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Extending the Functional Behavioral Assessment Process: A Methodology for Test-driving Interventions with Varied Choice Dimensions to Reduce Escape-maintained Behaviors Displayed by Youth with Emotional and Behavioral Disorders

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**EXTENDING THE FUNCTIONAL BEHAVIORAL ASSESSMENT PROCESS:
A METHODOLOGY FOR TEST-DRIVING INTERVENTIONS
WITH VARIED CHOICE DIMENSIONS
TO REDUCE ESCAPE-MAINTAINED BEHAVIORS
DISPLAYED BY YOUTH WITH
EMOTIONAL AND BEHAVIORAL DISORDERS**

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This manuscript represents a dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Psychology (in School Psychology)

University of Southern Maine

August 2010

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An Abstract of the Dissertation Submitted in Partial Fulfillment of the Requirements for
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The benefits of extending the traditional functional behavioral assessment (FBA) process to include brief experimental comparisons between potential interventions were explored. After FBA interview and functional analysis (FA) data converged to suggest that the problem behaviors displayed by 2 youth with emotional and behavioral disorders (EBD) were maintained by escape from task demands, the youth participated in brief

intervention analyses to evaluate the relative effectiveness of functional communication training (FCT) and noncontingent reinforcement (NCR) interventions with varied choice dimensions. Results of the brief intervention analyses, which were highly idiosyncratic, were used to guide the selection of a treatment for implementation in the final phase of the study. One participant received an opportunity to select among the most effective variations of the FCT and NCR interventions, whereas an intervention employing differential positive reinforcement for task completion was implemented with the other participant. Implications for the assessment and treatment of youth with EBD were considered.

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LITERATURE REVIEW

The term functional behavioral assessment (FBA) encompasses a variety of assessment procedures designed to identify the variables that evoke, occasion, and maintain problem behaviors. Assessment data gathered through an FBA guide the design of treatment plans that alter the motivating conditions that evoke problem behaviors, minimize the reinforcement available for problem behaviors, and/or arrange for the delivery of functional reinforcers that promote socially appropriate behavior. In sum, FBA represents a problem-solving assessment process intended to discover *why* problem behaviors occur and then to use that information to develop individualized interventions that lead to socially significant behavior change (Steege & Watson, 2009).

Prior to the advent of FBA, applied behavior analysts relied on behavior modification techniques to effect behavior change. In other words, without a methodology for identifying the functions of problem behaviors, applied behavior analysts resorted to the practice of arranging potent, but arbitrary reinforcement and punishment contingencies designed to compete with the unknown contingencies maintaining problem behavior (Mace, 1994). The highly artificial and/or aversive contingencies necessary to effect behavior change when problem behaviors continued to contact functional reinforcers, though, raised a variety of concerns cited by Mace (1994). Bijou, Peterson, and Ault (1968) recognized this limitation to traditional behavior modification approaches and proposed one of the first FBA methodologies. Specifically, Bijou et al. (1968) presented a methodology for gathering descriptive data that quantitatively, reliably, and objectively describe relationships among antecedent events, behavior, and consequent events and thus provide direction for subsequent experimental

analyses designed to test hypotheses about functional relationships. Nearly a decade later, Carr (1977) operationalized the experimental analyses to which Bijou et al. alluded by outlining an experimental methodology for determining the functions of self-injurious behavior. Carr, Newsom, and Binkoff (1980) subsequently applied these methods to test the hypothesis that the aggressive behaviors displayed by 2 children with mental retardation were evoked by performance demands and maintained by negative reinforcement in the form of escape from those demands. Specifically, Carr, et al. (1980) exposed both participants to alternating conditions in which demands were present or absent. Given significantly elevated rates of aggression in the demand conditions relative to the no demand conditions, the researchers hypothesized that aggression functioned to terminate aversive demands. Interventions designed to (a) reduce the aversiveness of demands by introducing positive reinforcers to the instructional context, (b) arrange escape from demands contingent on an alternative behavior, or (c) extinguish aggression by discontinuing the response-reinforcer contingency then were evaluated to demonstrate the effectiveness of function-based treatments for problem behaviors.

Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994) extended these previous studies by describing a comprehensive operant methodology for evaluating the functions of self-injurious behavior. In this study, Iwata et al. (1982/1994) manipulated a variety of antecedent and consequent events within 15 min analogue sessions to test the specific hypotheses offered by Carr (1977). In order to test the positive reinforcement hypothesis, Iwata et al. arranged for conditions of low attention and the delivery of a combination of mild reprimands and brief physical contact contingent on occurrences of self-injury; in order to test the negative reinforcement hypothesis, they presented

participants with academic demands and then terminated the demands contingent on self-injurious behavior; and, in order to test the self-stimulation hypothesis, they placed the participants alone in a therapy room void of stimulation in the form of toys or other materials. These test conditions and a control condition characterized by unrestricted access to leisure materials and social attention were presented within a multielement research design, and elevated rates of self-injury in one or more conditions were interpreted as evidence for behavioral maintenance by the corresponding contingencies. Assessment results obtained for 9 participants ultimately suggested that self-injurious behavior occurred as a function of idiosyncratic environmental variables; thus, Iwata et al. proposed that results from pretreatment functional analyses may be critical for selecting interventions that yield a high probability of success.

Since Iwata et al. (1982/1994) advanced the methodologies of functional analysis, the completion of FBAs to guide the design of function-based interventions has emerged as a best practice standard. Myriad applied behavior analytic studies conducted since Iwata et al.'s seminal publication have described intervention technologies that produce socially significant changes in behavior by arranging for a functional match between the target response and the intervention. Significantly, function-based interventions minimize the need for intrusive, aversive, and/or artificial technologies by (a) disrupting the maintaining response-reinforcer relationship rather than attempting to override it and (b) arranging the delivery of functional reinforcers contingent on alternative behaviors in order to strengthen adaptive behavioral repertoires using naturally occurring reinforcers (Carr, Coriaty, & Dozier, 2000; Mace, 1994). In addition, accurate identification of behavioral function leads the applied behavior analyst to a host of evidence-based

treatment options with a high probability of success. For instance, evidence-based treatments for problem behaviors maintained by positive reinforcement include delivering the functional reinforcer on time-based schedules (Hagopian, Fisher, & Legacy, 1994) and delivering the functional reinforcer contingent on an appropriate communication response (Dixon, Benedict, & Larson, 1991). Similarly, research suggests that the provision of breaks on time-based schedules (Vollmer, Marcus, & Ringdahl, 1995) or contingent on requests for breaks (Lalli, Casey, & Kates, 1995) may effectively reduce occurrences of problem behavior maintained by negative reinforcement in the form of escape from task demands and that strategies such as sensory extinction may reduce problem behaviors maintained by automatic reinforcement (Ellingson et al. 2000). Finally, Repp, Felce, and Barton (1998) demonstrated that treatments matched to hypothesized behavioral functions yielded more favorable outcomes than treatments selected arbitrarily. These researchers conducted informal functional analyses to arrive at hypotheses for the functions of the self-injurious or stereotypic behaviors displayed by 3 children with developmental disabilities. Subsequently, they compared the effects of two treatments, one matched to the hypothesized function and one selected arbitrarily, on the problem behaviors displayed by each participant. The participant whose self-injurious behavior was hypothesized to be maintained by negative reinforcement responded more favorably to a treatment package comprised of escape extinction and compliance training than to a treatment package based on attention extinction and time-out from positive reinforcement, and the participants whose stereotypic behaviors were hypothesized to occur as a function of self-stimulation responded more favorably to treatments designed

to increase rates of contact with the environment than to treatments based on attention or escape extinction.

After conducting an FBA to identify behavioral functions, the primary challenge remaining for applied behavior analysts thus involves predicting which treatments will yield the most socially significant outcomes for given individuals. Although the FBA literature provides minimal guidance on methods for choosing among the available function-based intervention technologies, a potential solution was offered indirectly by Daly, Witt, Martens, and Dool (1997) in an article proposing a brief experimental methodology for efficiently comparing the effects of two or more academic interventions. Daly, Martens, Hamler, Dool, and Eckert's (1999) research, which entailed the conduct of brief experimental analyses to evaluate the relative effects of varied instructional procedures on students' oral reading fluency, subsequently validated the use of brief experimental methodologies for probing interventions "in an idiographic manner prior to making treatment recommendations" (p. 89). Martens, Eckert, Bradley, and Ardoin (1999) also employed brief experimental analyses to select interventions designed to increase compliance among 2 preschool students. Specifically, Martens et al. (1999) sequentially applied three treatments across abbreviated experimental phases and incorporated brief (i.e., single data point) withdrawal phases to rule out the possibility of carryover effects. The interventions selected for comparison, though, were not selected with regard to the functions of the participants' noncompliant behaviors. Accordingly, the interventions may have been associated with discrepant probabilities of success, and the capacity of the brief experimental methodology for detecting differential treatment effects may have been raised artificially.

Mueller, Edwards, and Trahant (2003), on the other hand, conducted brief experimental analyses to evaluate the relative effectiveness of intervention possibilities derived from FBA data. After teacher interviews and traditional functional analyses suggested that the problem behaviors displayed by 3 participants were maintained by negative reinforcement in the form of escape from academic demands, Mueller et al. (2003) conducted brief treatment comparisons to identify the most effective intervention for each participant. Three conditions—(a) differential negative reinforcement of alternative behavior (DNRA), (b) differential reinforcement of alternative behavior (DRA), and (c) noncontingent reinforcement (NCR)—were presented within a multielement design. DNRA involved the 20 s removal of task demands contingent on task engagement on a fixed-interval (FI) 30 s schedule; DRA involved the delivery of tokens (exchangeable for leisure activities after the session) contingent on task engagement on an FI 30 s schedule; and NCR involved the delivery of tokens (exchangeable for leisure activities after the session) on a fixed time (FT) 30 s schedule. Treatment comparisons continued until differentiated data patterns emerged or until the participants had been exposed to four sessions of each condition, and the resulting data suggested idiosyncratic responsiveness to the treatments. One participant evidenced slightly lower levels of problem behavior during the NCR condition; one participant demonstrated lower levels of problem behavior during the DRA and NCR conditions relative to the DNRA condition; and one participant showed undifferentiated response patterns. Accordingly, the treatment associated with the lowest levels of problem behavior *or* the highest teacher acceptability rating was selected for implementation within an extended treatment evaluation. Data obtained utilizing withdrawal design

methodologies to compare the effects of the selected treatment to a baseline condition ultimately revealed reductions in problem behavior for all 3 participants.

Given that Mueller et al. (2003) reported idiosyncratic responsiveness by their participants to three treatments indicated by FBA data, the experimental process of “test driving” interventions (Brown-Chidsey & Steege, in press) warrants research attention. The extension of brief experimental methodologies to the FBA process may enable applied behavior analysts to derive positive behavioral support recommendations from a solid foundation of data and thereby increase the likelihood that their proposed intervention strategies will yield the desired effects for individual students. For applied behavior analysts providing services within school systems, the practice of test-driving interventions prior to developing formal protocols and conducting staff trainings thus may constitute best practice in terms of evidence-based standards and cost-efficiency. Given that a primary objective for applied behavior analysts who serve the typical school-aged population often involves the identification of effective strategies for increasing academic engagement and reducing occurrences of escape-maintained behaviors that interfere with educational progress, brief experimental comparisons between commonly prescribed treatments for escape-maintained behavior may be especially beneficial.

Evidence-based treatments for escape-maintained behavior include (a) antecedent-based strategies such as NCR, which disrupts the contingent relationship between problem behaviors and access to escape from task demands while simultaneously abolishing the value of escape from task demands as a reinforcer; (b) replacement behavior strategies such as FCT, which involves teaching individuals a low-

effort alternative response to access the functional reinforcer of escape from task demands; and (c) consequence-based strategies such as escape extinction, which involves withholding escape as a reinforcer contingent on problem behaviors (Hansford, Zilber, LaRue, & Weiss, 2010). Vollmer et al. (1995), for example, demonstrated that the provision of breaks from instruction on a time-based schedule resulted in reductions in self-injurious behavior maintained by negative reinforcement. After functional analyses revealed that the self-injurious behaviors displayed by two school-aged individuals with developmental disabilities were maintained by negative reinforcement, Vollmer et al. utilized a combined multiple baseline across participants and reversal design to evaluate the effects of a treatment package involving noncontingent escape (NCE) from instruction. For both participants, initially dense FT schedules of escape from instruction resulted in immediate and substantial reductions in self-injury, which were maintained as the schedules were faded systematically. Specifically, a continuous schedule of escape was faded to an FT 10 min schedule of escape over 22 sessions for the first participant, and an initial FT 10 s schedule of escape was faded to an FT 2.5 minute schedule of escape over 10 sessions for the second participant. Vollmer et al. attributed the effectiveness of the intervention to the operations of extinction, motivational manipulations, and instructional fading and suggested that NCE may be preferable to differential reinforcement interventions due to the ease of implementation and to escape extinction due to the nonoccurrence of bursting side-effects.

Steege et al. (1990) also reduced the escape-maintained self-injurious behaviors displayed by children with severe developmental disabilities using a treatment based on extinction and negative reinforcement. During grooming tasks, brief intervals of escape

were provided contingent on the emission of a communication response (i.e., pressing a microswitch to activate a recording of the word “stop”), and guided compliance procedures were implemented contingent on occurrences of self-injurious behavior. This combination of FCT and escape extinction operations produced immediate reductions in self-injury for both participants, but led to increases in the duration of time required to complete grooming tasks. Lalli et al. (1995) also obtained positive results after implementing a similar treatment package to reduce the self-injurious and aggressive behaviors displayed by three children with developmental disabilities. After functional analyses indicated that the participants’ problem behaviors were maintained by escape from instructional activities, Lalli et al. implemented a treatment that combined FCT and extinction. That is, emission of a trained communication response (i.e., presenting a break card, saying “no,” or shaking the head to communicate “no”) produced a brief escape from the instructional activity, while occurrences of problem behaviors produced no consequences. Reductions in problem behaviors were observed for all participants subsequent to the implementation of this treatment; however, the participants never engaged in the instructional activities. Lalli et al. thus introduced a response chaining procedure in a subsequent experimental phase. This procedure, which involved gradually increasing the response requirements before delivering reinforcement in the form of a brief break from the activity, effectively led to increases in rates of task participation while maintaining low levels of problem behaviors.

The effectiveness of another function-based intervention for problem behaviors maintained by negative reinforcement was demonstrated by Iwata, Pace, Cowdery, Kalsher, and Cataldo (1990). In this investigation, 7 children and adolescents with

developmental disabilities participated in traditional functional analyses designed to identify the functions of their self-injurious behaviors. All participants demonstrated elevated levels of self-injury during the demand condition of the functional analysis; accordingly, it was hypothesized that all participants engaged in self-injurious behaviors to escape aversive instructional activities. The effect of an escape-extinction operation on rates of self-injury was evaluated within a multiple baseline across participants design. During treatment sessions, instructional activities continued independent of the participants' behavior, and guided compliance procedures were implemented contingent on occurrences of self-injurious behavior. This treatment resulted in clinically significant decreases in self-injurious behavior and corresponding increases in compliance with instructions for all but one participant, who responded to the treatment only after a response blocking procedure was incorporated into the treatment package. The outcome data also revealed that self-injurious behavior gradually decreased for 4 out of 6 participants and that 3 of these participants demonstrated response bursting during the initial treatment sessions. Therefore, Iwata et al. (1990) attributed treatment results to an extinction process rather than to a positive punishment process, which could have resulted from the aversive qualities of guided compliance procedures.

Research supporting the effectiveness of interventions such as NCR, FCT, and extinction for the treatment of escape-maintained problem behaviors also has been extended by studies comparing the relative effectiveness of these procedures. For instance, Kahng, Iwata, DeLeon, and Worsdell (1997) compared the effects of FCT and NCR using multielement designs presented within a multiple baseline design across 3 adults with developmental disabilities. Pretreatment functional analyses suggested that 2

participants' self-injurious behaviors were maintained by escape from demands. Accordingly, these participants were exposed to FCT and NCR conditions in which brief periods of escape were delivered contingent on the emission of an alternative response or contingent on the passage of time, respectively. The schedule of reinforcer deliveries during each NCR condition was yoked to the schedule of reinforcement in effect during the previous FCT condition in order to control for the rate of reinforcement across conditions. The research design thus allowed for a direct test of the extent to which individuals' ability to exert control over the schedule of reinforcement during FCT contributes to the effectiveness of FCT interventions for reducing occurrences of problem behavior. Given that the FCT and NCR conditions produced comparable reductions in the rates of self-injurious behavior displayed by the participants, Kahng et al. (1997) concluded that control over reinforcement was not a critical component of FCT. In fact, differential treatment effects were apparent only in the rates of alternative communication responses emitted by the participants. That is, participants emitted the trained communication responses more consistently during the FCT conditions relative to the NCR conditions.

Hanley, Piazza, Fisher, Contrucci, and Maglieri (1997) replicated and extended Kahng et al.'s (1997) findings with 2 children with physical disabilities, developmental delays, and behavioral disorders who engaged in problem behaviors maintained by positive reinforcement. Because FCT and NCR interventions again yielded comparable suppressive effects on problem behaviors, Hanley et al. (1997) implemented a concurrent-chains procedure to evaluate the participants' relative preferences for FCT and NCR. Given that both participants selected the FCT condition at higher rates than the

NCR condition, Hanley et al. proposed that control over reinforcement, though possibly irrelevant to treatment efficacy, may influence individuals' treatment preferences. More recently, Luczynski and Hanley (2009) employed a similar concurrent-chains procedure to demonstrate that typically developing preschool students also preferred to access social attention on a DRA schedule than on a time-based schedule.

Research conducted with individuals with developmental disabilities clearly suggests that interventions such as NCR and FCT yield comparable suppressive effects on escape-maintained problem behaviors. However, the generality of these findings to children and adolescents with emotional and behavioral disorders (EBD) and the collateral effects of these interventions on rates of task completion remain unknown. Moreover, research conducted by Hanley et al. (1997) and Luczynski and Hanley (2009) indicates that individuals with developmental delays and typically developing preschoolers may display a preference for FCT relative to NCR given that FCT interventions grant an opportunity to exert control over the schedule of reinforcement. Given evidence that youth with EBD often have experienced a learning history characterized by unpredictable and coercive social interactions (e.g., Patterson, DeBaryshe, & Ramsey, 1989), the value of control may be particularly influential among the EBD population; thus, it is possible that NCR interventions, which place control over reinforcement solely in the hands of the therapist, may be associated with both higher levels of problem behaviors and lower levels of task completion relative to FCT interventions.

Overall, a plethora of research supports the practice of conducting FBAs to identify the functions of problem behaviors and thereby guide the design of evidence-

and function-based interventions. The extension of the FBA process to include methodologies for test-driving potential interventions also may be considered a best practice approach for bridging the gap between assessment and intervention. By incorporating a response-to-intervention analysis within the assessment process, applied behavior analysts ensure that their recommended intervention plans yield socially significant outcomes for *individuals* and thus avoid allocating valuable time and resources to ineffective practices. This approach may be particularly critical for professionals serving youth with EBD who are grossly underrepresented as participants in applied behavior analytic research. Given these best practice ideals and the commonality of escape-maintained problem behaviors among youth with EBD, the purpose of this study was to extend the FBA process by test-driving evidence-based interventions designed to reduce the escape-maintained problem behaviors exhibited by youth with EBD. FCT and NCR were selected as interventions for inclusion in the treatment analyses in order to evaluate the generality of these procedures to the EBD population, and additional choice dimensions (i.e., the presence or absence of choice for scheduled break-time activities) were included in the analyses to test the hypothesis that individuals with EBD may respond differentially to treatments according to the extent to which they are able to exert control over reinforcement.

METHOD

Participants

Three males (identified by the pseudonyms Finn, Barry, and Artie) served as participants. All participants were enrolled in a behavior analytic day treatment program for youth with EBD and were selected for inclusion in the study based on teacher nomination.

Finn. Finn, an 11-year-old in 5th grade, was diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD) and a Learning Disorder. He received special education services designed to increase core academic skills, rates of work completion, compliance, and appropriate social interactions. He evidenced low average cognitive abilities and performed at approximately the 3rd grade instructional level in reading and mathematics. Finn also engaged in high rates of disruptive behaviors that precluded his participation in public school classrooms; thus, he completed all educational programming in the day treatment classroom with 1:1 support from an educational technician. He did not take any prescription medications while participating in the study.

Barry. Barry, a 13-year-old in 7th grade, was diagnosed with ADHD, Mood Disorder, Posttraumatic Stress Disorder (PTSD), and Reactive Attachment Disorder. He received special education services to increase core academic skills, rates of work completion, compliance, and appropriate social interactions. Records indicated that he displayed average cognitive abilities and performed at approximately the 6th grade instructional level in reading and mathematics. Barry engaged in high rates of disruptive behaviors, but had earned the opportunity to reintegrate into one class per day at his local public school. He spent the remainder of his day working 1:1 with an educational

technician in the day treatment classroom. Barry was prescribed Clonidine, Prozac, and Concerta while participating in the study.

Artie. Artie, an 11-year-old in 4th grade, was diagnosed with ADHD, Oppositional Defiant Disorder (ODD), Asperger's Disorder, and Bipolar Disorder. He received special education services to increase core academic skills, rates of work completion, compliance, and appropriate social interactions. He evidenced cognitive abilities in the low average range and performed at approximately the 3rd grade instructional level in reading and mathematics. He engaged in high rates of disruptive behaviors and thus spent approximately half the school day in a self-contained classroom at his local public school and the remainder of the school day in the day treatment classroom. In both settings, Artie received 1:1 support from an educational technician. His medication regimen during the study included Melatonin, Tegretol, and Trazodone.

Setting and Materials

All sessions were conducted in therapy rooms at the students' day treatment program. The rooms were barren except for tables, chairs, and the relevant experimental materials, which included instructional level math computation worksheets or maze (silent reading) worksheets obtained from AIMSweb (Pearson, 2008) and a variety of leisure activities (e.g., board games, cards, and balls). The participant, a therapist, and one or two data collectors were present in the room for all sessions.

Response Measurement, Interobserver Agreement, and Procedural Fidelity

Data were collected on problem behaviors and work completion. Problem behaviors were defined individually for each participant and documented using a 10 s partial-interval recording procedure. Accordingly, the percentage of 10 s intervals in

which problem behaviors occurred served as one dependent measure. For Finn, problem behaviors included oppositional vocalizations (i.e., yelling, swearing, saying no, or otherwise vocally protesting the task), disruptive behaviors (i.e., pushing away, throwing, or tearing up work materials or leaving the instructional area), and physical aggression (i.e., hitting, pushing, kicking, punching, or throwing objects at others). Barry's and Artie's problem behaviors included off-task behaviors (i.e., looking away from the instructional materials, engaging in speech unrelated to the instructional activity, or manipulating objects not related to the instructional activity), oppositional vocalizations (i.e., screeching, yelling, saying no, or otherwise vocally protesting the task), and disruptive behavior (i.e., pushing away, throwing, or tearing up work materials or leaving the instructional area). Table 1 provides a summary of each participant's problem behaviors.

Table 1: Problem Behaviors

Participant	Problem Behavior	Operational Definition
Finn	Oppositional Vocalization	Swearing, saying no, or otherwise vocally protesting the task.
	Disruptive Behavior	Pushing away, throwing, or tearing up work materials; leaving the instructional area
	Physical Aggression	Hitting, pushing, kicking, punching, or throwing objects at others
Barry	Off-Task Behavior	Looking away from the instructional materials, engaging in speech unrelated to the instructional activity, or manipulating objects not related to the instructional activity
	Oppositional Vocalization	Screeching, yelling, saying no, or otherwise vocally protesting the task
	Disruptive Behavior	Pushing away, throwing, or tearing up work materials; leaving the instructional area
Artie	Off-Task Behavior	Looking away from the instructional materials, engaging in speech unrelated to the instructional activity, or manipulating objects not related to the instructional activity
	Oppositional Vocalization	Screeching, yelling, saying no, or otherwise vocally protesting the task
	Disruptive Behavior	Pushing away, throwing, or tearing up work materials; leaving the instructional area

Work completion was defined in accordance with the nature of the instructional activity and documented based on a review of permanent work products. Finn was presented with math worksheets during each session; thus data collection for Finn involved counting the number of correct digits written, and the number of correct digits produced per minute served as the dependent measure. Barry and Artie completed maze activities during each session; thus data collection for Barry and Artie involved counting the number of correct responses circled, and the number of correct responses per minute served as the dependent measure. For Artie, an additional dependent measure, percent correct, also was calculated because anecdotal observations suggested that he was randomly selecting responses rather than reading the worksheets during some sessions. The percent of correct responses was determined by dividing the number of correct responses by the total number of responses emitted during each session and then multiplying by 100.

A second observer concurrently and independently collected partial interval data on problem behaviors during 27% of sessions across all conditions and all participants. Interobserver agreement (IOA) subsequently was calculated on an interval-by-interval basis by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. Overall agreement ranged from 93 – 100% with a mean of 98%. A second observer also independently scored 31% of the worksheets. IOA for work completion was calculated on an item-by-item basis by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. Results revealed 99% (range 95 – 100%) agreement for the worksheets.

Partial-interval data recording procedures also were utilized to estimate procedural fidelity. That is, data collectors observed the therapists' behaviors and documented the delivery of instructions, social attention, breaks from instructional activities, and/or tokens during 100% of sessions. These data confirmed that therapists adhered to the procedures with 98% (range 88 – 100%) accuracy.

Pretreatment Assessment

FBA's were completed for all participants in order to identify the maintaining functions of their problem behaviors prior to conducting the experimental intervention analyses. Preference assessments also were conducted in order to identify preferred break-time activities for inclusion in the interventions.

Functional behavioral assessment interview. FBA interviews guided by the Functional Behavioral Assessment Screening Form, Antecedent Variables Assessment Form, Individual Variables Assessment Form, and Consequence Variables Assessment Form (Steege & Watson, 2009) were conducted with the participants' primary therapists. Data obtained via the interviews were utilized to develop operational definitions for the participants' problem behaviors, identify relevant instructional activities and preferred activities for inclusion in subsequent phases of the study, and develop hypotheses about the functions of the participants' problem behaviors.

Preference assessment. To identify activities for inclusion in assessment and intervention analyses sessions, multiple stimulus without replacement (MSWO) preference assessments were conducted according to the procedures described by Daly et al. (2009). Eight activities identified as preferred during the FBA interviews and/or readily available in the day treatment classrooms were depicted on 10 cm by 10 cm

laminated cards via photographs and written labels. These activities included table-top leisure activities such as board games, card games, and art activities. At the beginning of each session, the therapist presented the participant with all eight activity cards in a randomized horizontal array and delivered an instruction to “choose your favorite activity.” After the participant emitted a selection response by labeling, pointing to, or picking up an activity card, the therapist removed that activity card, reallocated the first card to the last position, and then re-centered the remaining cards. This process repeated until the participant had selected all available cards, and the entire assessment was repeated three times on separate days. The mean ranking for each activity across the three assessment sessions served as the estimate of preference.

Functional analysis. Functional analyses (FAs) were conducted to confirm the results of the indirect FBA interviews, which suggested that all participants’ problem behaviors were evoked by the presentation of academic activities and maintained by escape from those activities. Two conditions similar to the demand (escape) and play (control) conditions described by Iwata et al. (1982/1994) and Mueller et al. (2003) were presented within a multielement design in an alternating order until differentiated data patterns were achieved. Sessions extended for 5 min for Finn and for 10 min for Barry and Artie.

During the demand condition, participants were seated at a large desk and presented with math worksheets (Finn) or maze silent reading worksheets (Barry and Artie). At the start of each demand session completed with Finn, the therapist stated, “It’s time for math. Please try to work each problem in order as quickly as you can without making mistakes.” Barry’s and Artie’s demand sessions began with the instruction, “It’s

time for reading. When you come to a group of three words, circle the one word that makes the most sense. Please work as quickly as you can without making mistakes.” During the sessions for all participants, the therapist delivered instructions to “keep working” or “try the next one” on an FT 30 s schedule. Contingent on occurrences of problem behaviors, the therapist emitted the statement “never mind” using a neutral tone of voice, removed the worksheets, and diverted his or her attention from the participant for 30 s. After the 30 s escape interval, the therapist re-presented the worksheets and delivered the instruction to “try the next one.” No consequences were arranged for occurrences of non-target behaviors.

During the play condition, participants received continuous access to preferred activities and social interaction. The participants selected activities such as board games, card tricks, and playing ball, and the therapists engaged in the activities as requested. Social attention was programmed for delivery at least once every 30 s; however, the nature of the activities selected by the participants resulted in nearly continuous social interactions across all sessions. No demands were placed on the participants, and all problem behaviors were ignored.

Brief Intervention Analysis

A combination of multiple schedule and reversal design features was utilized to compare the relative effects of four intervention conditions on Barry’s and Artie’s levels of problem behavior and rates of work completion. Finn declined to participate in this phase of the study and was discontinued. Sessions lasting 10 min each for Barry and Artie were separated by a minimum of 5 min, and one to five sessions were conducted

per day. The order of conditions was randomized, and participants completed sessions one to two times per week.

Baseline. The demand sessions conducted during the pretreatment FA served as the baseline.

NCR with activity choice (NCR Choice). The therapist introduced each session by stating, “It’s time for reading. You will have some breaks during the work. Which activity would you like to choose for your breaks?” The therapist then presented the pictures of the three activities ranked highest during the preference assessment and allowed the participant to select a break-time activity. After the participant made a selection, the therapist presented a red sheet of letter-sized paper with the following words: “Break Times: Teacher Choice. Break Activities: Student Choice.” The therapist read the words aloud and placed the paper on the student’s desk before presenting maze silent reading worksheets comparable to those utilized during the demand condition of the FA. The session timing began immediately after the therapist orally presented the maze directions.

During these sessions, the therapist emitted the statement, “time for a break,” and removed the task materials on a time-based schedule that was determined individually for each participant on the basis of baseline data (see below). A limited hold also was arranged such that the therapist delayed signaling the break until the participant completed a response if it happened to be in progress. Immediately after removing the instructional materials, the therapist engaged the participant in the break-time activity selected at the beginning of the session. The duration of the break varied by participant,

but always concluded with a removal of the break-time materials, the re-presentation of the instructional materials, and an instruction to “try the next one.”

The NCR schedules were determined by calculating the average latency to the first occurrence of problem behaviors observed during demand conditions of the FA and then multiplying the resulting number by .80. Accordingly, breaks were offered on FT 3 min and FT 1 min schedules for Barry and Artie, respectively. For Artie, the duration of scheduled breaks matched the duration of contingent breaks during the demand condition of the functional analysis (i.e., he received 30 s breaks). For Barry, the duration of schedule breaks was longer (i.e., 1 min) given the relatively lean NCR schedule in place.

Contingent on occurrences of problem behaviors during these sessions, the therapist delivered a combination of gesture prompts (i.e., pointing toward the next item) and vocal prompts (i.e., an instruction to “try the next one”) on an FT 10 s schedule. Attempts to leave the area were physically blocked, and thrown or destroyed materials were immediately replaced with new materials. Accordingly, the occurrence of all problem behaviors was followed by an extinction operation, and only the passage of time produced breaks.

NCR without activity choice (NCR No Choice). The therapist introduced each session by stating, “It’s time for reading. You will have some breaks during the work to play [activity name].” For each participant, the highest ranked activity from the preference assessment was offered as the break-time activity. The therapist then presented a blue sheet of letter-sized paper with the following words: “Break Times: Teacher Choice. Break Activities: Teacher Choice.” All subsequent procedures were identical to those implemented during the NCR Choice condition.

FCT with activity choice (FCT Choice). The therapist introduced each session by stating, “It’s time for reading. You will have some breaks during the work. Anytime the break card is on the table, you may hand it to me and then take a break. Which activity would you like to choose for your breaks?” The break-time activity was selected by the participant according to the same procedures employed during the NCR Choice condition, and then the therapist presented a yellow sheet of letter-sized paper with the following words: “Break Times: Student Choice. Break Activities: Student Choice.” Subsequent procedures were identical to those implemented during the NCR conditions except that the therapist placed a laminated break card on the desk directly above the participant’s worksheet for a 10 s window before and after the FT schedule previously in effect; accordingly, comparable rates of reinforcement were available across all conditions. The participant received a break contingent on each exchange of the break card. The therapist also prompted the participant to exchange the break card on the first opportunity of each session by gesturing toward the card and saying, “Hand me the card and you can take a break.”

FCT without activity choice (FCT No Choice). The therapist introduced each session by stating, “It’s time for reading. You will have some breaks during the work to play [activity name]. Anytime the break card is on the table, you may hand it to me and then take a break.” For each participant, the highest ranked activity from the preference assessment was offered as the break time activity. The therapist then presented a green sheet of letter-sized paper with the following words: “Break Times: Student Choice. Break Activities: Teacher Choice.” All subsequent procedures were identical to those implemented during the FCT Choice condition.

Extended Intervention Analysis

Barry and Artie participated in individually-designed extended intervention analyses, which were informed by the data obtained during the brief intervention analyses. Results from the brief intervention analysis conducted with Barry suggested that three of the treatment conditions were comparably effective in reducing levels of problem behavior. Therefore, during the extended intervention analysis, Barry was presented with concurrent choices between those three treatment conditions. After making a selection, he was exposed to the chosen condition for 5 min, and choice-making opportunities continued until stable patterns of responding (as determined by visual inspection of the data) during conditions emerged. Artie's brief intervention analysis data suggested that problem behaviors persisted across all four function-based treatment conditions. Accordingly, a differential reinforcement for alternative behavior (DRA) contingency for accurate responding was introduced in lieu of an intervention based on negative reinforcement. The DRA procedure entailed the delivery of tokens (i.e., pennies) contingent on accurate responding on an FR1 schedule, while problem behaviors resulted in gestural and verbal prompts to continue working. Artie was permitted to exchange the tokens for tangible items (e.g., chips, stickers, pens, and other school supplies) at the end of each session.

RESULTS

Pretreatment Assessment

Functional behavioral assessment interview. FBA interviews conducted with the participants' primary therapists suggested that all 3 participants' problem behaviors were evoked by the presentation of academic demands and maintained by avoidance of or escape from those demands. Finn's therapist reported that Finn pushed materials away, emitted oppositional vocalizations and disrespectful language, attempted to leave the classroom, destroyed property, and engaged in physical aggression primarily in the context of academic instruction. The therapist also observed that problem behaviors were most likely to occur when Finn was presented with traditional pen-and-paper tasks and/or assignments on which errors were probable. Reportedly, the emission of these behaviors typically resulted in the cessation of the task and the offer to engage in alternative activities (e.g., taking a walk or playing a game). Interview results for Barry suggested that he too engaged in the highest rates of problem behaviors in the context of academic instruction. Specifically, Barry's therapist reported that Barry evidenced high levels of off-task behavior (e.g., off-task speech, fidgeting, and wandering around the classroom) and vocal opposition when presented with academic work. According to the therapist, these behaviors were most likely to occur during independent seatwork and/or writing activities and frequently resulted in delays to the initiation of assignments. Finally, the interview with Artie's primary therapist revealed that Artie engaged in off-task behavior (e.g., playing with electronic games, doodling, wandering around the room, repetitive head movements, and off-topic speech) and emitted oppositional or disruptive vocalizations (e.g., vocally refusing to complete an assignment or screeching) primarily

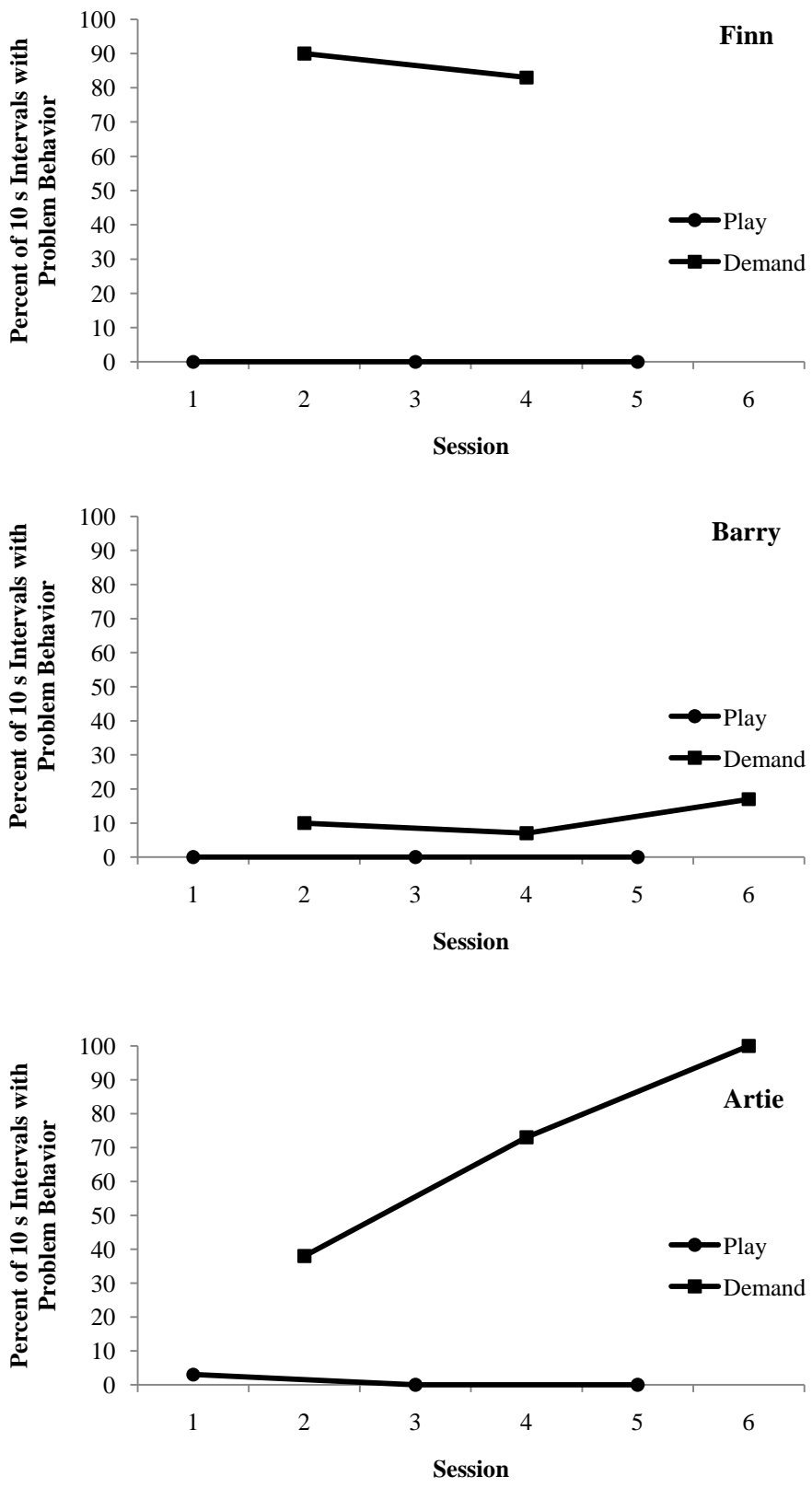
in the context of difficult academic assignments. These behaviors reportedly resulted in the avoidance of many academic activities.

Preference assessment. Three preferred break-time activities were identified for each participant on the basis of the preference assessment data. Finn ranked Monopoly Deal®, Sorry!®, and UNO® as his most highly preferred activities; Barry ranked Life®, Monopoly Deal®, and Sorry!® as his most highly preferred activities; and Artie ranked Monopoly Deal®, Mancala, and Monopoly® as his most highly preferred activities. All participants were highly consistent with their top three choices across assessment sessions.

Functional analysis. Figure 1 displays results from the FA. These data show that all 3 participants engaged in elevated levels of problem behavior during the demand condition relative to the control condition. Whereas zero occurrences of problem behavior were emitted by Finn during the play condition, he engaged in problem behavior during an average of 86.5% of intervals in the demand condition. For Barry, problem behaviors were observed during an average of 11% of intervals in the demand condition relative to 0% of intervals in the play condition. Artie emitted problem behaviors during an average of 70% of demand condition intervals compared to 1% of play condition intervals. Given the steeply increasing trend of problem behaviors across demand sessions with Artie, it also may be concluded that Artie evidenced a high level of sensitivity to the escape contingency and thus quickly learned that problem behaviors resulted in the termination of task demands. Overall, the FA results supported the hypotheses derived from the FBA interviews that all 3 participants' problem behaviors

were evoked by the presentation of academic demands and maintained by negative reinforcement in the form of escape from academic demands.

Figure 1. Percentage of intervals of problem behavior for all 3 participants during the pretreatment functional analysis.

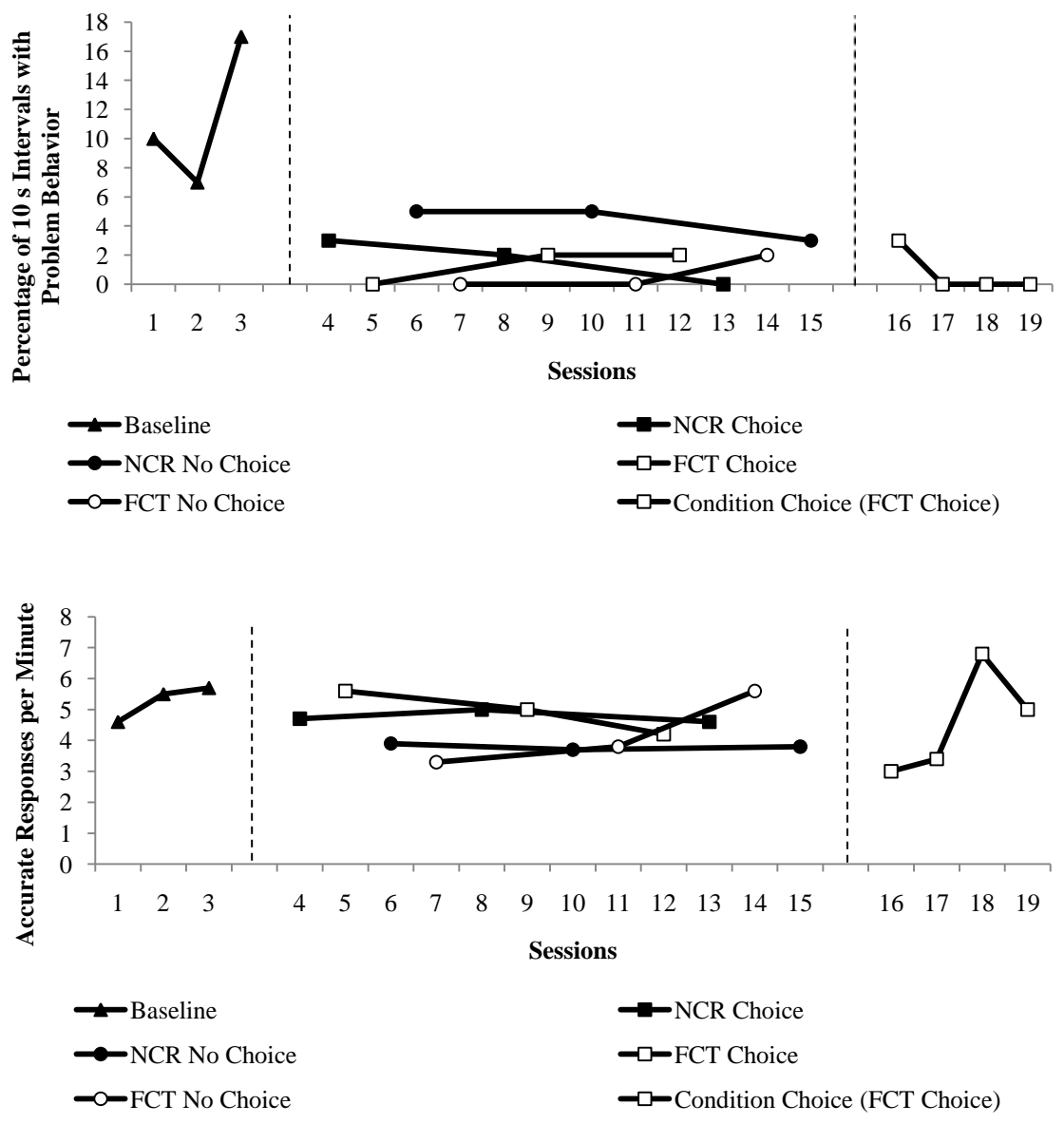


Brief and Extended Intervention Analyses

Barry. The results of the brief and extended intervention analyses conducted with Barry are shown in Figure 2. All four treatment conditions presented during the brief intervention analysis resulted in immediate and clinically significant reductions in levels of problem behavior relative to baseline (top panel). Problem behaviors occurred during an average of 11.33% of intervals during the demand condition baseline relative to averages of 1.67%, 4.33%, 1.33%, and .67% during the NCR Choice, NCR No Choice, FCT Choice, and FCT No Choice conditions respectively. The NCR No Choice condition, which appeared less effective than the other three treatment conditions, also was associated with the lowest rates of accurate responding on the maze task (bottom panel). Collateral effects on rates of accurate responding in the NCR Choice, FCT Choice, and FCT No Choice relative to each other and to baseline were not apparent.

A single, most effective treatment for Barry's escape-maintained problem behavior was not identified during the brief intervention analysis because the NCR Choice, FCT Choice, and FCT No Choice conditions (a) yielded comparable suppressive effects on problem behavior and (b) maintained relatively equivalent rates of accurate responding. Accordingly, these three treatments were presented to Barry within a concurrent choice arrangement during the extended intervention analysis. Results from this phase of the study show that Barry selected the FCT Choice intervention during 100% of trials and exhibited no problem behaviors during three out of four sessions.

Figure 2. Percentage of intervals of problem behavior (top panel) and rates of accurate responding (bottom panel) for Barry during the baseline, brief intervention analysis, and extended intervention analysis phases.

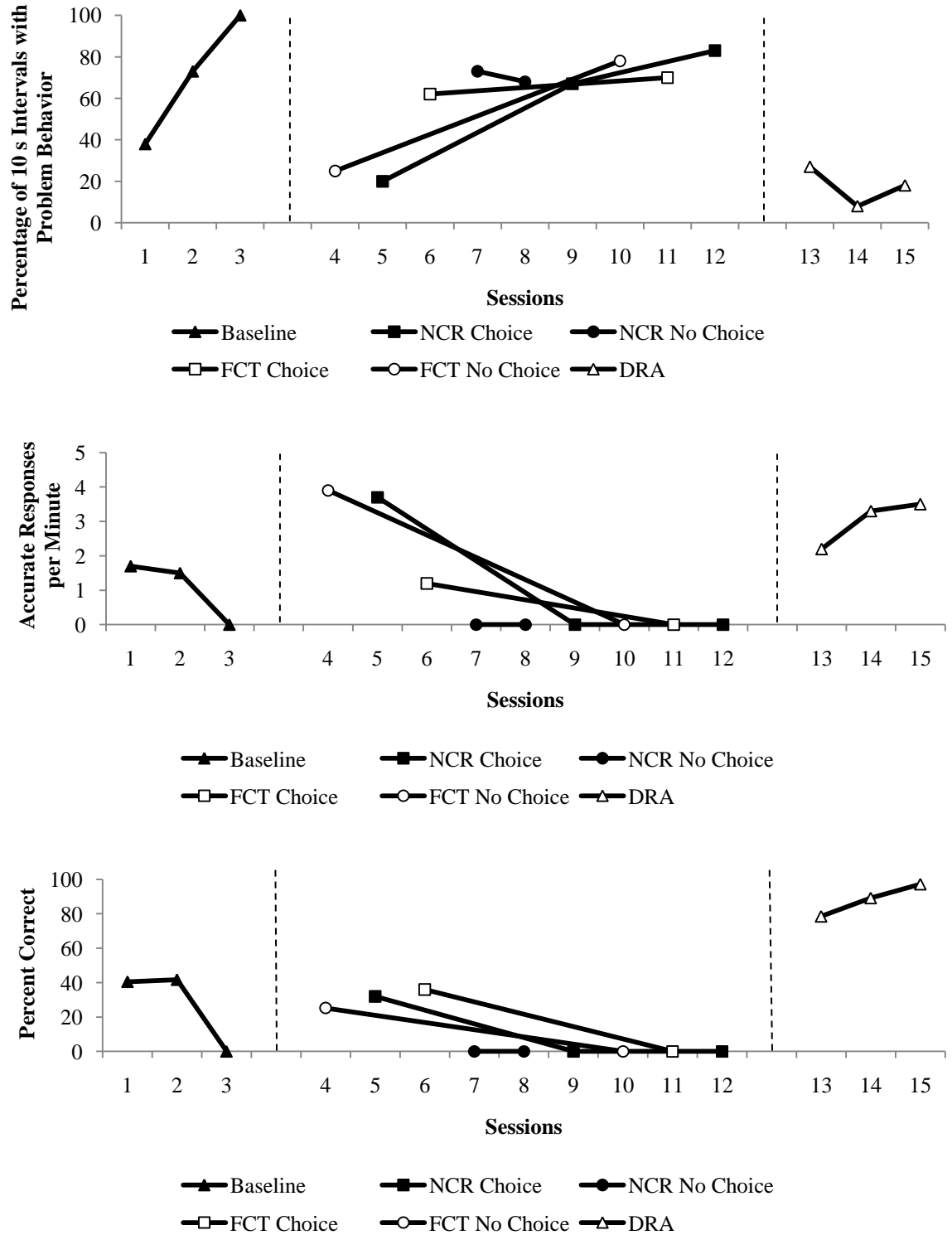


Artie. The results of the brief and extended intervention analyses conducted with Artie are shown in Figure 3. Although modest reductions in problem behavior were observed during the first two sessions of the brief intervention analysis relative to baseline, the four treatment conditions generally yielded no differential effects on problem behavior relative to one another or to baseline (top panel). Problem behaviors occurred during an average of 70.33% of intervals during the demand condition baseline relative to averages of 56.67%, 70.50%, 66.00%, and 51.50% during the NCR Choice, NCR No Choice, FCT Choice, and FCT No Choice conditions respectively. Rates of accurate responding during the brief intervention analysis conditions also were undifferentiated and comparable to baseline rates (middle panel). Although the data show initial increases in rates of accurate responding during the first two treatment sessions relative to baseline, the elevations were an artifact of Artie's random guessing behavior on the multiple choice maze task items.

Given that the four function-based treatment conditions implemented during the brief intervention analysis were equally ineffective for reducing levels of problem behavior and increasing rates of accurate work completion, an intervention based on positive reinforcement was introduced during the extended intervention analysis. The DRA procedure resulted in immediate and significant reductions in levels of problem behavior and increases in rates of accurate responding. Specifically, the data show a 75% reduction in problem behavior and a 64% increase in accurate responding during the DRA condition relative to baseline. Moreover, percent accuracy (bottom panel) increased from a baseline average of 41% to an average of 88% during the DRA condition, and

Artie's rate of accurate responding (middle panel) increased to the level predicted on the basis of his estimated reading ability.

Figure 3. Percentage of intervals of problem behavior (top panel), rates of accurate responding (middle panel), and percent accuracy (bottom panel) for Artie during the baseline, brief intervention analysis, and extended intervention analysis phases.



DISCUSSION

The objective of this study was to demonstrate the potential utility of an assessment methodology for identifying the most effective evidence- and function-based treatment for any given individual after the completion of an FBA. Given (a) the likelihood of work-avoidance behaviors among youth with EBD, (b) the historical underrepresentation of youth with EBD as participants in applied behavior analytic research, and (c) the possibility that control functions as a high-value reinforcer for youth with EBD, an assessment methodology for “test-driving” interventions indicated by an FBA was employed to evaluate the relative effectiveness of NCR and FCT interventions (both with and without choices for break-time activities) for increasing rates of work completion and reducing work-avoidance behaviors displayed by school-aged youth with EBD.

Pretreatment Assessment Outcomes and Implications

Results from the pretreatment FBA interviews and FAs converged to suggest that all 3 participants engaged in problem behaviors evoked by academic demands and maintained by negative reinforcement in the form of escape. Given numerous published reports that hypotheses derived from indirect and experimental FBA procedures inconsistently yield convergent results (Tarbox et al., 2009) and the relative dearth of research utilizing FBA procedures with the EBD population, this outcome represents an important contribution to the literature that generally supports Cunningham and O’Neill’s (2007) assertion that a multi-method approach to assessment of behavioral problems displayed by youth with EBD may increase confidence in the validity of obtained results. The converging sources of evidence supporting escape as the maintaining function for the

present participants' problem behaviors thus lend a high level of support to the validity of the functional hypotheses.

Intervention Outcomes and Implications

Although researchers generally agree that assessments designed to identify the function of problem behaviors are integral to the selection of appropriate interventions (Delfs & Campbell, 2010), results from the brief intervention analyses conducted during the present study suggest that knowledge of behavioral function may be necessary, but not sufficient for intervention planning. For Barry, knowledge of behavioral function led to the identification of four effective treatments, but only the completion of the brief intervention analysis offered information about the single most effective and most preferred intervention. For Artie, none of the treatments guided by knowledge of behavioral function yielded positive results, and the brief intervention analysis provided data illuminating the necessity of implementing an alternative intervention. For both participants, then, a response-to-intervention methodology served as an essential extension of the FBA process, and this finding maintains direct implications for clinical practice.

As noted previously, behavioral intervention strategies typically are selected on the basis of FBA results, especially when data obtained from indirect and experimental assessment procedures converge to produce a high level of confidence in the hypothesized function of problem behavior. Results from the present study, though, support further analyses in which the relative effects of potential treatments are compared experimentally. As an extension of the FBA process, this “test-driving” methodology supplements data about the function of problem behavior with information about the

effectiveness of potential solutions and thus eliminates the need for applied behavior analysts to initiate an involved problem-solving process when recommended evidence- and function-based interventions prove ineffective for a given individual. The necessity of this additional problem-solving process, which entails consideration of multiple causes of treatment failure (e.g., inaccurate identification of behavioral function, lapses in treatment integrity, insufficiently dense schedules of reinforcement, etc.), may be minimized by proactively test-driving interventions prior to investing resources for training staff members to implement an intervention that may be supported by efficacy research, but not by effectiveness studies with individuals directly comparable to the individuals referred for assessment and treatment.

In the present study, FBA data suggested that both Barry and Artie engaged in escape-maintained problem behaviors, which are commonly treated with NCR, FCT, and/or escape extinction. The brief intervention analyses, though, showed that the participants responded idiosyncratically to these evidence- and function-based treatments. Specifically, the brief intervention analysis conducted with Barry supported the differential effectiveness of only some variations of function-based treatments based on negative reinforcement, and the brief intervention analyses conducted with Artie suggested that all variations of these traditional treatment approaches were ineffective. In both cases, the FBA data alone were insufficient for the selection of an effective intervention, and the completion of intervention analyses provided an efficient method for identifying maximally effective approaches to treatment.

During the brief intervention analysis, Barry showed a positive response to all function-based treatment variations; however, the treatment associated with the absence

of opportunities for him to exert control over reinforcement (i.e., NCR No Choice) was least effective. Moreover, during the extended intervention analysis, Barry displayed an exclusive preference for the treatment associated with the highest level of control over reinforcement (i.e., FCT Choice). These results (a) lend support to the hypothesis that some individuals with EBD may value opportunities to exert control over reinforcement and (b) extend the generality of the existing literature on the value of choice (e.g., Fisher, Thompson, Piazza, Crosland, & Gotjen, 1997; Tiger, Hanley, & Hernandez, 2006). In their discussions, Fisher et al. (1997) and Tiger, Hanley, and Hernandez (2006) suggested that opportunities for individuals to make choices may lead to the subsequent receipt of reinforcers that are momentarily highly valued due to the presence of temporary motivating operations (MOs). A similar conceptual account for individuals' preference for choice may explain Barry's differential response to interventions with varied levels of opportunities for choice-making. First, the opportunity to select when breaks occurred during the FCT conditions enabled Barry to engage in breaks only when the motivation for escape was present, and support for this explanation may be derived from data showing that Barry repeatedly opted to continue working rather than to request a break during the FCT conditions. The NCR condition did not allow for similar adjustments to the reinforcement schedule in response to fluctuating MOs. Second, the opportunity to select break-time activities may have resulted in access to activities that were highly valued at that time and thus may have functioned as more effective reinforcers. Although the most highly preferred break-time activity identified by the pretreatment preference assessment always was arranged during the No Choice conditions, research repeatedly has documented fluctuations in preference over time (see Hanley, Iwata, & Roscoe,

2006) and only the Choice conditions were sensitive to these changing MOs. As Golonka et al. (2000) demonstrated, breaks enriched with access to high quality social and leisure activities may lead to greater reductions in escape-maintained problem behavior than breaks alone; thus, the momentary value of break-time activities may influence the effectiveness of interventions based on negative reinforcement. Finally, the superior effectiveness of the FCT Choice intervention during the extended intervention analysis (when an additional opportunity for choice of conditions was present) relative to during the brief intervention analysis (when the condition was selected by the therapist) may suggest that choice-making opportunities also function as abolishing operations by temporarily reducing the aversiveness of task demands.

Whereas all function-based treatments resulted in some reductions in levels of problem behavior for Barry, none of the function-based treatments yielded suppressive effects on Artie's problem behavior. Although Artie's levels of problem behavior declined during the initial sessions of the brief intervention analysis relative to baseline, levels of problem behavior returned to baseline levels during all subsequent sessions across all variations of the NCR and FCT interventions. Anecdotal observation suggested that this pattern of responding may be accounted for by his difficulty discriminating the change in contingencies between the baseline demand sessions and the function-based intervention sessions. Specifically, during the last demand session, Artie was observed to respond to the presentation of the maze worksheet by immediately sliding the paper back toward the therapist. In effect, he had learned to access the break contingency by emitting a low-effort response that had not been observed in his repertoire during the initial demand sessions. During the first two sessions of the brief intervention analysis, this low

effort response persisted. After repeated exposure to the extinction contingency, though, Artie was observed to engage in more intense and variable members of an escape-maintained response class hierarchy. For example, he began emitting threatening gestures, tearing up work materials, and attempting to crawl under the table. This extinction burst was accompanied by zero rates of work completion and the persistence of problem behaviors during scheduled break times.

In Artie's case, knowledge of behavioral function clearly was inadequate for selecting an effective intervention, and the extension of the FBA process to include a brief intervention analysis prevented the recommendation of a treatment package that may have (a) discredited a behavior analytic approach to assessment and intervention in the minds of consumers or (b) necessitated a lengthy reiteration of the problem-solving assessment process. Rapid comparisons among four potential treatments quickly revealed the ineffectiveness of treatments based on negative reinforcement for Artie and suggested the need for test-driving additional strategies before selecting an intervention for long-term implementation.

Based on anecdotal observation that Artie initially protested the termination of break-time activities and the re-presentation of work activities and then eventually opted not to engage in the break-time activities at all, it was hypothesized that the pairing of the presentation of break-time activities with the subsequent condition of restricted access resulted in the establishment of a conditioned MO that abolished the value of breaks as an effective reinforcer. Given (a) this hypothesis, (b) data showing that Artie emitted haphazard guesses on the maze worksheets even during the initial brief intervention analysis sessions when levels of problem behavior were suppressed (which raised

questions about the extent to which skill deficits confounded the treatment effects) and (c) an existing research base demonstrating the effectiveness of positive reinforcement operations for the treatment of escape-maintained problem behavior, the brief intervention analysis was discontinued and followed by an experimental phase to test-drive an intervention based on DRA.

The DRA intervention, which introduced positive reinforcement contingencies for accurate work completion, led to immediate increases in Artie's rate of accurate responding and percent accuracy scores and to collateral reductions in levels of problem behavior. The results of the DRA intervention thus made it possible to rule out the hypothesis that Artie's limited effort during the brief intervention analysis reflected undetected skill deficits. Artie also reported enjoying the DRA intervention and requested to continue participating in DRA sessions after the completion of the study. This contrasts dramatically to his response to the NCR and FCT sessions, during which he repeatedly emitted statements such as "this is stupid" and "I hate this." Although DRA does not qualify as a function-based treatment for escape-maintained behavior, its effectiveness for Artie may be interpreted in light of the matching law, which predicts that relative response rates distributed across concurrently available response alternatives will match the relative rates of reinforcement obtained on those alternatives (Herrnstein, 1961, 1970). The generalized matching law (Baum, 1974) specifically predicts that variables such as response effort, rate of reinforcement, reinforcer magnitude, reinforcer quality, and delay to reinforcement affect response allocation. In the DRA condition, the immediate delivery of tokens (i.e., high quality generalized reinforcers that could be exchanged for a choice among a wide variety of reportedly preferred tangibles) on an

FR1 schedule for each response emitted on the maze worksheets resulted in the allocation of responding to work completion and a corresponding decrease in problem behaviors, which produced only neutral prompts to continue working.

Alternative explanations for the relative effectiveness of positive reinforcement compared to negative reinforcement for the treatment of escape-maintained behavior also have been offered. For example, after demonstrating that 5 individuals with developmental disabilities displayed lower rates of escape-maintained problem behavior and higher rates of compliance when compliance produced food than when compliance produced a break, Lalli et al. (1999) proposed that the availability of edibles during tasks reduced the aversiveness of the demand context and thus the motivation for escape. More recent and comprehensive analyses of the relative effects of positive and negative reinforcement contingencies, though, generally lend support to a matching law account of the effectiveness of the DRA intervention for Artie's escape-maintained behavior. For example, DeLeon, Neidert, Anders, and Rodriguez-Catter (2001) reported that participants selected edible reinforcers over breaks when exposed to dense schedules of reinforcement for task completion, but that their preferences shifted toward the break option when the work requirements to obtain reinforcement increased. The authors thus concluded that the increased work requirements functioned as an MO that increased the value of escape and thus the perceived quality of breaks relative to edible reinforcers. Similarly, Kodak, Lerman, Volkert, and Trosclair (2007) examined participants' preferences for tangible or break reinforcers while varying schedule requirements and the quality of the reinforcers. When presented with a choice between a tangible or a break reinforcer for task completion, all 5 participants in Kodak et al.'s (2007) study

demonstrated a preference for tangible reinforcement. One participant shifted his preference toward breaks when they were supplemented by access to attention, and 3 participants shifted their preferences toward breaks when the quality of the edible was reduced. In sum, the research suggests that the delivery of high quality positive reinforcers for behaviors incompatible with problem behaviors may be an effective alternative to traditional function-based treatments for escape-maintained behavior.

Regardless of the behavioral mechanisms responsible for the treatment effects observed for Barry and Artie, both case examples illustrate that the extension of the FBA process to include a methodology for evaluating individuals' responsiveness to interventions may be an essential component of best practice in applied behavior analysis. A valid FBA results in the identification of the function of problem behaviors. Knowledge of behavioral function allows applied behavior analysts to rule-out several contraindicated treatments (e.g., time-out from reinforcement always is contraindicated for escape-maintained behavior), but traditional approaches for selecting among the remaining treatment options may be described best as a process of educated guessing. Given that modern behavior analysis recognizes that the effects of contingent reinforcement depend on a range of variables such as the value of reinforcement for alternative response options, individuals' unique learning histories, and dynamic fluctuations of motivating operations, it is not surprising that function-based treatments supported by the research may not yield the intended effects on behavior for every individual in every environment (Mace, Gritter, Johnson, Malley, & Steege, 2006). Accordingly, supplementing the FBA process with the application of an efficient methodology for evaluating potential interventions, as demonstrated in the present study,

may be described as a state of the art approach to behavioral assessment and intervention and may be particularly valuable for selecting treatments for youth with EBD, who historically have been under-represented in the behavior analytic treatment literature (Lane, Kalberg, & Shepcaro, 2009).

Limitations and Future Directions

The present investigation offered preliminary support for the viability and utility of conducting brief intervention analyses as a final phase of the FBA process. The 2 individuals who participated in these intervention analyses demonstrated highly idiosyncratic response patterns, but replications of this methodology with larger numbers of youth with EBD are needed to determine the extent to which individual variability in responsiveness to standard, evidence-based intervention is the norm or an exception. The individual patterns of responding displayed by the participants in the present study also highlight the need for future research on (a) the generality of the effectiveness of NCR and FCT among youth with EBD, (b) the value of control among youth with EBD, and (c) the relative effects of negative and positive reinforcement as treatments for escape-maintained behaviors displayed by youth with EBD.

Barry's responsiveness to the NCR and FCT interventions implemented in the present study offered preliminary support for the applicability of these interventions beyond the population of individuals with developmental disabilities. However, in addition to the limitations imposed by the small sample, the present study did not explicitly examine the clinical feasibility of these interventions in classrooms for youth with EBD, consumer acceptability ratings, or the maintenance of treatment effects over time and in the context of schedule thinning. Furthermore, individuals with EBD

evidence higher levels of cognitive functioning and language ability than the typical participants in research on NCR and FCT. Accordingly, individuals with EBD may be more susceptible to display rule-governed behavior, and the extent to which adventitious reinforcement effects contributed to the ineffectiveness of the NCR and FCT interventions for Artie remains unknown. Finally, given the utilization of a multiple schedule design in the brief intervention analysis, the possibility that multiple-treatment interference influenced the results cannot be ruled out.

In addition to offering preliminary support for the generality of NCR and FCT interventions, the data obtained during the brief intervention analysis with Barry yielded tentative support for the value of control among youth with EBD. It is possible that greater differentiation among the interventions with varied choice dimensions would have been observed if not for the floor effect attributable to Barry's relatively low rates of problem behavior across all experimental sessions. Replications and extensions of the research conducted by Fisher et al. (1997) and Tiger et al. (2006) with participants classified with EBD undoubtedly will benefit the field.

The relative effectiveness of treatments based on negative and positive reinforcement for reducing escape-maintained behaviors displayed by youth with EBD also warrants further investigation. In the present study, Artie responded more favorably to a positive reinforcement contingency arranged for work completion than to negative reinforcement contingencies delivered on time-based schedules or arranged for the emission of an appropriate communication response. Several limitations to this phase of the study, though, warrant caution in interpretation. First, the present study did not include a comparison between the effects of negative reinforcement contingent on task

completion and positive reinforcement contingent on task completion. Although the results suggest the relative reinforcing effectiveness of tangibles compared to breaks, it remains possible that the arrangement of a contingency between task completion and access to breaks also may have shifted Artie's response allocation toward the completion of work and thereby reduced problem behaviors. Second, because the pretreatment preference assessments included only activity options, it is plausible that the tangible items available in exchange for tokens earned during DRA sessions may have been more highly valued than Artie's top-ranked activity choices. Enrichment of NCR and FCT breaks with the edible items that he almost always selected after the DRA sessions may have increased the quality and reinforcing effectiveness of the arranged negative reinforcement operations during those conditions.

Despite the limitations of the present study, it may be concluded that the potential of behavior analytic approaches to the assessment and treatment of problem behaviors displayed by youth with EBD looks promising. Additional research on (a) the applications of FBA methods and response-to-intervention analyses among youth with EBD, (b) the generality and effectiveness of function-based treatments for escape-maintained behavior displayed by youth with EBD, and (c) the effectiveness of interventions invoking choice and control as fundamental treatment components will provide school-based applied behavior analysts with a foundational evidence-base to address increasingly common referral concerns, while adhering to federal education law recommending the completion of FBAs and the development of positive behavioral supports for students whose behavior impedes their learning (IDEIA, 2004).

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BIOGRAPHY OF AUTHOR

Jamie Laura Pratt was born in Waterville, Maine. She obtained her high school diploma from John Bapst Memorial High School in Bangor, Maine in 1998 and attained a Bachelor of Arts degree with a major in Psychology from the University of Maine at Farmington in 2003. While pursuing her B.A., Ms. Pratt served as a Research Assistant for the New England Research Institutes, which was conducting a randomized clinical trial funded by the National Institutes of Health. The project, entitled the Children's Amalgam Trial, afforded Ms. Pratt the opportunity to administer neuropsychological test batteries to school-aged children.

Ms. Pratt's experience at the New England Research Institutes sparked her interest in pursuing further training in assessment and intervention with the school-aged population. Accordingly, in 2004, Ms. Pratt enrolled the Master's Program in School Psychology at the University of Southern Maine, but eventually transferred into the school's Doctoral Program in School Psychology. While completing her degree requirements, Ms. Pratt obtained a Master of Science in Educational Psychology from the University of Southern Maine. She also served as a research assistant to Dr. F. Charles Mace, who led a team exploring the topics of motivating operations, matching theory, and behavioral momentum; taught graduate level courses in academic and cognitive assessment at the University of Southern Maine, while serving as a teaching assistant to Dr. Brown-Chidsey; provided clinical supervision in a day treatment program for youth with emotional and behavioral disorders, while employed as Chief Clinical Specialist at Providence's Achieve Program in Bath, Maine; completed school psychology practicum experiences within the Bath Public Schools and Providence's Merrymeeting Center, an

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Ms. Pratt's primary professional interest involves behavior analytic approaches to assessment and intervention for youth with emotional and behavioral disorders, and she has devoted her research and practice to exploring the implications of motivating operations, the Matching Law, and functional behavioral assessment for the development of effective interventions for this population. She has served as a reviewer for the Journal of Applied Behavior Analysis, presented on the topic of response class hierarchies at the annual meeting of the Association of Behavior Analysis, and contributed to publications accepted by the Journal of Applied Behavior Analysis and the European Journal of Behavior Analysis. She also is a member of a variety of professional associations including the National Association of School Psychologists, the Association for Behavior Analysis, and the American Psychological Association. Ms. Pratt presently is a candidate for the degree of Doctor of Psychology in School Psychology from the University of Southern Maine in August 2010.