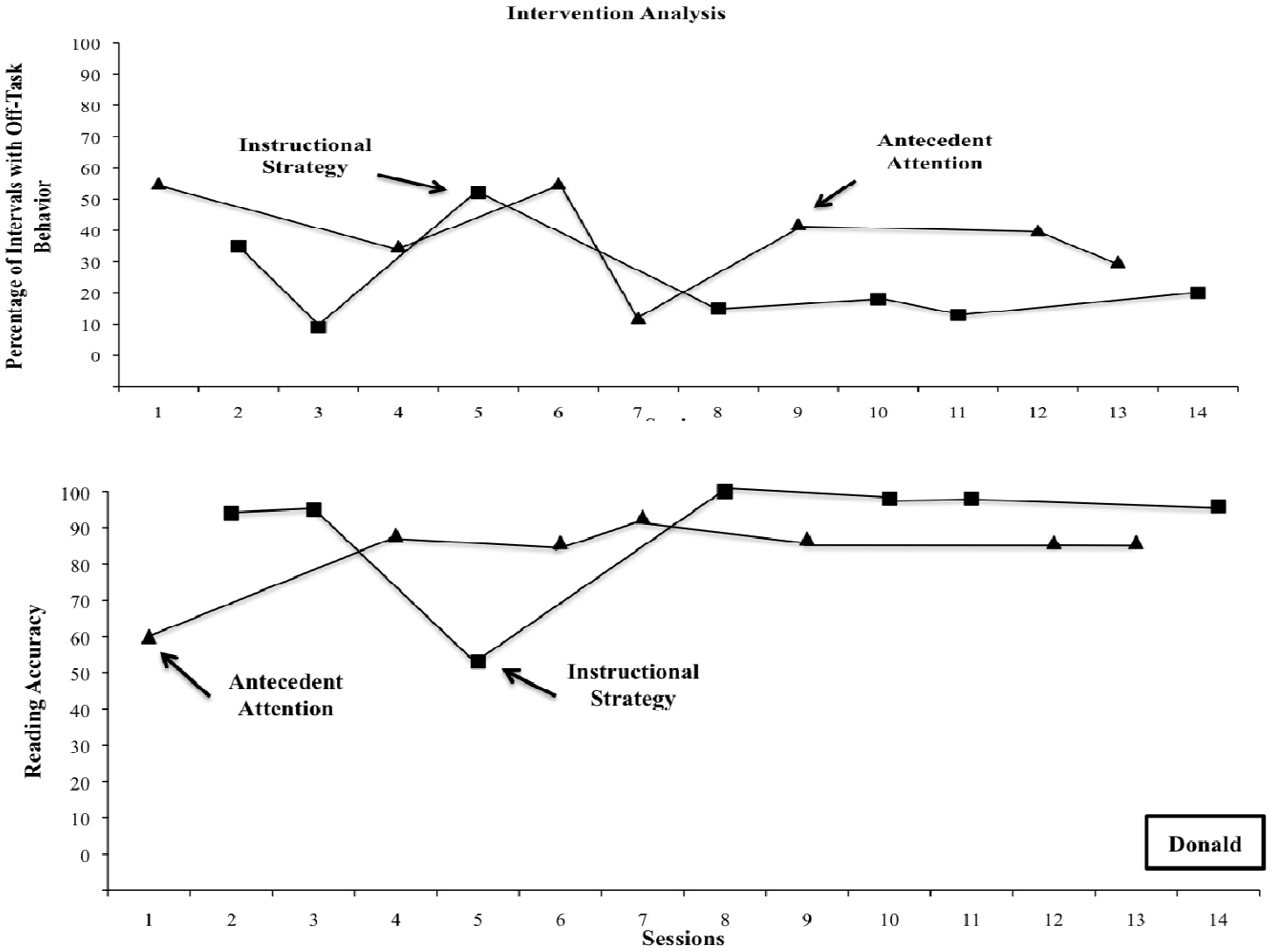

Intervention Analysis
Percentage of Intervals with Off-Task Behavior
100
90
80
70
60
50
40
30
20
10
0
Instructional Strategy
Antecedent Attention
1
2
3
4
5
6
7
8
9
10
11
12
Reading Accuracy
100
90
80
70
60
50
40
30
20
10
0
Instructional Strategy
Antecedent Attention
Jasmine
1
2
3
4
5
6
7
8
9
10
11
12
Sessions

Figure 13

Percentage of intervals with off-task behavior (top panel) and reading accuracy (bottom panel) for instructional strategy analysis for Donald.


Intervention Analysis
Percentage of Intervals with Off-Task Behavior
100
90
80
70
60
50
40
30
20
10
0
Instructional Strategy
Antecedent Attention
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Reading Accuracy
Antecedent Attention
Instructional Strategy
Donald
Sessions

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Appendix A: Partial-Interval Recording Form

Appendix B: Functional Analysis Procedural Fidelity Checklist

Functional Analysis Procedural Fidelity Checklist (Control Condition)

Step	Yes	No	N/A	Comments
Experimenter and participant are in a room equipped with leisure items and no academic materials are near participant.	Y	N		
Experimenter directs participant to leisure items with verbal prompt such as: *"You can play with any of these toys/activities. I can play with you or you can play by yourself."*	Y	N		
Experimenter activates a timer for 5 min.	Y	N		
Experimenter delivers a general praise statement at least every 30 s (e.g., *"Great job!, Nice work! Wow!"*)	Y	N		
No consequences are delivered for problem behavior.	Y	N	N/A	

_____ of _____ steps (Y or N) completed = _____ %

Notes:

- Do not count N/A toward total number of steps completed

Comments:

Functional Analysis Procedural Fidelity Checklist (Attention Condition)

Step	Yes	No	N/A	Comments
Experimenter and participant are at a desk/table and a reading worksheet is placed next to participant.	Y	N		
Experimenter reads the worksheet directions aloud to the participant.	Y	N		
Experimenter directs participant to work on worksheet with verbal prompt such as: *"I am busy and will be working over here. It is time for you to do this worksheet."*	Y	N		
Experimenter activates a timer for 5 min.	Y	N		
Experimenter sits at a chair approximately 6 feet from participant and ignores participant by reading from a binder of instructional materials.	Y	N		
If participant complies, experimenter continues to ignore.	Y	N	N/A	
If participant emits problem behavior:				
1. Experimenter increases proximity to participant	Y	N	N/A	
2. Experimenter delivers attention for 10 s: (e.g., says *"Don't do that, you might get hurt", "You need to be on-task", "You need to stop doing that", "That's not appropriate"*)	Y	N	N/A	
3. Task materials remain in front of the participant while the experimenter delivers attention.	Y	N	N/A	
After 10 s of attention have elapsed, experimenter prompts participant to engage in task with a verbal prompt such as: *"I am busy and will be working over here. It is time for you to do this worksheet."*	Y	N	N/A	
Process above is repeated for each occurrence of problem behavior.	Y	N	N/A	

_____ of _____ steps (Y or N) completed = _____ %

Notes:

- Do not count N/A toward total number of steps completed

Comments:

Functional Analysis Procedural Fidelity Checklist (Escape Condition)

Step	Yes	No	N/A	Comments
Experimenter and participant are at a desk/table and a reading worksheet is placed next to participant.	Y	N		
Experimenter reads the worksheet directions aloud to the participant.	Y	N		
Experimenter directs participant to work on worksheet with a verbal prompt such as: *"It is time for you to do this worksheet."*	Y	N		
Experimenter activates a timer for 5 min.	Y	N		
If participant complies, experimenter delivers a general praise statement (e.g., *"Great job!", "Nice work!"*).	Y	N	N/A	
If the participant emits problem behavior, the experimenter:				
1. Issues the verbal statement *"We can wait until you're ready"*	Y	N	N/A	
2. Withdraws the task materials	Y	N	N/A	
3. Turns away from the participant for 10 s	Y	N	N/A	
After 10 s of escape have elapsed, experimenter prompts participant to engage in task with a verbal prompt such as: *"It is time for you to do this worksheet."*	Y	N	N/A	
Process above is repeated for each occurrence of problem behavior.	Y	N	N/A	

_____ of _____ steps (Y or N) completed = _____ %

Notes:

- Do not count N/A toward total number of steps completed

Comments:

Appendix C: Performance Versus Skill Deficit Assessment Procedural Fidelity Checklist

Performance Versus Skill Deficit Assessment Procedural Fidelity Checklist

Step	Yes	No	N/A	Comments
Part 1: Baseline Read				
Experimenter is seated across the desk/table from participant (note the date of baseline read administration in comments box)	Y	N		
Experimenter administers standardized directions for the first passage	Y	N		
Experimenter prompts the participant to begin reading by saying "Begin"	Y	N		
Experimenter activates a timer for 1 min when the participant begins reading (if participant does not start reading within 3 s of "begin" prompt, experimenter supplies the first word/letter and activates timer)	Y	N		
After 1 min has elapsed, experimenter marks a bracket to the right of the final word/sound read and prompts the participant to stop reading	Y	N		
The process above is repeated for 2 additional passages	Y	N		
After 3 passages are read, the participant is asked to return to class. The experimenter calculates words read correctly and reading accuracy for each passage	Y	N		
Experimenter calculates the median reading accuracy of the 3 passages (note median in comments box)	Y	N		
If the median reading accuracy is 93% or above, experimenter notes that participant will skip Part 2 of the assessment	Y	N	N/A	

Step	Yes	No	N/A	Comments
Part 2: Read with Incentive				
Part 2 is administered between 1-4 days following baseline read (note the date of read with incentive administration in comments box)	Y	N		
Experimenter is seated across the desk/table from participant	Y	N		
A bin of incentive materials is placed on the desk/table	Y	N		
Experimenter explains that participant will read the same 3 probes as the baseline read but this time if they beat their score from the previous day, they will earn a prize: *"We are going to read these stories again. This will be the only task we have to do together today. Last time we read together, you got _____ correct. If you can beat your score, you can have anything you'd like from this bin. If you do not want anything from this bin, we can think of an activity to do together. You will earn the activity if you can beat your score."*	Y	N		
Participant is allowed to look through the bin of incentive materials	Y	N		
Experimenter asks: *"Do you see anything in there that you would like to earn?"*	Y	N		
Experimenter and participant establish a reinforcer for the task	Y	N		
Experimenter activates a timer for 1 min when the participant begins reading (if participant does not start reading within 3 s of "begin" prompt, experimenter supplies the first word/letter and activates timer)	Y	N		
After 1 min has elapsed, experimenter marks a bracket to the right of the final word/sound read and prompts the participant to stop reading	Y	N		
The process above is repeated for 2	Y	N		

additional passages				

Part 3: Hypothesis Generation				
If the participant reads at the instructional level or higher (i.e., 93% or higher accuracy) in Part 2, a *performance deficit* hypothesis is made (note hypothesis in comments box)	Y	N	N/A	
If the participant reads at the frustration level (i.e., less than 93% accuracy) in Part 2, a *skill deficit* hypothesis is made (note hypothesis in comments box)	Y	N	N/A	

_____ of _____ steps (Y or N) completed = _____ %

Notes:

- Do not count N/A toward total number of steps completed

Comments:

Appendix D: Antecedent Attention Condition Procedural Fidelity Checklist

Antecedent Attention Condition Procedural Fidelity Checklist

Step	Yes	No	N/A	Comments
Antecedent Attention Session:				
Experimenter allows participant to choose an activity he/she would like to do for 5 min	Y	N		
Experimenter activates a timer for 5 min and begins activity with the participant	Y	N		
Experimenter engages in undivided one-on-one attention with the participant	Y	N		
Reading Observation Session:				
Immediately following 5 min of continuous social interaction, the experimenter and participant enter the participant's classroom	Y	N		
Experimenter directs participant to engage in reading with the class with a verbal prompt such as: *"Now it's time to do independent reading/paired reading in your classroom. Take this book to your seat and read it."*	Y	N		
Experimenter does not interact with participant during reading observation session **Note:** If participant seeks help from experimenter or initiates an interaction, experimenter delivers a verbal prompt such as: *"I cannot help you right now. Do your best."*	Y	N		

Appendix E: Instructional Strategy Session Procedural Fidelity Checklist

Instructional Strategy Session Procedural Fidelity Checklist

Step	Yes	No	N/A	Comments
Instructional Strategy Session:				
Experimenter and participant are working alone in a hallway or classroom	Y	N		
Experimenter activates a timer for 10 min and begins instructional strategy with the participant **Note:** see attached fidelity checklists for instructional strategies (attached)	Y	N		
Reading Observation Session:				
Immediately following instructional strategy session, the experimenter and participant enter the participant's classroom	Y	N		
Experimenter directs participant to engage in reading with the class with a verbal prompt such as: *"Now it's time to do independent reading/paired reading in your classroom. Take this book to your seat and read it."*	Y	N		
Experimenter does not interact with participant during reading observation session **Note:** If participant seeks help from experimenter or initiates an interaction, experimenter delivers a verbal prompt such as: *"I cannot help you right now. Do your best."*	Y	N		

Appendix F: Incremental Rehearsal Procedural Fidelity Checklist

Incremental Rehearsal Procedural Fidelity Checklist

Step	Yes	No	N/A	Comments
Starting Activity:				
Each item is presented on an index card	Y	N		
There are 7 items in the set at all times	Y	N		
Interventionist introduces activity: *"We are going to practice some new words."*	Y	N		
Modeling:				
Interventionist models the unknown word: *"This is the word _____. What word?"*	Y	N		
Student responds by saying the word with the correct pronunciation	Y	N		
Interventionist praises and repeats the word. *"Good, _____".*	Y	N		
Rehearsal Sequence:				
Interventionist prompts participant to say the unknown word to begin IR sequence: *"What word?"*	Y	N		
1. Interventionist presents 1st unknown word and 1st known word/picture.	Y	N		
2. Interventionist presents 1st unknown, 1st known, 2nd known	Y	N		
3. Interventionist presents 1st unknown, then 1st , 2nd , 3rd knowns	Y	N		
4. Interventionist presents 1st unknown, then 1st , 2nd , 3rd , 4th knowns	Y	N		
5. Interventionist presents 1st unknown, then 1st , 2nd , 3rd , 4th, 5th knowns	Y	N		
6. Interventionist presents 1st unknown, then 1st, 2nd, 3rd, 4th, 5th, 6th knowns	Y	N		
Error Correction Procedure:				
Student given 3 seconds to respond before using error correction procedure	Y	N	N/A	
"That sound is _____. What sound?" (student responds appropriately) *"Good, _____."*	Y	N	N/A	

Appendix G: Sound Boxes Procedural Fidelity Checklist

Sound Boxes Procedural Fidelity Checklist

Step	Yes	No	N/A	Comments
General Steps:				
Interventionist has prepared decodable words to teach	Y	N		
Interventionist uses a letter sound box mat or uses a small whiteboard with boxes drawn on it	Y	N		
Interventionist uses positive praise (e.g., saying *"great!", "super!", "nice job!"*) throughout	Y	N		
Interventionist provides explicit and immediate feedback throughout	Y	N		
Modeling:				
Interventionist models a word: *"I hear the / /, / /, and / / sounds in the word _____. I hear the / / sound first, so I'm going to put it in the first box. I hear the / / sound second, so I will put it here. I hear the / / sound last, so I will put it at the end."* (Interventionist models putting the sounds in the boxes)	Y	N		
Interventionist says each sound while pointing to the letters and then blends the sounds together to read the whole word.	Y	N		
Guided Practice:				
Interventionist says another word for participant to practice: *"Let's do another word together. What sounds do you hear in this word?"*	Y	N		
Interventionist and participant practice putting letters together and sounding out the word.	Y	N		
Participant successfully completes the task with guidance.	Y	N		
Independent Practice:				
Interventionist says another word for participant to do independently: *"Now you try a word by yourself. What sounds do*	Y	N		

you hear in this word?"				

Appendix H: Listen Sentence Preview Procedural Fidelity Checklist

Listen Sentence Preview Procedural Fidelity Checklist

Step	Yes	No	N/A	Comments
Starting Activity:				
Interventionist and participant have a reading passage in front of them (or interventionist and participant share a reading passage)	Y	N		
Interventionist introduces activity: *"We are going to practice reading sentences."*	Y	N		
Modeling:				
Interventionist introduces modeling: *"First, I will read some sentences by myself. You follow along."*	Y	N		
Interventionist reads first 1-4 sentences aloud (places finger below text that is read, models appropriate accuracy, fluency, and expression)	Y	N		
Participant is looking at the passage while the interventionist reads	Y	N		
Guided Practice:				
Interventionist introduces guided practice: *"Now, let's read the sentences together. You try to match my voice and speed."*				
Interventionist and participant read the same 1-4 sentences together (up to 3 times)	Y	N		
Participant is looking at the passage while reading and is reading along with the interventionist	Y	N		
Independent Practice:				
Interventionist introduces independent practice: *"Now I get to listen to you read by yourself. Do your best reading."*	Y	N		
Participant reads the 1-4 sentences independently.	Y	N		
The above steps are repeated for subsequent sentences in the passage.	Y	N	N/A	
Errors are corrected immediately and participant reads the sentence again.	Y	N		

Error Correction Procedure:				
Student given 3 seconds to respond before using error correction procedure	Y	N	N/A	
"That word is _____. What word?" (student responds appropriately) *"Good, _____."*	Y	N	N/A	

_____ of _____ steps (Y or N) completed = _____ %

- Do not count N/A toward total number of steps completed

Comments: