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Behavioral Skills Training for Reducing Challenging Behaviors in Students With Down Syndrome With or Without Co-Occurring Autism Spectrum Disorder

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Behavioral Skills Training for Reducing Challenging Behaviors in Students With Down Syndrome With or Without Co-Occurring Autism Spectrum Disorder

by
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Approval Page

This applied dissertation was submitted by Jacqueline Tudor under the direction of the persons listed below. It was submitted to the Abraham S. Fischler College of Education and School of Criminal Justice and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Nova Southeastern University.

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Statement of Original Work

I declare the following:

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Abstract

Behavioral Skills Training For Reducing Challenging Behaviors in Students With Down Syndrome With or Without Co-Occurring Autism Spectrum Disorder. Jacqueline Tudor, 2023: Applied Dissertation, Nova Southeastern University, Abraham S. Fischler College of Education and School of Criminal Justice. Keywords: behavioral skills training, Down syndrome, autism, applied behavior analysis, function-based interventions, teacher training

This applied dissertation was designed to improve the effectiveness of professional educators in using the methodology of functional behavior assessment (FBA) and function assessment-based intervention (FABI) to reduce challenging behaviors exhibited by students with Down syndrome (DS), or a dual diagnosis of Down syndrome and autism spectrum disorder (DS-ASD). Educators often rely on traditional classroom management methods which curtail disruptive behaviors without determining the reason why the behavior is occurring. The study examined the effects of utilizing a behavioral skills training program of instruction, modeling, rehearsal, and feedback in the methodology of FBA and FABI.

The research was conducted using a single subject research design of multiple probes across participants to train three special educators working with students with DS or DS-ASD. All participants increased their ability to identify the function of the behavior and select appropriate interventions as measured by an increase in knowledge and percent correct of functionally appropriate interventions selected. There was a reduction in students' maladaptive behaviors of aggression and non-compliance in all three classrooms in the study as noted in the data collected from classroom observations. A social validity survey completed by the teacher participants confirmed the social acceptability of the training program and methods.

Table of Contents

Chapter 1: Introduction

The skillset of a teacher includes the ability to present the subject matter in an effective manner while maintaining instructional control. A barrier to effective education can be a deficit in classroom management strategies when students exhibit disruptive behaviors that interfere with the educational environment (Kestner et al., 2019; Oakes et al., 2018; Owens, 2018). The Individuals with Disabilities Education Act ([IDEA], 2004) mandates the use of functional behavior assessment (FBA) as an evidence-based strategy that identifies function of problem behaviors and drives the effective behavior intervention plans. The literature on the FBA educator training explicitly calls for the effective approaches to professional development so educators can successfully implement FBA and determine the function-based treatment or functional assessment-based intervention (FABI) for behavior management (Allday, 2018; Borgmeier et al., 2015: Lukins et al., 2022; Oakes et al., 2018).

Statement of the Problem

Within American classrooms, there are increasing rates of challenging behaviors, as indicated in the data from the Fifth American School District Panel Survey of 222 school districts (Hunter et al., 2022). Respondents of the survey rated student behavioral issues as those that may warrant disciplinary action. Ten percent of respondents were not concerned, 25% of respondents were slightly concerned, 40% of respondents were moderately concerned, and 25% of respondents found it to be a major concern. In total, 90% of respondents expressed concern in general. The same survey was administered to another group of respondents in the fall of 2021. The survey results revealed that 18% of respondents were not concerned, 23% of respondents were slightly concerned, 33% of

respondents were moderately concerned, and 26% of respondents were very concerned. There were 82% of respondents who expressed concern for the same behavioral measure (Diliberti et al., 2022). Mandatory quarantine of the COVID-19 pandemic and abrupt switch to virtual education, that interrupted the typical school routine, were also implicated as a contributing factor to the escalation of the problem behaviors in children (Lane et al., 2021; Minkos et al., 2020; Musa et al., 2022; Sun et al., 2022). In the 2022 School Pulse Panel Data Collection, which collects monthly data from approximately 2,400 public elementary, middle, high, and combined grade schools' surveys, reported the September 2022 results: There were 56% of the survey respondents from around 1,010 schools who indicated concern over student misconduct that led to classrooms disruptions, while 51% of the respondents reported the need for training on classroom management strategies (Institute of Educational Sciences, 2022).

Students with intellectual and developmental disabilities have an increased risk of challenging behaviors (Balboni et al., 2020; Patel et al., 2018) that can interfere with learning in the educational setting (Klopfer et al., 2019; Luck et al., 2022). For students diagnosed with autism spectrum disorder (ASD), high rates of challenging behavior are known to co-occur due to the social and communication deficits which are part of the symptomology of ASD and environmental factors (Feeley & Jones, 2006; Griffith et al., 2010), and are often addressed with behavior analytic strategies such as FBA (Alligood & Gravina, 2021; Traub et al., 2017). Students with Down syndrome (DS), who are not dually diagnosed with ASD, can also present with behavioral problems (Dieleman et al., 2018, Kirchner et al., 2021) that may be associated with intellectual disability (ID) and increase the risk of challenging behaviors (Balboni et al., 2020). Research specific to DS

has identified behavioral problems that are unique to this population and may also be presented with some notable psychosocial strengths which may be harnessed to improve outcomes (Dieleman et al., 2018; Griffith et al., 2010). While some researchers have investigated the use of behavior analytic methodology, including FBA, for people with the dual diagnosis of DS and ASD, the literature on DS alone as the disability of interest in applied behavior analysis (ABA) studies is scarce (Alligood & Gravina, 2021; Dillenburger, 2012; Dillenburger & Keenan, 2009).

As a result of behavioral challenges impacting learning in schools, targeted FABIs are necessary to decrease problem behaviors to improve learning (Allday et al., 2018; Hirsch et al., 2020; Luck et al., 2022). Despite federal mandates under the IDEA of 2004 that require that challenging behavior is addressed with FBA to determine the function of the behavior which, in turn, will drive the function-based interventions, professional educators are not trained to perform the assessments effectively (Hirsch et al., 2020; Luck et al., 2022; Oakes et al., 2018). The underutilization of evidence-based methods for students with disabilities may be a contributing factor in the level of challenging behaviors as their continued occurrence and reinforcement may create patterns of persistent maladaptive behaviors (Balboni et al., 2020).

One possible cause of professional educators not addressing behavioral concerns with FBA or FABI was a lack of targeted professional training opportunities that provided an effective skillset in these methods (Borgmeier et al., 2015; Hsiao & Petersen, 2019; Klopfer et al., 2019). Hsiao and Petersen (2019) noted that over 60% of the 144 educators remarked that they were presented with evidence-based strategies through direct instruction methods, without a practice component, which did not carry over to

real-world applications. Klopfer and colleagues (2019) highlighted the need for a shift in teacher education programs towards empirically validated strategies for behavior management. When educators were taught how to functionally address challenging behavior, the fundamental FBA training did result in school teams utilizing the strategies with success (Borgmeier et al., 2015). Because of the need for effective and targeted FBA training, many researchers turned to application of the ABA-based behavioral skills training (BST) that has already demonstrated a marked success as an alternative to the traditional professional development (Courtemanche et al., 2021; Davenport et al., 2019) with good social validity for participants (Reid et al., 2019; Young et al., 2018). A study that examines the effectiveness of BST on increasing teacher confidence and skillset in implementing FBA by utilizing a single-subject research design could resolve the teacher training situation and potentially lead to the appropriate use of evidence-based methods and function-based strategies to decrease challenging behaviors of school-age children with Down syndrome with or without co-occurring ASD.

The Research Problem

The problem to be studied is the increased prevalence of challenging behaviors in self-contained elementary school classrooms of children diagnosed with DS (Feeley & Jones, 2007), with some learners also having co-occurring developmental disorders such as autism (Balboni et al., 2020; Channell et al., 2019; Godfrey et al., 2019; Leader et al., 2022; Patel et al., 2018), and methods to reduce these behaviors to improve the effectiveness of instruction and the overall school environment (Bolourian & Blacher, 2018; Chan et al., 2022). FBA is an evidence-based approach to identifying the function of behavior (Hill et al., 2020), or maintaining variables for the occurrences of disruptive

behaviors (Allday, 2018; Borgmeier et al., 2015; Cooper et al., 2020; Steege et al., 2019). There is a long-standing concern that FBA is underutilized in the United States to address the increase in behaviors in the classroom (Oakes et al., 2018; Owens et al., 2018; Lukins et al., 2022) due to lack of targeted and effective FBA training for pre-service teachers (Hsiao & Petersen, 2019; Klopfer et al., 2019), novice teachers (Lukins et al., 2022), and ongoing professional development for school professionals (Fetherston & Sturmey, 2014; Hirsch et al., 2020; Hsiao & Petersen, 2019; Young et al., 2018).

Within the proposed research setting, according to the anecdotal data from school records, escalating numbers of problem behaviors impact instruction and lead to referrals for behavior services. In 2020-2021, three students received ABA services from a consulting behavior analyst. In 2021-2022, two students were receiving ABA services, and one had left the school; however, other challenging behaviors were reported to the administration. As a result, the behaviorist position was increased to full-time for 2022-2023 with a caseload of the original two students plus an additional 11 students needing various levels of behavioral support. The primary method currently used by the teachers, therapists, and paraprofessionals to address disruptive behaviors is suppression of challenging behaviors without evaluating the reason that these behaviors are occurring. Professional development for the staff is currently lacking in targeted FBA training, with a reliance on the behaviorist to create the behavior plans, without the educators understanding the methodology behind the FBA. Teachers and administrators are requesting solutions to manage the challenging behaviors and to assist in staff training methods which will result in a meaningful decrease in disruption to the learning environment.

Background and Justification

Research on the rates of challenging behaviors and their impact on the educational environment and student outcomes has been a notable area of study in the literature for effects on social inclusion (McGuire & Meadan, 2022), the correlation between classroom management style and problem behaviors (Kestner at al., 2019; Owens et al., 2018), and vetting of effective behavior management strategies (Simpson et al., 2020). When student behaviors were addressed with effective methods, there was a corresponding decrease in disruptive behaviors and an increase in student performance (Owens et al., 2018; Simpson et al., 2020). In the study conducted by Owens and colleagues, a rate of 51% effective teacher instructions, which contained positive statements, were proactive, and had clear expectations, and specific directions for the students, was associated with the lowest levels of challenging behaviors. Functionally based assessments address maladaptive behaviors by examining the environmental variables that happen before and after disruptive events (Allday, 2018; Simpson et al., 2020). From the functional analysis of behavior, appropriate interventions can be chosen to increase adaptive skills and decrease challenging behaviors (Allday, 2018; Owens et al., 2018; Simpson et al., 2020). For professional educators to attain fluency in FBA, BST has been explored for the effectiveness to teach trainees the logical process of FBA to determine the function or hypothesized reason for a behavior (Allday, 2018) and the corresponding functional assessment-based intervention (FABI) (Courtemanche et al., 2021). In a study of five special education teachers, behavioral skills training was demonstrated to be highly effective for problem-solving behavioral challenges and

selecting the appropriate functional communication training (FCT) variation to increase adaptive skills to replace the need for problem behaviors (Luck et al., 2022).

Deficiencies in the Evidence

Within the literature, challenging behaviors have been addressed from the perspective of classroom management with reliance on the skill set of the teacher and the behavioral effects on the educational environment (Borgmeier et al., 2015; Cooper & Scott, 2017; Gage et al., 2018; Owens et al., 2018). This global approach to behavior management is not function-specific and can result in the unintended consequences of the worsening of challenging behaviors (Allday, 2018; Simpson et al., 2020). There is a lack of ongoing and targeted training in FBA for teachers with many teacher preparation programs and school district professional development programs focusing on the overall classroom strategies (Hsiao & Petersen, 2019; Klopfer et al., 2019; Young et al., 2018).

For students with DS, there are medical comorbidities which can contribute to variables that increase the risk of maladaptive behaviors (Dieleman et al., 2018; Patel et al., 2020; Patel et al., 2018). Intellectual disability, which is common in students with DS, also increases the likelihood of maladaptive behavior manifestations (Balboni et al., 2020; Channell et al., 2021; Hassan et al., 2022). Parents and teachers of children with Down syndrome have reported challenging behaviors such as rule-breaking, aggression, and inattention as stressors in the home and school environments (De Clercq et al., 2022; Esbensen et al., 2021). However, the general lack of research on ABA and FBA methods outside of ASD that are specific to DS has been a notable deficit in the literature (Alligood & Gravina, 2021; Dillenburger, 2012; Dillenburger & Keenan, 2009).

Audience

The audience for this research study is school personnel, including teachers, administrators, therapists, psychologists, behaviorists, and other stakeholders affected by challenging behaviors in the student population. Successful strategies for reducing problem behaviors would benefit school-age students with disabilities in general and specifically students with DS or DS-ASD. Educators who work with students with DS will be informed of the targeted FBA strategies and function-based interventions that may assist with the overall improvements of the classroom and school environments for students with DS or DS-ASD. Behaviorists and researchers would also benefit by having staff training solutions for FBA and FABI in their repertoire of strategies for consultation in the school setting relative to students with DS or DS-ASD.

Setting of the Study

The setting of the study is a small private elementary school for students with Down syndrome and other related disabilities in New Jersey that serves children from ages 3 to 10 years old.

Researcher's Role

The primary researcher is a special educator and the behaviorist at the location where the study will be implemented. In this role, she provides behavioral support and training to the school's teachers, therapists, and paraprofessionals. Programs are implemented for 3–10-year-old children with DS, autism, and other disabilities and behavioral needs. The primary researcher is a New Jersey certified teacher of students with disabilities, and teacher of students' grades preschool to Grade 3. She also holds the

designation of Board Certified Behavior Analyst and has been in the special needs community in various roles since 1997.

Purpose of the Study

The primary purpose of this single-subject research study is to examine the effectiveness of the BST model on the acquisition of teachers' FBA skills and their direct application towards reduction of maladaptive behaviors of elementary-age students with DS in the classroom setting. The secondary purpose of this study is to evaluate the occurrences of challenging behaviors of the elementary-age students with DS by analyzing the hypothesized functions of maladaptive classroom behaviors with the use of FBA upon completion of the teacher training. Because the BST model has been utilized as an effective method for training school personnel, professionals, and paraprofessionals to identify the functions of behaviors and to create behavior reduction strategies (Gregori et al., 2020; Hirsch et al., 2020; Luck et al., 2022), it is perfectly suited for this study.

To address the increase in challenging behaviors, the proposed study would examine maladaptive behaviors of the elementary-age students with DS or DS-ASD through the integration of functional analysis of behaviors with classroom management strategies that will be differentiated according to the hypothesized functions of the target behaviors. Effective teacher training methods would be utilized to increase the skills, competencies, and application of FBA and potentially lead to selection of the function-based interventions and instructional methods as an overall comprehensive approach to classroom management.

Definition of Terms

*Adaptive behavior*s are identified as those behaviors which allow for functioning

in a society within social and cultural expectations of personal and social responsibility that is developmentally appropriate for activities of daily living, social interactions, and communication (Sattler, 2014).

Applied behavior analysis (ABA) is a natural science that systematically examines human behavior applied in the context of environmental variables that are conceptually systematic, technologically sound, and can be generalized across different environmental conditions to produce socially significant and meaningful change (Cooper et al., 2020; Fisher et al., 2014).

Antecedent is an environmental condition or stimulus that occurs before the target behavior (Cooper et al., 2020; Fisher et al., 2014).

Automatic reinforcement refers to reinforcement that is not mediated by others in the environment and is often thought to be sensory in nature (Catania, 2013; Copper et al., 2020).

Behavior is something that an organism does that can be observed with the senses when the individual interacts with the environment (Cooper et al., 2020; Fisher et al., 2014).

Behavioral skills training (BST) is an instructional procedure in which a skill is systematically taught with direct instruction, modeled by the instructor, rehearsed through role play, and then feedback is given to improve performance (Fisher et al., 2014).

Classroom management is a set of skills that allows for effective delivery of academic instruction while preventing disruptions to the educational environment (Borgmeier et al., 2015; Gage et al., 2018; Owens et al., 2018).

Consequence is an environmental condition or stimulus that follows the target

behavior (Cooper et al., 2020; Fisher et al., 2014).

Direct assessment is an observation method during which the behavior of interest is observed within the environment and conditions in which the behavior is likely to occur are considered and recorded (Cooper et al., 2020; Steege et al., 2019).

Evidence-based practices (EBP) are empirically validated teaching practices or skill sets which have been proven to effectively deliver instruction (Hsiao & Petersen, 2019).

Functional behavior assessment (FBA) is a systematic method using indirect and direct measures for the evaluation of variables that occur prior to and after a behavior of interest to determine the function (maintaining variables) or "reason" why a behavior occurs or is likely to occur (Cooper et al., 2020; Steege et al., 2019) .

Functional assessment-based intervention (FABI) or Function-based intervention (FBI) is a problem-solving method that uses the data from the FBA for the probable function of the problem behavior to understand why the behavior occurs and to teach skills and/or replacement behaviors that will meet the same function in more socially appropriate ways (Cooper et al., 2020; Steege et al., 2019, Umbreit et al., 2007).

Generalization refers to behavior change that occurs under different conditions such as various stimuli (stimulus generalization), for different ways of using the skill (response generalization) while maintaining the change over time (Cooper et al., 2020; Fisher et al., 2014).

Indirect assessment includes measures of the behavior of interest with data gathered from informants such as teachers, parents, and others who have knowledge and direct contact with the individual. Methods include rating scales, interviews, and records

review to gather information about the target behavior (Cooper et al., 2020; Steege et al., 2019).

Maladaptive behaviors are problem behaviors that are not socially functional or appropriate given social and cultural expectations of personal and social responsibility that are developmentally appropriate for activities of daily living, social interactions, and communication (Cooper et al., 2020; Steege et al., 2019).

Motivating operations refers to environmental variables that temporarily alter the value of a stimulus and influences the likelihood of a behavior occurring (Catania, 2013; Copper et al., 2020).

Negative reinforcement refers to removal or avoidance of an aversive stimulus following a behavior, which increases the likelihood of that behavior occurring in the future (Catania, 2013; Copper et al., 2020).

Positive reinforcement is when a stimulus is added to the environment and increases the likelihood of that behavior occurring in the future (Catania, 2013; Copper et al., 2020).

Chapter 2: Literature Review

This literature review is organized thematically starting with the theoretical framework which explains the scientific and philosophical underpinnings of ABA. Then, the researcher used the ERIC database to search for the most recent research studies published within the last 5 years and focused on traditional approaches to classroom management, FBA, and FABI to decrease challenging behaviors. Additional research articles were gathered for the paradigm of BST as utilized in the training of professional educators in how to implement FBA and FABI. The final section is a comprehensive review of the characteristics of DS with or without a comorbidity of ASD and how FBA and FABI are utilized in remediating behavioral challenges. The culmination of the literature review is the research questions which explore the extent to which FBA and FABI can be taught to professional educators to improve the educational experiences of people with DS and DS-ASD.

Theoretical Perspective

The problem of decreasing challenging behaviors through effective interventions based on function, or the reason why the behavior is occurring, is grounded in the theory of ABA. The origins of ABA had its beginning foundations in the philosophy of behaviorism as founded by Watson (1913) who primarily studied observable and measurable stimuli (S) and response (R). In 1927, Pavlov (Cooper et al., 2020) created a classical conditioning experiment with a dog in which food was paired with the sound of a bell and elicited the involuntary response of salivation, in absence of the food, as a learned behavior. In 1945, Skinner brought the science of behaviorism to the next level of the learning theory that became the three-term contingency (S-R-S) of operant

conditioning (Skinner, 1953), and radical behaviorism to include private events or internal thoughts that could be described via verbal behavior (Cooper et al., 2020; Skinner, 1957).

Another key contribution to ABA methodology was associated with the work of Ayllon and Michael (1959). These scientists studied evidence-based approaches to strengthening and weakening of behaviors. To be specific, Ayllon and Michael aimed at reducing the problem behavior of psychiatric patients by training nurses to use operant procedures that included reinforcement and extinction. As a result of this fundamental ABA research, Ayllon and Michael demonstrated successful application of the specific contingencies that may increase or decrease occurrences of target behaviors. This was also known as conditioning of behavior and was an important concept in the science of ABA because it described a mechanism that allowed a target behavior to become more frequent or less frequent, and more predictable in a given environment.

Carr (1977) examined the research literature for the chain of environmental variables surrounding self-injurious behavior (SIB) and found that SIB can be learned and maintained by the likely functions of positive reinforcement in the form of attention, escape in the form of negative reinforcement, and automatic reinforcement with sensory variables. Carr and colleagues (1980) added to the understanding of FBA in their single-subject research study of two participants with intellectual disabilities. The authors identified escape from socially mediated demands as a probable function of the aggressive behaviors of the participants. Moreover, Carr et al. demonstrated that escape-motivated aggression can be managed through application of strongly preferred reinforcers and strengthened by systemic teaching of alternative responses.

Iwata and colleagues' (1994) seminal research study improved the methodology of FBA by examining the functional relationships between SIB under various environmental conditions, supporting the concept of functionally specific behavioral interventions. The authors applied four separate control conditions to determine the function of SIB. Social disapproval, academic demand, play, and alone were among the conditions of the study. As a result of the experimental analysis, the authors successfully demonstrated that the presence of demands evoked SIB. With this clear presentation and verification of the function of behavior, the function-based interventions were likely to be very successful. The theoretical constructs of ABA contend that all behaviors have meaning and can be observed, measured, and changed through a functional analysis of the behaviors and effective application of the four types of consequences (positive reinforcement, negative reinforcement, positive punishment, and negative punishment) which contributed to the likelihood of a behavior increasing or decreasing in the future (Carr, 1977; Cooper et al., 2020; Iwata et al., 1994; Skinner, 1957; Umbreit et al, 2007).

Traditional Approaches to Classroom Management

Strategies to address challenging behaviors in the classroom were part of the curriculum in educational training programs prior to teachers taking their first jobs in the classroom (Hsiao & Petersen, 2019; Klopfer et al., 2019; Lukins et al., 2022). Traditional strategies included prevention and classwide supports; however, educators reported that they still needed additional professional development once entering the field (Hsiao and Petersen, 2019; Klopfer et al., 2019; Wills et al., 2019). The complex interaction between teacher and student behaviors has also been a focus of study as students will react to teachers in ways that may increase or decrease challenging behaviors based on the

teacher's approaches and responses to the disruptive behaviors (Klopfer et al., 2019; Owens et al., 2018; Wills et al., 2019). There was a deficit in teachers' ability to translate the theory into practice for positive behavior supports, and many teachers relied on stopping the behavior rather than determining the underlying variables maintaining the behavior (Hsiao & Petersen, 2019; Oakes et al., 2018) or finding a FABI to decrease future occurrences of the challenging behavior (Kestner et al., 2019; Oakes et al., 2018).

In a broad scope, Hsiao and Petersen (2019) examined 25 evidence-based practices (EBP) for special educators that were likely to be taught during teacher education or in-service training to work with students with ASD. The purpose of the study was to assess which EBP strategies were being taught in teacher preparation programs and during professional development opportunities. In their quantitative study, Hsiao and Petersen surveyed 63 educators, only 40% of whom reported being exposed to the same five practices out of the 25 EBP, which included differential reinforcement of alternative behavior (DRA), functional behavior assessment (FBA), prompting, reinforcement, and task analysis.

In a randomized control trial design of 82 teachers, Klopfer et al. (2019) researched methods for preservice teacher training to address challenging behaviors in the classroom. The researchers theorized that teachers needed the skills to manage challenging behaviors and the competency of a positive attitude toward students with emotional and behavioral disabilities to provide effective instruction. The purpose of their study was to analyze the effectiveness of the Errorless Classroom Management (ECM) model, which was created by Ducharme in 2007 (Klopfer et al., 2019), as a program of proactive behavioral strategies that prompt the learner to answer questions correctly

without making any errors. In comparing the data of the 50 preservice teachers who received ECM training and the 32 teachers in the control group who took an alternative elective, the results demonstrated the effectiveness of the ECM intervention for increasing immediate positive attitudes towards learners with challenging behaviors, and the use of proactive strategies in a classroom simulation environment.

Another approach to classroom management that was explored as an antecedent preventative approach was class-wide function-related intervention teams (CW-FIT) in elementary and middle school classrooms (Wills et al., 2019). In a single-subject research study with the use of withdrawal (ABAB) design, the researchers' purpose was to evaluate whether CW-FIT can be implemented with fidelity and effectiveness by three middle school teachers in their classrooms to affect change on the variables of on-task behavior, the frequency of teacher praise and reprimands, and if the intervention has social validity or usefulness for the student and educator participants. Components of the CW-FIT program included clear expectations for the classroom, behavior-specific praise, and interdependent group contingencies in which students are praised based on the group meeting expectations. The results of the teachers' behaviors demonstrated an increase in praise for all three classrooms; however, reprimands persisted, albeit at lower levels. Likewise, the students' target on-task behaviors increased in frequency for two of the three classrooms.

When looking further into classwide behavior management, the effects of the interplay of teacher and student behaviors were evaluated by looking at the percentage of correct teacher responses in accordance with EBP, per instance of problem behavior in the instructional setting across grade levels of kindergarten to fifth-grade learners for 55

teachers and 55 learners from the schools in Ohio and Florida (Owens et al., 2018). The goals of the study were to disaggregate teacher and learner behaviors by grade level, examine the impact of teacher behaviors as predictors of student challenging behaviors, and create parameters for appropriate teacher responses. The results supported the researchers' hypothesis that challenging behaviors would vary by grade level, with teachers using lower levels of praise as students age increased, showing a potential for future research to examine the developmental needs and teacher practices more closely. Notably, as the use of praise decreased, the rates of challenging behaviors began to rise, with a threshold of 51% praise statements being the minimum for behavior reduction.

Functional Behavior Assessment

In the history of ABA, there has been a foundational understanding that the scientific study of behavior would lead to socially significant improvements through interventions that are behavioral, analytic, applied, technological, conceptually systematic, effective and could have generality to outside of the intervention setting (Baer et al., 1968; Baer et al., 1987, Cooper et al., 2020). As a result, there are evidence-based strategies, such as FBA, surrounding learning theories derived from the science of behavior analysis, that have been applied to the school environment to improve educational outcomes and behavioral support (Alberto & Troutman, 2013; Cooper et al., 2020; Steege et al., 2019). FBA is a method designed to evaluate behavior in the context of the analysis of the environmental variables that contribute to the occurrence of problem behavior. In the process, the disruptive behavior is understood by determining a hypothesis of how the behavior of an individual serves a function or purpose that increases the likelihood of the behavior happening in the future (Cooper et al., 2020).

Behavior is learned and continues to persist because of contact with contingencies in the environment, which lead to likelihood of their occurrence in the future (Catania, 2013; Cooper et al., 2020). The maintaining functional relations that occasion behavior are identified by the broad contingencies of positive, or negative reinforcement. There are subcategories of socially mediated attention, escape, and access to tangibles, as well as automatic (non-socially mediated) reinforcement, which are usually sensory in nature (Cooper et al., 2020). In contrast, the topography of the behavior, which merely describes how the behavior appears, does not lead to information as to why the behavior occurs. For example, in looking at the aggressive behavior of hitting, there can be an instance of one child's hand striking another child on the arm; however, describing that isolated event of hitting does not indicate the reason or motivation for the aggression. Therefore, when a behavior of interest is evaluated within the context of environmental variables, instead of the form or appearance of the behavior, useful information can be gathered to find functionally specific solutions (Cooper et al., 2020).

The analysis of behavior identifies key variables, or stimuli, which include motivating operations, antecedents, behaviors, and consequences (Catania, 2013; Cooper et al., 2020). The behavior of concern is described in specific, measurable, and observable terms when conducting an FBA (Cooper et al., 2020; Umbreit et al., 2007). Behavior analysts utilize an inductive approach which considers the individual's behavior in a holistic framework within the environment (Copper et al., 2020). Antecedents are the stimuli that precede the behavior and may serve as a signal that reinforcement is or is not available, therefore creating the circumstances that a behavior may likely be triggered (Catania, 2013; Cooper et al., 2020). Consequences are responses in the environment

which follow the problem behavior and may lead to instances of the behavior in the future (Catania, 2013; Cooper et al., 2020). Motivating operations (MOs) are setting events in the environment that may alter the value of a particular consequence or behavior, and thereby increase the likelihood of that behavior occurring (Cooper et al., 2020).

To understand the reasons why a behavior occurs, an FBA is conducted in a systematic and formal process to examine the environmental variables that may occasion the instances of the behavior of interest (Cooper et al., 2020; Steege et al., 2019). There are multiple parts to the assessment process, in which information is gathered from direct and indirect measures, which includes interviews with teachers, parents, or other informants, and direct observations of the person engaging in the target behaviors in the natural environment (Cooper et al., 2020). Interviews are collected using narrative recording or with behavior rating scales such as the Motivation Assessment Scale (MAS), or Functional Analysis Screening Tool (FAST) to evaluate potential functions of problem behavior (Cooper, 2020). During the descriptive assessment, the observer records the antecedents, behaviors, and consequences, as well as other environmental events, or MOs, looking for the events that occur in temporal proximity to the target behavior (Copper et al., 2020). The collected data are interpreted, and hypotheses are formed as to the potential function(s) of the behavior so that interventions can be selected to address the challenging behaviors (Cooper et al., 2020). The final step of FBA is functional analysis (Cooper et al., 2020; Iwata et al., 1982). During this process, test and control conditions are carefully designed and implemented with a goal of clearly identifying the contingencies that maintain the target behavior. Following the Iwata et al.'s (1982)

seminal research study and its methodology, practitioners may implement four separate control conditions: social disapproval, academic demand, play, and alone. However, practical approach to experimental conditions' set up involves at least two essential conditions that are test and control conditions (Cooper et al., 2020). Each of these conditions usually describes motivating operation, contingency, and schedule of reinforcement, which are arranged according to the experimental design such as multiple schedule design or withdrawal design. The current functional analysis standard is that practitioners conduct at least one 5-minute test condition and one 5-minute control condition (Cooper et al., 2020; Iwata et al.,1994; Northrup et al., 1991; Wallace & Iwata, 1999).

Federal Laws Requiring Functional Behavior Assessment

With the passage of amendments under the Individuals with Disabilities Education Act of 1997 and its reauthorization in 2004, FBA was identified as an evidence-based practice that is required when challenging behaviors impact the education of a student (Borgmeier, et al., 2015; Cooper et al., 2020, IDEA, 2004). As a result of these legislative mandates that identified the need to provide more support and equal opportunities to all learners regardless of disabilities or abilities, effective instruction has been at the forefront of teaching and learning (Owens et al., 2018). The functional analysis of behavior is also mandated at the state level within the accountability standards that determine whether students have made satisfactory progress and have been given appropriate solutions for challenging behaviors (Borgmeier, et al., 2015; Owens et al., 2018).

Functional Assessment-Based Interventions

Although FBA and FABI are evidence-based, teachers are not always trained to fluency in the methods (Oakes et al., 2018). In a large-scale quantitative study conducted by Oakes and colleagues (2018), with 148 self-selected professional educators from 22 school districts located in the midwestern area of the United States, the researchers conducted a six-part professional development program for training in FABI methods. The Survey data were collected with the use of the FABI Knowledge, Confidence, and Use Survey (FABI KCU), which contained 15 Likert-style ratings for KCU, and 10 open-ended questions in which participants filled in the definitions for the concepts from FABI before and after the training series. The researchers aimed at confirming the results from the Lane et al.'s (2015) research that FABI can be effectively taught in a professional development setting and to further analyze the process of training in its individual steps. For each part of the training, there were checklists that needed to be completed to demonstrate the participants' engagement and knowledge levels for the completion of daily activities. Results of this study demonstrated increased scores on all parts of the FABI KCU with the perceived knowledge portion having the highest increases for the participants. In the step completion of daily task measures, there was a decline in the percentage from 100% on the first two steps, to 82.76% on steps three and four. On the fifth step, the rate was 68.97%, with an increasing number of tasks per day which may have contributed to the decrease in completion.

One FABI that has proven highly effective in decreasing challenging behaviors is Functional Communication Training (FCT) with variations based on the proposed function of the behavior (Luck et al., 2022). The purpose of the study was to incorporate

BST into the existing research which validated FCT as an evidence-based method. There were five special education teachers, with self-reported limited experience in choosing FABI, who volunteered to take part in a 5-day summer professional development training. The study was a multiple baseline design across participants with baseline and post-training data collected on the FCT protocol. Luck and colleagues were able to demonstrate that BST, as part of a brief training package, resulted in successful outcomes for fidelity to the selection and implementation of the six parts of FCT with a simulated student across all participants.

Elliot and colleagues (2023) emphasized the importance of examining the variables surrounding the challenging behavior in the context of the school and classroom as opposed to attributing the behaviors to the disability or outside influences such as the home setting. Using a behavior analytic framework, the researchers created an indirect tool, the Academic Diagnostic Checklist-Beta (ADC-B, Elliot et al., 2023) to assess the environmental causes that may occasion challenging behaviors and have a negative impact on academic performance, thereby allowing the researchers to determine the hypothesized function(s) of the deficits as they relate to performance challenges. ADC-B was comprised of 32 questions over six categories for direct observation, records review or interview format with students, parents, teachers, or other professionals, that takes approximately 15-30 minutes to complete. Each question corresponds directly to a suggested path for intervention that is functionally appropriate, and evidence based. The research team implemented an adapted alternating treatment design with a baseline for four English speaking participants, which included a 10-year-old Caucasian female of average intelligence with challenges in math ability, a 15-year-old Latino male diagnosed

with ASD, a nine-year-old African American male with Specific Learning Disability (SLD), and a 10-year-old Caucasian male diagnosed with ASD and Speech/Language Impairment. Each student had individualized goals with suggested and non-suggested interventions to test the validity of the tool's recommendations in identifying the environmental factors surrounding the deficits and appropriate corresponding interventions. Results of the four participants supported the use of the tool in assessing environmental variables, with a minimum of one area of primary concern for each learner, while substantiating the recommended interventions as effective when compared to the non-suggested counterparts. Some limitations include a sample size, no secondary validation of the instrument, and the brevity of the experiment; however, the ADB-C holds promise in its goals of improving the efficiency and effectiveness of assessment and intervention.

Increasing the ability of professional educators to use the FABI model was the aim of Common and colleagues (2022) research with the goal of replicating previous studies that supported practice based professional development.(PBPL) of the FABI principles. The sample population contained a demographically diverse group of 342 professional educators, administrators, and service providers from 67 schools, across all grade levels from early childhood through high school in the Midwestern area of the United States. The participants were randomly divided into three cohorts, and sub-divided into 69 teams by school location. They were provided training in a five-step systematic process for learning the process of FABI by either a university trainer (Cohort A), or a state trainer (Cohorts B and C) in a professional learning series. Students were recommended by the team members, and were predominantly males (81.46%) and had a

wide range of identified disabilities including ASD, intellectual disability (ID), SLD, emotional disturbance and other health impairments. Students with severe maladaptive behaviors were purposely excluded from consideration so their behaviors could be addressed in a timely manner. Data gathered examined the fidelity to treatment for each of the five steps in the process with an 18-item integrity checklist on a Likert-type scale. The results of the study supported PBPL for FABI processes, including marked increases on the FABI KCU survey with some higher scores across content in the university trainer lead cohort. Limitations to the generalizability of the study include the relatively small geographic region, lack of more severe challenging behaviors in the student population sample, and variations in cohort and team sizes, with some missing data (range 4% to 31%) which was statistically accounted for with pairwise deletion methods and multiple regression analyses. Overall, Common and colleagues' (2022) findings supported the strength of professional development for teaching FABI with moderate to high fidelity to the procedures.

Behavioral Skills Training

Behavioral Skills Training (BST) has been utilized with remarkable effectiveness in training educational and healthcare professionals and paraprofessionals in skills for a myriad of applications, including activity schedules (Fetherston & Sturmey, 2014), conversation skills (Ryan et al., 2019), discrete trial teaching (DTT) (Courtemanche et al., 2021; Fetherston & Sturmey, 2014), implementation of behavior intervention plans (BIPs) that remediate and reduce problem behaviors (Hogan et al., 2015), incidental teaching (Fetherston & Sturmey, 2014), functional communication training (FCT) (Gregori et al., 2020; Luck et al., 2022), reading strategies (Davenport et al., 2019), and

staff to staff training (Parsons et al., 2012; Parsons et al., 2013). While there were occasional variations in the steps of BST, the general format was to give a behaviorally specific explanation of the expected skill to be learned, presentation of the verbal description in writing, the trainer modeled the skill, the trainee practiced the skill in role-play, constructive feedback was delivered on the trainee's performance, and then the skill was rehearsed with feedback from the trainer until the trainee presented mastery of the skill (Courtemanche et al., 2021; Gregori et al., 2020; Hogan et al., 2015; Parsons et al., 2012; Parsons et al., 2013; Ryan et al., 2019).

Adults in staff training programs learned by being actively involved in activities related to their actual work responsibilities and challenges, as opposed to solely passive lecture-style presentations, which is the underlying philosophy for BST (Courtemanche et al., 2021) ; Parsons et al., 2012, Parsons et al., 2013). Parsons and colleagues (2012) studied BST, as presented to staff by behavior analysts in human service agencies, for most-to-least prompting and sign language with an analysis of staff performance and perceptions of staff acceptability of BST exercises. The design of the study was a strength as it added to its credibility in a multiple baseline across behaviors design, even though there were only a limited number of participants with seven educators and one teaching assistant, which is a limitation in the generalization of the results. The demographics of the participants were six women and two men with an age range of 30 to 53 years of age, with a population mean of 45 years, and an experience range of 1 to 30 years, with an average of 14 years. Research took place at an adult education program for consumers with severe disabilities in the classroom and in vivo in work sessions, with a noted limitation by the researchers of difficulty taking the trainees away from their direct

service duties for the group training.

Parsons et al. (2012) indicated the outcomes that support the effectiveness of the BST model with post-training data showing an increase for both skills sets, with most-to-least prompting and sign language increasing from a baseline of an accuracy average of 50% (range 44% to 56%) to over 99% for most-to-least prompting at 92% for sign language post-training across all subjects. When the skills were demonstrated by trainees on the job, the gains in competence and performance were sustained at an average of 96% for signs and 100% for most-to-least prompting. Feedback from the acceptability surveys of the training experience was also criticized as problematic for being the only measure of staff acceptance, with no other objective data to verify the continued use of the protocols, which would corroborate the participant survey results showing high acceptability.

In the 2013 research report, Parsons et al. investigated the use of a *pyramidal* training model with an experienced trainer as the facilitator of program instruction for 10 staff members using the BST model at an adult education and work program for people with autism and severe intellectual disabilities. There was a ratio of 70% women and 30% men in the training group, ages 31 to 57 years, with an average age of 46, and varied field experience with a range of 2 to 31 years, and an average of 16 years in special education. Seven participants were licensed special educators, one participant was an assistant teacher, and two participants were tasked with training in the staff development department, with none of the subjects having been previously trained in BST. A multiple probe design was utilized across all participants, who were in three separate groups, with baseline and post-training measures, for the designated eight steps to the study's BST

component structure. Interobserver agreement was collected for 83% of the assessments in baseline and post-intervention conditions to add reliability to the data. There was a final assessment of nine (of the 10) participants in vivo to determine if the skills trained were generalized to the natural environment. The results of the post-BST evaluations validated the *pyramidal* approach to training with a demonstrated proficiency of near or at 100% accuracy in using BST for the study participants while on the on-the-job. Then, the study participants became the trainers for nine subsequent novel staff trainees in the school with scores of 88% for one participant in the target of giving feedback, and 100% accuracy for targeted skills of prompting, backward chaining, sign language, and making jewelry for the other eight trainees.

A noted strength of the Parsons et al.'s (2013) research report was the experimental design of multiple probes across three groups of participants, which reduced the amount of time required to observe the participants, and addressed the criticism of BST being time-intensive (Parsons et al., 2012; Parsons et al., 2012; Reid et al., 2019). Additional control measures of interobserver agreement (IOA) added reliability to the data and potential generalizability despite the limitation of a small sample size. The *pyramidal* approach holds promise in reducing the training time of the senior trainer by replicating that skill set of BST across other members of the team, which could be especially useful in large organizations when there is only one behavior analyst, with the assumption that the staff trainers choose to keep the role, which was a limitation posed by the researchers.

Hogan et al. (2015) examined the use of BST to improve the fidelity in which staff were implementing the behavior intervention plans (BIPs) within the special

education classroom for children with autism and other developmental delays and co-occurring severe problem behaviors in a nonpublic school. The authors used a concurrent multiple baseline design across four female participants who were non-licensed staff members that were instructing two students in a fourth and fifth grade classroom. The BIP for the first student included the components of noncontingent reinforcement (NCR), differential reinforcement of alternative behavior (DRA) and extinction. The second student's BIP was a treatment package of functional communication training that relied on signal system for availability of a break and a padded area, DRA, and extinction. The results of this study demonstrated performance improvement in all four participants across all components of the BIPs for both students, with the largest gains occurring during the modeling and rehearsal phases of BST.

One notable strength of the Hogan and colleagues' (2015) study is the implementation of the research in the natural environment, instead of a contrived scenario, which would speak to the social validity and generalization of the training effectiveness of BST. The concurrent multiple baseline design was advantageous in allowing the researchers to analyze the effects of their intervention across participants, which adds to the validity and reliability of the results. A limitation of the study included the small sample size, which could be accounted for in the future with replication studies to validate the findings across different populations and settings. The researchers disclosed two limitations of the study which were a lack of multiple opportunities for repetition of a skill if the staff made an error as the BIP was implemented in vivo with students, and the researchers' presence in the classroom created reactivity which could have skewed the results. Likewise, Hogan and colleagues were forthcoming about not

measuring student performance or challenging behaviors which could be an area for improvement to provide a complete assessment of the effectiveness of their model.

Staff acceptability and successful implementation of the BST model was an explicit concern for many researchers (Fetherston & Sturmey, 2014; Parsons et al., 2012; Parsons et al., 2012; Reid et al., 2019). In a longitudinal study spanning 2007-2017, Reid et al. (2019) examined the variables that lead to the challenges in participant acceptance and the attributes which contributed to the social validity of the BST model for behavior analysis and support services for adult consumers with intellectual disabilities. The research reviewed 132 workshops for behavioral training methods, with four instructors and 646 participants (in groups of an average of 16 trainees), across four states in the Southeastern United States. Participants were from varied settings of group homes, job training, and day programs in centers, with 95% of the trainees in the role of staff supervisors at their respective work locations.

In their qualitative study, Reid et al. (2019) asked only two open-ended questions which were “What was the best thing about the training?” and “What was the worst thing about the training?” (p.525). Workshops were coded by three of the researchers using the open-ended responses, and then there was an IOA check for 29% of the workshop data independently coded by two of the researchers, at 93% IOA for the “Best” or positive comments and 82% IOA for the “Worst” or negative statements (p.526). From the analysis, the common categories in the results were, with the highest overall frequency, content, trainer style, trainee activities, and physical environment. Role play, which is a part of the BST model and fell under activities, was the most commented upon category, accounting for 45% of all positive statements about the trainings in the trainee activity

section. Overall, the research suggested to make certain that the content of the workshops is relevant and specific to the training population, the trainer should demonstrate the skills, and there should be active responding opportunities such as role play and peer interaction for the participants.

One limitation of the Reid et al. (2019) study, was that it revolved around the factor of trainer style, which was the second most commented area for "Best" thing about the workshops, and only second to content. With only four trainers, the results should be viewed with caution as the limited trainer population, in the limited demographic region, could limit generalizability of the results. A second limitation was the coding by the researchers of their own study may have included unintentional bias and subjective evaluation of the open-ended responses. Although the IOA data did mitigate some of this concern, it remained a threat to reliability and validity. A strength of the study was the large quantity of data collected that could be subdivided and analyzed for nuances that may not have been evident in a preformatted survey with a Likert type scale for responding. Reid et al. also elaborated on the lack of functional control over the responses as it limits application to future trainings directly, and may be best utilized as part of potential preferences rather than a strict set of parameters.

In their pursuit of efficiency in utilizing BST, Fetherston and Sturmey (2014) conducted research to confirm the effectiveness of BST and to extend the findings to larger group teaching formats for professionals in the skills of discrete trial teaching, incidental teaching, and activity schedules, and whether those new skills would generalize across untrained programs. In addition to these goals, the researchers also assessed generalization of the BST to the classroom with measures of effectiveness of

staff implementation of the new skills with the students by collecting data on student performance of target goals, plus generalization to novel programs. Finally, there was an evaluation of the social validity data from trainees to assess the acceptability of BST.

Fetherston and Sturmey (2014) devised a multiple probe design with separate IOA data, in which researchers worked with instructors for learners, ages 3–12, in a full day private school for students with developmental disabilities. There were four teacher-learner dyads, that were pulled from the original 11 dyads, with an educational level of a bachelor's degree, with no other demographics disclosed of the participants. The results supported the effectiveness of BST for multiple participants across the trained, untrained goals, and with high social validity.

A noted challenge of the study was in generalization for one educator across different skill sets (Fetherston & Sturmey, 2014). Even though the participant met criteria in each skill, no other educator took part in all three conditions, thus limiting cross comparison. Problem behavior from a learner occurred in Experiments 2 and 3 and was not stopped or displaced by the intervention and may have decreased effective responding; however, the overall trend was an increase in correct responding across skills. Strengths of the study were in its experimental design with multiple conditions, across three experiments and a baseline establishing an experimental control. An additional limitation of the study was the small sample size, which merits future replication to indicate if these findings will apply to other populations, targets, and settings. There was also a limited literature review in the study, which detracts from the credibility of the results.

Ryan et al. (2019) examined the effectiveness of teaching BST directly to six

adults (five males and one female, 19-20 years old) with ASD. Five of the members in the group also had a dual diagnosis of mild intellectual disability. The goal of the study was to improve the participants' conversation skills in a multiple probe design across participants, with baseline, intervention, and follow-up phases, in an adult training center in Ireland. One limitation would be the uncertainty of the cultural comparisons that can be derived from a study conducted in Ireland to communities in the United States. The second reservation is the direct nature of teaching BST to the consumer, which was a different format than other studies with the educator as the intermediary between the trainer and the learner. However, it is possible with the *pyramidal* approach (Parsons et al., 2013) that a senior trainer could train the direct support staff, who then teach BST to the consumer.

The structure of the program in the Ryan et al.'s (2019) research started with BST in a private observation room and then generalized to the natural setting quickly to collect probe data post-training, which is a relative strength of the study protocols. Retraining was available as needed and determined by the data. Parents and guardians of the participants were included in the study to respond to questions about whether there was generalization to other untrained and unmonitored environments. IOA data were collected for 25% of the sessions for all participants, in addition to a treatment integrity checklist, which created good experimental controls, and is an additional strength of the study. Overall, there was an improvement in conversational skills for all members of the group, with generalization for five learners to the natural environment and for one participant after a booster retraining session.

In a multiple probe design across three teacher-student dyads, Davenport et al.

(2019) evaluated whether BST improved the teacher's fidelity in implementing the protocols of the reading racetrack sight word program (board game) as an intervention for struggling readers, who were not diagnosed with a disability, in a private, parochial Montessori school with children ages 6 to 9 in three different classrooms. Before training, there were baseline data taken for the teachers' performance of the game execution and for each student's sight word skills. Next, teachers were trained individually by the experimenter according to the BST protocols. The feedback including positive support for implementing a step correctly and then additional cycles of re-teaching of skills that did not meet mastery criteria. As an additional reliability step, during the intervention and maintenance phases, IOA data were taken by another staff member who was at the school. Satisfaction surveys were presented to the school personnel and in a simpler form (to be read) to the students in the program.

The results in the Davenport et al.'s (2019) study supported the effectiveness of BST and confirmed its social validity in performance-based training of teachers to use the reading racetrack intervention with fidelity, and the concurrent positive effects on correct responding by students, with good social validity and acceptability reported from instructors and students. The authors claimed a functional relation between the BST and the correct implementation of the reading racetrack intervention. Another strength of the research is the experimental design that incorporates multiple baseline measures across the three phases of baseline, intervention, and maintenance, with the added reliability of the IOA data for teacher fidelity to programs. Some limitations of the study include the small sample size in a specific setting, which could inhibit implications for inferring these findings to other populations. Although the structure of the study was sound, there were

few data points collected in maintenance and no data for generalization. Social validity data was also an area where improvements could be made in the limited self-reports, with no comparison across peers or behavioral observations to analyze.

Similar to Davenport et al. (2019), Courtemanche et al. (2021) investigated ways to make BST more efficient and conducive to a larger scale by teaching multiple skills to larger groups with peer responses in the feedback component of BST. One strength was in the consecutive two cohort design with data-based decisions from social validity measurements used to inform instruction for the second cohort based on challenges discovered in the first cohort's training experience and feedback. Another strength was in adding peer feedback which increased the efficiency of the instruction without compromising the effectiveness of BST. The participants were two cohorts of 18 volunteers, each recruited from employees in a private special education research school on a university campus with the administrative goal to transition from an eclectic approach to behavior analytic methods in the instruction. The participants of the groups were classroom teachers, related service providers, or paraprofessionals, predominantly female, with varied experience levels. Over half the participants in each cohort completed at least a bachelor's degree, with the remaining members all having high school diplomas. Training was already allocated in the schedule, so there was no additional time away from the learners.

Courtemanche et al. (2021) reported effectiveness in competency and performance across all measures for the myriad of programs and participants with generalization to untrained behaviors for larger groups with an 18:1 ratio of trainees to trainer. A strategy explored by Courtemanche et al. (2021), which was additive to the

previous literature (Fetherston & Sturmey, 2014), was to assess if the trainees generalized their new skills to other contexts, with a result of 67% across both cohorts in novel situations for the current study. Drawbacks and limitations exist in the highly controlled environment of a university setting compared to general settings, the voluntary nature of the participants, which may speak to their motivation to learn new strategies, and the lack of data for maintenance over time for the newly acquired skills. There was also no baseline for trainees with actual clients, only in contrived role-play, so the post-intervention data for generalization to clients are not comparable to the baseline, thus limiting the measure of effectiveness.

Functional communication training was addressed by Gregori et al. (2020) to assist direct support professionals (DSPs) in preventing and managing problem behaviors in three adults with intellectual and developmental disabilities in a local day program. The non-concurrent multiple baseline design was used for a study of BST with coaching to train staff to implement FCT with the goal of displacing challenging behavior with appropriate communication. Coaching was also included in the in vivo sessions with the consumer and included most to least verbal prompts and debriefing post-session. There were six phases of the ABCDE design for baseline, intervention (BST), post-training measures, coaching, and maintenance, with data collected on DSP fidelity to protocols and client communication and challenging behaviors, and additional IOA data to ensure reliability. At the conclusion of the research, DSPs filled out the Likert-type questionnaires for social validity on eight different questions regarding the effectiveness and usefulness of the BST of FCT. Probe data on the maintenance of skills were tailored to the acquisition rate of two participants, and no maintenance occurred for one consumer

who left the program.

Gregori et al. (2020) reported a relationship between the fidelity of staff to protocols and the decreased levels of consumers' challenging behaviors and increased functional communication occurrences. According to the researchers, coaching was a necessary component in achieving mastery criteria for the DSPs and was an integral part of the overall comprehensive approach to generalization, which is a strength of the design protocols. Another strength of the study was the short duration of 5 min per session, which was compatible with daily schedules. Limitations include the small sample size and attrition of one consumer in the maintenance phase. Gregori et al. (2020) also discussed the lack of skill generalization with only one DSP demonstrating appropriate use of skills learned from BST in the natural setting. There was also a short maintenance phase, which the authors remarked as a limitation in their study. The presence of severe challenging behaviors from the consumers was mentioned as a factor in negative reinforcement when some of the DSPs will avoid situations which may occasion these maladaptive behaviors and could have contributed to some errors made by DSPs in delaying the removal of reinforcers.

In the 2022 research report from Luck et al., a concurrent multiple baseline design across participants, examined the effectiveness of BST in helping teachers to identify functional relations of challenging behaviors and to select interventions accordingly within the FCT framework. There were five special educators from various experience levels for students in different grade levels from kindergarten to 11th grade who voluntarily enrolled in the 5-day training program for behavior analytic methods. Two Board Certified Behavior Analysts monitored the BST as implemented by master's level

graduate students in behavior analysis. Data were collected on the competency and performance skills in the role-play scenario and not directly with students. There was also a competency-based computer program that participants completed prior to the BST, along with a lecture on FCT presented by one of the researchers.

Although there were a limited number of subjects, the research design allowed for the determination of the relation between the training results and the participant's ability to identify the correct function and FCT protocol (Luck et al., 2022). Similar to Gregori et al. (2020), the sessions were short and did not last more than 6 min, which is a strength in the structure of the research design and might be a factor in the positive social validity results. An additional strength was the function-specific interventions that were presented by the trainer in response to the hypothesized functions likely maintaining the challenging behaviors. Limitations include a lack of application of skills in applied settings, short duration of the training, small number of participants, and lack of follow up in the post-training environments. The researchers proposed that learning and utilizing these skills in the context of a busy classroom might require revisions to protocols to increase efficiency.

Overall, BST has been empirically validated as an effective intervention across environments, ages, ability levels, and skill targets for increasing competency and performance (Gregori et al., 2020; Hogan et al., 2015; Luck et al., 2022; Reid et al., 2019). One theme that recurred in the literature, and has progressed in the last 10 years, was how to increase the efficiency of BST through training multiple people so the interventions can be utilized effectively and efficiently given the time constraints in schools, adult settings, or competing factors in the natural environment (Luck et al.,

2022; Parsons et al., 2012; Parsons et al., 2013; Reid et al., 2019) . When looking towards programs for training staff, BST also lends well to social validity (Courtemanche et al., 2021; Davenport et al., 2019; Fetherston & Sturmey; 2014; Reid et al., 2019) when the targets are specific to the trainees' work environments (Courtemanche et al., 2021; Davenport et al., 2019; Reid et al.; 2019), and skills being trained are usable in the context for the challenges in working with individuals with intellectual and/or developmental disabilities, especially with co-occurring challenging behaviors (Balboni et al., 2020; Gregori et al., 2020; Hogan et al., 2015; Luck et al., 2022).

Down Syndrome

Prevalence and Diagnostic Characteristics

According to the Centers for Disease Control and Prevention (CDC, 2022). Down syndrome (DS) is a genetic condition in which there is an extra copy of the 21st chromosome. Prevalence of the disorder occurs in about 1 of 700 births, or approximately 6,000 babies per year. There are three types of DS, with Trisomy 21 being the most prevalent type that affects 95% of people with DS in which there are 3 copies of the 21st chromosome in each cell of the body. For Translocation Down syndrome, which occurs in about 3% of cases, the third copy of chromosome 21 is attached to a different chromosome instead of being a separate chromosome 21. The rarest form of DS is Mosaic Down syndrome, which is reported in 2% of the cases of DS, in which only some of the person's cells have three copies of chromosome 21, while the remainder of the genetic makeup is the typical two copies of chromosome 21, thus creating the likelihood that the person will present with fewer symptoms and characteristics of DS. Physical features of a person with DS may include a flat face, almond shaped eyes that have an

upward slant, a shorter neck, small ears, and a protruding tongue. There may also be white spots on the irises of the eyes, short stature, smaller hands and feet, small pinky fingers that curve toward the thumb, hypotonia and loose joints. Medically, people with DS are prone to eye diseases, ear infections, sleep apnea, hearing loss and congenital heart defects.

Patel and colleagues (2020) noted the medical comorbidities in DS as a key factor in behavioral problems when normed with typical peers' data. The authors explored common patterns of behaviors in 378 children and youth, between 2 and 22 years of age, diagnosed with DS, and the medical conditions which may contribute to the behaviors. The design of the study was a retrospective descriptive statistical analysis of medical records from the Sie Center for Down Syndrome at Children's Hospital Colorado over the time period of November 1, 2010, to June 14, 2018, of four behavioral patterns which were externalization, apprehension, internalization, and harm/unrest. Medical conditions that were noted to have an influence on behaviors were attention deficit hyperactivity disorder (ADHD), ASD, feeding problems, heart defects, infantile spasms, sleep apnea, and prematurity. ASD manifested behaviorally in all categories, except internalization. Harm/unrest were most likely to occur when there were comorbidities of ASD, infantile spasms, and prematurity. Heart defects were the least associated with behaviors with a lower statistical significance for signs of apprehension.

For individuals with DS who display social and behavioral challenges, there was variability of the estimates from 7%–19% (Channell et al., 2019) to 16%–42% (Godfrey et al., 2019) of individuals with DS meeting the clinical criteria for a cooccurring ASD diagnosis. Medical needs for those with DS often present at birth or shortly thereafter,

and genetic testing can be accessed before any presentation of behavioral cognitive or social challenges; thereby making a second diagnosis of ASD more challenging as caregivers and educators may attribute maladaptive behaviors to the original DS diagnosis (Godfrey et al., 2019; Patel et al., 2020). Channel and colleagues (2019) evaluated a sample of 203 people with DS from the DS Cognition Project database, 6–25 years old, for associations with risk factors for ASD across gender, age, IQ, adaptive and maladaptive behaviors for the purposes of screening and treatment planning. Tools used to gather information from parents of the study participants who completed the Social Communication Questionnaire- Lifetime (SCQ), Nisonger Child Behavioral Rating Form (NCBRF), and Scales of Independent Behavior-Revised, Short Form (SIB-R). The individuals with DS filled out the Kaufman Brief Intelligence Test, second edition (KBIT-2.). The results from the assessment tools were analyzed in the research report and several relationships between the variables emerged. There was a correlation in the increase in ASD symptom presentation with lower IQ scores. Higher measures of adaptive behaviors were indicative of lower occurrence of ASD symptoms, while maladaptive behaviors were correlated with ASD characteristics.

Profile comparisons of dually diagnosed children with ASD and DS (11 children) were compared to DS only (22 children) and ASD only (66 children) groups in the 2019 study from Godfrey and colleagues to examine the association of these two conditions from the perspective of parent reports. The tools used in the assessment process were the Autism Diagnostic Observation Scale (ADOS) and The Mullen Scores of Early Learning (MSEL), and The Autism Diagnostic Interview (ADI-R). Data from the analyses supports the increase in social communication deficits in the dually diagnosed, although the

impairments were more subtle than the ASD only counterparts. The authors implore families to seek ASD screening for their children with DS as there is a high correlation between DS and ASD, and the early intervention with ASD is empirically validated in mitigating ASD symptomology, especially in the areas of repetitive behaviors and social-communication challenges (Godfrey et al., 2019).

Cognitive and Behavioral Traits

People with DS have a wide range of cognitive and behavioral challenges and abilities, with varying symptoms and conditions (Channell et al., 2021). Cognitively, people diagnosed with DS tend to have mild to moderate impairment in Intelligence Quotient (IQ) measures and have delayed speech (CDC, 2022; Channell et al., 2021; Patel et al., 2020). There is a direct correlation between an increase in challenging behaviors when the person with DS has an IQ in the low to moderate range below 70, which is the score indicative of an intellectual disability (Balboni et al., 2020; Channell et al., 2021; Hassan et al., 2022). Behavioral phenotypes vary but there are an increased number of maladaptive behaviors in the DS population compared to those not affected by the disorder (Balboni et al., 2020; Channell et al., 2021; Hassan et al., 2022; Patel et al., 2020; Patel et al., 2018). Intellectual disability is highly correlated with behavioral challenges in autism as well, so when the individual has a dual diagnosis of ASD and DS, there is a much higher risk of these comorbidities having a negative impact on functioning and limited adaptive ability (Balboni et al., 2020; Channell et al., 2019; Godfrey et al., 2019). The most common challenging behaviors that present in developmental disabilities include self-injury, aggression, property destruction, non-compliance, stereotypy, and difficulty with transitions (Harvey et al., 2021), as well as

sensory difficulties, irritability, anger, and anxiety (Bolourian & Blacher, 2018).

The occurrence of challenging behaviors in DS is a known component of the DS behavioral phenotype despite some noted psychosocial strengths (Dieleman et al., 2018). In the research report from Dieleman et al. (2020), 67 parents (79% mothers, 16.9% fathers, and 4.5% foster parents) of children with DS, ages 4–19, completed the online (86.6%) and paper form (13.4%) questionnaire which included the Vineland screener to determine developmental age, the Child Behavior Checklist (CBCL) and the Behavioral and Emotional Rating Scale (BERS-2). The results were analyzed with a confirmatory factor analysis, which yielded challenges and strengths to describe emotional and behavioral strengths and challenges while looking at the correlation of these variables. Attributes that were considered strengths for children with DS included family involvement, empathy and expressing affect and openness to affection. Parents' responses to the questionnaires expressed concern with social ability, inattention, repetitive thoughts, anxiety, and depression.

In 2022, Hassan and colleagues investigated the prevalence of behavior problems of 40 children, ages 8–11, diagnosed with DS in Pakistan as compared to their typically developing peers. The authors noted an increased trend of maladaptive behavior rates in children with DS, which echoed the findings from Patel and associates' 2020 results. Hassan et al.'s (2022) study was important in shedding light on the societal impact of perceptions associated with DS and limitations incurred as a result of disability. The authors suggested that a comprehensive therapeutic approach should incorporate counseling and education for children with DS as well as their caregivers, as the range of disability seems to correlate with gender, with males exhibiting more behavioral

problems.

Assessment Tools

Assessment of adaptive skills and maladaptive behaviors for individuals with DS can be difficult due to deficits in language and cognitive abilities (Balboni et al., 2020; Patel et al., 2018). To develop an overall comprehensive profile of the child, indirect and direct assessments are utilized to develop programs for people with ASD and/or DS (Balboni et al., 2020). The Vineland Adaptive Behavior Scales-3 is a standardized assessment tool that measures adaptive functioning, maladaptive behaviors and motor skills, so it is commonly used in school and clinical environments (Balboni et al., 2020). To assess the possibility of ASD in the DS or other populations without DS, the ADOS is utilized to identify specific social and communication deficiencies that are indicative of ASD (Godfrey et al., 2019).

Behavioral assessment to develop treatment and education plans for DS were best supported with ABA strategies of FBA and FABI (Feeley & Jones, 2006; Feeley & Jones; 2007). Other strategies noted in the research report were surveillance via direct observation and parent report of the child and the environments which can prevent and provide early intervention for problem behaviors before they become entrenched patterns (Feeley & Jones, 2006; Feeley & Jones; 2007). Similarly, Steege et al. (2019) recommended indirect assessment with the Functional Assessment Interview (FAI) and other rating scales with caregivers and teachers as informants. The authors also advocated for the use of direct observation to obtain quantitative data for assessment of the variables maintaining the challenging behaviors through the development of operational definition, and the collection of antecedent, behavior, and consequence measures.

Behavioral Intervention Strategies for Down Syndrome

Behavior analytic strategies to improve adaptive functioning and decrease maladaptive behaviors in learners with DS and/or DS-ASD have been showcased in the recent literature (Balboni et al., 2020; Dillenburger, 2012; Dillenburger & Keenan, 2009; Patel et al., 2018). Behavioral intervention approaches that have been suggested in the literature for DS, with or without the cooccurrence of ASD, include FBA and FABI (Channell et al., 2019; Channell et al., 2021; Feeley & Jones, 2006; Feeley & Jones, 2007; Oxelgren et al., 2019). Early intervention with behavior analytic strategies for children with developmental differences and cognitive challenges was empirically supported to improve outcomes and prevent further escalation of the problem behaviors (Godfrey et al., 2019; Harvey et al., 2021). However, there may be a misconception that ABA is only for ASD as associated with the Lovaas' (1987) seminal study on the effectiveness of ABA in the treatment of ASD in young children (Alligood & Gravina, 2021; Dillenburger, 2012; Dillenburger & Keenan, 2009). It can be argued that the science of ABA looks at behaviors of individuals regardless of the diagnoses, and can be utilized in a broad manner that accounts for intellectual disabilities such as DS (Balboni et al., 2020; Copper et al., 2020; Dillenburger, 2012; Dillenburger & Keenan, 2009).

In a single-subject nonconcurrent multiple baseline design (NCMB) across participants, Harvey and colleagues (2021) utilized FBA and FABI to address challenging behaviors with the use of the Prevent-Teach-Reinforce for Young Children (PTR-YC) program. . The authors recruited two teachers who had neither training nor experience with PTR-YC. They also recruited three participants who were enrolled in the local special education preschool program: a 4-year-old boy with DS and ASD, a 3-year-

old boy with developmental delay in social emotional skills, and a 4-year-old boy with ASD. The researchers explored the effectiveness of the PTR-YC model in decreasing challenging behaviors while increasing desirable behaviors and prosocial interactions with the teacher. To estimate duration of target behavior and collect data, the authors used partial interval recording of the observed sessions. Based on the initial observation, Harvey and colleagues used 10 s intervals and were able to observe one participant for a total of 18 intervals and two other participants for a total of 90 intervals. As a result of the FBA that was completed for each participant, a behavior intervention plan (BIP) was drafted and included the individualized steps for the implementation of the PTR-YC intervention. The independent variable was the PTR-YC. The dependent variables were duration of the challenging and desirable behavior per interval as well as duration of the prosocial behavior per interval. As a result of the PTR-YC implementation, Collin's challenging behaviors decreased from about 25% of intervals in baseline phase to near 0% of intervals in the intervention phase. Nicholas showed a decreasing trend at baseline from 80% to 65% of intervals, which dropped to near 10% of intervals in the intervention phase. Devin had a decreasing baseline trend from 55% to 40% of intervals, with an outlier of 80%, to a noticeable decrease to 15% of intervals during the intervention phase. Desirable and prosocial behaviors also increased during the intervention phase for all three children. Findings of this study support the use of the PTR-YC program for all participants. Teachers who completed the social validity survey also reported high satisfaction with the PTR-YC's implementation. The research highlights the need for social validity measures in the ABA studies to bolster adherence to the implementation of the intervention strategies. One limitation of the study is the use of NCMB, which limits

experimental control and introduces internal threats of maturation and history. Another limitation noted by the authors is the advanced training of the trainer who teaches the PTR-YC strategies to the teachers, which is an advantage that may not be available in a replication of the study and may limit generalizability of the results.

Oxelgren and colleagues (2019) also recognized the value of principles of ABA as they apply to the psychoeducational intervention programs for improvement of social communication, interaction, and restrictive behaviors of children with ID in their cognitive levels and adaptive ability skill set. In the study conducted by Oxelgren and colleagues in Sweden, the researchers aimed to improve the participants' involvement in family and school activities. Oxelgren et al. recruited 14 children and adolescents who met the criteria of a dual diagnosis of DS and ASD with ID, had been recently diagnosed with ASD, and were within the age range of 6–18. They also recruited the parents of participants and school personnel who participated in a workshop that addressed the component and practical implementation of the psychoeducational intervention program over a three-week period. After a period of three months, the intervention results were evaluated based on the social-communication and daily living activity goals set for each participant. They demonstrated that more than 90% of the goals were achieved in both home and school environments across all participants. However, the results of the Family Strain Index (FSI) questionnaire showed no significant change in how parents rated the stress of parenting a child with multiple disabilities. In the 18-month follow-up, there were positive responses from the parents on their perceptions of the effectiveness of the intervention, and that the communication and socialization strategies were still in use in the home. Because the psychoeducational intervention program design relied on the

principles of ABA, it serves as evidence of the effective use of ABA for children and adolescents with DS soon after an ASD diagnosis. Successful implementation of the program resulted in improvement in adaptive and social communication functioning of children with dual diagnosis of DS and ASD. It also attests to versatility and utility of the science of ABA across different diagnoses, ages, and impairment levels. Results for generalizability and replication should be interpreted with caution as the study was conducted in Europe, and the results may be socially and culturally specific.

The Down syndrome behavioral phenotype has been explored and characterized throughout the literature as a common set of traits and behaviors that can be the basis for understanding typical patterns of behaviors within the DS population (Dieleman et al., 2018; Esbensen et al., 2021; Feeley & Jones, 2006; Feeley & Jones; 2007; Patel et al, 2018), especially with a comorbidity of ASD which can amplify these characteristics of challenging behaviors (Channell et al., 2019; Channell et al., 2021; Patel et al., 2020). Based on the insight from the behavioral phenotype findings, Lemons, and colleagues (2017) attempted to create a novel phonics-based reading intervention based in part on the tendency for behaviors thought to be associated with the DS behavioral phenotype.

Participants in the Lemons and colleagues (2017) study were seven children from Pittsburgh, Pennsylvania area public elementary schools, ages 6 to 8 years, comprised of two females and eight males, all Caucasian, with IQ scores between 40 and 67, and English as their primary language. Children were screened for reading and pre-reading skills to qualify for the study. The respective staff, four special education teachers and three paraprofessionals, for each child implemented the intervention with support from coaches and staff from the reading initiative project. Demographically, the school staff

and the research coaches were female and caucasian. The intervention consisted of four sessions of 20-40 minutes in duration per week within the regular classroom setting and capitalized on the DS behavioral phenotype of visual processing abilities, while accounting for short-term memory and cognition deficits, and avoidance of difficult tasks, thereby reducing escape-maintained behaviors. Data was gathered for each student in a "multiple-probe across lessons design" (Lemons et al, 2017, p. 180). The average total of lessons was 45 sessions over 16 weeks, with probe data for three sight words, three letter sounds and decoding of designated words. In the limited time for the study, two students demonstrated increased reading ability; while the other students showed partial, albeit slow improvement, with the remaining learners not making significant progress. Lemons et al. noted that the outcomes are reflective of the behavioral phenotype characteristics of variability in responding, and may be associated with short term memory and motivation challenges, although most learners did sustain their academic gains in the maintenance phase. The lack of population diversity in the Lemons et al. (2017) of staff, coaches and participants has its drawbacks in the ability to generalize the results to people from other demographic groups, as does the brevity of the time frame for the study.

Another example of effective use of behavior analytic strategies to increase adaptive functioning was demonstrated by Barboza and colleagues (2023) in a non-concurrent multiple baseline design across participants for a video modeling (VM) intervention to increase face covering behavior (FCB) for students with DS in two different schools in an urban area in Nebraska. The students were referred to the school behavior analytic team were two boys with DS, both age 13 years old, who were enrolled

in a public middle school special education program, and one 11-year-old male with DS from a parochial elementary school. Sessions were in the respective classrooms with the behavioral team, and lasted 15 min per session. In the observations during the initial baseline, none of the participants exhibited FCB for the target duration of 900 s, even though the behavior was modeled, trained, and requested by the staff. Baseline was collected with each participant completing the prerequisite checklist for the ability to engage in FCB independently, and via an observation of the duration of FCB. The intervention phase for two of the boys included VM alone, which resulted in an increase of FCB, while the third participant required the addition of behavior specific praise (BSP), as attention from adults was determined to be a reinforcing variable, to reach criterion for FCB. A maintenance phase was implemented for the two students who increased the duration of FCB with VM alone, although not for the third child who required a package of VM and BSP, as the students were scheduled for a long break from school. Reliability of FCB data was ensured by training additional observers using BST and calculating IOA data of the researchers and the reliability observers for 26% of the total sessions. The addition of BSP for the third participant was a functionally based decision gathered from observations and interviews with the teachers to increase the likelihood that FCB would meet the aims of the researchers. Limitations of the study were that only face masks were modeled in the video, so generalization to other varieties of face coverings was not explored, the maintenance phase for the two participants who received VM alone was limited by the school break, and there were only three participants in the study.

As noted throughout the review of the literature, the scientific and philosophical

foundations of ABA can be of great benefit in an educator's toolbox of strategies for behavior management (Alberto & Troutman, 2013; Cooper et al., 2020; Owens et al., 2018; Steege et al., 2019; Umbreit et al, 2007; Vargas, 2020). Traditional approaches to disruptive behaviors can leave professional educators at a loss when they are relying mainly on approaches of punitive measures for behavior reduction (Flower et al., 2017; Gischlar & Riffel, 2020; Hsiao & Petersen, 2019; Klopfer et al., 2019; Oakes et al., 2018). FBA, which relies on the science of behavior analysis, has been proven to be an effective methodology for ascertaining the function or the underlying contextual variables that lead to the occurrence of disruptive behaviors (Allday, 2018; Cooper et al., 2020; Elliot et al., 2023; Gischlar & Riffel, 2020). Fortunately, the information gathered from an FBA can direct instruction and remediation to evidence-based FABI to decrease challenging behaviors (Common et al., 2022; Elliot et al., 2023; Owens et al., 2018; Young et al., 2018).

When providing training to educators, BST is a behavior analytic teaching method that was confirmed as an effective for instruction in the skills required for implementing FBA (Balmer, 2022; Courtemanche et al., 2021; Davenport et al., 2019; Gregori et al., 2020; Hogan et al., 2015; Luck et al., 2022; Reid et al., 2019), and FABI (Common et al., 2022; Luck et al., 2022; Oakes et al., 2018). BST consisted of the multi-step process of instructions, modeling, rehearsal, and feedback, and was more specific to the competencies needed in the natural environment than a simple didactic lecture format (Davenport et al., 2019; Luck et al., 2022). The BST model afforded learning opportunities in the applied setting which generalized trained concepts learned with independent practice and coaching and resulted in greater fluency and self-efficacy

(Allday, 2018; Hogan et al., 2015; Oakes et al, 2018; Reid et al., 2019). Overall, providing teachers with meaningful training in FBA and FABI was valuable in producing positive behavior change with socially acceptable assessment and implementation strategies (Davenport et al., 2019; Reid et al., 2019; Klopfer et al., 2019; Young et al., 2018).

Individuals diagnosed with DS or DS-ASD have specific characteristics noted by researchers as the DS behavioral phenotype (Channell et al., 2019; Dieleman et al., Esbensen et al., 2021; Feeley & Jones, 2006; Feeley & Jones; 2007; Patel et al, 2018) which include medical comorbidities (Patel et al., 2020) and cognitive variability (Chan et al., 2022; Channell et al., 2021) that could benefit from ABA strategies (Alligood & Gravina, 2021; Dillenburger, 2012; Dillenburger & Keenan, 2009). However, educators working with students with DS with or without a comorbidity of ASD are not utilizing the FBA and FABI strategies when remediating behavioral challenges (Godfrey et al., 2019; Oxelgren and colleagues, 2021), despite empirical support that ABA is an evidence-based practice for students with DS with or without ASD symptomology (Alberto & Troutman, 2013; Balboni et al., 2020; Dillenburger, 2012; Godfrey et al., 2019). The forgoing research questions explore the extent to which a BST training model is effective in providing training in FBA and FABI to professional educators to improve their educational expertise in classroom management that could result in behavior reduction targets for students with DS or DS-ASD in the classroom setting.

Research Questions

1. What is the effect of BST on increasing a teacher's effective use of FBA to identify the function of students' challenging behaviors in a self-contained elementary

school classroom for students with DS, with or without co-occurring ASD?

2. What is the effect of BST on increasing a teacher's effective selection of functional assessment-based interventions FABI to address the function of students' challenging behaviors in a self-contained elementary school classroom for students with DS, with or without co-occurring ASD?

3. What is the effect of BST on the teacher's implementation of FBA and FABI to reduce challenging behaviors of non-compliance and aggression exhibited by students in a self-contained elementary school classroom for students with DS, with or without co-occurring ASD, as measured by the number of occurrences of challenging behaviors before and after teacher training and implementation of FBA and FABI in the classroom?

4. What is the effect of BST on how teachers rate BST as a socially valid strategy for implementing FBA and FABI to reduce challenging behaviors in students with DS, with or without co-occurring ASD, as measured by the social validity survey?

Chapter 3: Methodology

Participants

Professional educators working with students with DS and DS-ASD are tasked with providing high quality instruction for diverse individuals while managing challenging behaviors. It was hypothesized that using a BST framework to provide educators with the skillset in the form of FBA to identify the functions, or maintaining variables, of challenging behaviors and to address these behaviors with FABI would be beneficial in reducing instances of maladaptive behaviors. The researcher aimed to recruit three teachers who a) worked with students diagnosed with DS or DS-ASD; b) possessed a valid temporary or standard New Jersey teaching certificate; c) had no advanced training in ABA as part of any post-baccalaureate studies; and d) were not enrolled in a master's certification program in ABA. The participants included teachers working in a private special education school in New Jersey. The researcher collected demographic data utilizing a qualitative questionnaire of the potential participants' gender, educational background, teacher certification, and teaching experience prior to commencement of the study (Appendix A). Upon completion of the study, each participant completed a social validity questionnaire (Appendix I).

The primary population sampling method in the study was to gather participants through purposeful sampling, which was a strategic approach to recruit participants who were qualified to provide the information that would meet the aims of the study (Creswell & Guetterman, 2018). Snowball sampling was also utilized by asking teacher participants to recommend others to take part in the study (Creswell & Guetterman, 2018). Teachers recruited for the study identified two maladaptive behaviors that were exhibited by most

of the students in their classroom, without identifying any individual students. Student participants became part of the research through convenience sampling (Creswell & Guetterman, 2018) as they were readily available for the study in the respective teacher participant's classroom, although no individual students were identified in the study.

Prior to the teacher training program (Appendix E), the researcher observed all students in each teacher's classroom to collect data to determine a baseline of problem behaviors in that setting, which aligned with the secondary purpose of the study to reduce the instances of challenging behaviors in the student population. The intervention of teacher training was implemented within the teacher population in separate sessions, and not directly with students. After the teacher training, in accordance with the primary purpose of the study, the primary researcher observed each classroom to evaluate the generalization of the effects of the teacher training of FBA and FABI methods to the natural environment. The researcher observed the impact of training on the teacher's ability to implement FBA and FABI with fidelity in the classroom setting. After the four phases of the intervention, the researcher collected frequency data for overall instances of the student behaviors that were targeted for decrease.

Instruments

Instrumentation in ABA are often unique as they are created to meet the parameters of the research aims and to best serve the individuals who would benefit from the study by providing meaningful, socially valid objectives in applied settings (Baer et al., 1968; Bailey & Burch, 2018; Cooper et al., 2020). The measurement tools that were utilized in the study were various self-created instruments including a participant demographic questionnaire (Appendix A), frequency data sheet (Appendix B), classroom

observation form (Appendix C), training program and classroom observation fidelity checklists (Appendix F), interobserver agreement data collection sheet (Appendix H), and social validity questionnaire (Appendix I). There was a pre and post training instrument (Appendix D) to assess each participant's knowledge of functional behavior assessment and interventions, which was Balmer's (2022) Educator Functional Assessment Knowledge Evaluation (EFAKE). An additional measure of training effectiveness was the modified competing behavior pathways organizer (Appendix G) adapted from the O'Neill and colleagues' (2015) graphic organizer. To follow are detailed descriptions of how each instrument was utilized within the current research.

Demographic Questionnaire

Prior to the commencement of the study, participants were asked to complete the Participant Demographic Questionnaire (Appendix A) to confirm their eligibility for the study and to gather data for the population characteristics as an added measure of validity for the study. There were five questions within the questionnaire that ascertained the participant's age, gender, primary role in the school, level of education, number of years teaching, and teaching certification.

Pre and Post Training Assessment

In order to determine a baseline of knowledge of functional assessment and intervention, participants completed the EFAKE instrument (Appendix D) that was developed by Balmer (2022). The EFAKE has been successfully evaluated for face and content validity and reliability with a Cronbach's alpha (a=.89), and endorsed by experts in the field of ABA (Balmer, 2022). The EFAKE contains 20 questions to assess a person's knowledge of functional assessment and intervention, and was reported to have

a completion time of approximately 35 min. Scoring of the EFAKE was be completed by a percentage of correct responses divided by the number of items on the assessment (twenty), and then multiplied by 100 to attain the percent correct on the evaluation (Balmer, 2022). At the conclusion of the training, the EFAKE was readministered to each participant as a post training measure.

Frequency Data Collection Sheet

Challenging behaviors in the classroom are the crux of the problem that was addressed in the current research. To collect data on the number of occurrences of challenging behaviors, a measurable dimension of the behavior resulted from an operational definition provided by the researcher, after consultation with each teacher participant on the selection of the two most frequently occurring maladaptive behaviors that were presenting in the respective classrooms. Per guidance from Cooper et al. (2020) and Bailey and Burch (2018), behavior can be counted and quantified if it abides by dimensional qualities of either repeatability, temporal extent, or temporal locus. For the current study, the count, which reflects the repeatability aspect of dimensions of behavior, occurred as part of the data collection of challenging behaviors exhibited by students in baseline prior to the commencement of the training program. After an operational definition of the disruptive behavior was determined, the researcher and the teacher completed the Frequency Data Collection Sheet (Appendix B). Upon completion of the training, and after teachers had the opportunity to implement the FBA and FABI protocols for a designated period of time, the frequency of the challenging behaviors was collected once more by the teacher and the researcher in the classroom. Interobserver reliability measures were calculated with the interobserver agreement data sheet, which

can be found in Appendix H, for both the pre and post training periods. It is hypothesized that the training in FBA and FABI would an effect on how the teachers implemented these procedures and would result in improvement as measured by the instances of disruptive behaviors in the classroom.

Modified Competing Behavioral Pathway Organizer

O'Neill and colleagues presented the Competing Behavioral Pathway model in 1997 as a visual method for supporting educational professionals in aligning the results of the FBA with FABI by identifying the functionally appropriate replacement behaviors that will reduce the needs for problem behaviors (O'Neill et al., 2015). In the current study, the Modified Behavioral Pathway Organizer (Appendix G) was employed in the training program to assist the participants in identifying the parts of the behavior chain and corresponding interventions. The tool was also utilized to help the researcher guide the teachers in developing the skills required to identify the parts of the behavior chain for each behavioral scenario.

Classroom Observation Data Collection

There were two types of data measured by the researcher during each classroom systematic direct observation, which were the frequency of the non-compliance and aggression as the designated disruptive behaviors in the classroom on the Frequency Data Collection Sheet (Appendix B), and the adherence to functional assessment and intervention procedures which was collected on the Classroom Observation Form (Appendix C). Observations were conducted in 15-min increments, throughout various activities, and times of the day, in an unobtrusive manner to mitigate reactivity (Cooper et al., 2020). The termination criteria for the observation were 15 minutes or when five data

points were collected regardless of the time period, whichever comes first. For each occurrence of challenging behavior, the researcher identified and documented the contingencies for the behavior sequence, and marked the observation sheet accordingly. Within the recording of the behavior sequence, the researcher documented the contextual variables and determined if and what type of functionally appropriate intervention strategy was utilized. The classroom observation form was in a checklist format and included the following: antecedents, behaviors, consequences, hypothesized function of the behaviors, and the functional relatedness of the teacher's response to the behavior. Each recording of the teacher's response to a challenging behavior was marked correct or incorrect with the sum of the correct functionally appropriate responses divided by the total number of correct plus incorrect responses.

Educator Social Validity Assessment

Social validity was a subjective measure of the overall social significance of the goals, the appropriateness of the procedures and satisfaction of the results of an intervention for the participants (Bailey & Burch, 2018; Cooper et al., 2020; Wolf, 1978). The data collection instrument is a self-created questionnaire that collected subjective data as interval level quantitative variables in a Likert-style format based on the research questions of the study. As the study aims were intrinsic and specific to the current research, there was not a standardized instrument that encompassed the specific parameters of the study, which was typical of the individualized nature of ABA research (Anderson et al., 2022; Bailey & Burch, 2018; Ledford & Gast, 2018). The social validity survey (Appendix I) contained six statements for participants to select from a 4-choice continuum of agreement with statements about BST of FBA and FABI, and the

application of the procedures to the natural environment for students with DS and DS-ASD. The researcher measured the participants' rating of the effectiveness of the training procedures, social importance of the methods of FBA and FABI, teacher self-efficacy, effectiveness in managing challenging behaviors, and the content of the program materials.

Materials

Each teacher participant received a researcher created workbook for the training program that included the Power Point presentation slides with room for note taking, 10 fillable copies of the Modified Competing Behavioral Pathway Organizer (Appendix G), pens, pencils, and highlighters. In the rehearsal component of BST, the participants completed the organizers for each behavioral scenario so the researcher could analyze the results and provide corrective feedback as necessary. After the in vivo part of the study, members of the study received a Social Validity Survey (Appendix I), and pens to complete their assessment of the social validity of the intervention package. The researcher needed a computer with the Microsoft Excel program and a calculator to analyze the data. The researcher also utilized IBM SPSS® statistical analysis software. Additionally, for the classroom observations, the researcher required a clip board, copies of the Frequency Data Collection Sheet (Appendix B) and Classroom Observation Form (Appendix C).

Measures

The independent variable in the study was a multi-component intervention that consisted of a package of BST for teacher training which included didactic instruction, modeling, rehearsal, and feedback (Fisher et al., 2014), with a generalization component

of in vivo observation and consultation with feedback in the natural environment.

The primary dependent variable in the study was the teachers' knowledge of the principles of FBA and FABI, as well as generalization of these skills to the natural environment of the classroom. Knowledge of FBA involved the ability to correctly identify the components of a behavior sequence (antecedent, behavior, consequence) and the function, or purpose, that the behavior served for the individual. Understanding of FABI was quantified as the ability to select a functional-based intervention, given the knowledge of the FBA for the behavior in question. There was a bank of function-based interventions provided in the training which served as the resource for the participants to select the FABI. During the coaching sessions, other function-based interventions were modeled for the participants depending on the circumstances of the challenging behaviors that presented while the researcher was conducting classroom observations. The primary purpose of the study was to utilize BST to increase the teachers' effectiveness in using FBA to identify the function of challenging behaviors and to select functionally appropriate behavioral interventions. The EFAKE was employed as a pre and post measure, with each of the 20 questions containing "one correct answer, and four distractor choices" (Balmer 2022), which was calculated as a percentage of correct answers. An additional measure of teacher implementation of FABI was derived from the classroom observation sheets (Appendix C) of the percentage of correct function-based interventions demonstrated by the teacher.

A secondary dependent variable was the pre and post treatment frequency measures of two identified challenging behaviors: aggression, and non-compliance, per participant's classroom, that were operationally defined and quantified (Bailey & Burch,

2018; Cooper et al., 2020). Aggression and non-compliance were targeted because they were viewed by the participants, administrators, and the researcher as the most disruptive to instruction and overall classroom functioning. The secondary purpose of the study was to evaluate the occurrence of challenging behaviors in students with DS or DS-ASD to determine if the BST training of teachers in FBA and FABI would have an impact on these disruptive behaviors. These frequency measures were specific to the two designated challenging behaviors identified by each participant in their respective classrooms. Data was graphed and analyzed visually, as is standard in ABA treatment protocols (Bailey & Burch, 2018; Cooper et al., 2020) for determining trends in measures.

The third dependent variable was the quantified measures of social validity from the Social Validity Survey (Appendix I) completed by each member in the study. These surveys measured, in a quantitative method, the acceptability of FBA and FABI procedures, which aligns with the aims of ABA research to provide socially meaningful outcomes for the participants (Anderson et al., 2022; Bailey & Burch, 2018; Ledford & Gast, 2018).

Design

This research study used a single-subject research design (SSD) of multiple probes (MP) across participants, with each participant serving as their own control (Ledford & Gast, 2018). As a research approach, SSD aimed to show experimental control by measuring dependent variables in relation to the introduction of the independent variable as a demonstration that the intervention has an effect on definable measure of behaviors, such as performance of FBA and FABI procedures (Bailey & Burch, 2018; Horner et al., 2005; Ledford & Gast, 2018). The MP design allowed for

discontinuous measures to collect data at various intervals in a study with repeated measures of each participant to compare the experimental variables (Bailey & Burch, 2018; Ledford & Gast, 2018), which allowed for the researcher, who was the observer and facilitator of the corrective feedback, to collect data across multiple classrooms. To mitigate the threats to internal validity from intermittent measurement, most data was collected in each classroom on multiple days which served as a grouping of initial probes after the teacher training and to observe the implementation of the corrective feedback during generalization (Ledford & Gast, 2018). Other designs in SSD that can show more control than MP across participants are reversal or withdrawal treatment designs; however, it would not have been possible to remove an intervention such as teacher training (Ledford & Gast, 2018). Another consideration in the design of the experiment was to control for differences in abilities and behavioral covariation among participants, and to limit the influence they could have on each other, which was a potential threat to internal validity (Ledford & Gast, 2018). As such, training and observations were conducted individually in separate classrooms.

In turning to the component of challenging behaviors, there was a recognized possibility that some disruptive behaviors may constitute a greater need for intervention based on the severity of the behavior, or if delaying treatment would be unethical and a detriment to the participant (Cooper et al., 2020), so these teacher participants would receive the intervention phase first, which could shorten the length of the baseline collection of the frequency of challenging behaviors. Such a problem presented in Cindy's classroom, so baseline was limited to three data points, and the decision was made to move into intervention quickly to mitigate the danger that students' aggressive

behaviors posed to the other students and staff.

Procedures

Data Collection Procedures

1. The researcher sought approval from the university's Institutional Review Board (IRB).
2. After the IRB approval was obtained, the researcher began the participant recruitment process for the study.
3. Recruitment of the participants was conducted by word-of-mouth while relying on purposeful sampling techniques.
4. An invitation to participate in this study was emailed to all potential participants who expressed initial interest, and an IRB approved flyer with the information about the study was posted in the school office.
5. The appropriate consent was obtained from all qualifying participants.
6. Each participant completed a demographic questionnaire.
7. Prior to the onset of the study, the researcher determined the fidelity of the data collection system. For this study, the researcher set the fidelity at 90% for the classroom training. The researcher was the primary agent responsible for data collection throughout the study.
8. The study began with each participant meeting with the researcher to create operational definitions for two challenging behaviors that had been observed in the respective classroom.
9. The researcher trained the participants in how to collect frequency data to gain a baseline of challenging behaviors per response topography.

10. The researcher and the participants each collected frequency data on the challenging behaviors of non-compliance and aggression in each participant's respective classroom.
11. Participants turned in their completed frequency data collection sheets to the researcher.
12. Additional observations by the researcher were conducted to complete the classroom observations of the baseline data of each participant's ability to respond to challenging behaviors with a functionally appropriate strategy in alignment with the hypothesized function of the behavior as determined by the researcher in vivo.
13. After the baseline data on classroom observations was collected, the EFAKE was administered to assess each participant's knowledge of functional behavior assessment and interventions.
14. Once the data was collected for the assessment of each participant's knowledge of functional behavior assessment and interventions, the training began as part of the intervention phase of the study.
15. During the training presentation, which was conducted with each person separately, the participant was exposed to teaching materials via a Microsoft Power Point© presentation that described the procedures and protocols of functional behavior assessment and interventions. The researcher asked probing questions to check for understanding and repeated or clarified any information presented upon request.
16. Once the presentation portion was completed, the researcher modeled how to

identify the antecedent, behavior, consequence, and function for contrived behavioral scenarios. The competing behavioral pathway model was modeled for the functionally appropriate intervention selection. Upon concluding the modeling part, the researcher answered any questions related to the demonstration.

17. Next, the participants had an opportunity to rehearse what they have learned by analyzing contrived behavioral scenarios while using the Modified Completing Behavioral Pathway Organizer.
18. Once rehearsal was completed, the researcher provided all participants with corrective feedback.
19. After the participants completed the training, they were then given their workshop materials and encouraged to utilize their functional assessment and intervention skills in the classroom, with the researcher providing feedback and coaching with each in vivo observation. The researcher retained and scored copies of the completed Modified Completing Behavioral Pathway Organizers from each participant.
20. Next, the researcher readministered the functional assessment and intervention knowledge instrument (EFAKE) as a post training measure of effectiveness.
21. There was a minimum of three post-training observations in each classroom.
22. The researcher continued the observations and feedback for the minimum of 2 to 3 weeks, up to 4 weeks to allow enough time for participants to utilize their new skills in functional assessment and interventions.
23. At the conclusion of the intervention phase, participants and the researcher collected frequency data on the identified challenging behaviors in each

classroom.

24. After the completion of the in vivo application of FBA and FABI procedures with the classroom observations and feedback from the researcher, the participants completed the social validity survey.
25. The researcher collected and aggregated all data from the assessments and data collection instruments.
26. The researcher compared the participants' pre and post assessment results. The results were graphed and analyzed visually, and checked. Inferential statistics of a paired *t*-test comparison of pre and post measures of the EFAKE was calculated.
27. The researcher compared the pre and post frequency data for challenging behaviors. The results will be graphed and analyzed visually, and a percentage of non-overlapping data (PND) was calculated to determine statistical significance.
28. The researcher individually analyzed each participant's percentage of correct of appropriate intervention selection during baseline, intervention, classroom generalization and maintenance probes on the multiple baseline graphs created from the data collected. The PND and levels of statistical significance were calculated for each participant.
29. A trained observer checked for adherence to the training protocol and took reliability data.
30. Interobserver agreement (IOA) was calculated for 25% of classroom observations and correct function-based interventions by the teacher and was collected by the researcher and a trained observer.
31. IOA data was also gathered for pre and post frequency counts of challenging

behaviors by the teacher and the researcher.

Internal Validity

Overall, the MP design across participants has reasonable internal validity and some advantages compared to other SSD designs when methods to control for threats to internal validity were employed (Ledford & Gast, 2018). Internal validity is established when the results of a study can be demonstrated as being functionally correlated to the intervention and not extraneous variables of influence (Creswell & Guetterman, 2018; Ledford & Gast, 2018). For MP designs, an extended baseline due to discontinuous measures, a lack of stability in the baseline, or interruption in baseline, there is a possibility of threats of history effects and maturation which can alter the findings. As a result of history or maturation, there could be a change in the participant's abilities due to experience, rather than related to the intervention. As a method to control for these threats, the baseline was monitored for stability and kept to a limited time period so that no participants remain in baseline for longer than one week, with a duration of four weeks for the entire study. As mentioned previously, if there are significant challenging behaviors in one classroom when the baseline is collected, there will be an ethical obligation to move to the intervention phase quickly, so as to not leave a participant in an aversive baseline condition. As the challenging behaviors were presenting at high levels with potential for injury in the baseline observations for Cindy's classroom, the baseline was limited to three observations.

Another concern in a MP design is attrition, which is when participants of the study leave before the completion of the experiment (Ledford & Gast, 2018) as there are a limited number of subjects in the study. To protect against this type of threat to internal

validity, the researcher's goal was to include a sufficient number of at least three, with a maximum of five, participants in the study. The goal was met with three participants who remained for the duration of the study.

While conducting observations, the Hawthorne Effect was another potential threat to internal validity as there may have been reactivity to the observation (Ledford & Gast, 2018). To mitigate reactivity, the researcher created protocols to describe and report any anecdotal evidence in terms of its potential effects on the data. The researcher did not find any anecdotal evidence of direct effects on the study in terms of reactivity, although the possibility could not be entirely eliminated as the researcher and trained observers were already known to the participants and the students in the setting. To protect against reactivity, the researcher would sometimes observe from outside of the classroom door.

Social Validity

Social validity provides those people who are receiving ABA treatment with the benefits of goals, interventions, and outcomes that have social significance to their lives (Bailey & Burch, 2018; Cooper et al., 2020; Wolf, 1978). One of the aims of the current research was to examine social validity of BST for the implementation of FBA and FABI via the Social Validity Survey (Appendix I).

Reliability of Measure

Reliability of measurement was ensured by calculating interobserver agreement (IOA) during the baseline, intervention, and generalization phases of the research for the frequency of challenging behaviors and the number of function-based interventions implemented in the classroom by the participants. The researcher trained observers to record the data for these measures for at least 25% of all sessions for the classroom

observations. The IOA data for the challenging behaviors was calculated from the teacher and researcher's Frequency Data Collection Sheets which can be found in Appendix B.

Treatment Fidelity

When implementing an intervention, there is a need to replicate the intervention with fidelity and to avoid treatment drift (Ledford & Gast, 2018). Appendix F contains the Training Fidelity and Classroom Observation Checklist which was followed by the researcher when conducting the training prior to the classroom generalization in vivo. Areas addressed were providing materials, correct implementation of steps of BST for instruction, rehearsal, modeling, and feedback. For the classroom observations, a separate fidelity checklist was used to establish rapport, set time for feedback, find an unobtrusive location to observe and answer questions. An independent trained observer took fidelity data on 25% of sessions for these phases of the research study.

Data Analysis Procedures

The primary procedure for data analysis was visual analysis of graphed data on Microsoft Excel spreadsheets to examine the interaction between the independent and dependent variables for trend, variability, and level for each variable across participants (Cooper et al., 2020). The results were calculated as changes in the dependent variable over time for each participant across all phases. There was a focused analysis on the dependent variable as the intervention was implemented to look for an immediacy of change (Ledford & Gast, 2018) which would indicate the strength of the intervention. Descriptive statistics was also employed when comparing the means, standard deviations and ranges for each participant's data in each phase of the study. A percentage of non-overlapping data (PND), which is standard practice in the meta-analysis of data in a

single subject experimental design when comparing two adjacent phases, was calculated. If the data were similar, then that would have indicated a weaker treatment effect, while a higher PND would support a more robust treatment effect (Ledford & Gast, 2018; Tarlow & Penland, 2016). Similarly, a *t*-test was used to compare the pre and post scores from the EFAKE assessment to determine the statistical significance between the two sets of data.

The results of the post intervention Social Validity Survey were inputted into Microsoft Excel, according to the 4-point Likert type ratings, to create a visual display of trends of average responses. For each of the six statements on the Social Validity Survey (Appendix I), there was a sum of the responses, as an indicator of the strength of the social validity measure per participant, along the continuum of (1) *strongly disagree*, (2) *disagree*, (3) *agree*, (4) *strongly agree* in response to each statement. For example, at the highest level of agreement, there would be a selection of four points for each of the six questions or 4x6=24. If a participant selected (1) *strongly disagree* across each statement, then the score would be 1x6=6, which indicates the weakest level of social validity. A visual analysis of all surveys was calculated by displaying the per participant global scores, which fell in a range of 6 to 24 points, and then dividing that sum by the number of participants to measure the social validity of the overall program. An individual analysis per statement on the survey was also conducted across participants using descriptive statistics for each measure of social validity, and to ascertain areas for improvement.

Chapter 4: Results

Introduction

This study examined the impact of a BST model on training professional educators in functional assessment and intervention procedures to reduce challenging behaviors in the classroom. Both contrived and natural settings were utilized for the analysis of each participant's ability to implement the FBA and FABI techniques. Participants were exposed to a brief training presentation for FBA and FABI methodology that accounted for the three-term contingency of antecedents, behaviors, and consequences to determine the function of the behavior and a function-based intervention such as verbal redirection, ignoring the behavior, repeating the demand, giving attention, prompting to use functional communication, first/then board (based on the Premack Principle), or other techniques as appropriate for the hypothesized function. Participants were given the opportunity to observe the modeled FBA and FABI techniques, rehearse the strategies with the contrived behavioral scenarios, and receive feedback during the training. Afterwards, participants practiced these strategies in their respective classrooms by implementing functional intervention to reduce challenging behaviors exhibited by students, while being supported by the researcher. The generalization of the function-based assessment and intervention procedures were further examined without the BST components. Pre and post measurements of the overall instances of challenging behaviors in each classroom were gathered to assess the impact of these function-based approaches. Treatment fidelity checks and interobserver agreement data (IOA) were gathered during the research study. The challenging behaviors chosen for the data collection were non-compliance and aggression as these

behaviors were deemed by the participants, school administration, and researcher as the most disruptive to the learning environment. A final post-intervention social validity survey was administered to determine participants' ratings of the usefulness and acceptability of the BST for employing FBA and FABI to reduce challenging behaviors. Questions under investigation in this study were:

1. What is the effect of BST on increasing a teacher's effective use of FBA to identify the function of students' challenging behaviors in a self-contained elementary school classroom for students with DS with or without co-occurring ASD?

2. What is the effect of BST on increasing a teacher's effective selection of FABI to address the function of students' challenging behaviors of non-compliance and aggression in a self-contained elementary school classroom for students with DS with or without co-occurring ASD?

3. What is the effect of BST on the teacher's implementation of FBA and FABI to reduce challenging behaviors of non-compliance and aggression exhibited by students in a self-contained elementary school classroom for students with DS with or without co-occurring ASD as measured by the number of occurrences of challenging behaviors before and after teacher training and implementation of FBA and FABI in the classroom?

4. What is the effect of BST on how teachers rate BST as a socially valid strategy for implementing FBA and FABI to reduce challenging behaviors in students with DS with or without co-occurring ASD as measured by the social validity survey?

Demographic Characteristics

There were three female teachers who participated in this study. The age range of participants was 31 to 50 years of age. All participants held at least one valid New Jersey

teaching certificate, with two participants holding dual teacher certifications. Participant Cindy held Teacher of Students with Disabilities and Preschool through Grade 3 certifications. Participant Becky held Teacher of Students with Disabilities and Elementary Education certifications. Participant Julia was certified as a Teacher of the Handicapped. All three participants hold master's degrees. Cindy earned a Master of Arts in Teaching, and Julia and Becky earned a master's degree in education. None of the participants had advanced training or certifications in applied behavior analysis. The participants' teaching experience ranged from 10 to 24 years with a mean of 16 years. Each participant had a primary teaching role as a special education teacher at a small private elementary school for students with Down syndrome and other related disabilities in New Jersey.

Data Analysis

The researcher utilized visual and statistical analysis to evaluate the collected data. As guided by Cooper and colleagues (2020), a visual analysis of the line graphs for trend, variability, and level were evaluated for each participant across all phases to determine the effect of the intervention. Inferential statistical analysis with the use of a paired *t*-test was used to calculate the statistical significance of the two averages of baseline data and the intervention condition data (Huck, 2012). The researcher calculated the percentage on non-overlapping data (PND) for each participant and then the average for all participants. PND is a statistical tool for the meta-analysis of single-subject research designs to measure the effect size (Ledford & Gast, 2018; Tarlow & Penland, 2016). A probability measure of the *p*-value was calculated for each PND to determine the statistical significance of the results, with a threshold of $p < .05$ that allows the

rejection of the null hypothesis and confirms the changes in data collected were a result of the intervention, and not by chance or another outside factor (Cohen, 1994; Grabowski, 2016). The data were further evaluated using Cohen's *d* effect size to determine with the criteria of *d* >.20 (*small effect size*), d > .50 (*medium effect size*), and d > .80 (*large effect size*) as related to the difference in two means in terms of standard deviation units (Cohen, 1988).

Research Question 1

The researcher first examined the effect of BST on acquisition of the participants' FBA knowledge with the use of the EFAKE, which was administered pre and post training. The researcher scored the participants' responses by taking the number of correct responses divided by the total number of correct responses added to incorrect responses multiplied by 100 to render an overall percent of correct responses. For the EFAKE assessment, pre and post percent of correct responses were compared per participant and across participants for improvements in knowledge of FBA. The mean percent correct for the EFAKE pre-assessment was 70 % ($N = 3$, $SD = 13.23$). For the EFAKE post-assessment, the mean percent correct was 95% ($N = 3$, $SD = 5.00$). The overall observed increase in participants' knowledge was 25%. A paired *t*-test comparison of pre and post measures shows a statistically significant difference: $t\ (2) = 4.330$, $p = 0.049$, and the Cohen's *d* effect size indicated a large difference between pre and post test results ($d = 2.50$) which further confirms improvements in learning of FBA methodology for all participants (Cohen, 1988).

Research Question 2

The researcher assessed the effect of BST on the participants' selection and

application of FABI to reduce students' aggressive and non-compliance behaviors. To that end, participants were assessed in four different phases. The researcher collected baseline data that represented the participants' ability to utilize functional assessment and then select and apply the functionally appropriate and evidence-based approaches in their respective classrooms. In the second phase, the participants were exposed to BST that accounted for instruction, modeling, rehearsal, and feedback components. Then, each participant was given five behavioral scenarios to dissect for the three-term contingency, hypothesized function of the target behavior that was followed by the application of the functionally related intervention approach that is designed to promote a desired behavior, desired consequence, alternative/replacement behavior, and the use of appropriate teaching strategy. Altogether, there were 10 possible points in completing the modified behavioral pathway for each scenario, with a possibility to earn 1 point for each section and 2 points for the *Teach* section by describing the functionally related and scenario-based intervention approach. The researcher collected data on the correct application of the functionally appropriate approaches by taking the number of correct items divided by the total number of correct items added to incorrect items multiplied by 100 to render an overall percent of correct score. In the third phase, observations were conducted for generalization of the FABI to the classroom, along with feedback during coaching sessions. Finally, in the fourth phase, the researcher observed the participants and collected the follow-up data to assess the stability of the classroom use of functionally appropriate approaches after the coaching sessions were concluded.

Figure 1

Participant Ability to Identify Function and Appropriate Intervention

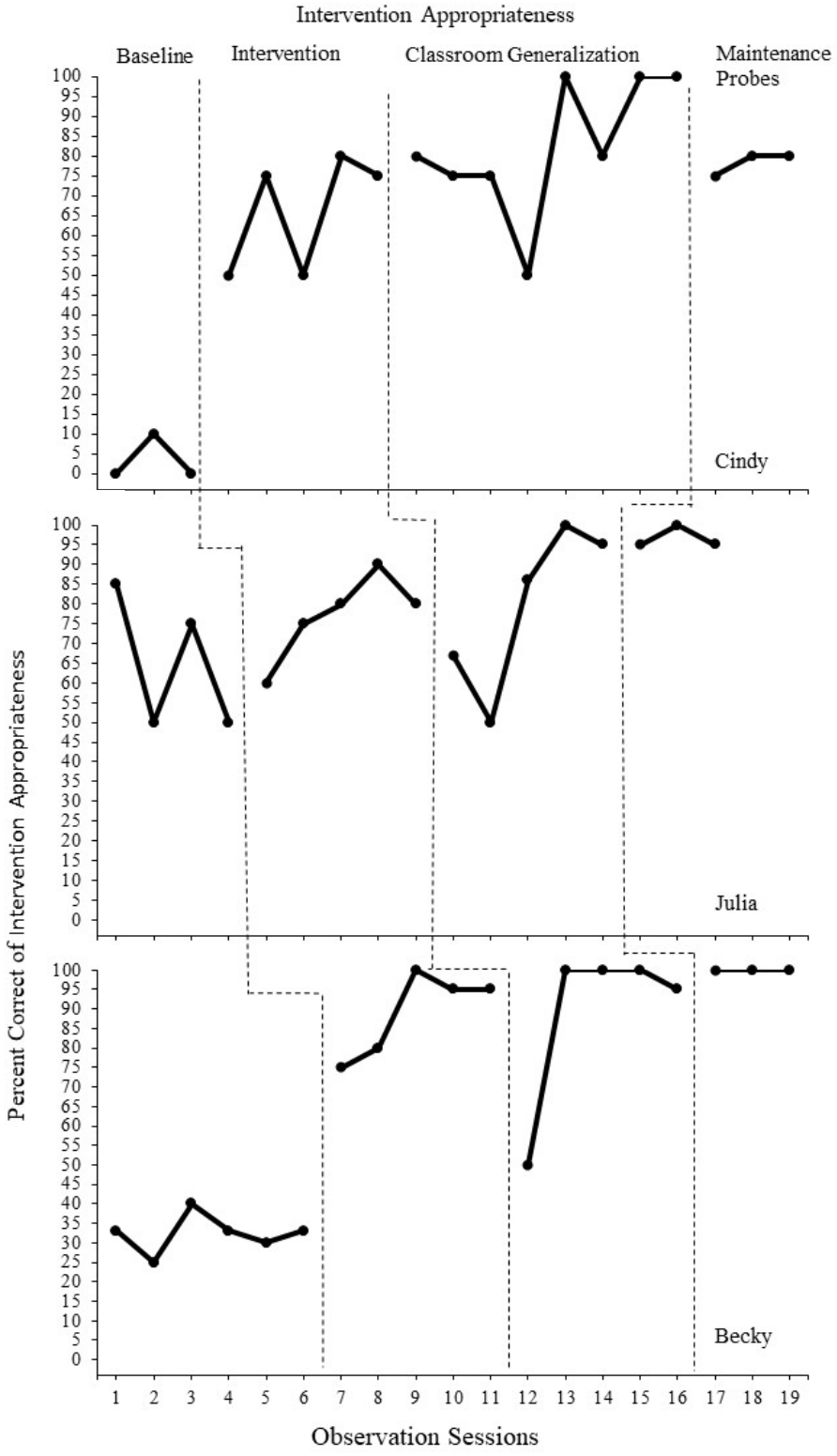


Figure 1 demonstrates the interaction between the independent and dependent variables over time (Cooper et al., 2020). Baseline logic, which holds to the standard of stability in baseline data before moving to the next phase (Ledford & Gast, 2018), was not utilized due to the high intensity and frequency of aggressive behaviors in Cindy's classroom necessitating immediate intervention, and timing of availability of participants for the training program for Becky and Julia.

Data were inputted into the IBM SPSS® software for descriptive statistical analysis to determine the individual participant's average, standard deviation, and range of the collected data for each phase. Further inferential analysis of PND and *p* value were also calculated for changes in level from baseline to intervention.

Cindy's data demonstrated a marked growth in skills immediately following baseline (M = 3%, SD = 5.77, n = 3, range 0–10), and maintained an upward trend during the intervention (M = 66%, SD = 14.74, n = 5, range 50–80), and classroom generalization (M = 83%, SD = 17.32, n = 8, range 50–100) with high variability. Follow-up probes for Cindy decreased in level (M = 78%, SD = 2.89, n = 3, range 75–80), without returning to the baseline, and less variability, suggesting stability in the skill acquisition and application to the natural environment. Julia started with highly variable data in baseline (M = 65%, SD = 17.80, n = 4, range 50–85), with a slightly increasing trend, indicating a possibility of prior knowledge which was also reflected in the PND and *p* value, which will be discussed later. Moving into the intervention, Julia's mean of percent correct increased with moderate variability (M = 77%, SD = 10.95, n =5, range 50–100), and further improved with increasing variability during classroom

generalization (*M* = 80%, *SD* = 20.8, *n* = 5, range 95–100), and stabilized in maintenance probes with a level trend (*M* = 97%, *SD* = 2.89, *n* = 3, range 95–100). Becky remained in baseline for a longer period of time than the other participants due to timing of her availability for the training and according to the research design (*M* = 33%, *SD* = 6.13, *n* = 6, range 25–40). There was an immediate favorable change for Becky's data during the intervention (*M* = 89%, *SD* = 10.84, *n* = 5, range 75–100), which persisted during classroom generalization with higher variability (*M* = 89%, *SD* = 21.91, *n* = 5, range 50–100), and further improved for maintenance probes to the highest scores of all participants (*M* = 100%, *SD* = 0.00, *n* = 3). As a note of interest, Becky's percent correct jumped from 50% in Session 12 to 100% in Session 13 and remained as such until the end of the generalization phase. The same change has been observed for Cindy at the same time. Julia's performance accelerated from 50% in Session 12 to 85% in Session 13 of the generalization phase.

As seen in Table 1, there was a statistically significant increase in Cindy's ability to identify the function of the target behaviors, and to select a functionally equivalent intervention (PND = 100%, *p* = 0.001). The analysis of Becky's data also demonstrated a statistically significant increase (PND = 100, *p* = 0.000). However, the analysis of Julia's data was less indicative of changes in performance being correlated with BST (PND = 46.15, *p* = 0.112). According to Ledford and Gast (2018), a higher PND (above a threshold of 50%) increases the probability that the intervention was solely correlated with the change in level of the data between baseline and the intervention. Likewise, in the visual analysis of the data for Cindy and Becky, the immediacy of change in level indicates that the intervention had a positive effect. As PND has its limitations in

measurement of effect size (Tarrow & Penland, 2016), *p* values were also calculated for each data set. The *p* value is a measure of statistical significance with the standard level of $p < .05$, which allows researcher to reject the null hypotheses and infer that the intervention likely produced the intended effect (Cohen, 1994; Grabowski, 2016). Since Julia's *p*-value is greater than the standard threshold (PND=46.15, $p=0.112$), then there is an approximate 11% chance that the intervention was not solely responsible for any changes observed for the collected data across all phases for Julia.

Table 1

Percentage of Non-Overlapping Data Points With Level of Significance

Category	Cindy	Julia	Becky
PND	100	46.15	100
P-Value	0.0006	0.116	0.00

Figure 2

Frequency of Participant Use of Verbal Redirection

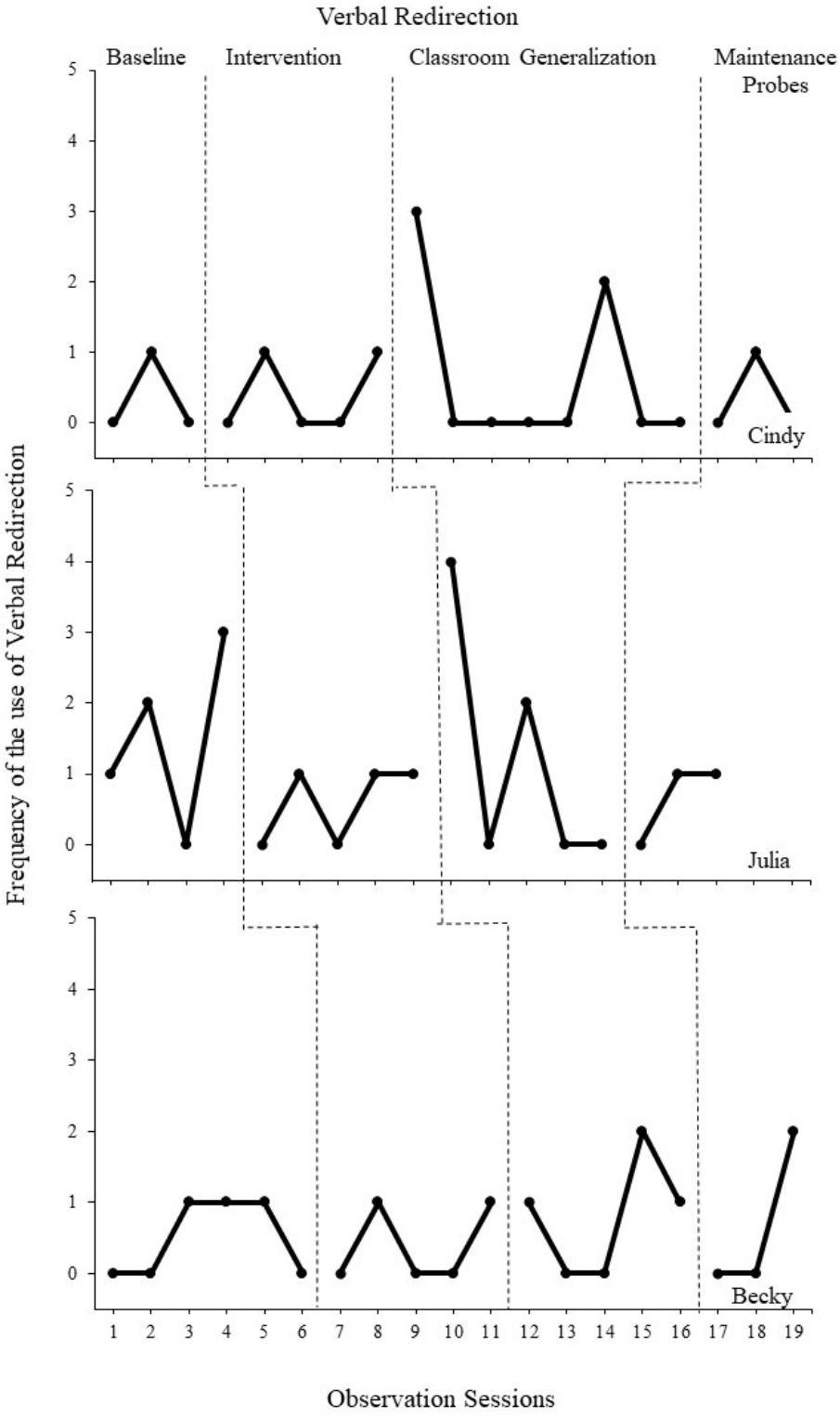


Figure 2 demonstrates the frequency of verbal redirection with all participants utilizing verbal redirection in each phase of the study. Cindy provided verbal redirection with a flat trend and some variability, beginning with low levels in baseline (range = 0–1 instance), increasing in the classroom generalization phase (range = 0–3 instances), and returning to the baseline tendency in maintenance phase (range = 0–1 instance). Julia used verbal redirection more frequently than Cindy, starting with an accelerating trend in baseline phase (range = 1–3 instances), increasing slightly with a decelerating trend in classroom generalization phase (range = 0–4 instances) and maintenance phase (range = 0–1 instance). Becky was consistent with a flat, but slightly accelerating trend across the three phases with baseline phase (range = 0–1 instance), classroom generalization phase (range = 0–2 instances), and maintenance phase (range = 0–2 instances). For the intervention phase, all participants chose verbal redirection, which was one of the potential FABI as given in the scenarios, as follows: Cindy (range = 0–1 instance), Julia (range = 0–1 instance), and Becky (range = 0–1 instance).

Figure 3

Frequency of Participant Use of Ignoring Strategy

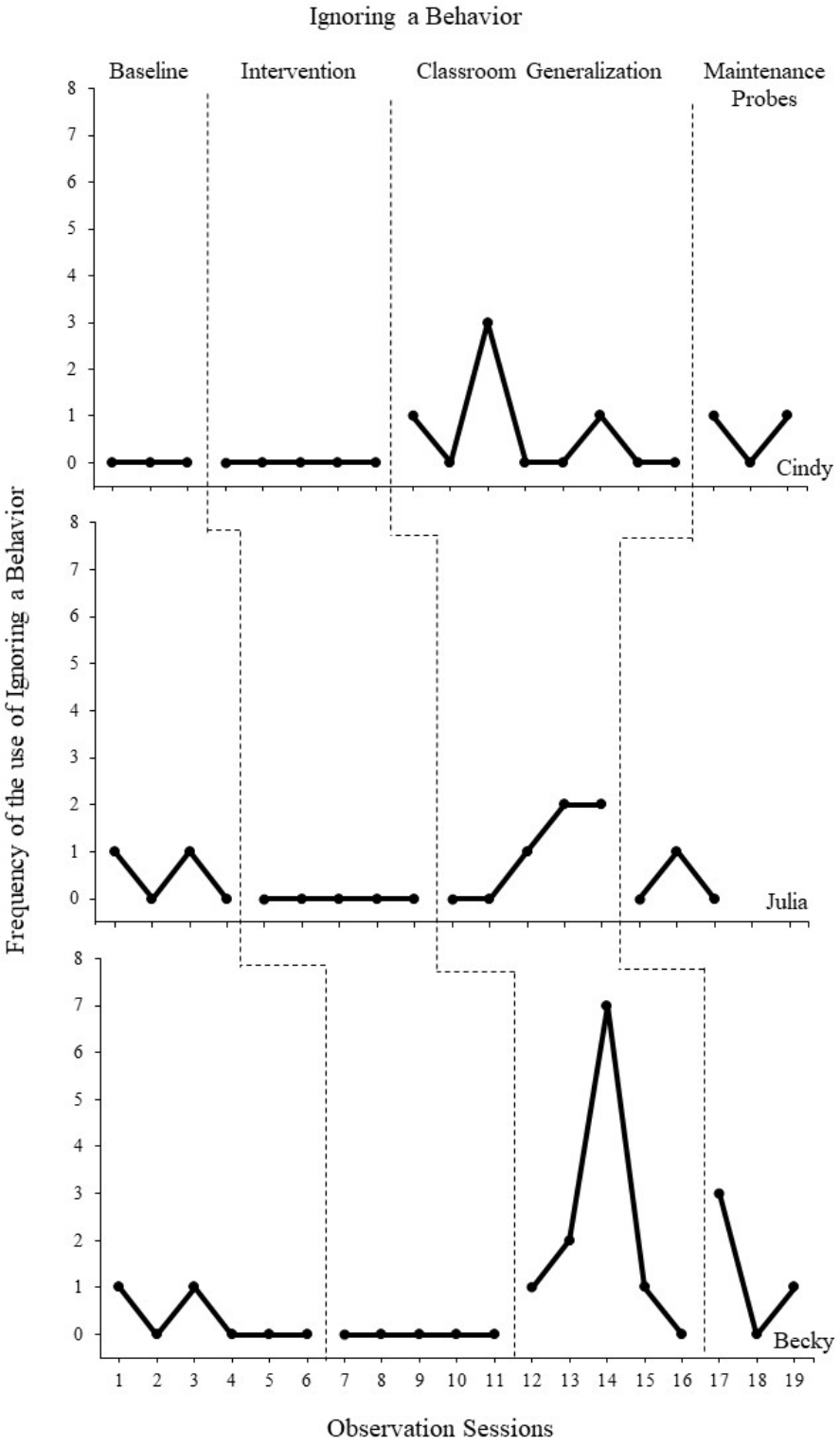


Figure 3 shows the frequency of ignoring a behavior, which was not a correct solution for the behavioral scenarios in the intervention phase, but was rather a coaching strategy in the classroom generalization phase. It was deemed to be a missing and necessary strategy to be taught to participants based on the presenting behaviors. Cindy was not initially able to ignore non-compliance behaviors during baseline with zero instances of using ignoring as an appropriate strategy. Cindy did increase the use of ignoring the target behaviors during the classroom generalization phase (range = 0–3 instances), and in maintenance phase (range 0–1 instance). Julia used ignoring strategy across all phases with a level trend, starting with baseline (range = 0–1 instance), with an accelerating trend in classroom generalization phase (range = 0–2 instances), and a slight decelerating trend during maintenance probes (range = 0–2 instances). Becky's data were more variable with a flat, but slightly decelerating trend in baseline phase (range = 0–1 instance), classroom generalization phase (range = 0–7 instances), and persisting in maintenance phase (range = 0–3 instances).

Figure 4

Frequency of Participant Use of Repeating a Request

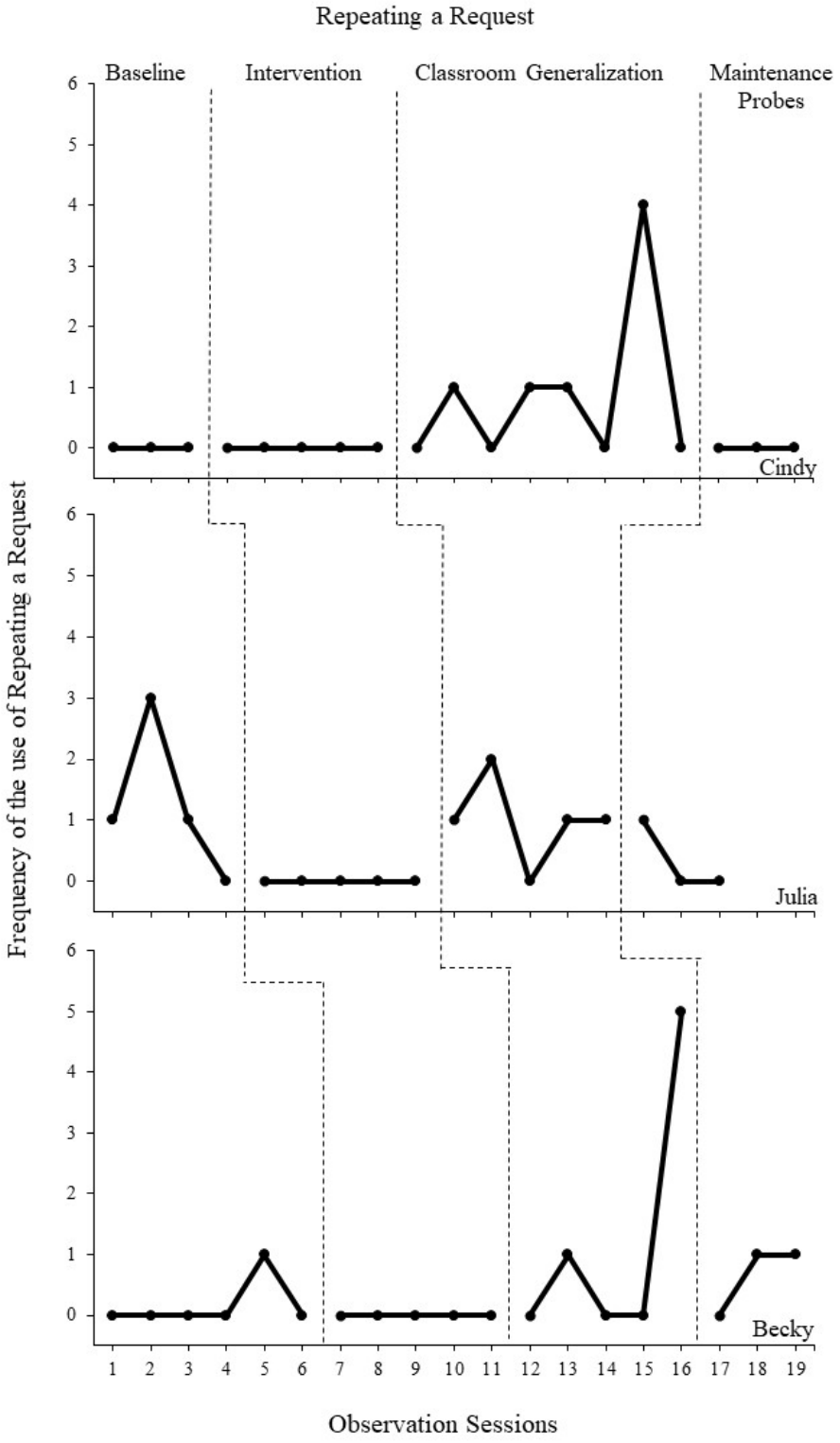
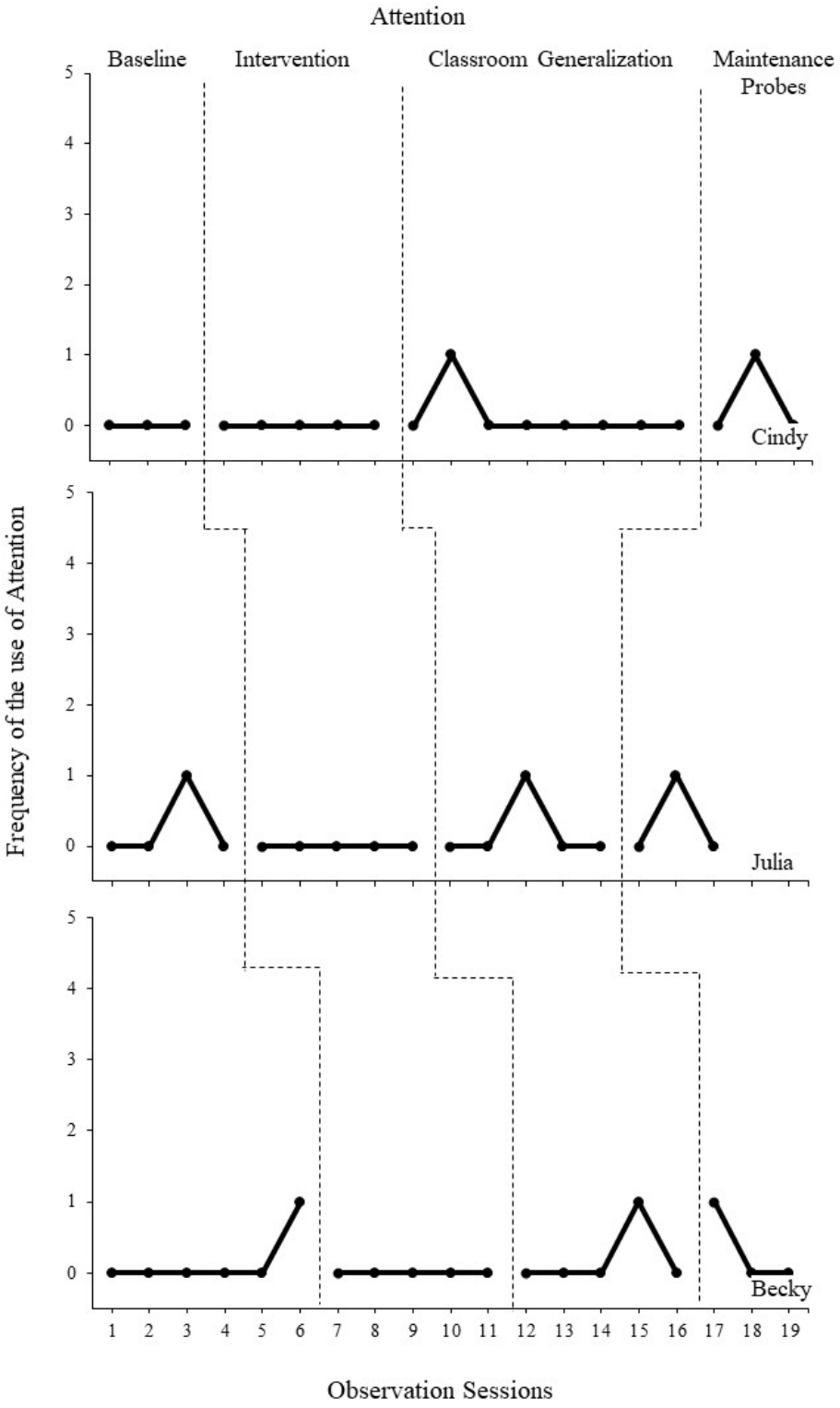


Figure 4 displays the frequency of repeating a request, which was not a correct solution for the behavioral scenarios in the intervention phase, but was observed as a strategy that participants chose in the classroom setting. Cindy did not initially use repeating a request during baseline phase, and then displayed an accelerating trend in classroom generalization phase (range 0–4), and a sharp decline to zero instances in maintenance phase. Julia used the repeating a request strategy across all phases with a slightly decelerating trend with baseline (range = 0–3 instances), classroom generalization phase (range = 0–2 instances), and one time in maintenance phase. Becky's instances of use of repeating request strategy were also flat with infrequent use in baseline phase (range = 0–1 instance), and then increased in classroom generalization phase with high variability (range = 0–5 instances), and a downward trend in maintenance phase (range = 0–1 instance).

Figure 5

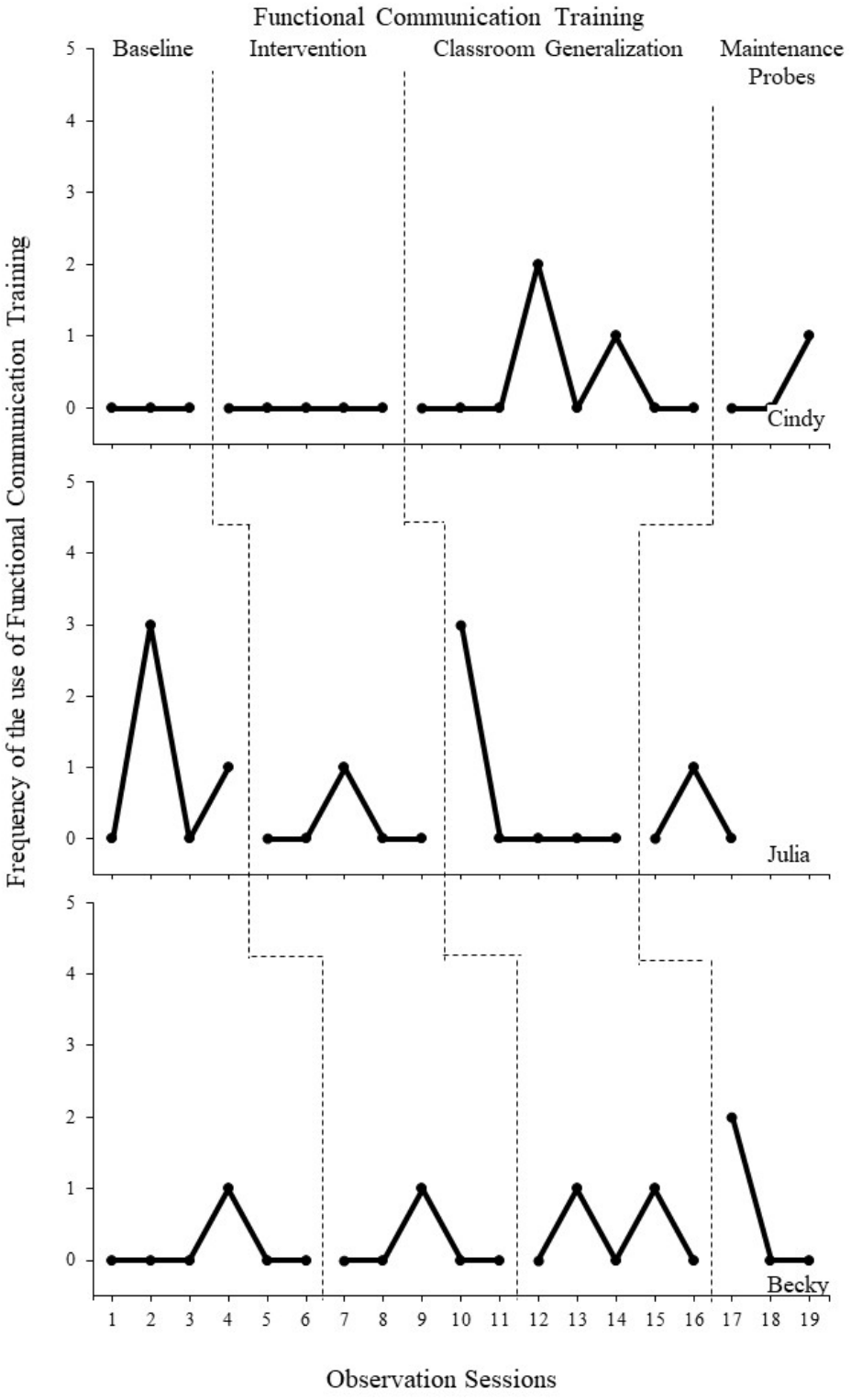
Frequency of Participant Use of Attention



As demonstrated in Figure 5, providing attention, which was not a correct solution for the behavioral scenarios in the intervention phase, was a strategy that was implemented by all participants in the three classroom observation phases. Overall, attention was utilized at low levels with a range of 0–1 instance for all participants. Cindy did not initially provide attention during baseline phase. Cindy did appropriately increase instances of attention in the classroom generalization phase (range = 0–1 instance) and in maintenance phase (range 0–1 instance). Julia used attention in all phases, but only one time in each phase: baseline (range = 0–1 instance), classroom generalization (range = 0–1 instance), and maintenance probes (range = 0–1 instance). Becky's instances of attention strategy use were also flat, with low rates in baseline phase (range = 0–1 instance), classroom generalization phase (range = 0–1 instances), and maintenance phase (range = 0–1 instance).

Figure 6

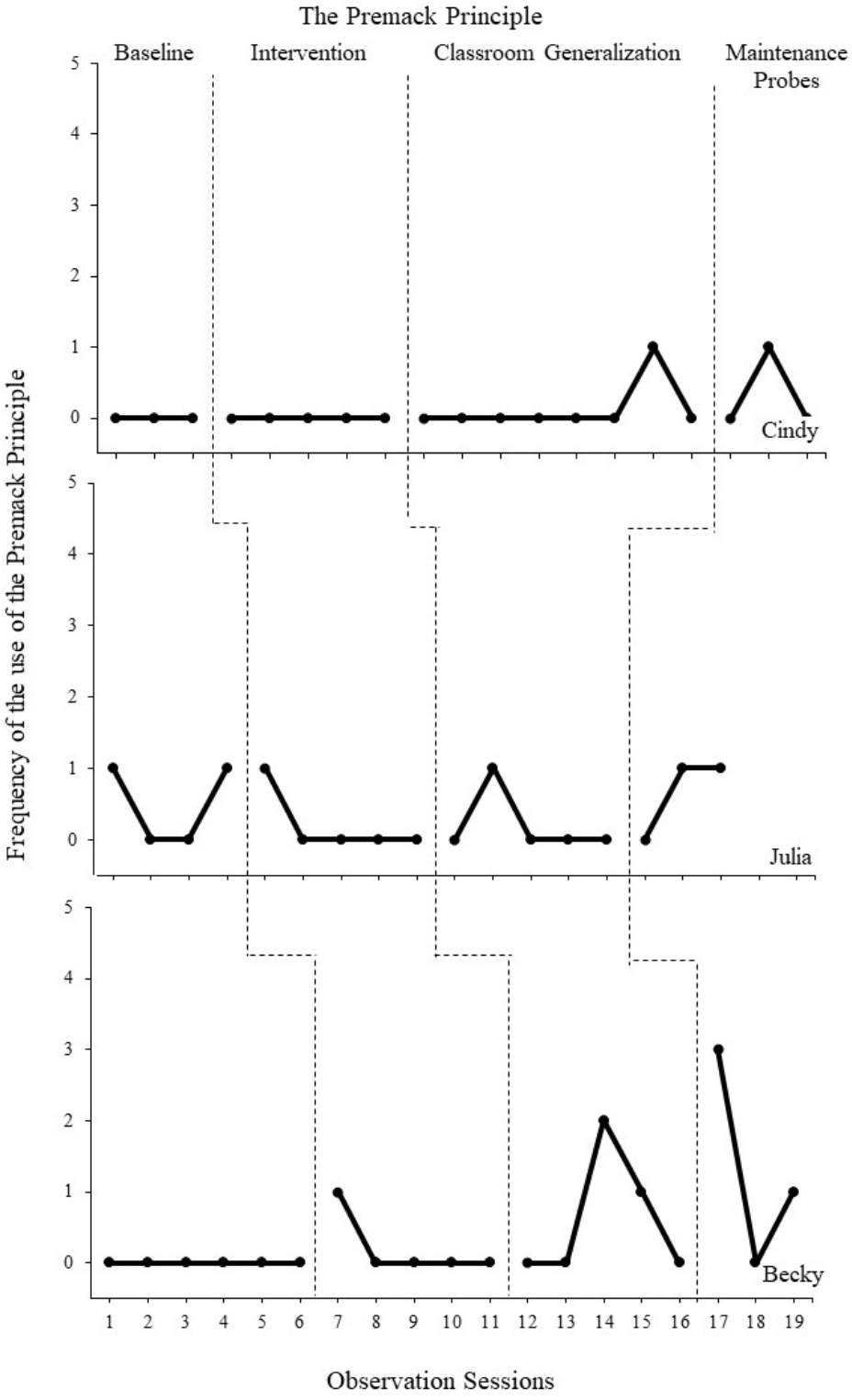
Frequency of Participant Use of Functional Communication Training



As demonstrated in Figure 6, the participants implemented functional communication training (FCT), which was modeled in the intervention phase. Only Julia and Becky selected the FCT strategy appropriately and in accordance to the given scenarios. Cindy did not initially provide FCT during baseline phase, but implemented it appropriately starting during the fourth of eight classroom generalization observations (range = 0–2 instances), and in maintenance phase (range 0–1 instance). Julia used FCT in all phases with high variability starting with baseline phase (range = 0–3 instances), classroom generalization phase (range = 0–3 instances), and maintenance phase (range = 0–1 instance). Becky's data were flat in baseline (range = 0–1 instance), classroom generalization phase (range = 0–1 instance), and with slightly accelerating trend in maintenance phase (range = 0–2 instances).

Figure 7

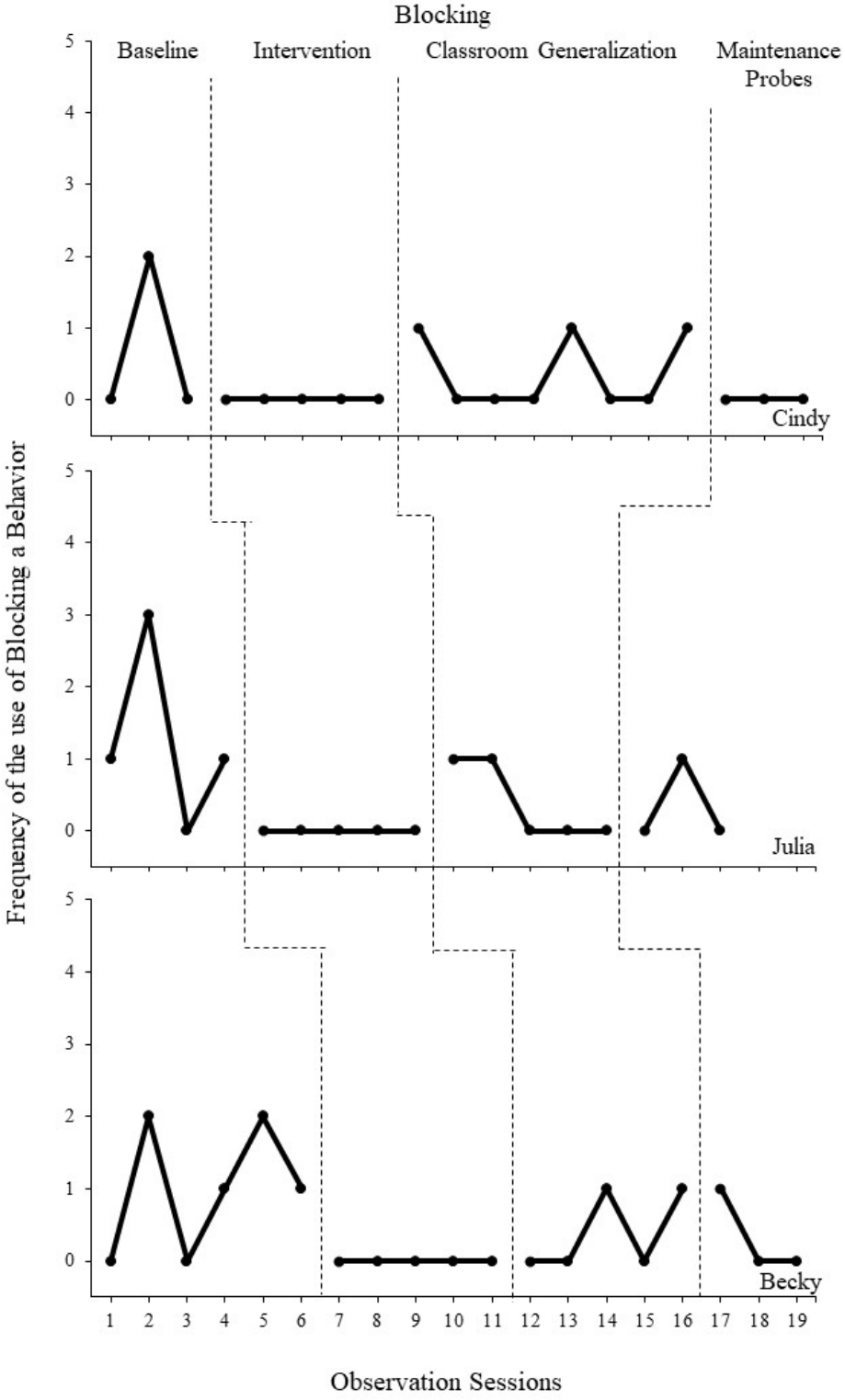
Frequency of Participant Use of the Premack Principle



The Premack Principle is a behavior management approach that relies on the principles of ABA and uses a *First-Then* strategy in which a preferred activity is provided as reinforcement for completing a non-preferred task (Cooper et al., 2020). The Premack Principle was a potential correct intervention for the behavioral scenarios in the intervention phase, and was chosen as a strategy by Julia and Becky. As shown in Figure 7, Cindy was least likely to use the Premack Principle in comparison to Julia and Becky with no occurrences in baseline, and one instance in the seventh observation during the classroom generalization phase, and one time in maintenance phase. Julia showed some low variability in the use of the Premack Principle in all phases starting with baseline phase (range = 0–1 instance), classroom generalization phase (range = 0–1 instance), and maintenance phase (range = 0–1 instance). Becky's use of the Premack Principle did not occur in baseline phase and then increased in classroom generalization phase (range = 0–2 instances), and in maintenance phase (range = 0–3 instances).

Figure 8

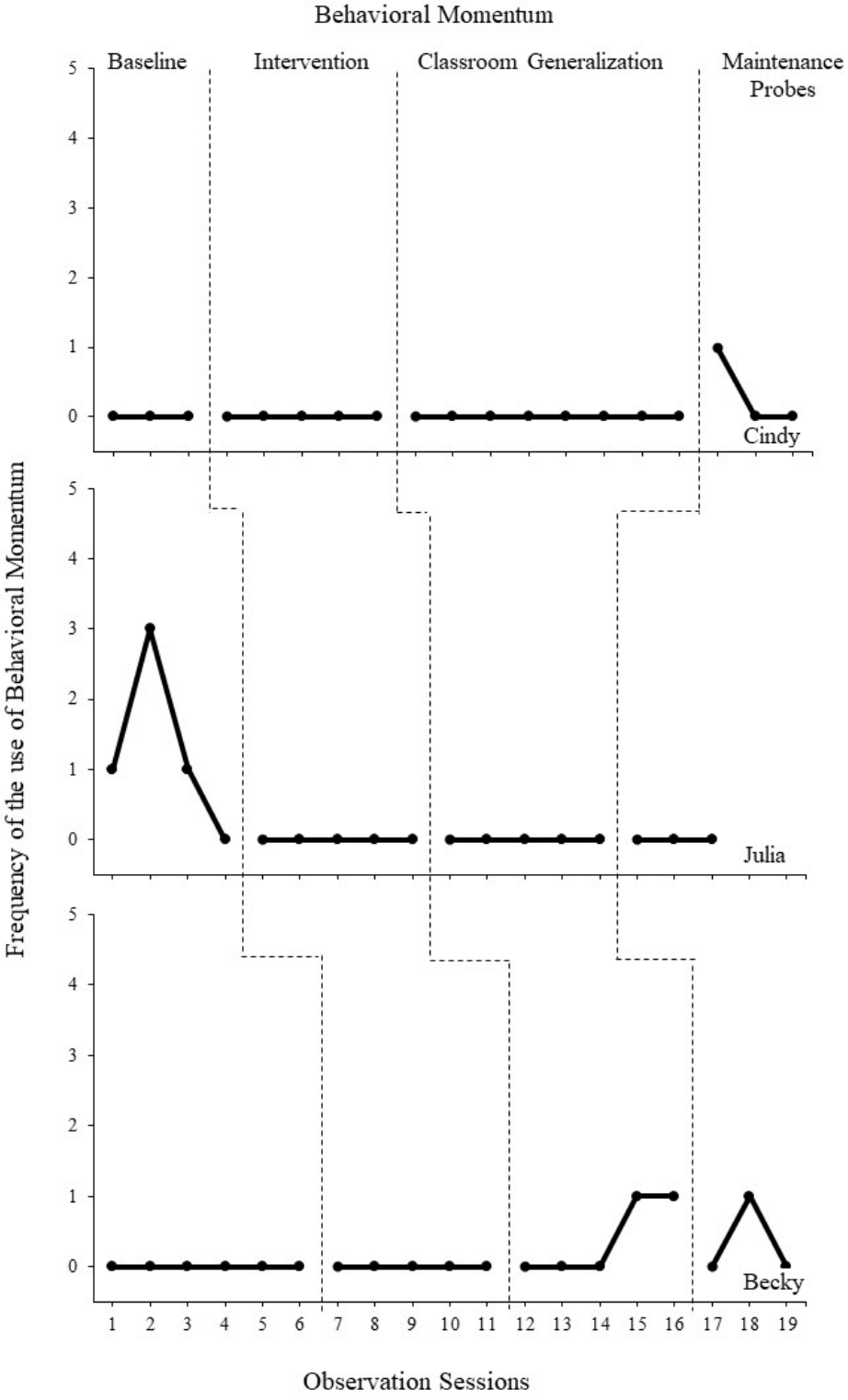
Frequency of Participant Use of Blocking



As demonstrated in Figure 8, blocking a behavior, which was not a correct solution for the behavioral scenarios in the intervention phase, was a strategy observed being implemented by all participants at some point during the classroom observation phases. Blocking was displayed by Cindy during baseline phase (0–2 instances), in classroom generalization phase (range = 0–1 instance), but not in maintenance phase. Julia used blocking in all phases with high variability starting with baseline phase (range = 0–3 instances), which was followed by a decelerating trend in classroom generalization phase (range = 0–1 instance) and maintenance phase (range = 0–1 instance). Becky's data had initially higher occurrences in baseline (range = 0–2 instances), and a decelerating trend in classroom generalization phase (range = 0–1 instance), continuing into maintenance phase (range = 0–1 instance).

Figure 9

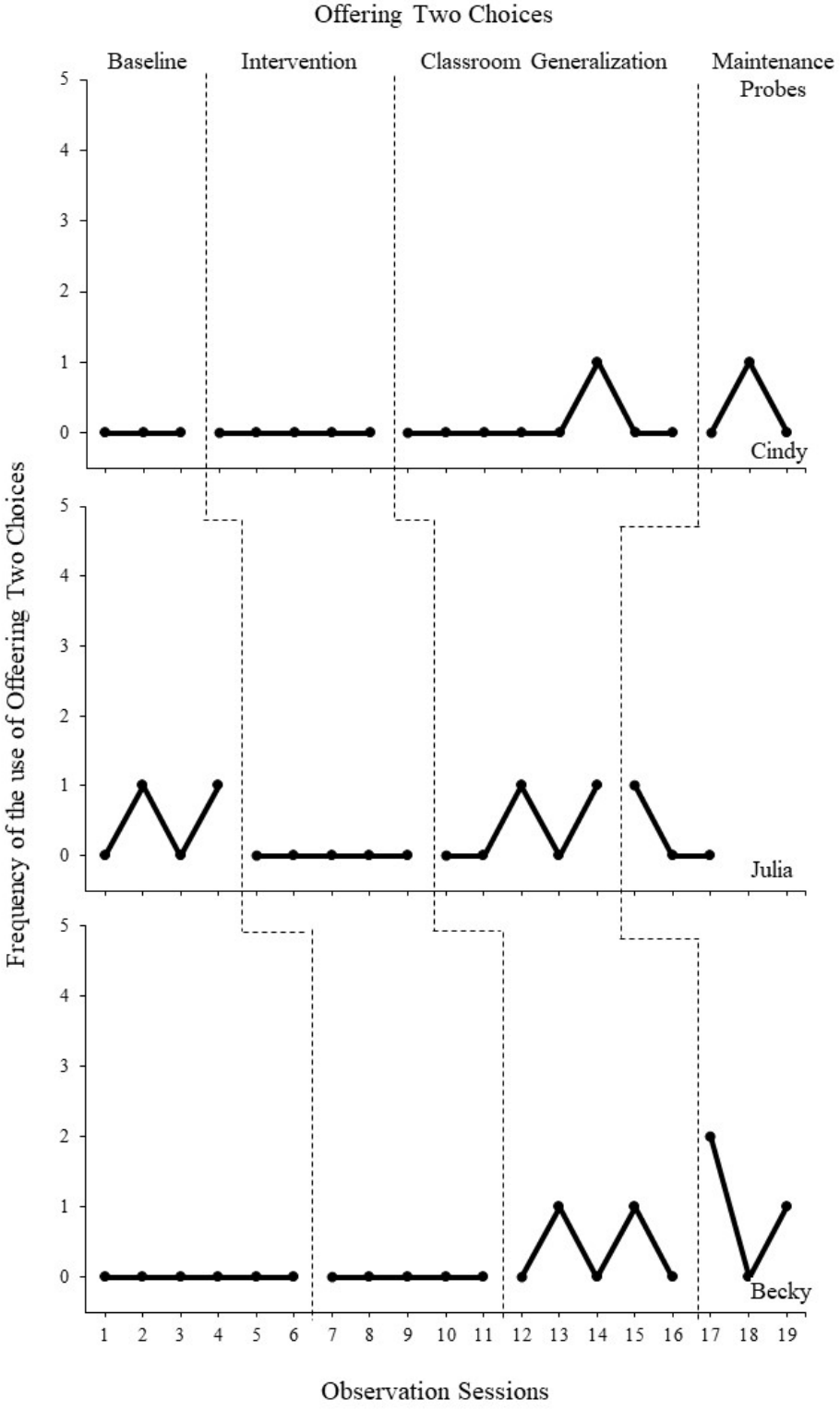
Frequency of Participant Use of Behavioral Momentum



The use of behavioral momentum by participants is depicted in Figure 9. Behavior momentum strategy was not one of the solutions for the behavioral scenarios in the intervention phase and it was the least implemented strategy for all participants overall. Behavioral momentum is a behavior management approach that relies on the use of a high-probability sequence of instruction with two to five mastered tasks followed by a more difficult task to create behavioral momentum (Cooper et al., 2020). Cindy did not initially provide behavioral momentum as a strategy during baseline or classroom generalization phase, although the strategy was modeled by the researcher during the coaching sessions in the classroom generalization phase. Cindy appropriately used behavioral momentum in maintenance phase one time. Julia provided behavioral momentum only in the baseline condition (range = 0–3 instances). Becky did not implement the behavioral momentum sequence until the end of the classroom generalization phase (range = 0–1 instance), and in maintenance phase (range = 0–1 instance).

Figure 10

Frequency of Participant Use of Offering Two Choices



Although offering two choices strategy was not listed among potential solutions for the behavioral scenarios, all participants implemented it throughout the classroom observations (see Figure 10). Overall, offering two choices was utilized at low levels with a range of 0–1 instance for all participants. Cindy did not engage in the two-choice strategy at baseline phase. There was only one instance in the generalization phase and maintenance phase. Julia, on the other hand, used the two-choice strategy in all phases: baseline (range = 0–1 instance), classroom generalization (range = 0–1 instance), and maintenance probes (range = 0–1 instance). There were no occurrences of Becky practicing two-choice strategy in baseline phase (range = 0–1 instance), an increase in frequency in classroom generalization phase (range = 0–1 instance), and a further increase in maintenance phase (range = 0–2 instances).

Table 2

Interobserver Agreement Data Across Participants and Phases

Phase	Cindy	Julia	Becky	Average
Baseline	86	81	80	82
Generalization	80	82	86	82
Maintenance	87	80	100	89

As demonstrated in Table 2, IOA data were collected for classroom observations to ensure experimental control and reliability. The researcher and a trained observer recorded data on the number of functional assessment-based interventions observed across 25% of all observations. The smaller of the two numbers was divided by the larger number of functionally assessment-based interventions observed and the quotient was multiplied by 100 to render a percent agreement. The total number of percent agreements were added together and divided by the total number of addends to render an overall total

IOA. According to Cooper et al. (2020), the goal for IOA was set at the standard acceptable range of 80% and was achieved throughout all phases of the study, with an average IOA of 84% for all phases across all participants. Treatment fidelity data were gathered for the intervention and generalization phases, using the Training Treatment Fidelity Checklist and Classroom Observation Fidelity Checklist (Appendix F), and determined that there was 100% procedural fidelity across all participants.

Research Question 3

The third research question focused on the frequency of students' aggressive and non-compliance behaviors before and after the BST implementation and application of the functionally appropriate intervention approaches. The operational definitions for the target behaviors were as follows:

Aggression was defined as any instance in which the learner attempts, and is blocked, or successfully makes contact with another person with his/her hand, object, or saliva with enough force to leave a visible mark on the skin, cause injury, move the person's body, or cause an audible sound. Examples include biting, pulling hair, kicking, pushing, or spitting. Non-examples include giving a high-5, social interactions such as dancing or playing tag, hugging, or saliva leaving the learner's mouth while talking or drooling.

Non-Compliance was defined as refusal to respond to a verbal or physical direction that is part of the instructional routine, rules, or expectations in the school setting within 30 s of the demand being placed or the commencement of a usual routine. Examples include dropping to the ground, refusing to transition, swiping items off the table when presented with a task, or not following directions. Onset is 30 s of occurrence

and offset is initiation to complete the directive or task. Non-examples include asking for a break, or engaging in a response that matches the instruction.

As noted in Figure 11, there was a reduction in the student target behaviors from the baseline to post-treatment phase in each classroom. No individual students were identified for data collection per classroom pre- and post-intervention. Non-compliance was occurring more frequently than aggression for all classrooms, although aggression posed a higher safety risk than non-compliance.

In Cindy's classroom, in the pre-intervention phase, non-compliance was occurring at high levels (range = 16–17 instances) with a slightly decelerating trend. In the post-intervention phase, the researcher observed reduction in non-compliance behavior frequency (range = 5–8 instances) with a slightly decelerating trend. Instances of aggressive behaviors in Cindy's classroom were relatively high in the pre-intervention phase (range = 12–15 instances), and with an accelerating trend. In the post-intervention phase, data demonstrated some improvement (range = 2–3 instances) with a slightly decelerating trend. Overall, the data for challenging behaviors in Cindy's classroom had low variability.

In contrast, the data for aggression and non-compliance behaviors in Julia's classroom were more variable. Instances of non-compliance in the pre-intervention phase (range = 5–15 instances) exhibited an accelerating trend with a moderate decrease in level in the post-intervention phase (range = 7–10 instances) and a decelerating trend. Occurrences of aggression in Julia's classroom were at lower levels than instances of non-compliance in both phases with the pre-intervention condition (range = 3–8 instances), and decreasing in the post-intervention condition (range = 0–1 instance).

Becky's classroom data for non-compliance behaviors showed high variability in the pre-intervention condition (range = 5–10 instances) and a slightly decelerating trend, which improved in the post-intervention condition (range = 2–3 instances) with a flat trend indicating some post-intervention stability. Occurrences of aggression were at a lower initial level in the pre-intervention phase (range = 1–4 instances) as compared to the frequency of aggression in the other two classrooms. In the post-intervention phase, there were improvements for the frequency of aggression in Becky's classroom (range = 0–1 instance) with a slightly accelerating trend.

The researcher calculated the PND by counting the data points in the pre-treatment and post-treatment phases. As noted in Table 3 and Table 4, Julia's classroom PND = 100, $p = 0.000$ for aggression and non-compliance indicates that the intervention may likely have led to a reduction of challenging behaviors with statistical significance. However, Cindy's classroom did not meet the criteria for statistical significance for either behavior (PND = 100, $p = 0.061$), which might be a result of limited data points in pre-intervention (n=2) and post-intervention (n=3). Becky's results were favorable for the reduction of the instances of non-compliance (PND = 100, $p = 0.007$), but not for aggression (PND = 33, $p = 0.218$). The researcher will propose a remediation in Chapter 5.

Table 3

Percentage of Non-Overlapping Data Points With Level of Significance for Frequency of Aggression

Category	Cindy's Classroom	Julia's Classroom	Becky's Classroom
PND	100	100	33
P-Value	0.061	0.000	0.218

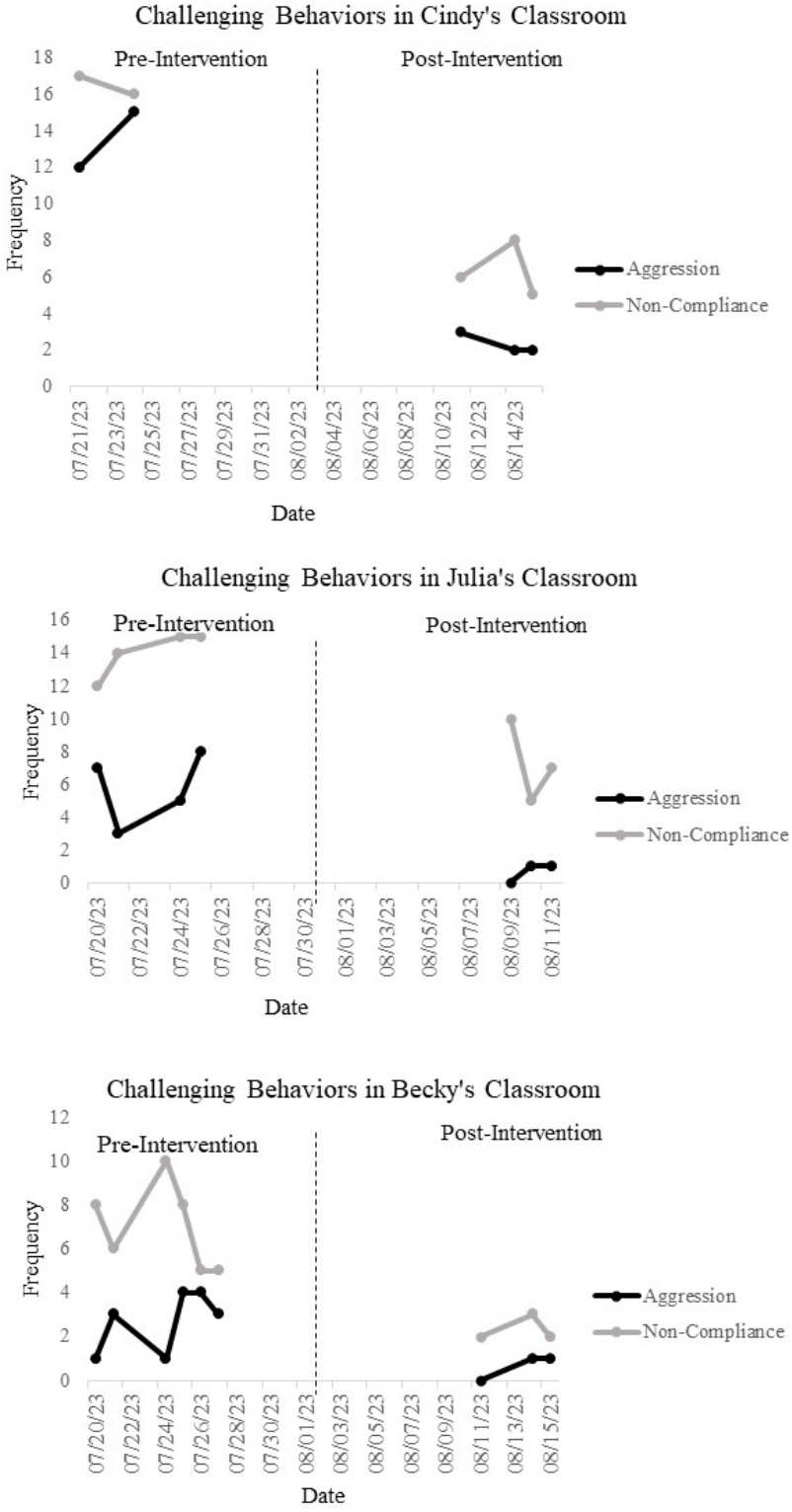
Table 4

Percentage of Non-Overlapping Data Points With Level of Significance for Frequency of Non-Compliance

Category	Cindy's Classroom	Julia's Classroom	Becky's Classroom
PND	100	100	100
P-Value	0.061	0.000	0.007

Figure 11

Frequency of Challenging Behaviors per Classroom Pre and Post Intervention



Research Question 4

The last research question addressed the perceived effect of BST as a socially valid strategy for implementing FBA and FABI to reduce challenging behaviors among students. Table 5 shows the percentage of agreement across the six measures of social validity. Agreement for statements on the effectiveness of the BST in teaching FBA and FABI methods, the effectiveness of FBA and FABI in reducing challenging behaviors, recommending these methods to others, and the helpfulness of the program materials each received favorable social validity ratings of *agree* (33.3%) and *strongly agree* (66.7%). Self-efficacy or competency social validity ratings were somewhat low with the 66.7% of agreement and 33.3% of strong agreement. Table 6 depicts the total agreement across all participants per statement. Notably, all participants selected either (3) *agree* or (4) *strongly agree*. The highest potential level of agreement of 4 points for each of the six questions was 24 (4x6=24). If a participant selected (1) *strongly disagree* across each statement, then the score would be 1x6=6, and serves as the weakest level of social validity. The total social validity was calculated with a range of 4 to 24 points per participant. Results of the collected data were favorable with social validity scores of 24, 23, and 18 (M=21, SD=3.22) for measures of the effectiveness of the training procedures, and techniques of FBA and FABI, teacher self-efficacy of effectiveness in managing challenging behaviors, and the usefulness of the program materials.

Table 5

Total Social Validity Results Across Participants

Percentage of Agreement per Statement

Statements	Strongly Disagree (1)	Disagree (2)	Agree (3)	Strongly Agree (4)
1-Effective in teaching me FBA	0.0%	0.0%	33.3%	66.7%
2-Effective in teaching me FABI	0.0%	0.0%	33.3%	66.7%
3-FBA and FABI are effective for reducing challenging behaviors	0.0%	0.0%	33.3%	66.7%
4-Recommend FBA and FABI to others	0.0%	0.0%	33.3%	66.7%
5-Feeling of competency in using FBA and FABI	0.0%	0.0%	66.7%	33.3%
6-Program materials were helpful	0.0%	0.0%	33.3%	66.7%

Table 6

Social Validity Results per Participant

Levels of Agreement per Statement

Participant	Statement						Total Score
	#1	#2	#3	#4	#5	#6	
Participant 1	4	4	4	4	4	4	24
Participant 2	4	4	4	4	3	4	23
Participant 3	3	3	3	3	3	3	18

Chapter 5: Discussion

Introduction

In the literature on behavior management, there has been a history of professional educators using methods to suppress a behavior without consideration to a hypothesized function or a functionally appropriate replacement behavior (Borgmeier et al., 2015; Gage et al., 2018; Owens et al., 2018). Lack of pre-service preparation and professional development training has been a barrier to teachers utilizing function-based strategies to mitigate disruptive behaviors in the classroom (Hsiao & Petersen, 2019; Klopfer et al., 2019; Young et al., 2018) despite the IDEA's (2004) mandate to use FBA to address challenging behaviors. For students with DS or DS-ASD, there has been a significant lack of representation of this population in FBA and FABI methods in the behavior management research (Alligood & Gravina, 2021; Dillenburger, 2012; Dillenburger & Keenan, 2009). Strong support of BST as a methodology to increase teachers' self-efficacy and fluency in FBA and FABI (Allday, 2018; Courtemanche et al., 2021; Davenport et al., 2019) informed the training parameters for exposing the participants to the content and strategies of functional assessment practices and providing ongoing guidance and personalized instruction in the natural environment.

The four research questions guided the researcher in addressing gaps in the literature in utilizing BST to increase teacher competency in functional assessment and interventions, applying the framework to decrease challenging behaviors exhibited by students with DS or DS-ASD, and the social validity of the training methods for the teachers participating in the study. The research study sought to examine the effectiveness of BST for skill acquisition of FBA methodology and FABI strategies

across four phases of data collection, and the application of these methods in the reduction of the occurrences of maladaptive behaviors pre and post teacher training. The researcher collected baseline data on the percentage correct of functionally appropriate interventions during classroom observations, and frequency of each participant's use of nine intervention strategies. The researcher conducted individual training workshops utilizing the BST framework of instruction, modeling, rehearsal, and feedback. The researcher collected data in intervention, classroom generalization, and maintenance phases for each participant's ability to identify function of the target behavior, select and apply an appropriate function-based intervention. The frequency of use of the nine intervention strategies was also collected in all phases. The frequency of challenging behaviors exhibited by students in the classroom setting was collected prior to the training and then after the completion of the intervention and classroom generalization phases. Additional measures were collected for the pre and post training administration of the EFAKE assessment, and the post intervention social validity survey.

Summary of Findings

Participants in the study increased their understanding of FBA and FABI as measured by the increase in EFAKE scores and overall accelerating trends in classroom observation data. Participants' scores on the EFAKE demonstrated a 25% increase in knowledge from the baseline average of 70% correct responses to the post intervention average of 95% correct responses. Similar gains were noted in the classroom observations (Figure 1) with an average baseline for the three participants of 33% correct selection of appropriate intervention (range = 3–65%), intervention phase mean of 77% correct selection of appropriate intervention (range = 66–89%), classroom generalization

phase of 84% accuracy (range = 80–89%), and further increasing in the maintenance phase to 92% accuracy (range = 78–100%). As evidenced by the data path in Figure 1, all participants increased their ability to identify the function of the behavior and select an appropriate intervention. In the visual analysis of data, there was also an immediacy of change for all participants from baseline to intervention, which supports the effectiveness of the training procedures (Cooper et al., 2020). However, as seen in Table 3, the PND values suggest that while Cindy and Becky had statistically significant increases in their knowledge and performance, Julia's data did not meet the criteria for statistical significance.

As depicted in Figures 2–10, teacher participants likewise demonstrated the correct application of a variety of functionally appropriate interventions as each participant utilized each of the nine intervention strategies during at least one phase in the study. Cindy demonstrated the largest increase in the variety of methods for addressing challenging behaviors. She implemented three of the nine strategies in baseline, increased to eight of the nine strategies in classroom generalization phase, and seven of the nine strategies in maintenance phase. Becky employed seven of nine intervention strategies in baseline, nine of nine in classroom generalization phase, and continued with nine of nine in maintenance phase. Julia had more strategies than the other two participants starting with nine of nine during baseline, and continuing with eight of nine in classroom generalization and maintenance phases.

The frequency of challenging behaviors of non-compliance and aggression exhibited by students was also improved as a result of the teacher training package (Figure 11) with decelerating trends for all measures from pre-intervention to post-

intervention in each participant's classroom. Although the limited number of data points for the learners in Cindy's classroom add caution to the generalization of these results with a PND that did not meet statistical significance, the visual analysis of data supports the success of the intervention with a decelerating trend for both target behaviors. Rates of target behaviors in Julia's classroom showed a statistically significant difference between pre and post intervention phases with reductions in both topographies of students' challenging behaviors. In Becky's classroom, the data on aggression were variable with low levels, which did not meet criteria for PND or statistical significance when compared to post-intervention data. However, the data variability and trend of post-intervention measures in Becky's classroom decelerated in comparison to the pre-intervention data.

Social validity findings indicated that all participants reported socially significant, and meaningful experiences from participating in the study. The anonymous self-reported levels of agreement with the research aims were favorable with the average social validity score of 21 out of 24 and the corresponding percentage of agreement of 100% for combined agree and strongly agree ratings for the six statements in the social validity survey. Participants expressed agreement in their ratings that BST was effective in terms of teaching them to outline the three-part contingency, hypothesize a function, and select a functionally appropriate intervention. They rated the program materials as helpful and indicated that they would recommend the program to other educational professionals.

Interpretation of Findings

Overall, the results of this study support the BST model's effectiveness for professional development of teachers in the skills of functional assessment and

intervention selection, and in the reduction of challenging behaviors in a manner that promotes social acceptance. Participants increased their ability to identify the antecedents, behaviors, consequences, and intervention strategies that appropriately addressed challenging behaviors, as evidenced by the data path in Figure 1 for percent correct of intervention appropriateness. Figures 2 through 10 represent the participants' individual abilities to utilize a variety of functionally appropriate behavior interventions in contrived and real-life situations. Based on visual analysis of the collected data (Figure 11), there were decelerations in all classrooms across both targeted behaviors of non-compliance and aggression, with statistical significance for reduction in the frequency of aggression and non-compliance in Julia's classroom and non-compliance in Becky's classroom.

When reflecting on the PND values for intervention appropriateness (Figure 1), it would appear that Julia potentially had a degree of prior knowledge which contributed to her increase in accuracy and frequency of FABI, even though that was not necessarily reflected in her initial EFAKE score of 75% correct responses, which increased to 100% correct responses in the post training administration. The same potential pre-existing skill set for Julia may have been captured in data the researcher collected on her initial use of all identified intervention strategies. Whereas Cindy originally scored 55% correct responses on the EFAKE, and used the lowest percentage of correct interventions (Figure 1, 3%, $n = 3$), and lowest variety of functionally appropriate interventions in baseline (three of nine), her EFAKE score increased to 90% accuracy in the post BST, indicating, as a whole, there were likely gaps in her knowledge of functional assessment procedures and interventions. Becky's score on the first administration of the knowledge evaluation

was the highest of the three participants at 80% correct response and rose to 95% correct response post intervention, which mirrors some of her initial knowledge of FABI with seven of nine strategies used in baseline. Another factor that the researcher accounted for was the length of baseline phase for Becky, which had six observations. This was significantly longer than Cindy's baseline with three observations. This potentially yielded more opportunities for Becky to utilize a wider variety of intervention methods. As mentioned in Chapter 4, the shortened baseline for Cindy was a result of the frequency and accelerating trend of the aggressive behaviors which necessitated immediate intervention strategies, thus limiting the number of data points (Figure 11). As such, it did not result in statistical significance in the PND calculation.

When examining the demographic data in relation to the results, the tenure of the participants in the careers may also have been a factor in Julia having the most initial knowledge of the FBA and FABI. She had been certified and practicing as a teacher for 24 years. Becky had been in the field for 10 years and Cindy had completed 15 years of teaching. The limited duration of the study may have been protective against attrition as a potential threat to internal validity.

Context of Findings

Historically, teachers used traditional approaches to classroom management to curtail behaviors without addressing the underlying reason for the behavior's occurrence (Hsiao & Petersen, 2019; Klopfer et al., 2019). In the study conducted by Hsiao and Petersen (2019), the majority of educators (60% of 144 participants) noted that a lack of a practical application to real-life settings was a reason that they did not have fluency in their classroom management skills. The same sentiments were disclosed by participants

in the present study as they all remarked that the practice component and coaching helped them to hone their skills. Within the framework of ABA, BST has been demonstrated to be an effective methodology for training professional educators in the skills of FBA procedures (Balmer, 2022; Courtemanche et al., 2021; Davenport et al., 2019; Gregori et al., 2020; Hogan et al., 2015; Luck et al., 2022; Reid et al., 2019) and FABI (Courtemanche et al., 2021; Oakes et al., 2018). As noted in the present study, there were multiple measures of increased competency for all participants in their training in FBA and FABI approaches which is in line with results from the numerous studies in the field (Balmer, 2022; Courtemanche et al., 2021; Davenport et al., 2019; Gregori et al., 2020; Hogan et al., 2015; Luck et al., 2022; Reid et al., 2019).

Similar to the research from Oakes and colleagues (2018), all participants in the current study were certified in special education and had an average of 16 years' experience in the field. These seasoned professionals reported gains in learning from the BST, which underscores the need for ongoing continuing education in functional assessment and intervention strategies. While novice teachers with 5 years or less experience have often been studied in the literature (Balmer, 2022; Hirsch et al., 2019; Lukins et al., 2022), a sample of veteran teachers with over 10 years of experience was often overlooked in the research. It is an interesting coincidence that Parsons and colleagues' (2013) study participants had the same mean of 16 years experiences (range 2–31 years, $n = 10$) as it was in the present study. There were seven special educators who demonstrated success in utilizing BST to improve accuracy in participants' correct implementation of behavioral intervention strategies in Parsons et al.'s study. Similar to the current research, the Parsons et al.'s participants had only one behavior analyst for the

organization and hence immediately benefited from the training because they were key stakeholders in the students' behavior management, and in self-efficacy and fluency in functional assessment and interventions.

Students with DS or DS-ASD are at an increased risk for challenging behaviors due to the DS behavioral phenotype (Balboni et al., 2020; Channell et al., 2021; Hassan et al., 2022; Patel et al., 2020; Patel et al., 2018), and medical co-morbidities (Dieleman et al., 2018; Patel et al., 2020; Patel et al., 2018). Professional educators and families who work with learners with DS have reported challenging behaviors that interfere with activities in the classroom and daily living (De Clercq et al., 2022; Esbensen et al., 2021). The current study addressed the gaps in literature of behavioral intervention strategies for students with DS or DS-ASD (Alligood & Gravina, 2021; Dillenburger, 2012; Dillenburger & Keenan, 2009; Feeley & Jones, 2007) by specifically providing the training to teachers who work exclusively with this population. By providing a BST program to these professionals, it allowed teachers to acquire skills while working with students with DS or DS-ASD in ways that were tailored to the learners. It was likely a significant factor in the high ratings of social validity while teachers increased their skill levels that also immediately translated into a reduction in disruptive behaviors in their classrooms.

Implications of Findings

The findings of the present study are consistent with the behavior analytic theories and evidence-based approaches surrounding behavior reduction through targeted assessments and interventions with the use of FBA (Gregori et al., 2020; Hsiao & Petersen, 2019; Klopfer et al., 2019; Young et al., 2018), and FABI (Common et al.,

2022; Luck et al., 2022; Oakes et al., 2018). The research also offers support for BST as an effective model for educator training (Courtemanche et al., 2021; Gregori et al., 2020; Hogan et al., 2015; Luck et al., 2022; Parsons et al., 2012; Parsons et al., 2013; Ryan et al., 2019), and social validated method for teaching skills in contrived and applied settings (Hogan et al., 2015; Reid et al., 2019). Although not all of the behavior data reached a level of statistical significance in this study, the observed reduction in behaviors offer support for behavior analytic functional assessment and intervention methodology, which has a history of longstanding effectiveness in the literature (Alberto & Troutman, 2013; Ayllon & Michael, 1959; Carr et al., 1980; Iwata et al., 1994; Kestner et al., 2019, Oakes et al., 2018; Steege et al., 2019). Conclusions about the effectiveness of BST as a training model can be drawn based on the overall accelerating trend of the accuracy of intervention approaches' selection during the in vivo phases. Moreover, the social validity measure of BST revealed that participants found the training effective in skill acquisition and practice of FBA and FABI methods, which means that the outcomes of the intervention were meaningful and important to them.

The study also adds to the limited body of research on the evidence-based practices for behavior reduction for students diagnosed with DS or DS-ASD. Dillenburger (2012) highlighted the need for strategies for students with the DS and discussed how ABA is often applied to ASD, but not always DS. Several studies have argued that the science behind ABA was not exclusive to the diagnosis of ASD (Balboni et al., 2020; Copper et al., 2020; Dillenburger, 2012; Dillenburger & Keenan, 2009). Prior to the current study, there was little discussion of ABA at the research site for students unless there was a dual diagnosis of ASD and DS, despite the increasing

frequency of challenging behaviors in students with DS.

Limitations of The Study

Single subject research designs are standard in ABA research (Bailey & Burch, 2018; Ledford & Gast, 2018), and there are certain parameters that should be followed to protect against threats to internal and external validity (Cresswell & Guetterman, 2018; Leford & Gast, 2018). For MP designs, the best practice is to collect a minimum number of data points to allow for stability in baseline, as well as assuring that no participants remain in baseline for an extended period (Leford & Gast, 2018). There were challenges with the implementation of the current study, especially with the abbreviated baseline, which had a negative impact on the calculation of PND for challenging behavior reduction. However, the severity and frequency of aggression in Cindy's classroom ethically mandated moving to intervention immediately (Bailey & Burch, 2018; Ledford & Gast, 2018). Baseline logic of steady responding (Ledford & Gast, 2018) was also not followed due to the limited availability of the participants within the four-week time period available for the study, and the BST was presented for Becky and Julia based on their schedules and not on the challenging behaviors presenting in the respective classrooms.

Another limitation, which is true to the single subject research and was found in the present study, was the small sample size of three teacher participants. Due to the specific nature of target behavior management strategies for the DS and DS-ASD students, the options for the research settings were limited. Hogan et al. (2015) examined the use of BST within the special education classroom for children with ASD and other developmental delays and co-occurring severe problem behaviors in a private school with

the use of a concurrent MB design for a sample of four non-licensed staff. Results of Hogan et al.'s study demonstrated performance improvement in all participants in the natural environment. Following Hogan and colleagues' lead, the current study also utilized a MP design across participants. It allowed for an analysis of the effects of intervention by comparing data paths of each participant, which added to the validity and reliability of the results.

It should be noted that the researcher's presence in the classroom could have provoked reactivity among participants and skewed the results. The researcher was known to participants and students in the building and was often in contact with the different stakeholders. As such, Hawthorne Effect could also be a potential issue and perhaps mitigated the study outcomes. To limit reactivity, the researcher sat by the door right outside of the classroom. The second observers collecting IOA data were also part of the school population and presented the same potential threat to internal validity.

Future Research Directions

Replication of this study across educators of children with DS and DS-ASD and settings will contribute to generalization of findings and testing of research for high quality, low risk of bias, and high internal validity (Ledford & Gast, 2018). Because the latter were found among limitations of this study, researchers can plan and conduct a well-organized replication study in a way that produces convincing outcomes and minimizes bias and other external factors. As the setting was limited to a private educational facility and specific diagnostic characteristics of participants, future studies could analyze the impact of a brief training opportunity in other settings and with other developmental disabilities. To this end, it would be advantageous to determine if these

findings would generalize to other settings such as general education where there may be less trained professionals to implement strategies with fidelity. In the current study, the class ratios were an average of two students to each professional in the classroom, which was comprised of the main teacher and paraprofessionals. All teachers had special education certification which means that the FBA methodology may likely have been part of their training programs. General education teachers are not trained in implementation of procedures and programs that are grounded in the science of ABA in their teacher training programs (Flower et al., 2017; Smith & Higbee, 2021). It would be interesting to compare the results of general education teachers to special educators to see how quickly they master the novel skills. Also, the complexity of behaviors, especially with the dual diagnosis of DS-ASD, may present very differently in a self-contained out of a district placement compared to other classrooms with less restrictive environments.

Another area for improvement for future consideration would be to collect more data points in baseline for teacher capabilities of the intervention strategies, as well as the frequency and topography of challenging behaviors. Because the target maladaptive behaviors of this research study were limited to noncompliance and aggression, future studies should incorporate different topographies of behaviors to determine if they respond to the BST package and proposed interventions. Moreover, maintenance probes in the current research were limited to three observations per participant. Future researchers should consider conducting a longitudinal study or extended maintenance probes to verify the stability of the performance of the participants, and to determine long term effects on rates of challenging behaviors.

Future studies may consider using a research design that specifically identifies

and tracks behaviors of interest rather than participants as well as tests for the effectiveness of a behavior reduction program. Due to the limitations of time and the necessity to focus on teacher training in the current study, specific student and behavior frequency data were not collected. The research study by Fetherston and Sturmey (2014) offers a great model for implementation of the teacher-student correlational training and behavior reduction. The authors recruited four teacher-student dyads and demonstrated accelerating trend in correct implementation of skills on the part of the teachers, although the behavior reduction results were not evident for two out of four learners. Designing a study with coordination between an educator's skills and correlating that data with frequency of corresponding student's maladaptive behaviors could further contribute to understanding of these important associations.

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Appendix A

Participant Demographic Questionnaire

Participant Demographic Questionnaire

Instructions: *Please check relevant boxes and write short answers as applicable.*

- Age (in years): □ 21 – 30 □ 31 – 40 □ 41 – 50 □ 51 – 60 □ Above 60
- Gender: □ Male □ Female
- Primary Role: □ Special Ed. Teacher □ Paraprofessional
  □ Other (Specify)_____
- Highest Educational Degree Attained:_____
- Number of Years of Teaching: _____
- Teacher Certification Grade/Subject Areas: _____

Appendix B

Frequency Data Collection Sheet

Frequency Data Collection Sheet

Classroom: _____**Observer's Name**: _____

Behavior 1 (Operational Definition): _____

_____

Behavior 2 (Operational Definition): _____

_____

Instructions: Please use tally marks for the occurrence of each behavior.
Example:

Date	Time	Behavior 1	Behavior 2	Comments
6/23/23	11:00 AM-11:15 AM	𝍸	||	New paraprofessional in the room.

Date	Time	Behavior 1	Behavior 2	Comments

Appendix C

Classroom Observation Form

Classroom Observation Form

Classroom/Participant:	
Observer's Name:	
Date:	
Observation Period:	

Instructions: The researcher will record the antecedents, behavior, and consequences. For each instance of a behavior, the function will be determined, and the teacher's response (intervention) will be analyzed for functionally based appropriateness.

Antecedent	**Behavior**	**Consequence**	**Function**	**Intervention Appropriateness**
☐ Demand/Request ☐ Difficult task ☐ Transition ☐ Alone (no attention) ☐ Told "No" ☐ Told "Wait" ☐ Free time ☐ Denied access to preferred item ☐ Teacher attending to another student ☐ Other _____		☐ Request repeated ☐ Ignored ☐ Reprimand ☐ Verbal redirect ☐ Attention given ☐ Prompted to use functional communication ☐ Other _____	☐ Attention ☐ Access ☐ Escape ☐ Sensory Comments:	☐ Yes ☐ No Comments:

Antecedent	**Behavior**	**Consequence**	**Function**	**Intervention Appropriateness**
☐ Demand/Request ☐ Difficult task ☐ Transition ☐ Alone (no attention) ☐ Told "No" ☐ Told "Wait" ☐ Free time ☐ Denied access to preferred item ☐ Teacher attending to another student ☐ Other _____		☐ Request repeated ☐ Ignored ☐ Reprimand ☐ Verbal redirect ☐ Attention given ☐ Prompted to use functional communication ☐ Other _____	☐ Attention ☐ Access ☐ Escape ☐ Sensory Comments:	☐ Yes ☐ No Comments:

Appendix D

Educator Functional Assessment Knowledge Evaluation

Educator Functional Assessment Knowledge Evaluation

Each participant will be assigned a letter. The test administrator will tell you your participant letter or pre-circle the letter for you.

A B C D E

Instructions: The following items will assess your knowledge in the areas of functional assessment and functional intervention. Please choose only ONE answer for each item.

1. The primary purpose of conducting an FBA is
    a) To understand the form of challenging behavior for the purpose of intervention planning.
    b) To understand why a challenging behavior is occurring and what strategies to include within the behavior plan for the purpose of intervention planning.
    c) To understand how often challenging behavior occurs in a set period of time for the purpose of intervention planning.
    d) To understand how long it takes for challenging behavior to occur following an environmental trigger for the purpose of intervention planning.
    e) Don't Know
2. Functional assessments can be completed by using which of the following measures
    a) Anecdotal recording
    b) Caregiver interview tools
    c) Rating scales and questionnaires
    d) Experimental manipulation of environmental conditions
    e) All of the above
3. When conducting an environmental observation, the observer should look for what three crucial components that comprise a behavior chain
    a) Consequences, setting events, reinforcement
    b) Antecedents, behavior, consequences
    c) Function, operational definition, behavior chain
    d) Antecedent, function, setting event
    e) Don't know
4. The overall _____ of each displayed behavior can determined by analyzing the narrative ABC data
    a) Function
    b) Frequency
    c) Motivating Operation
    d) Duration
    e) Don't Know

5. Teachers will often miss the function of a challenging behavior because they are often preoccupied with a behavior's _____.

    a) Frequency
    b) Rate
    c) Latency
    d) Topography
    e) Don't Know

6. When a student engages in problem behavior in an attempt to gain a preferred item or activity, that behavior is said to have a/an:

    a) Access to Tangible Function
    b) Attention Function
    c) Automatic/Nonsocial Function
    d) Escape Function
    e) Don't Know

7. When an individual engages in problem behavior when the teacher is attending to another student or is not attending to them, this problem behavior is said to have:
    a) Sensory Function
    b) Escape Function
    c) Attention Function
    d) Access to Tangible Function
    e) Don't Know

8. A student engaging in a target behavior directly after a demand is placed by a peer or teacher or engaging in a problematic behavior in response to being asked to complete work is said to be:
    a) Escape Function
    b) Access to Tangible Function
    c) Attention Function
    d) Sensory Function
    e) Don't Know

9. Teachers who react to inappropriate behavior by providing the student with one-to-one attention run into the risk of maintaining the inappropriate behavior as it can result in an increase in the inappropriate behavior. This is an example of: _____.

    a) Positive reinforcement of attention
    b) Negative reinforcement
    c) Extinction
    d) Punishment
    e) Don't Know

10. When selecting components of a Behavior Intervention Plan (BIP), which one of the following aspects should be considered the most important for consideration?

    a) The diagnosis of the child
    b) The topography of challenging behaviors
    c) The function of challenging behaviors
    d) Commonly used behavioral intervention practices
    e) Don't Know

11. In order to reduce the overall occurrences of behavior and build more adaptive behaviors in the classroom setting, the professional educator can
    a) Teach functional replacement skills
    b) Punish problematic behavior to suppress them
    c) Ignore the behavior as it will eventually go away
    d) Refer the individual to the school behavior specialist
    e) Don't Know

12. Gregory raises his hand in class for the first time. His teacher subsequently provides descriptive praise for Gregory's hand-raising behavior. If Gregory never raises his hand again in class, the teacher's praise may have functioned as:

    a) Positive reinforcement
    b) Negative reinforcement
    c) Extinction
    d) Punishment
    e) Don't Know

13. A student with limited verbal skills (e.g.,1-2 words) engages in aggression to escape work demands. Which of the following strategies would be the best option for intervention?

    a) Teaching appropriate communication to request break from work
    b) An Exclusionary Time Out from work demands
    c) Reprimanding the child to stop the challenging behavior
    d) Taking away privileges earned
    e) Don't Know

14. A student in your classroom presents with skin picking behavior when completing independent work that is causing visible damage to the fingernails, as an educator you could:
    a) Send the student to the nurse for first aide
    b) Deliver a reprimand to ensure the student no longer engages in that behavior
    c) Give the student an incompatible task to complete skin picking from occurring
    d) Send the student to the school counselor
    e) Don't Know

15. When a student gets out of completing a task by engaging in an inappropriate behavior, that behavior is said to be maintained by:

    a) Positive reinforcement
    b) Extinction
    c) Negative reinforcement or Escape
    d) Punishment
    e) Don't Know

16. To facilitate compliance with students who engage in escape-maintained challenging behavior, which one of the following antecedent strategies could be used to prevent the occurrence of challenging behavior?

    a) Time Out
    b) "First and then" Visual Cards
    c) Contingent Praise
    d) Taking away privileges earned
    e) Don't Know

17. For challenging behavior maintained by sensory/automatic reinforcement, which intervention strategy would be <u>most</u> effective?

    a) Non-Contingent Reinforcement
    b) Reprimands
    c) Non-Exclusionary Time Out
    d) Response Cost
    e) Don't Know

18. When developing a behavioral intervention plan for a student who engages in aggression maintained by access to tangibles or preferred items, which one of the following strategies would you employ first?

    a) Response Cost
    b) Differential Reinforcement of Appropriate Requesting
    c) Exclusionary Time Out
    d) Overcorrection
    e) Don't Know

19. When a student engages in behavior that is not harmful to themselves, others, or property, the professional educator can:
    a) Use planned ignoring as a primary intervention if other students are not affected
    b) Punish the disruptive behavior through their classroom management system
    c) Send the student out of the classroom
    d) Send the student to the principal's office
    e) Don't Know

20. When a student is engaging in a problematic behavior that is disruptive to the class as a whole, one strategy to employ is
    a) Publicly chastise the student's behavior
    b) Deliver a consequence consistent with the classroom management system
    c) Send the student to the neighboring teacher's classroom for a reset period
    d) Redirect the student to functionally equivalent appropriate behavior
    e) Don't know

Appendix E

Teacher Training Program

Educator Training in Functional Assessment and Intervention

For Students with Down syndrome (DS)
or Down syndrome and Autism Co-diagnoses (DS-ASD)

Presented by Jacqueline Tudor, M.A.T., BCBA

Objectives of this training:

This training will teach you to:

- 1. Restate the behavioral characteristics of individuals with DS and DS-ASD
- 2. Restate the purpose of functional behavior assessment
- 3. Identify the parts of the three-term behavioral contingency
- 4. Analyze a behavioral sequence
- 5. Determine the function of a challenging behavior
- 6. Select function-based interventions

Behavior Basics (Steege et al., 2019; Vargas, 2020)

- All behavior serves a purpose
- Behavior is communication
- Behavior can be learned
- Behavior can be changed
- Individuals are unique
- Behaviors can occur for different reasons
- By understanding the purpose that the behavior serves, an intervention can be selected
- Stopping the behavior does not teach what to do instead

Behavioral Characteristics of Down syndrome (DS) (Balboni et al., 2020; Channell et al., 2021; Hassan et al., 2022; Patel et al., 2018; Patel et al., 2020;).

- Increased instances of challenging behaviors compared to other disabilities
- Lower IQs lead to higher rates of challenging behaviors
- Health issues can be the underlying reason for challenging behaviors
- Most common challenging behaviors seen in DS:
  - Attention problems
  - Social withdrawal
  - Non-Compliance or refusal
  - Elopement
  - Stimming (Motor Stereotypy)
  - Compulsive behaviors and insistence on sameness
  - Dropping to the floor

Behavioral Characteristics of a Dual Diagnosis of Down Syndrome and Autism Spectrum Disorder (DS-ASD)

*Compared to students with only DS (Capone, 1999; Channell et al., 2019; Godfrey et al., 2019; Hepburn & Fidler, 2013)

- More impairments in social communication and relating to others
- Higher rates of self-stimulatory behaviors
- Limited gesturing, such as pointing and waving
- Poor eye contact
- Difficulties with recognizing emotions in others
- Rigidness in changes to routines
- Restrictive interests
- Repetitive behaviors

Why do these behaviors often occur in individuals with DS or DS-ASD? (Dieleman et al., 2019; Jones & Feeley, 2019)

- Issues with motor control and development
- Problems with communication, speech production, and language acquisition
- Cognitive difficulties which lead to issues with comprehension
- Visual vs. Auditory processing differences (visual processing is usually much stronger)
- Executive function control and regulation is underdeveloped
- Self-care skills are later developing and are related to oral-motor, fine motor, and gross motor differences
- High rates of medical co-morbidities including cardiac, swallowing and gastrointestinal disorders

Functional Behavior Assessment (FBA):
(O'Neill et al., 2015; Steege et al., 2019)

- Why do we need to complete an FBA?
  - 1. To determine the purpose of the behavior
  - 2. To identify how others respond to the behavior
  - 3. To assess the function or "why" the behavior continues to happen
  - 4. To select an intervention to reduce the need for and usefulness of the behavior

FBA in Special Education: Requirements and Rationale
(Borgmeier, et al., 2015; Cooper et al., 2020, IDEA, 2004; Owens et al., 2018)

❖The Individuals with Disabilities Act (IDEA) of 1997 and the reauthorization of IDEA in 2004, FBA was identified as an evidence-based practice that is required when challenging behaviors occur and impact the education of the student in any educational setting or agency.

❖The legislation provides that all students have the right to effective instruction regardless of disabilities or abilities and need to be provided with support and opportunities to learn.

What causes challenging behaviors?
(Cooper et al., 2020; Vargas, 2020)

Behavior is learned and repeated because it:

- Works
- Requires less effort
- Is more efficient
- Is self-regulating (the person enjoys the behavior)
- Communicates a need

WHY Behavior Happens....

Functions of Behavior

- Attention from others/Reactions from others
- Escape or avoid tasks or demands
- Access to items or activities
- Sensory feedback or regulation/ Removal of pain

(Cooper et al., 2020; Vargas, 2020)

Direct Observation of A-B-C

An efficient way to assess a behavior

Antecedent
- What happens before the behavior? (Trigger for the behavior)

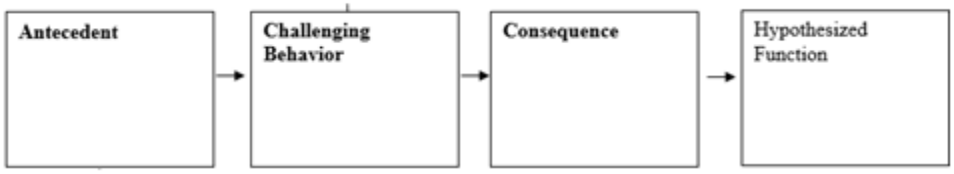
Behavior
- What is the student doing? (Observable and measurable action)

Consequence
- What happens after the behavior? (Specific and immediate reaction in the environment)

(Cooper et al., 2020; O'Neill et al., 2015)

Linking the A-B-C to the Function

- Step 1
  - Collect the **A-B-C** data
    - Antecedent: What happens before the behavior?
    - Behavior: What is the behavior?
    - Consequence: What happens after the behavior?
- Step 2
  - Determine the **Function** of the behavior
    - Why is the behavior happening? What purpose does it serve?



Time to Practice Together

Analyzing a Behavior

13

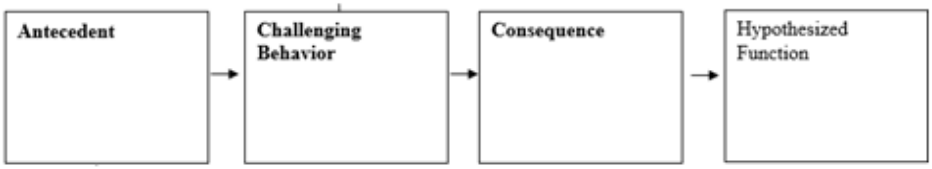
Scenario 1:

Suzie is playing with blocks. She stacks four blocks, and the tower falls over. She looks up at the teacher, Mrs. Smith, and starts whining. The teacher is already helping another student. Suzie keeps looking up at the teacher and back at the blocks. Suzie builds another tower, and it falls down again. Suzie throws the block, which lands with a loud crashing sound across the room. Mrs. Smith tells Suzie not to throw blocks because it is dangerous. Suzie throws a block again, and Mrs. Smith tells Suzie not to throw blocks and takes away the blocks. The next day, Suzie builds another block tower, it falls, and she throws a block across the room.

- Step 1: Identify the A-B-Cs
- Step 2: Determine the function of the behavior

14

Scenario 1: Suzie and the blocks



Antecedent	Challenging Behavior	Consequence	Hypothesized Function
Suzie's block tower falls	Throwing of blocks	Mrs. Smith talks to Suzie	Attention

Your Turn To Practice

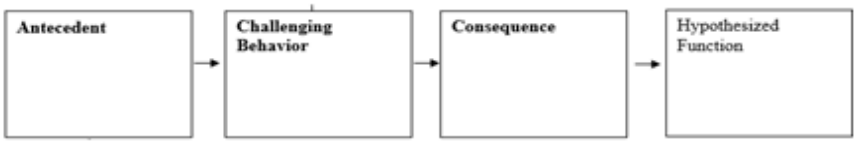
Analyzing a Behavior

Scenario 2:

Every day, the students have math at 11:00 AM. Mr. Bell keeps the schedule on the wall, and Tommy often looks at the schedule during the day. When Mr. Bell starts to hand out the worksheets, Tommy picks up his pencil and taps it on the desk, breaking off the point. Tommy gets up and sharpens his pencil and returns to his chair. This happens three more times while Mr. Bell is helping other students in the class. Tommy starts tapping the pencil again, as Mr. Bell walks to Tommy's desk. Tommy breaks the pencil. Mr. Bell says that Tommy will need to finish the math after lunch.

- Step 1: Identify the A-B-Cs
- Step 2: Determine the function of the behavior

Scenario 2: Tommy and the pencil



Mr. Bell hands out math worksheets	Tommy breaks pencils	Tommy delays doing the task (math work)	Escape from the (math work)

Why do these behaviors keep happening?

- The **Antecedents** set the stage for the behavior
- The **Consequences** maintain the behavior
- Reinforcement **INCREASES** the likelihood that the behavior will happen again (Cooper et al., 2020)

Why does Suzie throw blocks?
- To get Mrs. Smith's attention

Why does Tommy break pencils?
- To delay doing his math work

Reinforcement

Examples:

- Social
  - Verbal praise, attention, high-5, smiles, hugs, clapping, cheering, thumbs up
- Sensory
  - Fidget toy, movement, music, scents
- Tangible
  - Toys, preferred objects, or activities
- Food
  - Use selectively and related to eating (First, eat your broccoli, and then you can have a cookie)

(Cooper et al., 2020; Jones & Feely, 2019)

General Guidelines:

- ❖ Individualize reinforcement
- ❖ Watch for "bootleg" reinforcement (ex., Someone else jumps in to "help")
- ❖ Be consistent and predictable with reinforcement
- ❖ Keep your promises to deliver
- ❖ If the demand is too high and reinforcement is too low, challenging behaviors are more likely to occur
- ❖ Pair social praise with other reinforcers

Step 3: Choose Alternative Behaviors

REVIEW

- Step 1: Identify the A-B-Cs
  Antecedent-Behavior-Consequence
- Step 2: Determine the Function of the behavior
  - Attention
  - Escape
  - Access to tangibles
  - Sensory
- **Step 3: Choose an alternative behavior with the same function**
  - Choose a function-based replacement behavior
  - The behavior should be easier and more efficient

(Cooper et al., 2020, O'Neill et al., 2015)

Common Interventions by Function

Attention	Escape	Access to Tangibles/ Activities	Sensory
Teach the student to tolerate waiting to receive attention from preferred individuals	First/Then Strategy *_First_ complete your work and _then_ you get to pick a book	Teach the student to tolerate delayed/denied access with praise and reinforcement for waiting	Redirect to a movement task
Teach the student to independent play and leisure skills	Teach the student to request a break	Teach the student to request access to item	Redirect to an incompatible behavior
Teach the student a strategy to interrupt others "excuse me"	Teach the student to ask for help	Teach the student to engage in other activities	Provide appropriate and safe sensory toys and redirect as necessary
Teach the student to play with peers	Present easier tasks before more difficult ones	Teach the student to accept other items	Create and use a choice menu
Teach the student to request attention by asking to play, touch a person's sleeve, etc.	Teach the client to say, "no" appropriately (head shake, push materials away)	Create and use a choice menu or schedule to clarify what is available and when	(Pain) Teach student to communicate discomfort by pointing to where it hurts

What Function-Based Intervention would you choose?

Why does Suzie throw blocks?

- To get Mrs. Smith's attention

Why does Tommy break pencils?

- To delay doing his math work

Step 4: Teach the Replacement Behavior

(Cooper et al., 2020; O'Neill et al., 2015; Vargas, 2020)

REVIEW

- Step 1: Identify the A-B-Cs

  Antecedent-Behavior-Consequence
- Step 2: Determine the Function of the behavior
  - Attention
  - Escape
  - Access to tangibles
  - Sensory
- Step 3: Choose an alternative behavior with the same function
  - Choose a function-based replacement behavior
  - The behavior should be easier and more efficient
- Step 4: Teach the replacement behavior
  - Redirect the behavior
  - Teach the replacement behavior
  - Reinforce desired behavior, plan to ignore the undesired behavior

Competing Behavior Pathway Model

(O'Neill et al., 2015)

- Step 1: Identify the A-B-Cs
- Step 2: Identify the hypothesized function
- Step 3: Choose an alternative behavior with the same function
- Step 4: Teach the replacement behavior

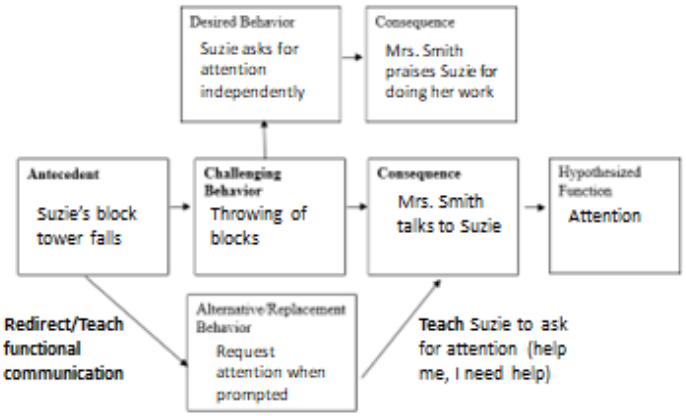
Goal: A new behavior (skill) that results in a better consequence

Let's Practice.....

Remember Suzie and the blocks…

Suzie is playing with blocks. She stacks four blocks, and the tower falls over. She looks up at the teacher, Mrs. Smith, and starts whining. The teacher is already helping another student. Suzie keeps looking up at the teacher and back at the blocks. Suzie builds another tower, and it falls down again. Suzie throws the block, which lands with a loud crashing sound across the room. Mrs. Smith tells Suzie not to throw blocks because it is dangerous. Suzie throws a block again, and Mrs. Smith takes away the blocks. The next day, Suzie builds another block tower, it falls, and she throws a block across the room.

Model: The Competing Behavioral Pathway for Suzie



Your Turn To Practice

Using the
Competing Behavior Pathway Model

Independent Scenario 1: Tommy and the pencil

Every day, the students have math at 11:00 AM. Mr. Bell keeps the schedule on the wall, and Tommy often looks at the schedule during the day. When Mr. Bell starts to hand out the worksheets, Tommy picks up his pencil and taps it on the desk, breaking off the point. Tommy gets up and sharpens his pencil and returns to his chair. This happens three more times while Mr. Bell is helping other students in the class. Tommy starts tapping the pencil again as Mr. Bell walks to Tommy's desk. Tommy breaks the pencil. Mr. Bell says that Tommy will need to finish the math after lunch.

Step 1: Identify the A-B-Cs
Step 2: Identify the hypothesized function
Step 3: Choose an alternative behavior with the same function
Step 4: Teach the replacement behavior
Goal: A new behavior (skill) that results in a better consequence

Independent Scenario 4: Suri and Max

Mrs. Hamilton's kindergarten class is on the playground at school. There are 12 children in the class and four adults. The students run around, laugh, and climb on the playground equipment. Suri and Max chase each other, and Max climbs the rock wall near the slide. Suri grabs Max's foot, takes his shoe, and throws it behind the bench. Max gets down from the rock wall and walks towards the bench. Suri picks up the shoe from behind the bench, and Mrs. Hamilton tells her to give it back to Max. Suri runs away with the shoe, and looks back at Max and the teacher saying, "Ha, Ha!"

Step 1:Identify the A-B-Cs

Step 2: Identify the hypothesized function

Step 3: Choose an alternative behavior with the same function

Step 4: Teach the replacement behavior

Goal: A new behavior (skill) that results in a better consequence

Independent Scenario 5: Andy and the computer

Ms. Ott has a busy schedule in her 2nd-grade classroom. By the afternoon, everyone is ready for a little break after lunch. At 1:00 PM, the children have "choice time" built into the routine, with the options rotating each day, so everyone gets a turn trying different activities. Andy prefers the computer and often refuses to do any other activity, complaining loudly to each adult in the classroom. Andy will persist, saying "computer" repeatedly. Sometimes it gets to be too much, and Mrs. Ott or one of the paraprofessionals will let Andy use the computer, saying, "You can use it just this one time." Occasionally a classmate will give up their turn on the computer.

Step 1:Identify the A-B-Cs

Step 2: Identify the hypothesized function

Step 3: Choose an alternative behavior with the same function

Step 4: Teach the replacement behavior

Goal: A new behavior (skill) that results in a better consequence

Next Steps>>>Trying out Functional Assessment and Intervention in the Classroom

Thank you for taking part in the training workshop!

Follow-up observations will be scheduled to coach you through real-life scenarios in your classroom.

If you have any questions, please contact Jacqueline Tudor at

Phone: 973-747-7991

Email: jt2091@mynsu.nova.edu

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Appendix F

Training Program and Classroom Observation Fidelity Checklists

Training Program Fidelity Checklist

Target	Training Date:	Initials
Provided participants with training materials: workbook, pens, pencils, highlighters and 10 Modified Behavioral Pathway Organizers.	Y N	
Reviewed training objectives	Y N	
Used an audible tone throughout training	Y N	
Checked for participant understanding of FBA procedures by examining the Modified Competing Pathways Organizer	Y N	
Checked for participant understanding of the FABI procedures	Y N	
Reviewed each behavioral scenario with participants	Y N	
Provided participants with clear instructions on how to dissect the behavioral scenarios	Y N	
Modeled the target behavior to participants	Y N	
Provided participants with opportunities to rehearse the skills independently	Y N	
Provided participants with verbal praise and corrective feedback	Y N	
Total Fidelity		

Classroom Observation Fidelity Checklist

Target	Training Date:	Initials
Greeted teacher and established rapport	Y N	
Determined a time to meet after the observation	Y N	
Found an unobtrusive location to observe	Y N	
Completed the information for the time and specifics of the observation on the form	Y N	
Provided verbal praise and corrective feedback to participant	Y N	
Asked if participant if they had any questions	Y N	
Total Fidelity		

Appendix G

Modified Competing Behavioral Pathway Organizer

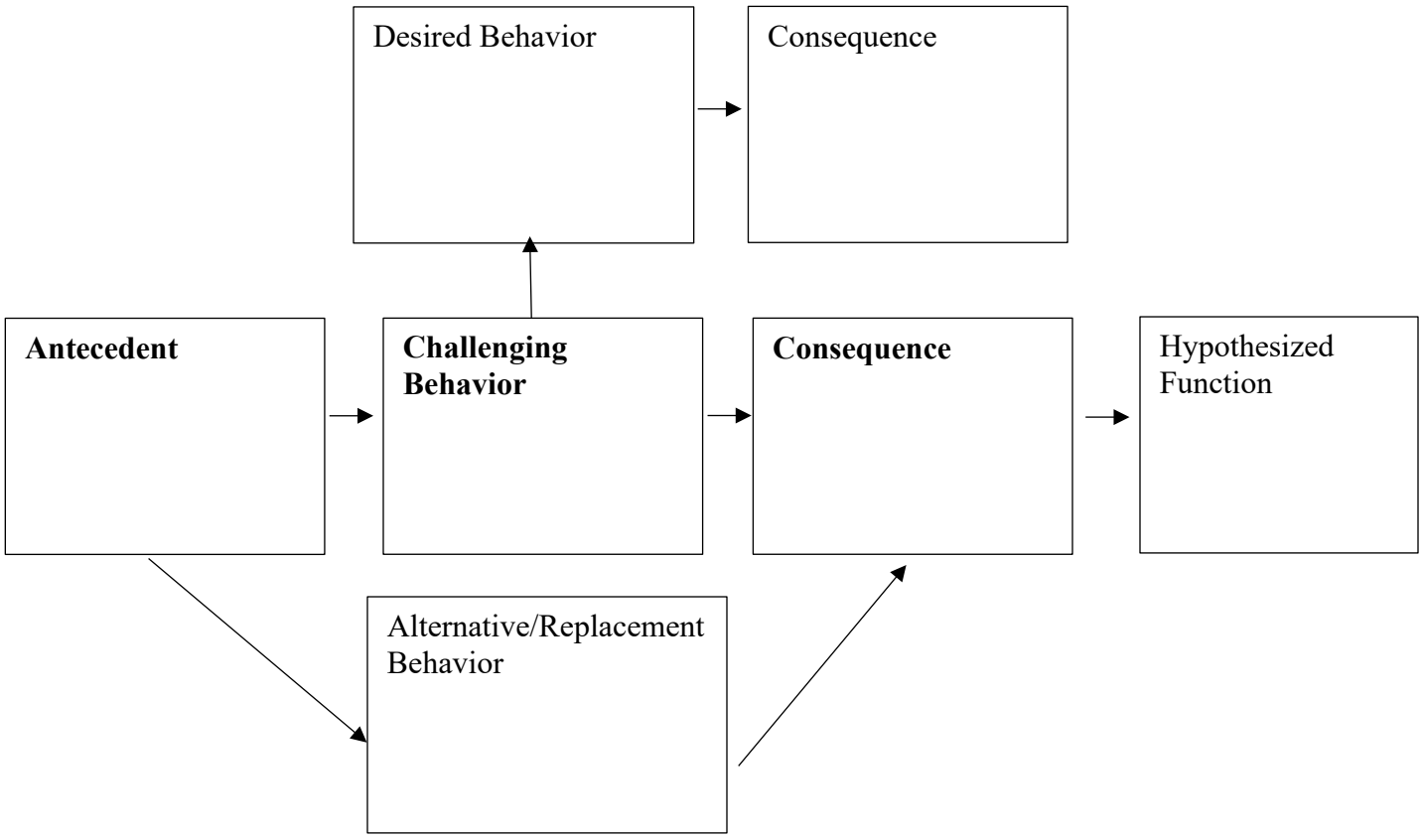
Modified Competing Behavior Pathways Organizer

Instructions: Using the provided visual organizer, identify the parts of the behavioral scenario into the components listed in the below boxes.

Scenario Number:_____

Participant:

A **B** **C** **D** **E**



Appendix H

Interobserver Agreement Data Collection Sheet

Interobserver Agreement Data Collection Sheet

Instructions:

For each classroom observation, divide the smaller number of functional assessment-based interventions by the larger number of functionally assessment-based interventions.

The quotient should be multiplied by 100 to render a percent agreement. The total number of percent agreements should be added together and divided by the total number of addends to render an overall Total IOA.

Date of Observation	Observer 1: Total Number of Functional Assessment-Based Interventions	Observer 2: Total Number of Functionally Assessment-Based Interventions	Percent Agreement between Observations

Appendix I

Social Validity Survey

Social Validity Survey

Directions: For each statement, please indicate your level of agreement relative to the completed training program by circling the following options as indicated below:

1 Strongly Disagree 2-Disagree 3-Agree 4-Strongly Agree

No.	Skills	Level of Agreement
1)	The behavioral skills training program was effective in teaching me to use functional behavior assessment (FBA) to identify challenging behaviors for students with Down syndrome (DS), or students with co-occurring autism spectrum disorder (DS-ASD).	1 2 3 4
2)	The behavioral skills training program was effective in teaching me to select functional assessment-based interventions (FABIs) to reduce challenging behaviors for students with DS or DS-ASD.	1 2 3 4
3)	Functional behavior assessment (FBA) and functional assessment-based interventions (FABI) are effective methods for reducing challenging behaviors for students with DS or DS-ASD.	1 2 3 4
4)	I would recommend the training program and the techniques of FBA and FABI to others who work with for students with DS or DS-ASD.	1 2 3 4
5)	I feel competent in managing challenging behaviors for students with DS or DS-ASD after completing the training program.	1 2 3 4
6)	The program materials were understandable and helped me to effectively use the behavioral strategies of FBA and FABI in the classroom for students with DS or DS-ASD.	1 2 3 4