EFFECTS OF FUNCTION-BASED CRISIS INTERVENTION ON THE CRISIS BEHAVIOR OF STUDENTS WITH DEVELOPMENTAL DISABILITIES IN THE SCHOOL SETTING

by

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A dissertation submitted to the faculty of
The University of North Carolina at Charlotte
in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
in Special Education

Charlotte

2017

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ABSTRACT

BRADLEY SEAN STEVENSON. Effects of Function-Based Crisis Intervention on the crisis behavior of students with developmental disabilities in the school setting. (Under the direction of DR. CHARLES L. WOOD)

Research has shown that some individuals with developmental disabilities exhibit problem behaviors, some of which are dangerous to themselves and others (Emerson et al., 2001; Kanne & Mazurek, 2011; Murphy et al., 2005). In addition to the threat of injury to themselves and others, engaging in these behaviors presents many risks including being subjected to intrusive and ineffective interventions (Burke et al., 2003; Powers, 2005; Scott et al., 2005), increased rates of school failure (Chandler & Dahlquist, 2010), increased negative interactions with caregivers (Lawson & O'Brien, 1994), and caregivers lacking confidence in their ability to work with these students (Hastings & Brown, 2002). Currently there are two models for intervening with dangerous behaviors. First, function-based interventions have proven to be effective at reducing challenging behaviors (Beavers, Iwata, & Lerman, 2013), but may be difficult to implement with dangerous behaviors and do not address some of the challenges that caregivers working with individuals who exhibit dangerous behaviors experience (e.g., lack of confidence). The second model, crisis intervention, has been shown to improve caregivers' experiences, for example increasing their confidence (Baker & Bissmire, 2000; Dawson, 2003; Soenen et al., 2009). However, crisis intervention has not been shown to actually decrease the rates of dangerous behaviors. Therefore, the purpose of this study was to evaluate the effects of an intervention that blends these two models, called Function-

Based Crisis Intervention (FBCI), on the crisis, precursor, and appropriate behavior of three students with developmental disabilities.

After initial functional behavior assessment, an individualized FBCI plan was developed for each of the three students included. The intervention was implemented using a delayed multiple probe across participants design. Results showed a functional relation between FBCI and students' crisis and appropriate behaviors. Although all students' precursor behavior decreased after FBCI was implemented, a functional relation was not demonstrated because one participant's precursor behavior showed a decreasing trend during baseline. Last, the results are discussed, followed by descriptions of the specific contributions of the study, suggestions for future research, and implications for practice.

DEDICATION

I would like to dedicate this to my family who has supported me and sacrificed to make this possible. Tiffany, it's been a long road we have walked together, and one that will go on still. However, I never would have made it to this milestone without you by my side. Emma and Avery, I love you girls to the moon and back. You've seen less of your Daddy than you would have liked at times, but every second I was away I was thinking of you. I hope you know how much I love you, and that you are as proud of me as I am of you.

Mom and Dad, you've supported me in all of my endeavors, whether they succeeded or failed. Your steady hands kept me afloat at times when I would have otherwise drowned. Keri, we were best friends as kids and you introduced me to this world. Now there's no one else I'd rather have as a partner as I look to make my mark in the field. Greg, you've always been there in case I needed you,. Although we've become more independent and I haven't had to lean on you recently, I know you're always there in case I do. Stephanie, I've never doubted the potential of any of the kids I worked with because of all you've accomplished. To my extended family, whether it was weeks at the beach or countless weekends hosted by the Dunnings, I appreciate every one of those moments deeply.

Tiffany, I opened with you and I will end with you because you are always the first and last person on my mind. When we met I was failing and without direction. When we started dating I began to find success, but direction did not come as quickly. I have changed careers multiple times, and I have been in school for thirteen out of the sixteen years we've been together. Through it all you've been there, offering

encouragement when I would fatigue, pushing me with hard truths when I would get complacent, and constantly believing in me. I have always dreamed big, but it wasn't until you came into my life that I started achieving anything. I would not be the person I am today without you. I owe everything to you. I love you, and I am eternally grateful that you've chosen to share your life with me.

ACKNOWLEDGEMENTS

There a number of people who deserve to be acknowledged for their contributions to this dissertation. To my advisor Charlie Wood, thank you. You have guided me throughout the whole process from recruitment to graduation. I can honestly say I would not be receiving a PhD without you. To David Test, you have been a mentor to me from the beginning of this program, always willing to offer sage advice as I needed it. I have and will always appreciate that. I would also like to thank Ya-yu Lo. Whether I was co-teaching with you, a student in your class, or you were reviewing my dissertation, your detailed feedback has helped me improve as a teacher and researcher. Thank you to Susan Furr for reading and providing feedback on both portfolios and my dissertation. Finally, I would like to acknowledge all of my peers who have been part of this process. This includes Jenny Root, Tosha Owens, Debbie Holzberg, and more. From nights out together to nights in working on projects, so many of you have helped me make it to this point.

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CHAPTER ONE: INTRODUCTION

Beginning with the passage of the Rehabilitation Act in 1973, all children with disabilities were guaranteed a free and appropriate public education. This right has been repeatedly affirmed with the passage of the Education for All Handicapped Children Act in 1975 and with its subsequent reauthorizations as the Individuals with Disabilities Education Act (IDEA; 1990, 1997, 2004). There are no exceptions to this right, including for students who exhibit challenging behaviors. Although it is possible for school administrators to go as far as changing a student's placement to effectively remove him or her from school, the educational agency must continue to provide educational services to ensure these students access the general curriculum and make progress on individualized educational program goals (IDEA, 2004). Therefore, teachers need effective ways to work with students with disabilities who exhibit the most severe problem behavior.

One subset of students who present this challenge is those with developmental disabilities (DD). DD is an umbrella term for a group of conditions such as autism, intellectual disability (ID), Down syndrome, fetal alcohol syndrome, and others. Handleman (1986) specified five criteria for DD. These include the disorder: (a) manifests before age 22; (b) is attributed to a mental impairment, physical impairment, or both; (c) will likely persist indefinitely; (d) impairs functioning in three or more major life activities (i.e., self-care, language, learning, mobility, self-direction, ability to live

independently, economic sufficiency); and (e) requires lifelong individually planned and coordinate services. DD are often co-occurring, such that individuals with autism are often diagnosed with ID as well (American Psychological Association, 2013).

Though the rates vary some across studies, it has been documented that a percentage of individuals with DD exhibit dangerous problem behaviors such as aggression, self-injurious behavior (SIB), and destructive behavior. For example, Emerson et al. (2001) found that 10-15% of individuals with ID exhibit dangerous behaviors with 7% exhibiting aggression, 4% exhibiting self-injurious behavior, and 4-5% exhibiting destructive behavior. Murphy et al. (2005) found rates that indicated a slightly higher prevalence. They assessed individuals with severe ID and/or autism and found that between 9.3-11.5% had marked problems with SIB, 7.6%-16.3% had marked problems with aggression, and 7.6%-23.2% had marked problems with destructive behavior. Surveying parents of individuals with autism, Kanne and Mazurek (2011) found even higher rates with 68% of respondents reporting their children with autism exhibited some level of aggression, 35.2% reported physical aggression, and 12% reported their children had engaged in violence towards their caregivers.

Exhibiting these types of challenging behaviors presents several risks to both the people with DD and those around them such as their caregivers (e.g., teachers). First and foremost, when students exhibit dangerous behaviors everyone involved is at risk of sustaining a physical injury (Burke, Hagan-Burke, & Sugai, 2003). Next, students who exhibit these behaviors are often subjected to intrusive and ineffective interventions. This includes medication with serious side-effects that do not address underlying causes of problem behavior (Powers, 2005). It also includes increased use of punishment and

exclusion (Burke et al., 2003; Scott et al., 2005). This is illustrated by the disproportionate use of seclusion and restraint with students with disabilities. In a 2014 report, the U.S. Department of Education Office of Civil Rights found that while 12% of the population consisted of students with disabilities, 58% of those secluded and 75% of those restrained had a disability. Further, a 2009 report by the Government Accountability Office described numerous cases of restraint resulting in abuse and death for individuals with DD in public schools.

In addition to physical risks, there are several other negative effects for students with disabilities associated with exhibiting problem behavior. Chandler and Dahlquist (2010) described four negative effects that exhibiting problem behavior has on students' school experience. First, students who exhibit problem behaviors are more likely to experience failure and not fulfill their academic abilities. Second, as shown in the Office of Civil Rights (2014) report, students with disabilities who exhibit problem behavior experience disproportionate levels of discipline. Third, these behaviors are often disruptive to their peers which can lead to greater peer rejection. Fourth, these students often lack quality social supports. Finally, and possibly most concerning, is the presence of these behaviors early in life correlates strongly with their presence later in life (Murphy et al., 2005). Since these behaviors can last a lifetime, it is not surprising the presence of problem behavior predicts poorer post-school outcomes for individuals with DD (Brosnan & Healy, 2011). Therefore, it is critical to remediate these challenges as early as possible.

The negative effects associated with dangerous behaviors are not limited to the individuals who exhibit them. Working with individuals with disabilities who exhibit

dangerous behaviors is also associated with several risks. For instance, caregivers have been shown to lack confidence in their abilities to work with individuals who exhibit dangerous behaviors (Allen & Tynan, 2000). These caregivers also experience increased levels of stress (Freeman, 1994; Hastings & Brown, 2002; Jenkins, Rose, & Lovell, 1997). Finally, there are increased negative interactions between caregivers and individuals who exhibit dangerous behaviors (Lawson & O'Brien, 1994). Since all students with disabilities have the right to a free and appropriate public education, it is safe to assume that teachers working with this population experience these effects.

With these risks in mind, it is clear there is a need for effective interventions that typical caregivers such as teachers are able to implement with confidence. In general, two methods have been suggested for addressing problem behavior in schools: (a) organizing interventions by topography (i.e., form of the behavior); and (b) organizing interventions by function. Although the distinction between topography and function is not perfect, as both methods attend to topography and function to some degree, this dichotomy illustrates the primary difference between how the two methods are used to design interventions.

1.1 Crisis Intervention

The methods that focus on the topography of the problem behavior, hereafter referred to as crisis intervention, are used to design distinct interventions depending on the intensity of problem behavior the target student is displaying. As described by Colvin and Scott (2015), crisis intervention begins by dividing the escalation to, and recovery from, problem behavior into several distinct phases. Next, each stage is operationally defined by the type of behavior exhibited during that phase. Finally, interventions are

developed for each phase with specific goals associated with each phase (i.e., prevention, safety, reintegration). Meeting this description are models including, but not limited to, Life Space Crisis Intervention (Dawson, 2003; D'Oosterlinck, Goethals, Boekaert, Schuyten, & De Maeyer, 2008; Grskovic & Goetze, 2005; Soenen, Volckaert, D'Oosterlinck, & Broekaert, 2014), Strategies in Crisis Intervention and Prevention (Baker & Bissmire, 2000), Nonviolent Crisis Intervention (Ryan, Peterson, Tetreault, & Vander Hagan, 2007), the Cycle of Acting-Out Behavior (Colvin & Scott, 2014), and the Cycle of Meltdowns for Students with Autism Spectrum Disorder (Colvin & Sheehan, 2012).

Life Space Crisis Intervention (LSCI) has been recommended for use in schools for students with various disabilities who exhibit dangerous problem behavior, and its effects have been evaluated by multiple studies (Dawson, 2003; D'Oosterlinck et al., 2008; Grskovic & Goetze, 2005). LSCI is based on the Conflict Cycle, which lays out a cyclical model to explain why problem behavior occurs and persists (Long, Morse, & Newman, 1996). In short, the cycle begins with a stressful event that activates pre-existing beliefs (e.g., the teacher never listens to me). This combination results in negative feelings, which drive inappropriate behavior. Next, adults respond to this behavior, typically by mirroring the student (e.g., if the student yells, the adult yells). The adult response then adds additional stress, reinforces the irrational beliefs, and sets the next cycle in motion at a more escalated level. LSCI interrupts this cycle with six stages of interventions (i.e., student crisis, student timeline, central issue, student insight, student new skills, student transfer of training; Dawson, 2001). The goal of the first three stages is to de-escalate the behavior and identify the causes of the problem through discussion

(D'Oosterlinck et al., 2008). Then, students are guided to gain insight into their own patterns of behavior, learn new skills from staff, and apply these skills in the natural setting (D'Oosterlinck et al., 2008).

Another model of crisis intervention is Strategies in Crisis Intervention and Prevention (SCIP). West and Kaniok (2009) described the SCIP program as consisting of a four-stage escalation process: setting events, early warnings, crisis, and recovery. Intervention corresponds to these phases. Early intervention should occur by responding to warning signs (e.g., tension, agitation) before escalation can occur. If early intervention fails, calming techniques are used that follow six sequential steps (i.e., recognizing the individual's feelings, stating that emotion, providing a personal example of when the caregiver felt similarly, reassuring the individual that caregivers are there to help, redirecting the individual to another activity, praising engagement in that activity). Finally, if a crisis does occur physical intervention is used by using the least amount of force necessary to maintain safety.

A third method of crisis intervention is Nonviolent Crisis Intervention (NCI). Designed by the Crisis Prevention Institute, NCI defines four stages a person goes through during a crisis (Crisis Prevention Institute, 2005). These stages are anxiety, defensive, acting out, and tension reduction. During these stages staff are trained to be supportive (e.g., empathetic, non-judgmental statements), be directive (e.g., setting limits in a non-confrontational manner), use nonviolent physical crisis intervention (e.g., approved block, approved restraint), and re-establishing therapeutic rapport (e.g., restart communication) respectively.

The last models of crisis intervention are both developed by Colvin in collaboration with other authors. Colvin and Scott (2015) developed Managing the Cycle of Acting-Out Behavior in the Classroom. This model describes seven phases to acting-out behavior: (a) calm, (b) triggers, (c) agitation, (d) acceleration, (e) peak, (f) de-escalation, and (g) recovery. They recommend that intervention for the first four phases focus on prevention. This includes strategies such as teaching appropriate behaviors during calm, precorrection during triggers, calming strategies during the agitation such as displaying empathy and allowing access to preferred activities, and non-confrontational limit-setting during acceleration. The focus during the peak phase is on maintaining safety and complying with school and district policies. The goals of the final two phases (i.e., de-escalation, recovery) are reintegration back into the environment. This is accomplished in the de-escalation phase by having the student engage in independent work until he or she meets pre-established exit criteria, and in the recovery phase teachers are to re-establish rapport by expressing support, praising appropriate behavior, and avoiding discussions about consequences that have been delivered.

In a second model, Colvin and Sheehan (2012) describe the cycle of meltdowns exhibited by students with autism. The authors distinguish between acting out behavior and meltdowns, stating that

> Meltdowns are a *different kind of response class* from acting-out behavior and tantrums. The assumption is that meltdowns are driven by internal processes in reaction to sensory overloading, cognitive dysfunctions, and socialization problems…Their behavior is fundamentally reactive to processes they cannot control. (p. 126)

Because the authors identify this difference, a similar but distinct model is presented. The cycle of meltdowns is divided into six phases consisting of calm, triggers, agitation, meltdown, re-grouping, and starting over. As with the cycle of acting-out, all pre-

meltdown phases are designed to prevent the challenging behavior. As such, recommended strategies include, but are not limited to: (a) effective classroom layout, visual schedules, establishing clear rules, accommodating perceived sensory needs during calm, and teaching appropriate responses during calm; (b) providing access to preferred sensory activities, modifying the pace of instruction to ensure a quick pace with lots of opportunities to respond, and precorrection during triggers; and (c) being empathetic and supportive, providing assistance, providing space, allow access to preferred activities with limits, and teach self-management during agitation. Safety and empathy are the foci during the meltdown phase with physical intervention only being used as necessary to maintain safety, after permission is obtained, and in accordance with district and school policies. The re-grouping and starting over phases are focused on reintegration into the classroom. Behavioral probes are used during re-grouping. This means simple interactions are initiated that build in complexity until the student is able to consistently and positively respond to interactions that reflect his calm state (e.g., “come here” first, “what’s your favorite TV show” second, “can we talk about what happened” last). The last phase, starting over, is designed to successfully integrate the student back into the routine by beginning with structured, scheduled activities followed by debriefing, shaping the ability to tolerate aversive sensory stimuli, skill building of replacement behaviors, and the development of a behavior support plan.

Research has identified several benefits to using crisis intervention, particularly to address the challenges caregivers face when working with individuals with disabilities who exhibit crisis behavior. For instance, numerous studies found training in crisis intervention led to increased caregiver confidence when working with individuals who

display crisis behaviors and resulted in increased ability to intervene with crisis behaviors (Baker & Bissmire, 2000; Dawson, 2003; Soenen et al., 2009). Training in crisis intervention has also led to decreased use of restraint, which is a common source of injury to caregivers and students themselves (Ryan et al., 2007). Finally, crisis intervention describes exactly how to physically intervene, when to physically intervene, procedures to follow, recommended documentation, and training requirements for physical intervention (Colvin & Scott, 2015; Colvin & Sheehan, 2012; Crisis Prevention Institute, 2005; Simonsen, Sugai, Freeman, Kern, & Hampton, 2014). Additionally, it specifies that all interventions be described with step-by-step detail (Gilliam, 1993).

Although there are benefits to the multiple crisis intervention options, there are also limitations. First and foremost, there is a lack of empirical support for crisis intervention with individuals with DD. There are a total of six intervention studies examining the effects of crisis intervention, four in schools and two in residential settings. Four used LSCI (Dawson, 2003; D'Oosterlinck et al., 2008; Grskovic & Goetze, 2005; Soenen et al., 2014), one used SCIP (Baker & Bissmire, 2000), and one used NCI (Ryan et al., 2007). All of these studies have at least one design flaw that prevents demonstrating a causal link between crisis intervention and reduction in challenging behavior. These flaws include lack of a control group (Baker & Bissmire, 2000; Ryan et al., 2007), lack of a third tier in a multiple baseline design (Grskovic & Goetze, 2005), and indirect measures of behavior (Dawson, 2003; D'Oosterlinck et al., 2008; Ryan et al., 2007). Although many of the interventions suggested by Colvin and Scott's (2015) cycle of acting-out and Colvin and Sheehan's (2012) cycle of meltdowns for students with autism spectrum disorder have research to support them (e.g., precorrection, teaching

replacement skills), no studies have evaluated whether these research-based interventions are effective when presented as a treatment package organized according to these models of crisis.

Another limitation of these studies was the target population was students with high-incidence disabilities such as emotional disturbance (Dawson, 2003; D'Oosterlinck et al., 2008; Grskovic, & Goetze, 2005; Ryan et al., 2007; Soenen et al., 2014). This is a concern for two reasons. First, it further limits the applicability of the research as only one study included students with DD, and this study did not result in a decrease in challenging behaviors (Baker & Bissmire, 2000). A second concern is that since the target population has typically been students with high-incidence disabilities, many of the recommended interventions may be inappropriate for students with DD. For instance, crisis intervention typically calls for repeatedly discussing the cause of conflict with students as a means to prevent the crisis behavior (Williams, 2009). This reliance on verbal interactions may be inappropriate for students with DD who often have language delays or very limited communication skills. Even the cycle of meltdowns, which Colvin and Sheehan (2012) proposed for use with students with autism, has frequent suggestions to engage in complex verbal exchanges such as asking to talk about what just happened.

A final limitation to the crisis intervention literature is the models developed and/or the accompanying interventions contradict established principles of behavior. For instance, LSCI teaches staff to verbally engage students any time they begin to escalate. However, if the behaviors are maintained by access to attention or escape from an aversive task, this may be reinforcing low intensity members of the response class. Similarly, Colvin and Scott (2015) and Colvin and Sheehan (2012) recommend providing

access to preferred activities upon the student exhibiting anxiety. This again may serve to reinforce those behaviors. Finally, when dangerous behaviors occur all models recommend removing aversive stimuli, providing space, and removing the student from the situation. While the need to maintain safety is understandable, these responses by staff could serve to reinforce and maintain these most intense behaviors and research has shown that extinction (i.e., ceasing to reinforce a previously reinforced behavior) may be necessary to reduce problem behavior (Fisher et al., 1993; Hagopian, Fisher, Sullivan, Acquisto, & LeBlanc, 1998).

Colvin and Sheehan (2012) go even further to suggest teachers need to calmly and supportively encourage students with autism through meltdowns. This could provide positive reinforcement in the form of attention in addition to the negative reinforcement provided by removing aversive stimuli. Although Colvin and Sheehan justify this by arguing the meltdowns exhibited by students with autism, as opposed to acting-out behaviors exhibited by other students, are uncontrollable, the recommended interventions are still not consistent with the principles of positive and negative reinforcement (Cooper, Heron, & Heward, 2007). Regardless of whether students with autism are actively monitoring their own behaviors during meltdowns, decades of research have shown these behaviors are ultimately controlled by environmental stimuli which include what happens in response to the dangerous behavior to reinforce it (Beavers, Iwata, & Lerman, 2013). Consequently, this effort to de-escalate the situation at all costs may actually perpetuate the occurrence of problem behavior.

1.2 Function-Based Intervention

The second method of intervention to address dangerous behaviors in school is function-based intervention (FBI). FBI consists of two phases. The first phase requires functional behavior assessment (FBA). Cooper et al. (2007) describe FBA as a systematic method for identifying the function a problem behavior serves for the individual. This includes analysis of variables that evoke, maintain, and affect the strength of the reinforcers maintaining the problem behavior. Upon completion of the FBA, one or more interventions target the controlling variables in order to address the function of the behavior. For instance, a function-based behavior plan may limit exposure to stimuli that evoke problem behavior, withhold reinforcement after problem behavior is exhibited, teach an appropriate behavior that is functionally equivalent (i.e., results in the same reinforcement) to replace it, or some combination of these and other interventions.

There are several reasons why FBI could be used to address the crisis behavior of students with DD. First and foremost, going back as early as Iwata, Dorsey, Slifer, Bauman, and Richman (1982) and Carr and Durand (1985) there are decades of empirical research supporting the use of FBI for reducing problem behavior (Beavers et al., 2013). Second, FBI has repeatedly been shown to be more effective than non-function-based interventions (Didden, Duker, & Korzilius, 1997; Filter & Horner, 2009; Ingram, Lewis-Palmer, & Sugai, 2005; Newcomer & Lewis, 2004; Payne, Scott, & Conroy, 2007). Finally, research suggests applying restraint as part of a comprehensive FBI plan is safer than applying restraint as crisis intervention (Williams, 2009).

Despite these benefits, there are also limitations to the FBI literature. First, as discussed by Hanley, Jin, Vanselow, and Hanratty (2014), the literature on FBI for severe

problem behavior is almost entirely dedicated to analyzing the effects of isolated components of assessment and/or intervention on severe problem behavior. As such, there is a dearth of resources on comprehensive, synthesized models for assessment and intervention that are required for meaningful reduction in severe problem behavior.

Second, the research rarely describes the methods used to maintain safety with replicable precision. For instance, in Falcomata, Muething, Gainey, Hoffman, and Fragale's (2013) study, participants were included who engaged in aggression, self-injury, and destructive behavior. The authors stated they used extinction after the problem behaviors were exhibited, but did not describe how extinction was implemented or how safety was implemented. Similarly, Schmidt, Drasgow, Halle, Martin, and Bliss (2014) included students with severe problem behavior (e.g., throwing objects, aggression, pica, self-injury, elopement, fecal smearing, property destruction, touching other's genitals, inappropriate statements), used negative punishment by removing the reinforcer upon the occurrence of problem behavior, and also did not describe how safety was maintained. This raises concerns as to whether these interventions can be effectively replicated in schools, as simply ignoring or not responding to severe problem behaviors is often not ethical (e.g., attention maintained self-injury) or not possible (e.g., attention maintained aggression).

1.3 Function-Based Crisis Intervention

Although crisis intervention and FBI have primarily been studied separately in the literature, they are not incompatible. Previous authors have described methods for incorporating crisis intervention and FBI (Duggan & Dawson, 2004; Marston, 2001). Considering the strengths and limitations of crisis intervention and FBI, it is likely that

these models complement one another. Specifically, crisis intervention has shown increased caregiver capabilities and thorough descriptions of frameworks for comprehensive intervention including how to physically intervene, but lacks demonstrated effectiveness at reducing problem behavior; whereas FBI has demonstrated effectiveness for reducing severe problem behavior, but lacks analysis of caregiver perceptions and descriptions of frameworks for comprehensive intervention.

Seeing the potential benefits of crisis intervention and FBI, Stevenson and Wood (2016) evaluated the effects of a synthesized intervention called Function-Based Crisis Intervention (FBCI) that designed FBI for each phase of the Colvin and Scott (2015) cycle of acting-out behavior with three students with DD. Although a functional relation was demonstrated, the study was conducted in a highly controlled setting (i.e., a conference room). Consequently, questions remain as to whether FBCI would be effective in more natural settings. Due to the limitations existing in the established literature, additional research is needed in this area.

1.4 Purpose

The purpose of this study will be to extend the research on FBCI by examining its effects on the crisis behavior of students with DD in a school setting. This study will seek to answer the following research questions:

1. To what extent does FBCI reduce students' level of crisis behavior in the school setting?
2. To what extent does FBCI reduce students' level of precursor behavior in the school setting?

3. To what extent does FBCI increase level of students' appropriate behavior in the school setting?
4. To what extent do the effects of FBCI maintain after intervention?
5. To what extent do the effects of FBCI generalize to other settings?
6. To what degree of fidelity can teachers implement FBCI after transferring from the researcher?
7. What are teachers' perceptions of FBCI?

1.5 Significance

This study will be significant because of a number of possible contributions it may make to the literature. First, the study will provide additional empirical support for a comprehensive, synthesized model of intervention to reduce crisis behavior and increase adaptive behavior. Additionally, by organizing intervention based on the topography of the students' behavior and not limiting FBI to pre-crisis phases, this study suggests a new approach to organize FBI in a way that caregivers can implement. Next, it extends the research on FBCI into the school setting, assessing its effectiveness in the presence of potentially confounding variables that exist in any natural setting. Finally, by measuring teachers' ability to implement FBCI, albeit under ideal circumstances, and assessing their perceptions after implementing it, this study begins to analyze the extent to which FBCI is feasible for teachers.

1.6 Delimitations of Study

The study's benefits should be interpreted in the context of the following delimitations. Assessment, development of the FBCI plan, and initial implementation will all be done by a doctoral student who is a Board Certified Behavior Analyst with 12 years

of experience working with individuals with DD who exhibit crisis behavior, which is not typical of school settings. Although the teacher(s) assume responsibility for implementation in the final phase, this is done in a non-experimental fashion and is under ideal circumstances (i.e., after intervention has already improved student behavior and teacher just has to maintain effects). Further, the FBCI plan will be implemented during isolated portions of the day, not across all settings. Therefore, it will not be possible to know if the effects of FBCI are applicable if it is implemented across the entire school day. Last, the setting is a separate school for students with severe disabilities, which is qualitatively different from many of the settings in which these students are served (e.g., homebound services, separate classroom, general education classroom). As such, it will not be possible to determine the effectiveness of an FBCI plan in a variety of settings in which students with DD who exhibit crisis behavior are served.

1.7 Definition of Terms

Abolishing operation. "A motivating operation that decreases the reinforcing effectiveness of a stimulus, object, or event. For example, the reinforcing effectiveness of food is abolished as a result of food ingestion" (Cooper et al., 2007, p. 689).

Acceleration. The fourth phase in the cycle of acting out behavior; "At first glance…there is little difference between this phase and the previous phase: agitation. However, there is a marked difference between the two phases in terms of the focus of the student behavior and outcomes of these behaviors. The previous phase [agitation] characterizes students who are unfocused, and the behavior is nondirected…However, in this phase, acceleration, student behavior becomes quite focused and directed (usually toward staff)" (Colvin & Scott, 2015, p. 37)

Agitation. The third phase in the cycle of acting out behavior; "A general behavioral term, or response class, that includes emotional dispositions such as being angry, upset, depressed, on edge, withdrawn, worried, disturbed, frustrated and anxious" (Colvin & Scott, 2015, p. 33-34)

Alternative schedule of reinforcement. "Provides reinforcement whenever the requirement of either a ratio schedule or an interval schedule-the basic schedules that makeup the alternative schedule-is met, regardless of which of the component schedule's requirements is met first" (Cooper et al., 2007, p. 689).

Antecedent. "An environmental condition or stimulus change existing or occurring prior to a behavior of interest" (Cooper et al., 2007, p. 689)

Autism. "Autism means a developmental disability significantly affecting verbal and nonverbal communication and social interaction, generally evident before age three, that adversely affects a child's educational performance. Other characteristics often associated with autism are engagement in repetitive activities and stereotyped movements, resistance to environmental change or change in daily routines, and unusual responses to sensory experiences." (IDEA, 2004)

Automatic reinforcement. "Reinforcement that occurs independent of the social mediation of others (e.g., scratching an insect bite relieves the itch)" (Cooper et al., 2007, p. 690).

Aversive stimulus. "In general, an unpleasant or noxious stimulus; more technically, a stimulus change or condition that functions (a) to evoke a behavior that has terminated it in the past; (b) as a punisher when presented following behaviors, and/or (c) as a reinforcer when withdrawn following a behavior" (Cooper et al., 2007, p. 691).

Behavior. "That portion of an organism's interaction with its environment that is characterized by detectable displacement in space through time of some part of the organism and that results in a measurable change in at least one aspect of the environment" (Johnston & Pennypacker, 1993, p. 23)

Behavioral indication. "Subtle, observable behaviors that occur immediately prior to problem behavior and indicate momentary states of motivation" (Schmidt et al., 2014, p. 45)

Brief functional analysis. A variation of a traditional functional analysis in which one cycle of relevant functional analysis conditions are conducted followed by a contingency reversal. A contingency reversal consists of three sessions replicating the elevated condition. The first and third session a functionally equivalent behavior to the problem behavior is reinforced. The second session replicates the condition that produced the fewest instances of challenging behavior (Northup et al., 1991).

Calm. The first phase in the cycle of acting out behavior; "During this phase, the students are able to exhibit, in varying degrees, the essential behaviors to succeed in class. These behaviors include the following: (a) maintaining on-task behavior, (b) following rules and expectations, (c) responding to praise, (d) initiating appropriate behavior, and (e) responding to goals and success" (Colvin & Scott, 2015, p. 27)

Chained schedule of reinforcement. "A schedule of reinforcement in which the response requirements of two or more basic schedules must be met in a specific sequence before reinforcement is delivered; a discriminative stimulus is correlated with each component of the schedule" (Cooper et al., 2007, p. 691).

Compound schedules of reinforcement. "A schedule of reinforcement consisting of two or more elements of continuous reinforcement (CRF), the four intermittent schedules of reinforcement (FR, VR, FI, VI), differential reinforcement of various rates of responding (DRH, DRL), and extinction. The elements from these basic schedule can occur successively or simultaneously and with or without discriminative stimuli; reinforcement may be contingent on meeting the requirements of each element of the schedule independently or in combination with all elements" (Cooper et al., 2007, p. 692).

Concurrent schedule of reinforcement. "Occurs when (a) two or more contingencies of reinforcement (b) operate independently and simultaneously (c) for two or more behaviors" (Cooper et al., 2007, p. 316-317).

Conjunctive schedule of reinforcement. Provides reinforcement whenever the requirement of both a ratio schedule and an interval schedule of reinforcement are met (Cooper et al., 2007).

Consequence. "A stimulus change that follows a behavior of interest" (Cooper et al., 2007, p. 692)

Crisis behavior. "Any occasion when a student's behavior requires immediate attention to protect the physical and/or psychological safety of that student, the teacher, or others" (Gilliam, 1993, p. 224)

Crisis intervention. A method of organizing interventions for crisis behaviors according to the topography of behaviors a student is displaying. Crisis behaviors are presumed to escalate from calm to crisis and back to calm in a predictable, cyclical pattern.

De-escalation. The sixth phase in the cycle of acting out behavior; "This phase marks the beginning of the student's disengagement and corresponding reduction in intensity of behavior. However, the students are not especially cooperative or responsive to adult social influence" (Colvin & Scott, 2015, p. 43)

Developmental disability. "a severe, chronic disability which:

- is attributable to a mental or physical impairment or combination of mental and physical impairments;

-is manifested before the person attains age 22;

- is likely to continue indefinitely;

- results in substantial functional limitation in three or more of the following areas of major life activity: (i) self-care, (ii) receptive and expressive language, (iii) learning, (iv) mobility, (v) self-direction,

(vi) capacity for independent living, and (vii) economic sufficiency; and

- reflects the persons need for special services that are of lifelong or extended duration and are individually planned and coordinated" (Handleman, 1986, p. 153).

Differential reinforcement. "Reinforcing only those responses within a response class that meet a specific criterion along some dimension(s) (i.e., frequency, topography, duration, latency, or magnitude) and placing all other responses in the class on extinction" (Cooper et al., 2007, p. 693)

Differential reinforcement of alternative behavior. "A procedure for decreasing problem behavior in which reinforcement is delivered for a behavior that serves as a desirable alternative to the behavior targeted for reduction and withheld following instances of the problem behavior" (Cooper et al., 2007, p. 693).

Differential reinforcement of other behavior. "A procedure for decreasing problem behavior in which reinforcement is contingent on the absence of the problem behavior during or at specific times" (Cooper et al., 2007, p. 694).

Direct assessment. Functional behavior assessment methods that involve actual observation of the target behavior (Cooper et al., 2007).

Discrete trial functional analysis. A method of functional analysis that applies the traditional functional analysis conditions in trials distributed across a person's day. Trials are typically one to two minutes with a control condition (e.g., no work) for the first half followed by a test condition (e.g., presenting work). Percentage of trials that evoke the target behavior is calculated (Iwata & Dozier, 2008).

Discriminative stimulus. "An antecedent stimulus correlated with the availability of reinforcement for a particular response class" (Cooper et al., 2007, p. 261).

Establishing operation. "A motivating operation that establishes (increases) the effectiveness of some stimulus, object, or event as a reinforcer. For example, food deprivation establishes food as an effective reinforcer" (Cooper et al., 2007, p. 695).

Extinction. "The discontinuing of a reinforcement of a previously reinforced behavior (i.e., responses no longer produce reinforcement); the primary effect is a decrease in the frequency of the behavior until it reaches a prereinforced level or ultimately ceases to occur" (Cooper et al., 2007, p. 695).

Fixed-interval schedule of reinforcement. "A schedule of reinforcement in which reinforcement is delivered for the first response emitted following the passage of a fixed duration of time since the last response was reinforced" (Cooper et al., 2007, p. 695).

Fixed-ratio schedule of reinforcement. "A schedule of reinforcement requiring a fixed number of responses for reinforcement" (Cooper et al., 2007, p. 696).

Functional analysis. "An analysis of the purposes (functions) of problem behavior, wherein antecedents and consequences representing those in the person's natural routines are arranged within an experimental design so that their separate effects on problem behavior can be observed and measured" (Cooper et al., 2007, p. 696)

Function-based crisis intervention. A system for intervening with dangerous challenging behaviors that organizes function-based interventions according to the stages of crisis intervention (Stevenson & Wood, 2016).

Function-based intervention. "A strategy used to improve behavior by developing intervention components based on prior assessment of the function of a challenging, or target, behavior" (Janney, Umbreit, Ferro, Liaupsin, & Lane, 2012, p. 113)

Functional-behavior assessment. "A systematic method of assessment for obtaining information about the purposes (functions) a problem behaviors serves for a person; results are used to guide the design of an intervention for decreasing the problem behavior and increasing appropriate behavior" (Cooper et al., 2007, p. 696)

Functional communication response. A communicative response that is functionally equivalent to the challenging behavior targeted for reduction (Carr, Smith, Giacin, Whelan, and Pancari, 2003).

Functional communication training. "An antecedent intervention in which an appropriate communicative behavior is taught as a replacement behavior for problem

behavior usually evoked by an establishing operation (EO); involves differential reinforcement of alternative behavior (DRA)" (Cooper et al., 2007, p. 696)

Idiosyncratic variables. Environmental variables influencing a behavior that are unique to the target individual.

Indirect assessment. Functional behavior assessment methods that obtain data from recollections, reconstructions, or subjective ratings of the behavior (Cooper et al., 2007).

Intellectual disability. "Intellectual disability (intellectual developmental disorder) is characterized by deficits in general mental abilities, such as reasoning, problem solving, planning, abstract thinking, judgment, academic learning, and learning from experience. The deficits result in impairments of adaptive functioning, such that the individual fails to meet standards of personal independence and social responsibility in one or more aspects of daily life, including communication, social participation, academic or occupational functioning, and personal independence at home or in community settings." (American Psychiatric Association, 2013)

Latency functional analysis. A variation of a traditional functional analysis that assesses the latency between the beginning of the session and the occurrence of challenging behavior as opposed to the rates of challenging behavior in a given condition (Thomason-Sassi, Iwata, Neidert, & Roscoe, 2011).

Matching law. "The allocation of response to choices available on concurrent schedules of reinforcement; rates of responding across choices are distributed in proportions that match the rates of reinforcement received from each choice alternative" (Cooper et al., 2007, p. 699).

Mixed schedule of reinforcement. "A compound schedule of reinforcement consisting of two or more basic schedules of reinforcement (elements) that occur in an alternating, usually random, sequence; no discriminative stimuli are correlated with the presence or absence of each element of the schedule, and reinforcement is delivered for meeting the response requirements of the element in effect at any time" (Cooper et al., 2007, p. 699).

Motivating operations. "An environmental variable that (a) alters (increases or decreases) the reinforcing or punishing effectiveness of some stimulus, object, or event; and (b) alters (increases or decreases) the current frequency of all behavior that has been reinforced or punished by that stimulus, object, or event" (Cooper et al., 2007, p. 699)

Multiple schedule of reinforcement. "Presents two or more basic schedules of reinforcement in an alternating, usually random, sequence. The basic schedules within the multiple schedule occur successively and independently. A discriminative stimulus is correlated with each basic schedule, and that stimulus is present as long as the schedule is in effect" (Cooper et al., 2007, p. 319).

Noncontingent reinforcement. "A procedure in which stimuli with known reinforcing properties are presented on fixed-time (FT) or variable-time (VT) schedules completely independent of behavior; often used as an antecedent intervention to reduce problem behavior" (Cooper et al., 2007, p. 700)

Peak. The fifth phase in the cycle of acting out behavior; "Generally, the students' behaviors are characterized by disruption so serious that class cannot continue or continues with difficulty. In addition, peak behaviors often represent a threat to the safety of others or to the involved students" (Colvin & Scott, 2015, p. 41)

Physical restraint. "A personal restriction that immobilizes or reduces the ability of a student to move his or her torso, arms, legs, or head freely. The term physical restraint does not include a physical escort. Physical escort means a temporary touching or holding of the hand, wrist, arm, shoulder or back for the purpose of inducing a student who is acting out to walk to a safe location." (U.S. Department of Education, 2012)

Precursor functional analysis. A modification to the traditional functional analysis in which the traditional functional analysis method is used to analyze the function of responses that immediately precede the targeted challenging behavior (Dracolby & Smith, 2012).

Punishment. "Occurs when stimulus change immediately follows a response and decreases the future frequency of that type of behavior in similar conditions" (Cooper et al., 2007, p. 702)

Recovery. The seventh phase in the cycle of acting out behavior; "In this final phase – recovery – the student returns to a nonagitated and relatively normal state. Essentially, the student is able to participate, perhaps marginally, in instruction or the current classroom activities" (Colvin & Scott, 2015, p. 46)

Schedule of reinforcement. "A rule specifying the environmental arrangements and responses requirements for reinforcement; a description of a contingency of reinforcement" (Cooper et al., 2007, p. 703)

Schedule thinning. "Changing a contingency of reinforcement by gradually increasing the response ratio or the extent of the time interval; it results in lower rate of reinforcement per responses, time, or both" (Cooper et al., 2007, p. 703-704)

Seclusion. "The involuntary confinement of a student alone in a room or area from which the student is physically prevented from leaving. It does not include a timeout, which is a behavior management technique that is part of an approved program, involves the monitored separation of the student in a non-locked setting, and is implemented for the purpose of calming" (U.S. Department of Education, 2012)

Stimulus delta. "A stimulus in the presence of which a given behavior has not produced reinforcement in the past" (Cooper et al., 2007, p. 705).

Structural analysis. A systematic evaluation of the antecedent variables that evoke a behavior of interest by altering analog antecedents conditions in an experimental design (Stichter, Randolph, Kay, & Gage, 2009)

Tandem schedule of reinforcement. "A schedule of reinforcement identical to the chained schedule except, like the mix schedule, the tandem schedule does not use discriminative stimuli with the elements in the chain" (Cooper et al., 2007, p. 75-706).

Triggers. "Defined as those events that set off the cycle of acting-out behavior. The triggers serve to increase the agitation level of the student" (Colvin & Scott, 2015, p. 27-28).

Variable-interval schedule of reinforcement. "A schedule of reinforcement that provides reinforcement for the first correct response following the elapse of variable durations of time occurring in a random or unpredictable order. The mean duration of the intervals is used to describe the schedule" (Cooper et al., 2007, p. 707).

Variable-ratio schedule of reinforcement. "A schedule of reinforcement requiring a varying number of responses for reinforcement. The number of responses required varies around a random number; the mean number of responses required for

reinforcement is used to described the schedule (e.g., on a VR 10 schedule an average of 10 responses must be emitted for reinforcement, but the number of responses required following the last reinforced response might range from 1 to 30 or more; Cooper et al., 2007, p. 708).

CHAPTER TWO: LITERATURE REVIEW

The proposed intervention consists of three broad components: crisis intervention, FBA, and function-based intervention (FBI). This chapter will review those broad categories as well as relevant sub-components. First, the literature on crisis intervention will be reviewed. This will begin with a brief overview of the foundational work on crisis intervention, followed by a review of several systematized methods of crisis intervention. Second, the literature on FBA will be reviewed. This will begin with the seminal works of scholars such as Carr and Iwata. Following this will be a review of various methods of FBA. Last, the literature on FBI will be reviewed. This section will focus specifically on FBI for improving the severe problem behavior of individuals with disabilities.

2.1 Crisis Intervention

Crisis intervention has long been used to intervene with individuals who exhibit dangerous problem behaviors across a range of populations and settings. A quick scan of the literature shows studies applying crisis intervention with students with and without disabilities in schools, individuals with disabilities in residential settings, patients in psychiatric wards and hospitals, and more. The origins of crisis intervention date back to Caplan's (1964) seminal work on preventative psychology where he laid out an initial model of crisis. Extending from this initial conception, many structured models of crisis have been developed to guide intervention. These include Life Space Crisis Intervention (LSCI), Nonviolent Crisis Intervention (NCI), Therapeutic Crisis Intervention (TCI),

Strategies in Crisis Intervention and Prevention (SCIP), and Positive Behavior Management (PBM). Finally, a few scholars have focused on the application of crisis intervention in schools specifically, making recommendations for how to conceptualize, plan, and intervene in the school setting. This final group includes the work of Gilliam (1993), Rock (2000), and Colvin and colleagues who developed two structured models of crisis intervention for schools: the Cycle of Acting-Out Behavior (Colvin & Scott, 2015) and the Cycle of Meltdowns for Students with Autism (Colvin & Sheehan, 2012).

2.2 Caplan

Though multiple scholars were working on the concept of crisis intervention in the 1960s and 1970s (e.g., Caplan, 1961; Long, Morse, & Newman, 1965; Parad, 1965), the seminal work stems from Caplan's (1964) *Principles of Preventive Psychology*. According to Caplan, people generally exist in a stable state, able to manage problems with their repertoire of adaptive skills. However, when a stressful event occurs that is beyond a person's ability to manage, a crisis occurs. With this in mind, a crisis can simply be defined as any time an individual's ability to cope or manage his or her situation has been exceeded (Morse, 1965a).

Caplan (1964) further detailed his concept of crisis by describing a process of escalating behaviors people exhibit as they move from a stable state to a crisis state. The process begins with the threatening event occurring and the person applying typical coping strategies. If the typical coping skills fail to resolve the threatening event, stress and tension escalate in the individual. As tension continues to increase, emergency and novel measures are attempted. If these methods fail, a breaking point is reached and crisis occurs in the form of disorganization of the individual's personality.

Critical to Caplan's (1964) conception of crisis intervention was that during a crisis new methods of coping are learned. On the one hand, it is possible the individual discovers new, socially acceptable means of coping to assist with future events. However, it is equally possible that socially unacceptable coping methods develop (e.g., aggression). If these methods resolve the threatening event they can become ingrained as parts of the person's means of dealing with stressful situations going forward. In this way, individuals in crisis can be seen as simply seeking an effective way to cope with their environment (Morse, 1965b). As such, a central tenet of crisis intervention is that problematic situations are opportunities for significant therapeutic impact with the ultimate goal being to teach the person effective coping skills to be maintained over time (Morse, 1965a). While it is acknowledged that individuals in crisis are typically difficult to teach, intervention at this point is critical because of the impressionable state people are in.

2.3 Life Space Crisis Intervention (LSCI)

Building from this foundational work on crisis intervention, a number of more formal systems have been developed. One such system is LSCI. Based on the Conflict Cycle described by Long, Morse, and Newman (1996), LSCI describes crisis as occurring when environmental stressors combine with pre-existing negative thoughts and beliefs. In essence, the cycle begins when a person has negative associations with someone or something, and an event seems to confirm those associations. For instance, a student may think nobody likes him and when the class selects partners for an assignment he is left without a partner. Even if this is by happenstance, it still supports the student's belief that no one likes him. Consequently, the student begins to exhibit inappropriate behavior

(e.g., disrupting the groups). Typically adults respond to inappropriate behavior by matching the student's emotional intensity, so if the student is escalating the teacher escalates as well. The adult response adds stress to the environment and often plays into the student's pre-existing beliefs (e.g., the teacher's response confirms for the student the teacher does not like him either). As such, the cycle repeats at an escalated level continuing until a crisis occurs.

Working off the tenet that crisis is a moment for unique insight and intervention, LSCI has caregivers engage in discussions with students at the moment of crisis to uncover the causes of behavior problems, facilitate student insight into their own behaviors, and encourage appropriate adaptive behavior (D'Oosterlinck et al., 2008). This approach is done through six stages of intervention. The first three stages are intended to de-escalate the student and assess the issue (D'Oosterlinck et al., 2008). These stages include: (a) student crisis, when the caregiver seeks to simply de-escalate the student; (b) student timeline, when the adult guides the student through sharing his understanding of the crisis; and (c) central issue, when the caregiver identifies the individual's pattern of self-defeating behavior (Dawson, 2001). The next three stages are meant to facilitate the student developing a lasting, generalizable solution to the problem (D'Oosterlinck et al., 2008). These include: (a) student insight, where the student is encouraged to understand his/her pattern of self-defeating behavior; (b) student new skills, during which the caregiver instructs the individual in adaptive skills to replace the self-defeating behavior; and (c) student transfer of training, when the caregiver meets with others to ensure the new skills are reinforced across settings (Dawson, 2001).

A number of articles have been published on LSCI. These include several data-based studies and two articles describing methods to integrate LSCI with positive behavior supports. Both are reviewed below followed by a summary of the literature on LSCI.

2.4 Data-based studies. Five studies have used LSCI for clinical applications. In 2001, Dawson completed her dissertation on the effects of training teachers in LSCI on the inappropriate behavior (i.e., crisis incidents, cognitive/behavioral/emotive manifestations of emotional disturbance) of students with emotional behavioral disorders (EBD), aged 11-15. Using a pre/post control group design, teachers in in-tact schools were assigned to treatment and control groups. Teachers were trained biweekly from October to December 1999, followed by weekly visits from January to May 2000. Analysis showed teachers in the experimental school had a statistically significant greater reduction in crises than teachers in the control school. Additionally, descriptive data indicated teachers in the experimental school experienced greater improvements in suspensions, attendance, transfers to less restrictive environments, and staff confidence.

Two years later, Dawson (2003) applied LSCI in New York City public schools with students with emotional disturbances. Participants were assigned to treatment or control conditions based on their presence in matched schools. Dawson had seven dependent variables, including (a) number of student crises, (b) number of student suspensions, (c) attendance, (d) number of students transferred to more restrictive settings, (e) number of students transferred to less restrictive settings, (f) number of students partially mainstreamed, and (g) staff's perceived ability to manage crises. Once again, students in schools receiving training in LSCI showed greater improvement than

students in control schools for all dependent measures, with a statistically significant difference in the number of student crises.

Two years later, Grskovic and Goetze (2005) examined the impact of LSCI on the challenging behaviors of four students with IQ scores between 70 and 85 and severe achievement deficits. The researchers used two multiple baseline designs, each with two students. Implementation of LSCI led to immediate changes in level and trend for all students' challenging behaviors. However, a functional relation was not demonstrated because neither multiple baseline had three demonstrations of effect. Also, though challenging behaviors were directly measured, only one student's definition included a dangerous behavior (i.e., physical aggression), and aggression was only one type of challenging behavior identified for him.

In 2008, D'Oosterlinck et al. examined the effects of LSCI in specialized schools for students with behavior problems. Thirty-one pairs of students were matched based on similar characteristics and divided into treatment and control groups. The majority of students were diagnosed with high-incidence disabilities with only 7.04% of the control group and 3.33% of the experimental group being diagnosed with pervasive developmental disorder. A number of dependent measures were used to assess the effects on staff and students. These included the Multidimensional Anxiety Scale for Children, Scale for Interpersonal Behavior, Buss-Durkee Hostility Inventory-Dutch, Competence Experience Scale for Adolescents, and Child Behavior Check List. Significant effects favoring students in the treatment schools were found for direct aggression and social desirability as measured by the Buss-Durkee Hostility Inventory-Dutch, and for athletic skills as measured by the Competence Experience Scale for Adolescents. However, it

should be noted the Buss-Durkee Hostility Inventory-Dutch and Competence Experience Scale for Adolescents rely on self-reporting by the students. Therefore, they are measures of student perception, not direct measures of the various challenging behaviors.

A final study on LSCI was conducted by Soenen et al. (2009). These researchers examined the effects of LSCI and a level system on a number of measures in a treatment center for youth with EBD. The level system involved five different levels through which students progressed, each with specific goals for the student. Level one focused on aggression and bullying. Level two targeted caring for one's self, others, and property. Level three involved respecting rules and boundaries. Finally, in levels four and five individualized goals were created for participants. Dependent measures included time in program, academic achievement, and ratings on the Child Behavior Checklist, Teacher Report Form, Youth Self Report, and the Screen for Anxiety and Related Emotional Disorders. A pre/post without a control group design was used, and data were analyzed via analysis of variance (ANOVA). Results indicated significant improvements favoring the treatment group for academic performance, Child Behavior Checklist scales (i.e., internalizing behavior, anxious/depressed, delinquent behavior, social problems, affect disorder, anxiety disorder), and the Screen for Anxiety and Related Emotional Disorders. This study had substantial limitations. First, the experimental design had no control group and, therefore, had poor internal validity. Second, direct measures of challenging behaviors were unavailable. In lieu of these, Teacher and Youth Report Forms were used and both indicated challenging behavior remained unchanged over the 4 years. This indicates that the actual rates of challenging behaviors may have remained unchanged,

despite improvements in the Child Behavior Checklist and Screen for Anxiety and Related Emotional Disorders.

2.5 Life Space Crisis Intervention and Positive Behavior Supports. Based on the requirements by IDEA for use of FBA, Marston (2001) made suggestions for how LSCI could complement FBA and positive behavior supports. Beginning with a description of FBA, Marston referenced attempts by other scholars to incorporate covert behavior (i.e., thoughts) into the FBA process. By incorporating covert behavior, Marston suggested LSCI could play an important role in the FBA process. LSCI could add data to the FBA as the different points in the Conflict Cycle lead to observable behavior and encourage students to explain the causes of their behavior. These insights could help identify the function of the behavior and have the student take a central role.

Duggan and Dawson (2004) also proposed a way to combine LSCI and positive behavior supports. They described how the special education district in New York incorporated LSCI into the existing positive behavior supports system. The existing system was based on the belief that students' strengths and needs have to be understood for a student to progress. The system included: (a) an incentive system based on simple, positively stated rules; (b) school-wide routines for activities such as transitions, and lunch; (c) proactive classroom management techniques; (d) social skills instruction; (e) individual behavior support plans based on FBAs; and (f) crisis intervention. The New York special education district infused LSCI throughout all the above phases. For instance, the philosophy that all crises are opportunities for change was integrated into the positive behavior supports philosophy. Social skills were a focus of every application

of LSCI. Additionally, the insights revealed through LSCI were used to inform the FBA and assist in the development of individualized strategies.

2.6 Summary. The research on LSCI shows some promise for application for students with disabilities. Multiple studies have shown LSCI resulting in a reduction in crises; two with students with EBD (Dawson, 2001; Dawson, 2003) and one with students with mild ID (Grskovic & Goetze, 2005). Similarly, D'Oosterlinck et al. (2008) and Soenen et al. (2009) reported significant improvement in student behavior, though both of these studies utilized indirect measures of behavior. However, the quality of the studies needs to be considered when interpreting the results as two studies had factors that compromised the internal validity. Grskovic and Goetze (2005) used multiple baseline design without three demonstrations of effect, and Soenen et al. (2009) study lacked a control group. Last, two articles described methods of incorporating crisis intervention and FBA (Duggan & Dawson, 2004; Marston, 2001).

2.7 Nonviolent Crisis Intervention

A second model of crisis intervention designed for application in the field of human services is NCI. Developed and copyrighted by the Crisis Prevention Institute, NCI is intended to be a practical program to allow staff to effectively manage the chaos of crisis episodes (Caraulia & Steiger, 1997). Caraulia and Steiger (1997) describe NCI as having four phases. The first is *anxiety*. At this stage the person is clearly becoming agitated, which can be observed through an increase in anxious behavior (e.g., pacing, fidgeting, rocking). During the anxiety phase, intervention should be *supportive*. This involves respecting the person's concern and responding empathetically (e.g., reassuring, offering to help, willingness to listen). If the situation is not resolved in the anxiety phase,

the person can escalate to the *defensive* phase. During this phase the person starts to lose control but still has some control. A defensive person may question, argue, yell, or threaten. Intervention should assist the person in regaining control by being *directive*. A directive response means providing simple, clear instructions while also, if necessary, setting limits by providing choices and related consequences. The third phase is the *acting-out person*, which is the phase in which the person loses control. He or she may become aggressive, and typically does not respond to supportive or directive interactions. As such, *nonviolent physical crisis intervention* may be required, which involves "nonharmful restraint techniques" (Caraulia & Steiger, 1997, p. 22) to maintain safety until the person regains control of his or her behavior. The fourth and final phase is *tension reduction*. This phase is highlighted as essential for intervention as the person is more open to change. As such, *therapeutic rapport* is recommended. This involves reviewing the crisis incident, the causes, and how to avoid future crises. A number of studies have been published on NCI. These include group design, descriptive, qualitative, and correlational studies. All are reviewed below.

2.8 Group design studies. As her dissertation, McIntosh (2003) conducted a study to examine the effects of NCI on the perceived self-efficacy of staff members at a mental health facility. Using a pre/post control group design without random assignment the researcher had 90 mental health workers (i.e., administrators, case managers, support staff, licensed professional counselors, nurses, psychologists, social workers) complete the *Safety in the Workplace* tool, a self-rating instrument, to measure self-efficacy immediately before, immediately after, and 6 months after treatment. *T*-tests and ANOVAs were used to analyze the differences in (a) self-efficacy, (b) anxiety arousal,

(c) avoidance of social activities, (d) participation in social activities, (e) personal vulnerability, (f) risk estimate, and (g) risk discernment. Results indicated a statistically significant difference in self-efficacy and perceived risk favoring the treatment group. Significant differences were not found for the other measures.

A year later, Smalls (2004) examined the effects of systemic changes (i.e., restraint education, policy changes, increased monitoring and review of restraint and programming, intense training in NCI) on the use of restraint and psychotropic medications for people with ID. Participants were 316 individuals with developmental disabilities. Staff members serving participants were provided 16 hours of training in NCI, 8 hours of training on restraint theory and application, and had to demonstrate mastery of training content. A pre/post without control group design was used over the course of 18 months. Results showed statistically significant decreases in restraint (94% reduction in restraint) and use of psychotropic medications (29% reduction psychotropic medications). Furthermore, no injuries occurred throughout the study. However, the absence of a control group weakened the internal validity of the study. Additionally, although reduction in restraints and medications would seem to indicate improved behavior, resident behavior was not measured. Therefore, it is possible the staff simply changed their responses to challenging behavior, and not that resident challenging behavior actually improved.

That same year McCue, Urcuyo, Lilu, Tobias, and Chambers (2004) reported the application of a treatment package in an attempt to reduce the frequency of restraint in a psychiatric inpatient setting serving individuals with psychiatric illness. The treatment package included (a) identifying patients who are likely to be restrained during intake, (b)

educating patients on stress and anger management, (c) training staff in NCI, (d) creating a crisis response team, (e) daily review of restraint episodes, and (f) incentives given to the unit with the fewest restraints each month. The study took place over a 5-year period with data being collected from 10,753 patients, 6,517 before intervention and 4,236 after intervention. Data were collected for 3 years prior to the intervention and compared to data for 2 years after the intervention was applied. A pre/post with no control group design was used and statistical analysis conducted via an unpaired, two-tailed *t* test. A statistically significant decrease in the rate of restraint (i.e., number of restraints per 1,000 patient-days) was found, which led the authors to conclude that with minimal expense and no additional staff, restraint can be reduced through education, monitoring, and administrative support. As with Smalls (2004), the lack of control group compromised the study's validity and there was no direct measure of patient behavior.

Three years, later Temple, Zgaljardic, Yancy, and Jaffray (2007) reported a study to assess the effects of NCI training on the comfort of 28 staff members when intervening with challenging behaviors. The study took place in a residential setting that served individuals with acquired brain injury. A pre/post with no control-group design and ANOVA were used to analyze scores on the Rehabilitation Situations Survey. After training, statistically significant decreases occurred in all of the Discomfort subsections (i.e., total, sexual situations, aggression, staff-staff interactions, motivation/adherence, interaction with family members) except depression. These decreases were maintained 1 month later except for interaction with family members. Once again, the lack of a control group was a major limitation of this study.

A second 2007 study investigating NCI was conducted by Tierney, Quinlan, and Hastings. The researchers assessed the effects of staff training on staff perceptions on self-efficacy, emotional reactions, and beliefs regarding the causes of behavior. Forty-eight staff members from organizations servicing individuals with ID were given a 3-day training consisting of (a) an overview of challenging behavior and positive behavior supports, (b) NCI, and (c) the effects of stress on staff working with individuals with challenging behavior. Challenging Behaviour Attributions (Hastings, 1997) and Emotional Reactions to Challenging Behaviour (Mitchell & Hastings, 1998) questionnaires were completed before training and 3 months after training. *T*-tests showed significant improvement in perceived self-efficacy, but not in either of the other areas the questionnaires measured (i.e., negative emotional reactions to challenging behavior, formulating a causal hypothesis for challenging behaviors). The researchers concluded the training described can improve confidence, but does not seem to alter the negative emotions staff experience or their beliefs regarding the causes of behaviors. A major limitation was the internal validity due to the lack of a control group.

Ryan et al. (2007) conducted a third study on NCI. Specifically, Ryan et al. evaluated the effects of NCI on the interventions used by 90 staff in a special school in Montana for students with inappropriate behaviors. The researchers used a pre/post without a control group as a research design. Dependent variables included (a) frequency of timeout and restraint, (b) mean duration of seclusion, and (c) percentage of timeout incidents that escalated to restraints. Additional descriptive statistics were also reported (i.e., interventions across gender and ethnicity, interventions across age and grade level, when incidents occurred, reasons for seclusion and restraint). Reductions in the frequency

of timeout and restraint occurred. However, the duration of seclusion remained the same while the percentage of timeouts that escalated to restraint increased from 15.5% to 25.8%. A major limitation of this study was the absence of a comparison group.

Finally, Godfrey et al. (2014) conducted a study to examine the effects of NCI training and a policy change requiring upper-management approval for mechanical restraint on the rates of mechanical restraints used on 3,244 patients in a psychiatric hospital. NCI training was delivered first, and results analyzed. Then the policy change was implemented, and results of that were analyzed. The total length of the study was 3 years. A pre/post without a control group design was used and data were analyzed with a multivariate analysis of variance. Results revealed a significant reduction in mechanical restraint following NCI training. As with preceding studies, no control group compromised the internal validity of this study, and there was no direct measure of patient behavior.

2.9 Descriptive Studies. In addition to group design, descriptive research has been conducted on NCI. Jambunathan and Bellaire (1996) investigated staff use of NCI when confronting instances of crisis using descriptive statistics. The researchers specifically looked to answer the following: (a) what the most common behavioral cues for each level of NCI crisis (i.e., anxiety, defensive, acting out, tension reduction) were; (b) whether there were differences in interventions used among units; and (c) if there was a correlation between staff use of NCI techniques and patient diagnosis, history of violence, age, sex, type of hospital unit (e.g., adult, adolescent), and/or time of the crisis. Data were collected from crisis incidents at a state-run psychiatric hospital. Following a crisis instance, 10 nurses completed a 51-item questionnaire organized according to the

levels of the NCI crisis model. Both closed- and open-ended questions were used. Results from 146 incidents over a 3-month period showed 84.2% of crisis episodes were resolved without seclusion or restraint. The most common behavioral cues were raised voice for anxiety level, refusing to listen for defensive level, other (e.g., yelling, throwing food) for acting out level, and reduced muscle tension for the tension reduction level. Supportive response, opportunity to deescalate, offering medication, redirecting, exploring alternatives, and negotiating a contract were used more regularly on adult admission, adult treatment, and child/adolescent units. Allowing patients a chance to reduce stimuli and refocus was used more frequently on the multiply impaired unit. There were no significant findings for the third research question.

2.10 Qualitative Study. A third type of research conducted on NCI has been qualitative research. Walsh (2010) conducted a case study to examine the effects of crisis training on the perceptions of a 10-person crisis response team at an elementary school. Crisis response training involved NCI training supplemented with additional components (i.e., Defining Defiant Student Violence, Team Dysfunctions Model [Lencioni, 2002]), as well as six bi-weekly team meetings to review progress. Perceptions were measured via a survey before and after the study and compared to the data reviewed at bi-weekly meetings. Participants reported they were more effective, consistent, proactive, calm, and confident in response to crisis, suggesting crisis response teams should engage in continued structured meetings.

2.11 Correlational Study. A final research method used to study NCI is correlational research. Gillam (2014) investigated the relation between training staff in NCI and violent incidents in an emergency department. Violent incidents were tracked by

"code purples" initiated, which referred to any situation when violence has occurred or appears imminent. After a year of data collection, correlations were calculated using Pearson's *R*. A significant negative correlation was found between percentage of staff trained in NCI and code purples.

2.12 Summary. Several studies support the effectiveness of NCI. Most studies focused on improving staff attributes, reducing restraint, or a combination of both. This has led to NCI being linked to: (a) improved staff self-efficacy (McIntosh, 2003; Tierney et al., 2007); (b) improved staff comfort (Temple et al., 2007); and (c) staff describing themselves as more effective, consistent, proactive, calm, and confident (Walsh, 2010). Additionally, many studies have related NCI training to reductions in restraint (Gillam, 2014; Godfrey et al., 2014; McCue et al., 2004; Ryan et al., 2007; Smalls, 2004). However, when assessing the application of NCI research to the crisis behavior of individuals with DD in schools, the following limitations must be considered. First, the research designs used often lack the ability to demonstrate causality between NCI and the dependent variables. This includes group studies that lacked a control or comparison group (Godfrey et al., 2014; McCue et al., 2004; Ryan et al., 2007; Smalls, 2004; Temple et al., 2007; Tierney et al., 2007), qualitative research (Walsh, 2010), and correlational research (Gillam, 2014). Last, only two studies were conducted with staff serving individuals with DD (Temple et al., 2007; Tierney et al., 2007), and only two were conducted in schools (Ryan et al., 2007; Walsh, 2010).

2.13 Therapeutic Crisis Intervention (TCI)

Based on the crisis intervention theories developed and described by Caplan (1964), TCI was developed as a highly structured method to respond to crisis. TCI

operates on the assumption that a caregiver's ability to respond to a person's crisis in a caring, therapeutic, and appropriate way is crucial for resolving the crisis and developing the long term coping skills (Nunno, Holden, & Leidy, 2003). With this as the basis, caregivers are trained to view people's crises as an expression of needs and an opportunity for intervention. Holden and Powers (1993) described TCI as involving four stages. First is the *triggering phase*. This phase is described as the first instance of changing or escalating behavior. It is caused by an event that upsets the person. During this phase staff should realize the behavior has a meaning, assist the individual in identifying the meaning, and work to find a way for the person to express feelings without aggression while attending to the person's needs. Second is the *escalation phase,* which involves increased anxiety and signs that disruptive behavior is nearing. Trusted staff should work to interrupt the escalation process. This can be done by methods such as prompting for appropriate behavior, redirection, and listening to the person. The next phase is the *crisis phase,* which involves a loss of rationality and, often times, aggression and other dangerous behaviors. In this phase staff intervene to protect all persons involved, including the person exhibiting the dangerous behaviors. Physical intervention may be necessary, but should be a last resort. Last is the *recovery phase,* which is described as a decrease in tension. During this phase the person is described as the most responsive to intervention, and therefore it is an invaluable opportunity for progress. The authors describe the Life Space Interview (Redl & Wineman, 1957; Wood & Long, 1991) as an intervention to be used during this phase to facilitate children's ability to understand the causes of the crisis and devising more appropriate ways to manage the situation in the future. TCI training also instructs caregivers to be aware of their own emotions regarding

crisis to ensure negative interactions, such as counter aggression, do not occur (Dawson, 2001).

One data-based study on TCI has been conducted by Nunno et al. (2003). In this study the researchers reported on the effects of implementing TCI in a residential child care facility serving 350 children. One-hundred and twenty employees were included in the study. During a span of 18 months a package of interventions was implemented including review of existing practices, development of intervention goals, training in TCI, implementation of TCI, and assessment of the intervention. Using a pre/post without a control group design data were collected on the following dependent measures, (a) knowledge of crisis intervention techniques, (b) staff confidence, (c) interviews with staff, and (d) critical incident reports. Results indicated an increase in employee knowledge of crisis intervention techniques, statistically significant increases in confidence, and one of the four units had consistent decreases in crisis incidents across the study. A major limitation was the lack of a control or comparison group. Also, even though results were reported as statistically significant, the method of statistical analysis used was not reported. These factors, and the fact the study was conducted in a residential facility, limits the applicability of this study to students with DD in schools.

2.14 Strategies for Crisis Intervention and Prevention

A fourth method of crisis intervention is titled Strategies for Crisis Intervention and Prevention (SCIP) or Strategies for Crisis Intervention and Prevention – Revised (SCIP-R). West and Kaniok (2009) provided a thorough description of the SCIP program.

SCIP suggests challenging behavior serves one or more of five functions: *self-stimulatory*, to gain access to *tangibles*, to *escape* from someone or something, to gain

attention, and *medical* causes. These functions are referred to as STEAM. Concerning the escalation of crisis behaviors, SCIP uses a four-stage model consisting of setting events, early warnings, crisis, and recovery. There are three phases of intervention: early intervention, calming, and physical intervention. Early intervention involves recognizing behavioral signals that dangerous behavior is imminent (e.g., tension, agitation, outbursts, glares) and attempting to prevent the escalation to a crisis from occurring.

Next is calming strategies, which are divided into non-verbal (e.g., ignoring, proximity control, limiting space by changing the individual's location, assuming appropriate body posture, redirection) and verbal techniques (e.g., distracting the individual by changing the topic, alerting other staff members, expressing understanding and empathy, humor, working one-on-one with the individual). All calming techniques should adhere to the following six-step sequence. First, *identify* the individual's feelings. Second, the staff member should *reflect* by stating the emotion the individual is exhibiting. Third, show *empathy* by providing a personal example of a similar experience. Fourth, caregivers are trained to *reassure* the person the caregiver is there to help. The fifth step is to *redirect* the individual to another activity. Finally, *praise* the individual for complying with redirection.

In the event that early intervention and calming techniques fail, physical intervention (e.g., escorts, restraints) may be necessary. However, the minimum amount of physical intervention necessary should be applied. When physically intervening, SCIP requires caregivers to monitor the individual's health at all times. Caregivers are trained to attend to the acronym BANC, which stands for breathing, ability to move, noise or sound, and color of facial skin. Additionally, once the individual has regained control,

caregivers should slowly fade their presence from physical intervention to touch to verbal support.

After the crisis is over, the individual should be medically examined, offered basic needs (e.g., water, bathroom), and debriefing with the individual should occur. Debriefing follows a seven-step process: isolate, explore, share, connect, alternatives, plan, and enter. *Isolate* refers to removing the individual from the situation; *explore* consists of analyzing the individual's point of view; *share* has the caregiver state his/her point of view; *connect* links the crisis behavior with specific emotions and situations; *alternatives* involves identifying behaviors that could be used in place of the crisis behavior; *plan* specifies how and when the replacement behavior will be used; and *enter* returns the person back to the initial setting. At the end of any crisis, thorough documentation should be completed that is written immediately after the incident and records all the interventions attempted and their effect.

There has been only one published study on SCIP (Baker & Bissmire, 2000). In this this study, the researchers sought to (a) ascertain the rate of physical restraint used by staff in a residential treatment setting for individuals with ID, and (b) evaluate the effectiveness of SCIP training on staff confidence and incidents of physical intervention. Using a pre/post without a comparison group design, a 2-day workshop on SCIP was provided. Results indicated 17 staff felt more confident in their ability. However, there was no effect on the rates of participant behavior, and data indicated an increase in staff's tendency to respond physically. The authors concluded that, because of these findings, SCIP should be used to support other interventions. In sum, similar to other approaches SCIP appears promising for improving staff confidence, though this is based on one pre-

experimental study. Additionally, SCIP does not appear effective at reducing the crisis behavior of individuals with DD.

2.15 Positive Behavioral Management

Another crisis intervention program has been developed and researched by Allen and colleagues in England. Initially referred to as Management of Aggression Training Program (Allen & Tynan, 2000) and later as Positive Behavioral Management (PBM; Hawkins, Allen, & Jenkins, 2005), the model was initially developed to move away from pain-inducing methods of intervening with individuals with ID exhibiting aggressive and dangerous behavior in residential behavioral treatment settings. The training program developed included: (a) education on the nature of aggressive incidents; (b) primary prevention consisting of antecedent strategies to manage setting events and triggers; (c) secondary prevention, which involved strategies to respond to early phases of escalation; (d) reactive strategies to safely, efficiently, and effectively physically manage patients' aggressive behaviors; and (e) how to provide post-incident support for both patients and staff who were involved in an aggressive episode (Allen, McDonald, Dunn, & Doyle, 1997). Over time the program has been updated as needed. For instance, all techniques using restraints on the floor were removed (Kaye & Allen, 2002). Also, trainings are individualized so that only the techniques that are most relevant to the target setting are taught (Kaye & Allen, 2002).

A number of studies have been published on PBM examining its effects on crisis incidents, its effects on staff knowledge and confidence, how PBM is actually used, and staff and patient experience with PBM. First, Allen et al. (1997) conducted the first study to look at the effects of staff training in responding to aggression on the rates of

behavioral incidents, use of physical intervention, and injuries in the care of seven individuals with ID in a residential behavioral treatment unit. The intervention involved training on all five components of PBM listed above, as well as the importance of using minimal physical restraint. Descriptive and correlational statistics were used to analyze the data. The number of behavioral incidents showed an overall decrease. The use of physical intervention also decreased, but not by a statistically significant amount. Finally, a decreasing trend in injuries was shown that was statistically significant. The authors noted a number of limitations. These included the non-experimental design, inconsistent data collection, not having consistent staff (i.e., more effective staff could have been hired later in the study), and the small sample size.

In the second study on PBM, Allen and Tynan (2000) investigated the effects of training in PBM on the confidence of 109 community service staff members serving individuals with DD who exhibited challenging behavior. This was designed as a two-phase study. The researchers first assessed the differences between a group that had been previously trained and a group who had not (between groups) on the Confidence in Coping with Patient Aggression Instrument. Second, they assessed the differences between the untrained group before and after training (within groups). For the between groups comparison, a Mann-Whitney *U* test was used. This resulted in the trained group being significantly more confident. Additionally, small but significant differences were found in knowledge of reactive behavior management that favored the trained staff. For the within groups comparison, the Wilcoxon signed-rank test was used. Results indicated significant increases in confidence and knowledge of reactive behavior management post-training. Although there was no measure of whether PBM affected patient behavior, the

researchers explained the study's relevance to improving patient behavior by writing that training in programs like PBM may be a prerequisite to staff implementing positive behavioral supports. The authors noted the following:

> If caregivers do not feel safe, the likelihood that they will implement and maintain more complex behavioral strategies, such as differential reinforcement or functional communication training, is slight… By delivering reactive training within the overall context of a positive behavioral approach, service providers can reduce the risk of reinforcing crisis-oriented working practices (Allen & Tynan, 2000, pp. 101).

Two years later Kaye and Allen (2002) conducted a descriptive study to determine the extent to which staff on a residential unit who were trained in reactive physical intervention (i.e., PBM) used the techniques learned. To collect data, an unspecified number of staff members completed a researcher-developed form following physical intervention. The form had four sections; the total techniques available, frequency of techniques used, comments on the techniques used, and total amount of techniques used per month. Results showed 15 out of 42 available techniques were used. Additionally, 90% were evasive/breakaway techniques, 4% were removal procedures, and 6% were restraint. Authors concluded that more focused training on techniques most relevant to the served population should be used.

A final study on PBM examined the experiences of staff-administering physical intervention and individuals receiving it. Hawkins et al. (2005) examined these experiences by interviewing eight dyads of staff and service recipients (i.e., individuals with ID in residential treatment centers) up to, but not exceeding, a week after an incident requiring physical intervention. The semi-structured interviews focused on (a) the impact of physical intervention on the recipients of intervention, (b) staff perception of impact on recipients, (c) the impact of physical intervention on the staff administering it, (d)

recipients' perception of the impact on staff, and (e) comparing the accounts of staff and recipients. Using Grounded Theory, results indicated recipients of physical intervention had negative experiences, regularly citing pain and discomfort. This was unexpected since PBM emphasizes non-pain-compliant techniques. Hawkins et al. also found much variation in the reports by staff and recipients, with recipient accounts being more negative. They concluded this lack of understanding by staff of recipients' experiences indicated staff did not fully appreciate the impact of physical intervention on recipients. Third, staff experience of physical intervention was largely negative, with the inability to predict the recipient's behavior having a clearly negative effect on staff experience. Finally, recipients had difficulty describing their perception of staff experiences.

2.16 Summary. The majority of the research on PBM has been conducted in settings serving individuals with ID in residential settings, not schools (Allen et al., 1997; Allen & Tynan, 2000; Hawkins et al., 2005; Kaye & Allen, 2002). The results indicated PBM has led to increased staff confidence and knowledge of crisis intervention (Allen & Tynan, 2000), as well as a reduction in behavioral incidents and injures (Allen et al., 1997). With that being said, these results came from studies that are unable to imply causality due to lacking an experimental design. Other results requiring consideration are that staff only used a select few techniques, which indicated training should be focused on those most relevant (Kaye & Allen, 2002), and that staff did not fully appreciate the effect physical intervention has on individuals (Hawkins et al., 2005).

2.17 Recommendations for Crisis Intervention in Schools

As has been shown, Caplan's seminal work has been applied in a number of settings. However, it took some time before concrete recommendations were made for

addressing crises in schools. This section will summarize four works that make specific recommendations for schools. These are Gilliam (1993), Rock (2000), Colvin and Scott's (2015) book *Managing the Cycle of Acting-Out Behavior in the Classroom*, and Colvin and Sheehan's (2012) *Managing the Cycle of Meltdowns for Students with Autism Spectrum Disorders*.

In 1993 Gilliam made recommendations for predicting and managing crisis in schools. He outlined three phases (i.e., precrisis, crisis, postcrisis) with recommendations for interventions during each. Precrisis was described as any event that could directly trigger a crisis. Examples given included engaging in dangerous behaviors such as being aggressive towards others, ingesting toxic substances, playing with hazardous materials, and more. The goal of precrisis intervention is to prevent escalation to crisis. Gilliam specifically recommended implementing strategies to teach skills that can effectively replace the dangerous behavior (e.g., social skills, requesting a break). Gilliam also made recommendations for daily interactions to prevent crisis from occurring. These included (a) setting clear rules regarding behavior, (b) setting consequences ahead of time and consistently enforcing them, (c) responding to violations without emotion, (d) allowing students to maintain self-respect, (e) ensuring everyone understands behavioral expectations, (f) modeling desired behavior, (g) discussing what students do as opposed to why, (h) avoiding arguing, and (i) intervening before conflict arises. Finally, Gilliam acknowledged that regardless of the quality of programming, crises will occur. Therefore, the final precrisis recommendation was to create and practice a crisis plan until proficient. Crisis plans should define the crisis behavior, identify individuals responsible for intervening, and have specific steps to take during and after the crisis.

The second phase in Gilliam's (1993) model is crisis, defined as anytime "a student's behavior requires immediate attention to protect the physical and/or psychological safety of that student, the teacher, or others" (Gilliam, 1993, p. 224). With safety as the top priority, recommendations consisted of (a) following the crisis plan, (b) staying calm, (c) staying out of range of the student, (d) explaining why the student needs to cease the behavior, (e) using the least amount of intervention possible, and (f) *not* becoming aggressive in return. Though physical intervention may be necessary, it should always be a last resort. Additionally, any physical intervention should only be applied by trained individuals, follow school policies, and only be used after seeking permission from parents.

The final phase is postcrisis, meaning after the student's behavior is under control. Gilliam suggested that a student may require seclusionary time-out until he is calm for 1-2 min. After the student is calm, the teacher should review why the student was in time-out, describe the expectations in the classroom, and return the student to the class. Finally, an incident report should be completed.

Seven years later, Rock (2000) extended the work on crisis intervention in schools. Whereas Gilliam (1993) focused on a model of crisis intervention, Rock focused on the process for crisis planning. Working with a similar definition of crisis as Gilliam's definition (i.e., students who pose an immediate threat to themselves and others), Rock suggested a collaborative method that focused on two goals: to protect students from injury and to protect teachers from injury. To achieve this goal a six-step framework was developed for intervening. These steps consist of (a) defining *when* crises are considered to be occurring, (b) identifying *who* will be responsible for intervening, (c) determining

how to notify crisis team members, (d) describing *what* individual roles and responsibilities will be, (e) deciding *where* intervention should take place, and (f) examining *why* the crisis occurred. Rock emphasized that crisis plans should be collaboratively designed, monitored for effectiveness, included in a student's IEP, have systems in place to record each episode, and require staff be formally training in crisis intervention. Interestingly, an early call for integrating FBA and crisis intervention was made with the suggestion that crisis team members identify precursors and motivational variables using FBA. Last, influences from Caplan (1964) can be seen in the recommendation that crisis be an opportunity for student growth.

2.18 Cycle of acting-out behavior. A detailed model for crisis intervention that was specifically developed for use in schools is the cycle of acting-out behavior. Developed initially by Colvin, and most recently updated by Colvin and Scott (2015), it is apparent this model is based on many of the same fundamental principles as others. For instance, Colvin and Scott describe crises as an escalating chain of behaviors that begins with a trigger (i.e., stressful event) that the student is unable to manage. Additionally, the importance of teacher intervention during the cycle is stressed in order to teach the student to become aware of the events in the escalation process and select appropriate behaviors to use in the future.

Colvin and Scott (2015) divide a crisis into seven phases, including (1) calm, (2) triggers, (3) agitation, (4) acceleration, (5) peak, (6) de-escalation, and (7) recovery, with accompanying strategies for each phase. The first phase, calm, refers to when the student is displaying appropriate behaviors (e.g., compliant, cooperative, responsive). Although there is no imminent threat of crisis occurring during this phase, interventions are still

recommended to prevent a crisis from occurring. These include proactive strategies such as appropriately designing the physical space, developing a practical schedule, establishing classroom expectations, implementing classroom routines, and using appropriate and engaging instruction.

The second phase is triggers, which refers to any event that can initiate the cycle of acting-out behavior. Triggers can be school based (e.g., conflicts with teachers, changes in routine, peer conflicts, poor problem solving, making errors) or non-school based (e.g., health problems, nutrition needs, lack of sleep, conflict at home). Trigger strategies are divided into two phases: precorrection and social skills. Precorrection refers to identifying the triggers and prompting appropriate behavior before the student exhibits the inappropriate behavior. Social skills training involves identifying and teaching the student strategies to solve the problems.

In the third phase, agitation occurs when a student is unable to manage a trigger. Colvin and Scott (2015) state this can lead to increases in behavior (e.g., darting eyes, frequent switches of groups, cycling between being on- and off-task) or decreases in behavior (e.g., withdrawing from groups, lack of eye contact, reduced communication). Students in this phase often look upset, depressed, worried, and/or frustrated. Interventions are intended to calm the student as soon as possible. For instance, teachers are supposed to convey empathy, assist in a challenging task, provide space or additional time, and allow access to preferred activities within certain limits.

During the fourth phase, acceleration, the agitated student attempts to directly engage the teacher. This can occur in multiple ways such as questioning, arguing, refusal to follow directions, provoking peers, property destruction, and threats to name a few.

Intervention should focus on: (a) avoiding escalating of the student; (b) remaining calm, detached, and respectful; (c) addressing the student non-threateningly; (d) setting limits non-confrontationally; (e) following through with stated contingencies; and (f) debriefing when possible. Debriefing involves assisting the student to identify the stressful environmental events, evaluate possible decisions, and choose appropriate options.

The fifth phase, peak, is the most serious phase. During this phase, students exhibit dangerous behaviors including aggression, self-injury, severe tantrums, and elopement. The primary concern of intervention is maintaining safety and complying with school and district policy. Documentation, debriefing, and evaluation of the plan need to occur following a crisis.

The sixth phase is de-escalation. This phase marks the beginning of a reduction of behavioral intensity. Students may continue to be uncooperative and unresponsive; however, they no longer present an immediate threat. Behaviors said to occur during de-escalation are confusion, attempts at reconciliation, withdrawal, denial, and deflecting blame. Teachers are encouraged to enact strategies that assist the student to return to a calm state. This includes isolating the student, having him engage in previously mastered independent work with reasonable expectations (e.g., completing a specific number of math problems without arguing), completing exit paperwork as necessary, determining consequences, restoring the environment if damaged, and resuming the typical schedule.

The seventh and final phase is recovery. At this point the student returns to a relatively typical state, though he or she may be defensive and prefer independent work. Intervention at this point focuses on transitioning the student back to the typical environment. This involves adhering to typical routines, not negotiating consequences for

the inappropriate behavior, praising appropriate behavior, and offering encouragement. Additionally, teachers should debrief with the student, as described in the acceleration phase, to create a plan for the next time the trigger is encountered.

2.19 Cycle of meltdowns for students with Autism Spectrum Disorder.

Following the earlier versions of *Managing the Cycle of Acting-Out Behavior in the Classroom*, Colvin and Sheehan (2012) developed a version specifically targeted for students with autism in a book titled *Managing the Cycle of Meltdowns for Students with Autism Spectrum Disorder*. The authors contended a separate model was necessary due to the unique characteristics of students with autism (i.e., social deficits, communication deficits, restricted interests, repetitive behavior, atypical responses to sensory experiences, cognitive deficits, physical health, emotional health, motor skill deficits). The authors also contended that "meltdowns" are qualitatively different from "tantrums" or "acting-out" behavior, stating meltdowns are internally driven whereas tantrums and acting out behavior are controlled by a need in the environment.

With the idea that acting-out behavior and meltdowns are different, Colvin and Sheehan (2012) described a six-phase model. These phases include (1) calm, (2) triggers, (3) agitation, (4) meltdown, (5) re-grouping, and (6) starting over. The calm phase describes when the student is appropriately interacting within the classroom (e.g., on-task, following directions, accepting help, transitioning between activities, initiating interaction, responding to praise). Intervention during this phase is meant to keep students productively engaged in the classroom activities. This includes managing the classroom layout, proactively addressing sensory issues, using visual supports, planning peer

support, teaching rules and expectations, following established routines, and delivering high quality instruction that is engaging.

The second phase, triggers, incudes events that initiate the cycle of meltdowns by disrupting a calm state. Common triggers listed by Colvin and Sheehan (2012) were schedule disruptions, sensory overload or cravings, inability to communicate wants or needs, inability to understand, conflicts (e.g. denied access to preferred stimuli), too much pressure, poor problem solving, receiving correction, motor activities, health issues, and issues at home. To address triggers, teachers should work to eliminate them entirely or reduce their effect. The authors list modifying the environment to address sensory issues, using visual supports, preparing for unexpected events (e.g., practicing variations in schedule, quickly intervening), promoting appropriate behaviors (e.g., precorrection, behavioral momentum), and altering instruction (e,g., increasing opportunities to respond).

Agitation is the third phase of the cycle of meltdown. This phase refers to a sudden increase or decrease in behavior that typically occurs prior to meltdown. This can include increased self-stimulatory behavior, noncompliance, making inarticulate noises, withdrawal from activities, and more. Agitation intervention is intended to calm the student down so he or she can resume participating in activities. Colvin and Sheehan (2012) stress the importance of intervening as early in the process as possible. A number of strategies are suggested to accomplish this (e.g., use empathy, know the student and ensure demands are appropriate, provide space, provide support, schedule breaks, create relaxation centers, allow access to preferred activities within limits). Any intervention selected should be monitored for effectiveness and altered as needed.

The fourth phase, meltdown, refers to when students exhibit challenging behavior so disruptive the class is unable to continue. Examples listed include aggression, property destruction, self-injury, elopement, and severe tantrums. In the even a meltdown occurs, Colvin and Sheehan (2012) list specific steps to take. These are: (1) moving the student to a safe place; (2) being supportive, which involves remaining calm, being understanding and supportive, remaining present while avoiding physical contact, and slowing movements; (3) dealing with one student at a time; (4) watching for signs of recovery; and (5) documenting the events. All of these steps should be done with the understanding that (a) meltdowns will come to an end, (b) they are different than tantrums, (c) safety is the primary goal, and (d) restraint should only be used as necessary. Additionally, all parties should be trained on nonviolent physical intervention, parents and students should be aware of the procedure(s), and intervention should comply with school and district policy.

Re-grouping, phase five, signals the end of a meltdown and when students begin to transition to a state in which they are capable of resuming normal activities. Students are reported to often be confused and withdrawn during this phase; however, they also may begin responding to directions and are able to complete simple mechanical tasks. Intervention during re-grouping is intended to facilitate the transition from meltdown to typical functioning. Teachers are to accomplish this by providing a sequence of demand probes that move from simple, mastered responses (e.g., tell me your name, clap your hands) to those reflective of typical demands (e.g., current academic goal). As the student responds positively to the probes, they should increase in complexity.

The final phase is labeled starting over. At this phase students are able to resume typical class activities. Intervention during this phase is intended to successfully return the student to the class and teach the skills necessary for successful functioning in the classroom. Successful return to the classroom is accomplished by emphasizing scheduled activities and transitions. Teaching the necessary skills is achieved by debriefing, working on the student developing tolerance to aversive sensory experiences, emphasizing skill building going forward, and developing a positive behavior support plan. Teachers should be aware that upon resuming the activities they may be more subdued in their interactions and prefer individual work. Students may also be defensive during this phase and hesitant to engage in problem solving activities.

2.20 Summary. Recommendations for crisis intervention in schools include a basic format laid out by Gilliam (1993). This is that precrisis intervention should focus on prevention, intervention during a crisis should focus on safety, and intervention after a crisis should focus on increasing student understanding and skills so the student can manage future events. Colvin and Scott (2015) and Colvin and Sheehan (2012) expanded this basic model in great detail including strategies for when students are calm, escalating, and de-escalating. However, the basic structure remains consistent. Finally, Rock (2000) stressed the importance of a collaborative planning and intervention. It is important to note these recommendations come without any research to support their effectiveness. Though many of the specific strategies suggested during the various phases (e.g., precorrection) have empirical support, the effectiveness of organizing intervention according to these models has not been studied.

2.21 Summary of Crisis Intervention

Although there are a number of competing models for crisis intervention, a review of the literature reveals several common features. Fundamental to the field is the definition that a crisis occurs when a stressful event exceeds a person's coping abilities. Also, crises are universally understood to occur in predictable patterns of escalation beginning with a calm state, moving through various levels of agitation to crisis, and ultimately returning to calm again. Regarding intervention it is commonly held that early intervention is critical to preventing incidents from escalating to crisis, and safety should be the primary concern during crisis. Last, consistent across the various models of crisis is the idea that crisis affords a unique opportunity for teaching appropriate behavior, as individuals are particularly receptive to change at that point.

When considering application to students with DD, the literature has several strengths. First and foremost, as Caraulia and Steiger (1997) suggested, models of crisis intervention provide a practical way for human service workers to systematically intervene in chaotic situations. Additionally, a number of studies have shown training in crisis intervention improves various staff abilities including confidence (Allen & Tynan, 2000; Baker & Bissmire, 2000; Walsh, 2010), knowledge (Allen & Tynan, 2000; Nunno et al., 2003), self-efficacy (McIntosh, 2003; Tierney et al., 2007), and comfort (Temple et al., 2007). Reduction in restraint has been repeatedly demonstrated (Gillam, 2014; Godfrey et al., 2014; McCue et al., 2004; Ryan et al., 2007; Smalls, 2004). Last, studies also indicate crisis intervention may lead to behavioral improvements for people with disabilities (Allen et al., 1997; Dawson, 2001; Dawson, 2003; D'Oosterlinck et al., 2008).

Despite the strengths of previous research findings it is important to interpret these results within the constraints of the following limitations. First, many studies lacked a design that could demonstrate a causal link between training in crisis intervention and the respective dependent variable. Factors preventing a causal link included lack of a control group (Allen et al., 1997; Baker & Bissmire, 2000; Godfrey et al., 2014; McCue et al., 2004; Nunno et al., 2003; Ryan et al., 2007; Smalls, 2004; Temple et al., 2007; Tierney et al., 2007; Soenen et al., 2009), lack of three demonstrations of effect for single-case studies (Grskovic & Goetze, 2005), correlational designs (Gillam, 2014), and qualitative designs (Walsh, 2010). Also, some studies examining the effects of crisis intervention on challenging behavior used indirect measures of behavior (D'Oosterlinck et al., 2008; Soenen et al., 2009), while others showed mixed results in reducing challenging behavior (Nunno et al., 2003; Ryan et al., 2007). A specific limitation when looking to apply crisis intervention for students with DD was the majority of crisis intervention research was not conducted in schools (Allen et al., 1997; Allen & Tynan, 2000; Baker & Bissmire, 2000; Gillam, 2014; Godfrey et al., 2014; Hawkins et al., 2005; Jambunathan & Bellaire, 1996; Kaye & Allen, 2002; McCue et al., 2004; McIntosh, 2003; Nunno et al., 2003; Smalls, 2004; Temple et al., 2007; Tierney et al., 2007) or with individuals with DD (Dawson, 2001; Dawson, 2003; D'Oosterlinck et al., 2008; Gillam, 2014; Godfrey et al., 2014; Jambunathan & Bellaire, 1996; McCue et al., 2004; McIntosh, 2003; Nunno et al., 2003; Ryan et al., 2007; Smalls, 2004; Soenen et al., 2009; Temple et al., 2007; Walsh, 2010). This is problematic because schools are substantively different than the settings of the research studies in a number of ways (e.g., purpose,

staffing ratios, training), and individuals with DD have needs that differ from individuals with EBD or mental illness.

2.22 Functional Behavior Assessment

FBA can trace its origins to the seminal work of Carr in the 1970s (Carr, 1977, Carr, Newsom, & Blinkoff, 1976). In 1976 Carr et al. applied the principles of behavior analysis to identify variables controlling a child's SIB. The child was 8 years old, diagnosed with mild ID and childhood schizophrenia, and would strike himself in the head and face. By systematically manipulating various conditions (i.e., free time, therapist idly commenting, therapist placing demands) according to a reversal design, Carr et al. were able to demonstrate experimentally that SIB was maintained by environmental variables (i.e., escape from demands).

Having demonstrated the role of the environment in evoking and maintaining problem behavior, Carr (1977) wrote a piece reviewing the major hypotheses for explaining SIB at the time. According to Carr, five hypotheses were prevalent at the time. The first was that SIB was operant behavior maintained by positive social reinforcement. Similarly, the second was that SIB was operant behavior maintained by negative social reinforcement. A third possibility was that SIB produced some type of sensory stimulation, and was therefore automatically reinforcing. A fourth hypothesis was that SIB was organic in nature, simply the byproduct of irregular psychological processes. Finally, a psychodynamic theory postulated that SIB was an "attempt to establish ego boundaries or to reduce guilt" (Carr, 1977, p. 801). Carr reviewed data to support all of the hypotheses, and suggested that any one explanation may be unable to account for why

SIB occurs on its own. As such, he contended there was a dire need to develop a method to experimentally analyze the controlling variables of self-injury.

Five years later, this call for a systematic method to experimentally assess the variables controlling SIB was answered. Iwata et al. (1982/1994) conducted the seminal study on what they termed the functional analysis (FA) of self-injury. Iwata et al. were working with nine individuals with developmental delays who were admitted to an inpatient pediatric hospital due to their SIB. To identify the function of the participants SIB four conditions were created. The first condition, *social disapproval*, tested if SIB was maintained by attention. The experimenter entered a therapy room with a participant, provided some toys, and told the child to play while the experimenter worked. If the child exhibited SIB, the experimenter ceased his work and made brief statements of concern and/or disapproval. All other behaviors were ignored. The second condition, *academic demand*, assessed if the function of SIB was to escape demands. The experimenter guided the participant to a table and prompted him to engage in a relatively challenging academic demand. The experimenter continued to prompt the child to complete the demand, but if SIB was exhibited the child was given a 30 s break. The third condition, *unstructured play*, served as the control condition against which other conditions were compared. Participants were given free access to toys; social praise with physical contact was delivered minimally once every 30 s; SIB was ignored. The fourth and final condition, *alone,* was to assess if the behavior was self-stimulatory in nature and therefore maintained by automatic reinforcement. In this condition the participant would be observed when he/she was alone in the therapy room without access to any toys or materials. All sessions were 15 min in duration, rate of SIB was recorded, and assessment

lasted until one of three conditions was met: stability in SIB responding occurred, unstable rates of SIB persisted across all conditions for 5 days, or 12 days of sessions were delivered. Using an alternating treatments design, results showed clear increases in responding in one condition for six participants. The elevated responding indicated a clear function for the children's SIB. However, responding was undifferentiated for the remaining three. Iwata et al. postulated some possible explanations (i.e., failure to discriminate due to profound ID, controlling variables not included, behavior is multiply controlled).

Since the Iwata et al. (1982/1994) study was published, that method of FA has been the a standard for analysis of challenging behavior. However, efforts have also been made to make assessment more efficient while still maintaining its accuracy, leading to a number of methods for FBA. As such, today the term FBA serves as an umbrella term for any method that attempts to identify the relations between environmental variables and target behaviors (Cooper et al., 2007). FBA encompasses three general methods of assessment: indirect assessment, direct assessment, and FA. All three are reviewed below.

2.23 Indirect Assessment

FBAs often start with indirect methods of assessment. Indirect assessment consists of methods of assessment that are separate in time and space from when and where the target behavior occurs (Gresham, Watson, & Skinner, 2001). In other words, actual observation of the behavior does not happen. Indirect assessment methods include interviews (e.g., open-ended, structured), checklists, rating scales, and questionnaires focusing on the environmental variables that may affect the target behavior (Cooper et

al., 2007). IA is conducted with people familiar with the individual who demonstrates the challenging behavior (e.g., teachers, parents, paraprofessionals) or the individual himself or herself.

Because these methods require relatively few resources to complete, often simply meeting with caregivers, indirect assessment methods are some of the most frequently used (Rooker, DeLeon, Borrero, Frank-Crawford, & Roscoe, 2015). However, because they depend on "the subjective recall of the informant" (Rooker et al., 2015, p. 4), indirect methods have been shown to be inaccurate and are not recommended as the sole method used when conducting an FBA. Research has been conducted on several types of indirect methods of assessment. This includes the Functional Assessment Screening Tool, Motivation Assessment Scale, Question About Behavioral Function, Functional Assessment Interview, and Functional Assessment Checklist for Teachers and Staff.

2.24 Functional assessment screening tool. The Functional Assessment Screening Tool consists of a series of yes/no questions to assess if the behavior is maintained by attention, delivery of tangible items, escape from aversive stimuli, sensory stimulation, or pain attenuation. In 2013, Iwata, DeLeon, and Roscoe conducted a study to assess the reliability and validity of the Functional Assessment Screening Tool. To examine the reliability, the Functional Assessment Screening Tool was independently delivered to pairs of informants for 196 behaviors. The mean interrater reliability on individual items was 71.5% with a range from 53.3% to 84.5%. The interrater reliability for identified function was 64.8%. To assess the validity, the function identified by the Functional Assessment Screening Tool was compared to the function identified by FA for 69 cases. The Functional Assessment Screening Tool corresponded to the FA results for

63.8% of cases. The researchers concluded that even though the accuracy of the Functional Assessment Screening Tool compared well with other indirect assessment methods, it was not a sufficient basis for treatment.

2.25 Motivation assessment scale. The Motivation Assessment Scale consists of 16 questions to assess the following possible functions: sensory reinforcement, escape, attention, and tangible reinforcement. Questions inquire whether the behavior occurs in response to various stimuli (e.g., when you are talking to people in another room), and informants rate each question on a seven-point scale from always to never.

An initial study, Durand and Crimmins (1988) demonstrated strong interrater reliability, test-retest reliability, and validity (i.e., corresponding to FA results). However, those results have not been confirmed as subsequent research has repeatedly shown the reliability and validity of the Motivation Assessment Scale to be lacking (Conroy, Fox, Bucklin, & Good 1996; Duker & Sigafoos, 1998; Spreat & Connelly, 1996; Thompson & Emerson, 1995; Zarcone, Rodgers, Iwata, Rourke, & Dorsey, 1991)

2.26 Questions about behavior function. Originally developed by Matson and Vollmer (1995), the Questions About Behavior Function consists of questions answered using a Likert scale ranging from zero (i.e., never) to four (i.e., often) related to five possible behavioral functions. These functions include attention, escape, nonsocial, physical, and tangible. Studies have shown relatively strong test-retest reliability and interrater reliability for the Questions About Behavior Function (Matson & Wilkins, 2008; Paclawskyj, Matson, Rush, Smalls, & Vollmer, 2000; Paclawskyj, Matson, Rush, Smalls, & Vollmer, 2001; Zaja, Moore, Van Ingen, & Rojahn, 2011). However, Paclawskyj et al. (2001) found the Questions About Behavior Function only

corresponded with the results from an FA for 56.3% of cases. Therefore, the authors recommended it be used as part of a broader assessment process.

2.27 Functional assessment interview. Another method of informant assessment is the Functional Assessment Interview. Developed by O'Neill, Horner, Albin, Storey, and Sprague (1997), the Functional Assessment Interview is a structured interview. Open-ended questions are arranged according to the following nine sections: (a) behavioral topography, (b) setting events, (c) immediate antecedents, (d) consequences, (e) alternative behaviors, (f) communication skills, (g) interaction techniques to use and avoid, (h) reinforcers, and (i) history of the challenging behaviors and corresponding intervention. Yarbrough and Carr (2000) compared the results of the Functional Assessment Interview to the results of functional analyses. For each case, informants generated multiple hypotheses regarding the function of problem behavior, and rated them according to their likelihood to evoke problem behavior. In cases where informants identified events likely to evoke the challenging behavior (i.e., 6 or 7 on a seven-point Likert scale), the functional analyses corresponded with the Functional Assessment Interview. Instances identified as less likely to evoke challenging behavior did not correspond with FA results. This indicated that when respondents' confidence is high, the Functional Assessment Interview can lead to valid identification of the function.

2.28 Functional assessment checklist for teachers and staff. A final indirect assessment method that has been studied is the Functional Assessment Checklist for Teachers and Staff. The Functional Assessment Checklist for Teachers and Staff is a semi-structured interview that consists of a combination of rating scales, yes/no questions, and open ended questions to identify the context in which the behavior occurs,

immediate antecedents to the behavior, consequences of the behavior, setting events, and behavioral topography.

Borgmeier and Horner (2006) used the Functional Assessment Checklist for Teachers and Staff to extend the work of Yarbrough and Carr (2000) on confidence ratings with Functional Assessment Interview. Specifically, they analyzed whether staff confidence was related to function accuracy as identified by FA. Fifty-eight teachers and staff were interviewed about one of nine students who exhibited challenging behaviors. Correlations were analyzed using Pearson's *r*. Contrary to Yarbrough and Carr, there was not a correlation between confidence ratings and accuracy of function ($r = .055$; $p = .683$). However, further analysis revealed a statistically significant correlation between (a) staff who were highly confident and had extensive contact with the target student, and (b) accuracy of function. While staff who had a lot of contact with students and were confident in function tended to be more accurate, these results still cast doubt on the overall validity of the Functional Assessment Checklist for Teachers and Staff specifically and Functional Assessment Interview in general.

2.29 Summary. A number of formal interviews have been developed to conduct indirect assessment. This includes the Functional Assessment Screening Tool, Motivation Assessment Scale, Questions About Behavioral Function, Functional Assessment Interview, and Functional Assessment Checklist for Teachers and Staff. Research on these various interviews has shown a variety of results. The Functional Assessment Screening Tool, Motivation Assessment Scale, and Questions About Behavioral Function have all been assessed on various psychometric properties including interrater reliability, test-retest reliability, and internal consistency with the Questions About Behavioral

Function showing relatively strong interrater reliability and test-retest reliability compared to the Motivation Assessment Scale and the Functional Assessment Screening Tool. However, all had questions regarding their accuracy when compared with FAs. The lack of correspondence with FA held true for the Functional Assessment Checklist for Teachers and Staff as well. The lone exception was the Functional Assessment Interview, an interview that uses structured, open-ended questions, which Yarbrough and Carr (2000) showed was accurate when informants were confident about their hypothesis. However, these results have yet to be replicated.

Because the various methods of indirect assessment have consistently shown to be unreliable when identifying behavioral function, researchers have repeatedly recommended using indirect assessment as one component in an FBA. Hanley (2012) went a step further, stating the purpose of indirect assessment should not be to identify function at all. Instead, he advocates using a structured, open-ended interview to inform the design of individualized FA conditions. In his 2012 article, Hanley provides a sample interview to accomplish just that.

2.30 Direct Assessment

In contrast to indirect assessment, which relies on the subjective report of informants, direct assessment consists of observing instances of the target behavior in the natural setting (Cooper et al., 2007). Data are collected on the behavior and events that occur immediately before (i.e., antecedents) and after (i.e., consequences) the behavior (Rooker et al., 2015). These data are then analyzed for connections between the target behavior and the events surrounding it. Cooper et al., (2007) describe three common methods of direct assessment. These are: (a) ABC continuous recording, which involves

developing codes for specific antecedent and consequence variables and recording all instances of these variables and whether the target behavior co-occurred during a predetermined period of time; (b) ABC narrative recording, which consists of open ended recording of the antecedents, behaviors, and consequences only when the target behavior occurs; and (c) scatterplots, which tracks when the behavior occurs throughout the day. Because the observations are of naturally occurring episodes, the variables are not systematically arranged. This prevents experimental analysis of the relation between environmental stimuli and challenging behaviors, and therefore results of direct assessment are correlational, not causal, relations (Rooker et al., 2015).

The use of direct assessment as a method of FBA dates back to Bijou, Peterson, and Ault (1968). In this seminal article, Bijou et al. describe a process for systematically observing and recording behavior during a descriptive field study. Components in the Bijou et al. method are (a) defining the setting in objective terms, (b) using observable definitions to record the occurrence of behavioral and environmental events, and (c) ensuring observer reliability. The authors provide an example of a recording method which involves a data sheet with description of the setting at the top and four columns underneath. The four columns were (a) time of episode, (b) antecedent event that occurred immediately prior to the target behavior, (c) physical description of the behavior(s) exhibited, and (d) consequence events that occurred immediately after the target behavior.

Since that time, a number of studies have been conducted that allow evaluation of the accuracy of DA methods in identifying the function of challenging behaviors. Sasso et al. (1992) reported on two studies to assess the accuracy of teacher conducted FBA. In

the first study they compared the results of researcher-conducted FA, teacher-conducted direct assessment, and teacher-conducted FA on the challenging behavior of two students with autism. All assessments identified negative reinforcement as the function. In the second study, the teachers in the first study trained additional teachers to conduct direct assessment and FA. The results of the second group of teachers' assessments also yielded negative reinforcement as the function. This provided some support that direct assessment can yield accurate results on their own, or can be used to inform subsequent FA.

One year later Lerman and Iwata (1993) conducted a study to explicitly test whether independently conducted direct assessment and FA would yield the same results. The assessments were conducted with six individuals who exhibited self-injurious behavior. Direct assessments were conducted in the individuals' residential sites and FA were conducted at their day program. The conditional probability of SIB occurring in relation to antecedent, consequence, and concurrent events was calculated. For antecedent events this was done by (a) dividing intervals containing SIB following an antecedent event by all SIB intervals and (b) dividing intervals containing SIB following an antecedent event by all intervals with the antecedent event. Calculations for consequence and concurrent events used the same process, but consequence events occurred after the target behavior and concurrent events occurred at the same time as the behavior. While the FAs resulted in clear functions for all six participants, direct assessments were less clear. The researchers pointed to the issue of stimuli being correlated with challenging behavior in the natural setting, while not being functionally

related. Therefore, they concluded direct assessment may be insufficient for identifying controlling variables or for developing treatment plans.

In 2005 St. Peter et al. conducted a study to assess whether conducting direct assessment and analyzing the results with the matching law could yield false results. Participants were three individuals with developmental disabilities who exhibited challenging behavior that FA had shown were not maintained by attention. For each participant direct assessment was conducted and simple and generalized matching equations were used to calculate the correlation between naturally occurring events and problem behavior. Results of the matching analyses indicated that adult attention was a function for all three participants' challenging behaviors. The researchers proposed a number of possible explanations including: (a) that challenging behavior typically results in some type of attention from caregivers, even if is not reinforcing; and (b) that high-frequency, response independent stimuli will incidentally be correlated with problem behavior. Thus, it was concluded that even calculating conditional probability with direct assessment can be problematic, and FA is critical for developing interventions.

Two years later Thompson and Iwata (2007) assessed the accuracy of direct assessment by comparing the outcomes to FA. Assessments were conducted on the behavior of 12 individuals with severe to profound ID. Direct assessment consisted of four 15-min observations or until 10 instances of problem behavior and 20 instances of antecedent demands occurred, whichever happened last. FA followed the procedures used by Iwata et al. (1982/1994). Results from the direct assessment matched the FA results for only three participants. The majority of direct assessment indicated attention as the function even though only two participants' behaviors were maintained by attention. This

once again illustrates the confounding role correlated events (e.g., attention from caregivers) can have and the need for conducting an FA.

In a final study on the validity of direct assessment, Pence, Roscoe, Bourret, and Ahearn (2009) compared the results of three types of direct assessment to the results of FA. The three methods were: (a) the antecedent-behavior-consequence method of narrative recording; (b) the conditional probability method (Lerman & Iwata, 1993); and (c) the conditional and background probability method, which involved comparing the conditional probability to the probability of the event occurring independent of the response (Vollmer, Borrero, Wright, Van Camp, & Lalli, 2001). Six participants who attended a residential school for students with autism and engaged in challenging behavior were included. Results were consistent across the three methods of direct assessment for five of the six participants. However, DA results differed from the FA for five of six participants. Thus, the researchers concluded this study supports the previous research, demonstrating the descriptive assessment is ineffective at identifying the functions of behaviors.

2.31 Summary. Beginning with the suggestions of Bijou et al. (1968), direct assessment has become an integral part of most FBAs. However, the majority of studies analyzing the accuracy of direct assessment have found direct methods of assessment to be inaccurate (Lerman & Iwata, 1993; Pence et al., 2009; St. Peter et al., 2005; Thompson & Iwata, 2007). The crux of this inaccuracy seems to be that direct assessment conveys the prevalence of environmental events occurring in close proximity, but not the relevance. Therefore, even though an event may be highly correlated with a behavior (e.g., a teacher attempts to calm a student after he exhibits self-injury), it may not have

any functional relation to the behavior (e.g., the student engages in self-injury to escape an aversive task). This has led experts to call the reliance on direct assessment "troublesome" (Hanley, 2012, p. 56), and recommend conducting brief observations to refine behavioral definitions and identify events to include in an FA (Hanley, 2012).

2.32 Functional Analysis

The final method of assessment in FBA is FA. FA refers to the systematic presentation of antecedent and consequence events, and then measuring the target behavior under the different conditions (Cooper et al., 2007). This method allows for the person conducting the analysis to identify the controlling variables by demonstrating functional relations between (a) antecedent events and the target behavior, and (b) consequence events and the target behavior. As such, FA is also referred to as an experimental analysis.

The initial work on functional analyses was done by Iwata et al. (1982/1994). Described in detail earlier, this seminal study continues to serve as the standard in FA. However, over time variations to the Iwata et al. method and new methods have both been researched. A majority of the variations have been conducted to clarify inconclusive results. New methods of FA include brief FA, discrete-trial FA, precursor FA, and latency FA. It is also worth noting that terminology has also changed over the years. For instance, the Iwata et al. method has also come to be referred to as an analog-, standard-, and traditional-FA at times. Also, the conditions used in FA have begun to be referred to by the putative reinforcer they are assessing. Thus, what Iwata et al. named "social disapproval" is often referred to as the "attention" condition, and "academic demands" is referred to as "escape."

2.33 Clarifying inconclusive results. The procedures described by Iwata et al. (1982/1994) have not always yielded conclusive functions for behaviors. As such, researchers have developed ways to clarify FAs. Two common causes for inconclusive results were idiosyncratic variables and low frequency-high intensity behavior.

2.34 Idiosyncratic variables. One of the major causes of inconclusive results is when idiosyncratic variables control the target behavior, and therefore are not included in the standard FA conditions. Mace, Page, Ivancic, and O'Brien (1986) used caregiver interviews to design a new condition. The researchers replaced the alone condition with a condition they called divided-attention. In this condition two adults sat in the room with the child and told the child to play while they talked. Participants were three individuals with disabilities including developmental disability, ID, and traumatic brain injury. The FA resulted in a clear function for two participants. However, additional idiosyncratic conditions were required to identify the function for the third participant. These were: (a) group social disapproval, having a group of adults express disapproval upon aggression; (b) ignoring, a single adult ignoring instances of aggression; and (c) group ignoring, a group of adults all ignoring aggression. Ensuing interventions based on the FA results were implemented. The authors concluded that if an FA is initially inconclusive, variations of traditional conditions may be necessary to identify the controlling variables.

Carr, Yarbrough, and Langdon (1997) continued the work on inconclusive FAs by systematically evaluating the impact of idiosyncratic variables during FAs. Three participants with autism who exhibited self-injury, aggression, or property destruction were included. IA and DA produced hypotheses for the functions of the behaviors. However, traditional FAs yielded inconclusive results. Carr et al. then experimentally

assessed the effects of idiosyncratic variables on the FAs. For instance, one participant regularly held small objects. When holding the small objects, challenging behavior was suppressed across all conditions. However, when small objects were denied, challenging behavior increased. Similarly, a second participant showed few instances of challenging behavior across conditions. However, when the staff read a magazine (e.g., *People*) during the attention condition instead of a book, challenging behavior increased. The authors concluded that professionals need to assess for idiosyncratic variables if inconsistencies appear between (a) FA results and indirect assessment or direct assessment hypotheses, (b) FA results across settings, (c) FA results across times, or (d) unexpected variations within sessions. The results of this study also indicated the role access to tangible items may play, which were not historically assessed.

The possibility that challenging behavior is maintained by escape from attention and access to tangibles was examined by Hagopian, Wilson, and Wilder (2001). In this study an initial FA was conducted with individuals with autism and mild ID who engaged in severe problem behavior (i.e., aggression, property destruction, SIB). An initial FA was conducted, and the highest rates of responding occurred during the free play condition, which was intended to serve as a control. As such, Hagopian et al. conducted a second FA, adding two conditions. First, a therapist sat with the participant and provided praise while he played. Escape from attention was provided contingent upon challenging behavior. In the second, access to preferred tangibles was restricted. Contingent upon challenging behavior, the participant was given brief access to the toys. Results showed the challenging behavior was maintained by both escape from attention and by access to tangibles.

A second study demonstrating the role escape from attention could play in obscuring FA results was conducted by Harper, Iwata, and Camp (2013). In this study, initial FAs were conducted on the aggression of four individuals with ID. Results showed increased responding during the free play and demand conditions. A second FA was conducted that only had two conditions, a test and control condition. In the test condition participants were given moderately preferred objects and praise every 5 s. Upon aggression, the therapist ceased providing attention and moved away for 30 s. In the control condition the participants were allowed access to the objects and the therapist ignored them throughout. Results showed aggression was maintained by negative reinforcement in the form of escape from attention. The authors suggested using a social avoidance assessment if initial FAs are inconclusive.

Another idiosyncratic variable that has been assessed is access to ritualistic behaviors. Hausman, Kahng, Farrell, and Mongeon (2009) conducted an FA on the challenging behavior (i.e., SIB, aggression, property destruction) for a girl diagnosed with autism, moderate ID, and cerebral palsy. Results of the standard FA were inconclusive. However, observations and parental reports indicated she engaged in intense behavior if she was blocked from engaging in ritualistic behaviors. As such, a condition was created in which the therapist would disturb a carefully placed object (i.e., door with a doorstop) and contingent on problem behavior, the girl would be allowed to control the position of the door. In the control condition, the door was left untouched by the therapist. Results showed the challenging behaviors were controlled by access to the ritualistic behavior. This study added another example of why it is important to incorporate idiosyncratic variables into FAs.

Acknowledging the importance of evaluating idiosyncratic variables Roscoe, Schlichenmeyer, and Dube (2015) conducted a study to assess the effectiveness of a systematic method for identifying these unique stimuli. Six individuals with autism underwent traditional FAs that were inconclusive. Following the inconclusive FAs, the researchers conducted indirect assessment and direct assessment with the express purpose of identifying idiosyncratic variables, as opposed to conducting them to identify the function. The functional assessment interview consisted of closed- and open-ended questions on possible idiosyncratic variables. Following the interview, recordings of challenging behavior were made. These recordings were then analyzed for antecedent and consequent events with high conditional probability. Based on the results of the indirect assessment and direct assessment, individualized FA conditions were created. Using the individualized conditions, clear functions were obtained for five of the six participants' challenging behaviors. Despite its utility, the researchers stopped short of recommending idiosyncratic variables be assessed before ever beginning an FA. Pointing to the extensive support for the effectiveness of traditional FAs, they argued that idiosyncratic variables should only be assessed if an initial FA indicates the behavior is not controlled by typical conditions.

A final publication on idiosyncratic variables was a review conducted by Schlichenmeyer, Roscoe, Rooker, Wheeler, and Dube (2013). In this review, the researchers found 42 articles that reported on a pre-treatment FA that allowed the demonstration of functional relations and included idiosyncratic modifications to the traditional FA method. Variations in social negative relations, social positive relations, automatic reinforcement relations, and contextual variables were found. Social negative

relations included changes to demands (e.g., varying type of task, difficulty, preference, magnitude of tasks), varying instructional style (e.g., more or less abrasive, amount of attention), and contextual variables (e.g., seat assignment, transitions). Social positive relations included antecedent and consequence alterations. Antecedent changes involved diverting attention and combining antecedent variables (e.g., tasks and diverted attention, task and blocking access to tangibles). Consequence changes involved idiosyncratic positive reinforcers (e.g., reprimands, tickles, eye contact, combative play, ritualistic behaviors). A variation in automatic reinforcement relations was the inclusion of tangible items that facilitated self-stimulatory behavior in the alone conditions. Last, contextual variations involved the study of variables that might affect a variety of functions (e.g., added noise, illness, quality of relationship with the person conducting the FA). Finally, a number of strategies were used to identify the idiosyncratic variables. These strategies included informal observation, informal anecdotal reports, indirect assessment, direct assessment, and experimental manipulation. The review concluded with a statement regarding the need for more systematic pre-assessment methods to identify the relevant environmental variables.

2.35 Low rate-high intensity behavior. Another possible cause of inconclusive FA results is when high intensity behaviors occur very infrequently. Kahng, Abt, and Schonbachler (2001) encountered this issue when a standard FA on the aggressive behavior of a 15-year-old girl with profound ID did not produce any aggression. As such, the same conditions were used, but the duration of the conditions was extended from 10 min to 7 hours (i.e., 9:00 am to 4:00 pm). During the attention condition, the girl was allowed access to toys for the entire day with verbal reprimands occurring after problem

behavior. For the demand condition, tasks were implemented using graduated guidance for 45 min followed by a 15-min break. Also, 30 s breaks were given contingent on aggression. During the play condition, she had free access to toys and continuous attention for a day. Results indicated the behavior was controlled by positive reinforcement in the form of attention.

Eleven years later, Davis, Kahng, Schmidt, and Bowman (2012) extended the work on low rate-high intensity behaviors. Standard FAs were conducted with six children with ID and autism in an in-patient hospital for severe problem behaviors. All results were inconclusive. Sessions were then extended to 7 hours as described in the Kahng et al. (2001) study. The extended durations necessitated other alterations such as incorporating direct care staff, moving the location from an isolated room to the natural setting, and limiting the conditions to the most likely to evoke and maintain the target behaviors. This resulted in clear functions for each participant. The researchers concluded this to be a viable method for experimentally analyzing the function of low rate behavior; however, they were careful to point out potential barriers such as direct care staff lacking the skills to conduct the extended FA, the extreme amount of resources required, and the ethical concerns with subjecting individuals to long periods of deprivation (e.g., ignoring for multiple hours).

2.36 Brief functional analysis. Despite the accuracy yielded by standard FAs, these analyses have been regularly criticized as being too complex and resource intensive. In response to this, Northup et al. (1991) assessed the accuracy of a brief FA to identify the function and as the basis for intervention for three individual with disabilities (i.e., ID, cerebral palsy). The brief FA consisted of one cycle of relevant FA conditions

(i.e., alone, tangible, demand, and/or attention), each lasting 5 to 10 minutes. Following this cycle, the researchers implemented what they called a contingency reversal. The contingency reversal consisted of three sessions that replicated the condition with elevated responding (i.e., if increased responding occurred during the attention condition, the attention condition would be implemented again). During the first and third sessions of the contingency reversal an appropriate, functionally equivalent behavior was reinforced and the problem behavior led to ignoring or prompting the appropriate behavior. The second session of the contingency reversal replicated the initial FA condition with the fewest occurrences of problem behavior. Results demonstrated clear functions for all participants, and the contingency reversal phase demonstrated an effective treatment. The authors admitted the lack of repeated measures prevented an experimentally valid functional relation being demonstrated. However, they maintained the brief FA was still convincing, and therefore may be a viable alternative to the more extensive traditional FAs.

One year later this same research group summarized 79 cases in which a brief FA had been utilized (Derby et al., 1992). Using the same method described above (i.e., single-probes of relevant FA conditions, with a replication of the conditions with the most and fewest instances of challenging behavior). A clear function was identified for 66% of cases and behavioral change occurred for 77% of cases. In light of these results, the authors suggested brief FA may be most useful for individuals who engage in high frequency behavior.

In a later study to assess the accuracy of brief FA techniques, Kahng and Iwata (1999) compared the results of 50 standard FAs to the results of brief FAs and within-

session analysis that graphed data from the brief FA to show minute-by-minute changes in responding. The cases reviewed were of 50 individuals with ID living in a residential facility due to their SIB and/or aggression. The brief FA corresponded with the traditional FA for 66% of cases and the within-session analysis corresponded for 68% of cases. In depth analysis of the types of agreement indicated brief FA was more likely than within-session analysis to positively identify a function. This occurred for true positives (i.e., identifying a function that was corroborated by the traditional FA) and false positives (i.e., identifying a function when it was unclear in the traditional FA). A major limitation noted by the authors was that brief FA sessions in this study were 15 min, whereas they are often as short as 5 min. Therefore, if this study had used procedures more typical of practice, the accuracy would likely be even lower. With that being said, the researchers concluded that accuracy was high enough that brief FA may be justified in response to certain constraints.

2.37 Discrete-trial functional analysis. A second fundamental alteration to the traditional FA method is discrete-trial FA. With discrete-trial FA test and control conditions are created and presented in trials throughout a person's day. A typical trial consists of a brief, 1 to 2 min, control condition (e.g., no work) and a similarly brief test condition (e.g., presenting work; Iwata & Dozier, 2008). Typically the test condition is terminated upon the occurrence of the target behavior or after 1 min to 2 min, whichever occurs first. All relevant conditions are presented repeatedly, and the percentage of test conditions in which the target behavior occurred are calculated. Sigafoos and Saggers (1995) conducted the first study using this method of discrete-trial FA with two individuals with autism who exhibited aggression. After 20 assessment trials discrete-trial

FA revealed clear functions for each participant, thus suggesting discrete-trial FA as a potentially valid method.

Bloom, Iwata, Fritz, Roscoe, and Carreau (2011) extended the research on discrete-trial FA by assessing its validity. The researchers implemented discrete-trial FA and traditional FAs with 10 students who exhibited problem behavior (i.e., aggression, SIB, bizarre vocalizations, inappropriate touching). All students were diagnosed with ID. Additional diagnoses included autism, Down syndrome, hearing impairment, and a speech and language delay. Results showed a match in identified functions for six out of 10 participants. For two participants the discrete-trial FA was modified after the traditional FA, and the modified discrete-trial FA matched the traditional. The researchers concluded discrete-trial FA could be a viable alternative if staff are unable to conduct a traditional FA.

In 2014, Rispoli, Ninci, Neely, and Zaini conducted a systematic review of studies using discrete-trial FA to assess and treat challenging behavior. Studies that used a discrete-trial FA to assess challenging behaviors and reported the outcomes were included. Thirteen studies met these criteria. Data from the studies were summarized by (a) participants, (b) behaviors, (c) discrete-trial FA characteristics, (d) outcomes, and (e) ensuing intervention. At that point discrete-trial FA had been conducted with 47 participants. Ages ranged from 3 to 29. The most common diagnoses were autism (n = 29), 19 of which also had an ID, followed by developmental disability (n = 13). Fourteen topographies of behavior were included with the most common being aggression (n = 29), then SIB (n = 8), followed by disruptive behavior (n = 6), and inappropriate vocalizations (n = 5). The majority of the studies, eight, were conducted in schools, and

eight of the 13 studies had teachers or paraprofessionals implement the discrete-trial FA. All studies utilized some combination of the following conditions: attention, tangible, escape, ignore, and control/play. Order of the conditions varied with some using a test-control format, others a control-test, and finally one study used a control-test-control format. The number of trials implemented ranged from 3 to 20, and the duration of the trials ranged from 2 to 6 min. When analyzing the results, functions were identified in 35 of 36 completed analyses. A few studies assessed the validity of discrete-trial FA by comparing the results to traditional FAs. In these studies the functions matched for 10 of 17 participants (59%). Finally, four studies reported the results of interventions based on discrete-trial FA results, and all were effective at reducing problem behaviors. The researchers concluded that discrete-trial FA shows promise as a method for experimentally evaluating the functions of behaviors in applied settings, but cautioned practitioners given that in the four studies that examined the validity, only 59% were accurate.

2.38 Precursor functional analysis. Another modification to the traditional FA technique is to conduct an FA on precursors to the target behavior. Precursor behavior is defined as any behavior that reliably precedes the target behavior (Dracolby & Smith, 2012; Fritz, Iwata, Hammond, & Bloom, 2013). Smith and Churchill (2002) were among the first to examine whether precursor behaviors were functionally equivalent to ensuing target behaviors. Working with three participants with developmental disabilities who exhibited dangerous problem behaviors, the researchers began by using caregiver report and direct observation to identify and define precursor behaviors. The participants then underwent two FAs. The first was a traditional FA with consequences delivered after

problem behavior. The second FA was exactly the same, except consequences were delivered after a precursor behavior. For every participant the FAs revealed that problem and precursor behaviors were functionally equivalent. Further, during the precursor FA the rate of problem behavior drastically decreased. As such, the researchers concluded that a precursor FA was a promising alternative to traditional FA when assessing severe problem behavior as it minimizes all parties' exposure to dangerous behaviors.

Some years later, Najdowski, Wallace, Ellsworth, MacAleese, and Cleveland (2008) extended the research on precursor FA by conducting precursor FAs and basing treatment on the results. Their study included three individuals with disabilities (i.e., traumatic brain injury, developmental delay, ID) who exhibited severe problem behavior. Identification of precursors followed the same method as Smith and Churchill (2002). Precursor FA resulted in clear functions for the behavior of all three participants. Furthermore, the effects of ensuing interventions were evaluated with reversal designs. For all three participants a functional relation was established between the ensuing interventions and the elimination of precursor behavior. Problem behavior was not exhibited during baseline phases, so no reduction was seen. The researchers postulated this was because staff responded to precursors during baseline instead of waiting for an escalation to problem behavior. They concluded the results add to the support for using precursor FAs with severe problem behavior.

In the same year, researchers reported their data on methods for systematically identifying precursors. Langdon, Carr, and Owen DeSchryver (2008) evaluated (a) whether transitional probabilities and FAs could demonstrate precursor and problem behavior to be functionally equivalent, and (b) if functional communication training

(FCT) targeting precursor behaviors could reduce problem behaviors. Three individuals with developmental disabilities and severe problem behavior were included. Following descriptive assessment, data were collected on precursor behavior, problem behavior, and behaviors that occurred 30 s following precursor and problem behavior. Then, the researchers calculated the probability that (a) precursor was followed by problem behavior, (b) precursor was followed by precursor behavior, (c) precursor was followed by other behavior, (d) problem behavior was followed by problem behavior, and (e) problem behavior occurred independent of precursor or other problem behavior. Next, FAs were conducted on precursor and problem behavior independently. Finally, the effects of FCT targeting precursor behavior on problem behavior was evaluated using a B-A-B reversal design. Results confirmed the hypothesis in that precursor and problem behaviors were shown to be functionally equivalent and an intervention targeting the precursor behavior reduced the rate of problem behavior.

A third study in 2008 on precursor FA was conducted by Borrero and Borrero. They also used probability analyses and separate FAs to assess if precursor and problem behaviors were functionally equivalent. Participants included two individuals with autism who engaged in problem behavior. Following descriptive assessment three types of probability analyses were conducted to identify precursor behaviors: conditional probability analyses (i.e., the probability of a potential precursor given problem behavior, the probability of a problem behavior given a potential precursor), unconditional probability analysis (i.e., the probability of potential precursor given the opportunity to engage in it, the probability of problem behavior given the opportunity to engage in it), and lag-sequential analyses (i.e., the probability of a potential precursor occurring 50 s

before and after a problem behavior). Results indicated higher conditional than unconditional probabilities, meaning the precursors were more likely to occur given the problem behavior occurring. Also, lag-sequential analyses showed the probability of precursors was at its highest in the second before problem behavior occurred. Similarly, the probability of problem behavior was at its highest 1 s after a precursor occurred. Having firmly established precursor behaviors, traditional FAs were conducted on the precursor and problem behaviors. Results indicated they were functionally equivalent for all participants. Researchers concluded this study demonstrates a valid method for identifying precursor behaviors. Further, when precursors are identified in this way, FAs targeting precursor behaviors can be a valid alternative to traditional FAs targeting problem behaviors.

Dracolby and Smith (2012) added further support for precursor FA as a basis for treatment of severe problem behavior. These researchers conducted three studies to (a) identify a precursor to SIB, (b) conduct an FA on precursor behavior, and (c) evaluate the effects of a treatment targeting precursor behavior on SIB. The participant was a man with mild ID who engaged in SIB. The procedures to identify precursor behavior matched those by Borrero and Borrero (2008) and the precursor FA methods replicated those of Smith and Churchill (2002). Using these methods, a reliable precursor to SIB was identified (i.e., lifting his head up) that was shown to be maintained by attention. Based on these results, the man was told that if he wanted to talk to simply lift his head up, and differential reinforcement was provided for this behavior. Data were analyzed via a reversal design, which showed a clear functional relation between the precursor intervention and decreasing rates of SIB to zero levels.

A final publication on precursor FA by Fritz et al. (2013) consisted of three separate studies. Similar to Dracolby and Smith (2012), Fritz et al. identified a precursor, confirmed it was functionally equivalent to the target behavior via traditional FA, and implemented a treatment targeting precursors. Participants were 16 individuals with ID who exhibited severe problem behavior. Precursor identification was accomplished by contriving trials that created establishing operations for relevant FA conditions, similar to discrete-trial FA. All trials were recorded, and later viewing led the researchers to document several potential precursors. Conditional and unconditional probability analyses were conducted to determine which behaviors would be considered a precursor. Next, traditional FAs were conducted for eight participants to determine if identified precursors and problem behavior were functionally equivalent, which they were for 88% of cases. Finally, the effects of a treatment package consisting of noncontingent reinforcement, schedule thinning, and differential reinforcement of alternative behaviors on the rates of precursor, appropriate, and problem behavior was analyzed via a multiple treatment reversal design. Results showed a decrease in precursor behaviors, increase in appropriate behaviors, and problem behaviors remained low.

2.39 Latency functional analysis. A final version of FA to be reviewed is latency FA. Due to the inherent risks of repeatedly exposing individuals to conditions that may evoke dangerous problem behavior, as with a traditional FA, Thomason-Sassi, Iwata, Neidert, and Roscoe (2011) assessed the validity of using response latency as the measure in FAs as opposed to measures of rate. This was done in three experiments with individuals with developmental disabilities. The first was to assess if there was an inverse relation between latency to the first response and rate of responding. Using a multiple

baseline design, participants were provided models for a target behavior. During baseline no reinforcement was given, and during intervention reinforcement was provided for emitting the target response. As reinforcement was provided, the rate of behavior increased while the latency from the beginning of the session to the first response decreased. Results were replicated across three participants, suggesting that a shorter latency would imply higher rates of responding. In the second experiment, the researchers reviewed the records of 37 individuals who had undergone FAs. In 87% of cases, analyzing the data identified the same function as analyzing the data by response rate. The conflicting results came from participants whose behaviors were either maintained by multiple social contingencies or by automatic reinforcement. In the third and final study, latency FAs and traditional FAs were implemented for 10 individuals and results compared. Procedures for latency FAs matched those for traditional FAs, except sessions were a maximum of 5 min and were terminated after the initial instance of the target behavior. Corresponding functions were found for 9 out of 10 participants, with the lone conflict occurring when the latency FA identified escape and attention as the function whereas the traditional FA identified escape. Use of the latency FAs also drastically reduced the occurrences of problem behavior. As such, the researchers concluded that a latency FA could be a valid and useful alternative to traditional FA if faced with dangerous behaviors or time limitations. However, measures of rate were still deemed preferable.

A second study also used latency as the measure. Neidert, Iwata, Dempsey, and Thomason-Sassi (2013) used a discrete-trial FA format and measured latency when assessing the elopement of two individuals with profound ID. Results indicated

elopement was multiply controlled for each participant. In summary, the researchers pointed out the benefits of using a latency measure and trial-based format for elopement, given the fact that resetting the condition after elopement is often more involved than with other challenging behaviors.

2.40 Literature reviews. A few literature reviews have been published on the research of FA. Hanley, Iwata, and McCord (2003) conducted one of the earlier reviews by summarizing the studies using FAs from 1961 through 2000. Ten years later, that review was updated by Beavers et al. (2013), who extended the review to include studies between 2001 and 2012. Inclusion criteria were that studies had to report data on "(a) a pretreatment assessment based on (b) direct observation and measurement of problem behavior was conducted under (c) at least two conditions involving manipulation of some environmental variable in an attempt (d) to demonstrate a relation between the environmental event and behavior" (Hanley et al., 2003, p 149-150). Results shows a drastic increase in publications beginning in the mid-1990s. Demographic results indicated 75% of studies included children, 33% included adults, 88% of participants had developmental disability, 27% had autism, and 14% had no disability. The most common settings in the studies were inpatient hospital (41%), school (36%), institution (18%), outpatient clinic (13%), and home (11%). The most common behaviors assessed were SIB (56%), aggression (43%), vocalizations (23%), disruption (22%), and property destruction (20%). Characteristics of FAs were also reported, and the majority of FAs (a) were designed to assess the maintaining consequences (89%), (b) included attention (86%) and escape (90.1%) conditions, (c) were full length (i.e., not a brief FA; 84%), (d) used an alternating treatments design (81%), and (e) reported data by session values

(81%). Relatively few were informed by any type of supplementary assessments (i.e., indirect or descriptive assessment; 13%). Finally, 94% of all cases resulted in differentiated results (i.e., clear function). The researchers noted the following trends. First, there was an increased use of the tangible condition as time progressed. Second, multiple response topographies were increasingly being assessed in a single FA, which the researchers suggested may be leading to a third trend: increased results indicating multiple control. Finally, they noted an increased focus on making FA methods more efficient.

2.41 Summary. A substantial amount of research has been published on factors that can obscure FA results. Chief among these factors are idiosyncratic variables and low rate-high intensity behavior. A variety of studies have demonstrated a number of idiosyncratic variables including, but not limited to, divided-attention (Mace et al., 1986), group social disapproval (Mace et al., 1986), group ignoring (Mace et al., 1986), access to tangibles (i.e., small objects, magazines; Carr et al., 1997), escape from attention (Hagopian et al., 2001; Harper et al., 2013), and access to ritualistic behaviors (Hausman et al., 2009). Additionally, several strategies have been explained for identifying these variables including caregiver interviews (Mace et al., 1986), informal observation (Carr et al., 1997), formal indirect and direct assessments (Hausman et al., 2009; Schlichenmeyer & Dube, 2015), and calculating conditional probabilities (Schlichenmeyer & Dube, 2015). Both Kahng et al. (2001) and Davis et al. (2012) demonstrated that conclusive FA results could be obtained for low rate-high intensity behavior by extending session duration.

Additionally, several variations of the traditional FA have been researched (i.e., brief FA, discrete-trial FA, precursor FA, and latency FA. Brief FA, which involves assessing each condition once with a replication of the highest and lowest responding conditions, represents an efficient, less resource intensive method of FA. However, reviews indicated this method identifies a clear function in approximately 66% of cases, and these functions match traditional FAs 66% of the time.

The second variation is discrete-trial FA. Discrete-trial FA, conducting several short test and control trials throughout a person's day, is similar to brief FA in that it is much less resource intensive than a traditional FA. Also, research has demonstrated it is a method natural caregivers (e.g., teachers, parents, paraprofessionals) are able to implement (Rispoli et al., 2014). However, the only study on the accuracy of discrete-trial FA found it to corresponded to traditional FAs only for 59% of cases (Rispoli et al., 2014).

A third method, precursor FA, involves conducting a traditional FA on behaviors that immediately precede the target behavior. This method provides a safer alternative when assessing dangerous behavior. Research has repeatedly shown precursor FA to match the traditional FAs for the target behavior (Borrero & Borrero, 2008; Fritz et al., 2013; Langdon et al., 2008; Smith & Churchill, 2002). Methods for identifying precursor behaviors have also been researched, which primarily involve a type of probability analysis (Borrero & Borrero, 2008; Dracolby & Smith, 2012; Fritz et al., 2013; Langdon et al., 2008). Also, studies have repeatedly demonstrated that interventions based on precursor FA and targeting precursors result in reductions in the target behavior (Borrero

& Borrero, 2008; Dracolby & Smith, 2012; Fritz et al., 2013; Langdon et al., 2008; Najdowski et al., 2008; Smith & Churchill, 2002).

The last variation, latency FAs, used latency to the first instance of the target behavior as the measure to analyze and terminate the session after this instance. These are another alternative when working with dangerous behavior. The little research conducted on latency FAs have shown them to correspond to traditional FAs for approximately 87% of cases and be effective in designing interventions (Neidert et al., 2013; Thomason-Sassi et al., 2011).

2.42 Function-Based Intervention

Function-based intervention has been used to address severe problem behaviors of individuals with moderate/severe disabilities for decades. Carr, Langdon, and Yarbrough (1999) identified two major components to function-based intervention. First, a FBA is used to identify the variables controlling the problem behavior. This includes discriminative stimuli (S^D; i.e., stimuli that signal that reinforcement is available) that can trigger the problem behavior by signaling that reinforcement is available, variables that occur after the problem behavior occurs and reinforce that behavior, and variables that alter the effectiveness of the reinforcers (i.e., motivating operations [MOs]). Second, an intervention based on those controlling variables is designed and implemented. Two common types of interventions are (a) those that affect the MOs and (b) teaching students a communicative response that serves the same function as the problem behavior, meaning the communicative response results in the same reinforcement as the problem behavior. The second type of intervention is commonly referred to as functional communication training (FCT).

2.43 Motivating Operations

One method to address severe problem behavior for individuals with moderate/severe disabilities is to affect the motivating operations associated with the target behavior. According to Michael (2007), MOs are defined as any variable that alters (a) the reinforcing or punishing value of a stimulus and (b) the frequency of any behavior previously affected by that reinforcing or punishing stimulus. This term can be broken down into two types: establishing operations and abolishing operations. Establishing operations increase the effectiveness of a stimulus as a reinforcer, while abolishing operations decrease the effectiveness of stimuli that act as reinforcers (Cooper et al., 2007). This is relevant to severe problem behavior because if the reinforcer has no value (i.e., an abolishing operation has reduced its effectiveness), the behavior will not be emitted. Therefore, in function-based intervention, procedures to manipulate the MOs, after identifying the controlling reinforcer, seek to (a) minimize establishing operations and/or (b) create abolishing operations to prevent the need for the severe problem behavior to occur.

Research on this topic has included two main interventions. First, noncontingent reinforcement (NCR), defined as providing reinforcement on an interval schedule independent of a person's behavior (Cooper et al., 2007), creates an abolishing operation by providing regular access to reinforcement thereby negating the need to engage in problem behavior. Second, strategies to mitigate aversive stimulation serve to reduce the establishing operation for problem behavior.

Vollmer, Iwata, Zarcone, Smith, and Mazaleski (1993) conducted an early study applying NCR to the severe problem behavior of individuals with moderate/severe

disabilities. In this study, Vollmer et al. compared the effects of differential reinforcement of other behaviors (DRO) and NCR on the SIB of three women with developmental disabilities. Two different types of experimental design were used. Researchers used an alternating treatments design embedded within a multiple baseline design with two participants. This involved a baseline for both participants followed by a treatment phase, with a staggered introduction, that alternated between NCR and DRO. A multiple treatment reversal design was used with the third participant in the form of an ABAC series (i.e., baseline, NCR, baseline, DRO). Results indicated that both DRO and NCR effectively reduced the SIB of the three women. Given the similar results, the authors pointed out several advantages of NCR that could make it a preferred intervention. These were: (a) the increased responding in behaviors undergoing extinction, in this case SIB, known as extinction bursts was mitigated for two of the participants; (b) NCR resulted in higher rates of reinforcement delivery; and (c) the ease of implementation since NCR is delivered on an interval schedule.

Extending the research on NCR, Vollmer et al. (1998) compared the effects of extinction and NCR on a fixed-time schedule on the severe problem behavior (i.e., aggression, SIB, property destruction) of three individuals with moderate/severe disabilities. Extinction is a procedure in which reinforcement is withheld following a behavior, in this case severe problem behavior that has been previously reinforced. Using an alternating treatments design, results showed both procedures effectively reduced the rates of problem behavior. However, NCR reduced behaviors more quickly and, similar to NCR used in the Vollmer et al. (1993) study, avoided the initial increase in responding associated with extinction bursts. Vollmer et al. (1998) explained the effects of NCR

through (a) disrupting the contingency between problem behavior and reinforcement, (b) the creation of an abolishing operation that reduces the value of the putative reinforcers, and (c) progressive schedule thinning leading to an ability to "tolerate" periods without access to reinforcement. However, they cautioned that NCR could lead to incidental reinforcement of problem behavior, which could result in increased rates of problem behavior.

In a third study, Rush, Crockett, and Hagopian (2001) compared the effects of two treatment packages involving NCR on the screaming and SIB of two children, ages seven and eight, with moderate/severe disabilities. The treatment packages consisted of NCR with punishment (i.e., facial screening for 30 s following problem behavior) and NCR with extinction (i.e., ignoring problem behavior), and they were evaluated using a multiple-treatment reversal design. Results indicated problem behaviors maintained by automatic reinforcement (i.e., behaviors that produce their own reinforcing consequences) were unresponsive to NCR plus extinction, but adding the punishment component of a facial screen to NCR effectively reduced them. A second dependent variable in this study was "positive affect" (e.g., laughing, smiling), and results showed the addition of the punishment component had minimal effects on positive affect. This indicates behaviors that result in automatic reinforcement may require additional treatment components beyond NCR.

A second method for addressing MOs is to mitigate aversive stimuli that affect the value of reinforcers, meaning implementing strategies to make situations less aversive. Carr et al. (2003) successfully reduced the severe problem behaviors of three women by allowing access to items like heating pads and bedrest during menstruation.

Additionally, the research team provided NCR, redistributed the schedule of demands, programmed choice making opportunities, “embedded” difficult aversive demands within preferred activities (i.e., behavioral momentum), and taught functional communication responses (FCR). This effectively reduced the discomfort the women were experiencing while also making the tasks more enjoyable, thereby creating an abolishing operation that reduced the value of escaping the activities. Via a multiple baseline design, results revealed a functional relation as the problem behaviors were reduced to near-zero levels for all participants and maintained for 1-2 years.

2.44 Summary. As this section has shown, conducting an FBA to accurately identify and then target the MOs of a behavior can be an effective method of reducing severe problem behavior. Research thus far has indicated two main methods for achieving this. NCR can be used to provide regular access to reinforcers for individuals, thereby creating an abolishing operation that reduces the need for them to engage in problem behavior to access those reinforcing (Rush et al., 2001; Vollmer et al., 1993; Vollmer et al., 1998). A second method is to mitigate aversive stimuli through ways such as reducing discomfort and pairing the aversive stimuli with preferred stimuli (Carr et al., 2003). This also creates an abolishing operation, reducing the need to escape non-preferred environments. However, research on MOs has also shown that additional interventions can be beneficial (Carr et al., 2003; Rush et al., 2001).

2.45 Functional Communication Training

The most commonly used function-based intervention to address severe problem behavior for individuals with moderate and severe disabilities is FCT. Cooper et al. (2007) define FCT as an intervention that consists of prompting and reinforcing a

functionally equivalent appropriate behavior while placing the problem behavior on extinction in order to effectively replace the problem behavior. For instance, if a person was engaging in severe aggression to escape from demands, the individual may be taught to say “break please” and then a break would be provided. Requesting a break is referred to as “functionally equivalent” to the problem behavior because they both result in the same reinforcer (i.e., escape from demands). This is distinct from MO targeted interventions because FCT seeks to replace the problem behavior with an appropriate one, whereas interventions targeting MOs seek to make the problem behavior unnecessary altogether.

Carr and Durand (1985) wrote the seminal article on FCT. In this article, researchers conducted two studies, one to evaluate an assessment method and one to evaluate the effects of an intervention based on the results of the assessment. The participants were four children ages 7 to 14 with diagnoses of autism, brain injury, and developmental delay and hearing impairment. All participants engaged in severe problem behavior, including aggression, SIB, and disruptive/destructive behavior. After identifying the putative function in study one, researchers taught the participants to request (a) help in situations where their behavior was maintained by escape from demands and (b) praise in situations where their behavior was maintained by access to attention. The effects of the FCT was evaluated with a reversal design, which revealed a functional relation between FCT and problem behavior reduction. Furthermore, results confirmed the authors’ hypotheses that problem behavior served a specific function as participants whose problem behaviors were maintained by escape from task only showed a decrease in behavior when the request for assistance was reinforced. Conversely,

participants whose problem behaviors were maintained by attention only resulted in a decrease in behavior when the request for praise was reinforced.

By showing that a problem behavior can be efficiently reduced by teaching and reinforcing an FCR, Carr and Durand (1985) set the stage for several lines of research on FCT. This includes how to use FCT for behaviors that have multiple functions, combining FCT with other interventions, and how to implement FCT in sustainable ways.

2.46 FCT and multiply controlled problem behavior. Since the initial study by Carr and Durand (1985), the literature has been extended in many ways. One way is to use FCT for multiply controlled problem behavior by teaching a different FCR for each function a behavior serves. For example, if an individual's aggression is maintained by escaping from a task and to gain attention, he might be taught to ask for a break and to ask for attention. In 1996, Sigafoos and Meikle investigated the effects of FCT on multiply controlled problem behavior of two children with autism by teaching a separate FCR for each function. The participants were both 8 years old and exhibited a variety of problem behavior including, but not limited to, aggression, SIB, property destruction, yelling, and crying. Functional analyses revealed these behaviors were controlled by access to preferred items and attention. As such, the participants were taught one FCR to access the preferred items and a separate FCR to access attention. A multiple baseline across participants design was employed, and results indicate immediate changes in level for the problem behavior from near 100% to near 0%. However, since there were only two participants, a functional relation could not be established. The authors concluded the intervention was effective despite the lack of a functional relation, and as such, if

problem behavior is multiply controlled a separate FCR should be taught for each function.

A decade later, Neidert, Iwata, and Dozier (2005) conducted a similar study by teaching individual FCRs for the different functions of the multiply controlled severe problem behavior of two young children with autism who engaged in SIB, aggression, and disruptive behavior. Assessment revealed the participants' challenging behaviors were maintained by escape and access to attention. Neidert et al. taught participants to request a 30 s break from demands and 20 s of attention. For one participant, the researchers decided to also provide an alternative reinforcer (i.e., candy) for task completion to facilitate compliance with demands. Researchers evaluated the effects of FCT using a multiple baseline across behaviors and participants design, to allow for sufficient replications of effects to establish a functional relation between FCT and multiply controlled problem behavior. Results showed that FCT led to decreases in problem behavior and increases in both FCR and compliance for the escape and attention conditions of both participants.

These studies demonstrate multiple important points for using FCT to address multiply controlled problem behavior. First, it is important to identify all functions of the targeted behavior serves. Second, it is critical to teach an FCR for each function. Without doing both things, under certain circumstances the individual will not have an appropriate way to communicate his/her needs, and will therefore likely continue to engage in the problem behavior. For example, if a student engages in aggression to escape from demands and to get attention when left alone, and is only taught to request a break, when left alone the individual will likely continue to exhibit aggression.

2.47 FCT and punishment. A few studies have combined FCT with punishment when intervening with severe problem behavior. An early study exploring this was conducted by Hagopian et al. (1998). These authors compared FCT with and without extinction and punishment on the severe problem behavior of 21 individuals with ID, ages 2 to 16, who were admitted to an inpatient hospitalization unit. FCT with punishment was only used if FCT with and/or without extinction proved ineffective. Punishment in this study were individualized to each participant, and included (a) time-out in another room, (b) time-out in a chair, (c) contingent basket hold restraint, (d) facial screen, (e) prompting the individual to put hands down, or (f) contingent demands. Variations of the reversal design (e.g., ABAB, ABABCBC) were used to evaluate the effects of interventions with each participant. A functional relation between one of the intervention conditions (i.e., FCT without extinction, FCT with extinction, FCT with punishment) and rates of severe problem behavior was established for each participant. However, since not all participants received the same interventions (e.g., some received FCT without extinction and FCT with punishment, some received just FCT with extinction, some received all three), the more meaningful results came when the researchers summarized the effects across cases. This led to several relevant findings. First, simply teaching and reinforcing alternative responses (i.e., FCT without extinction) actually resulted in a mean 17.4% increase in problem behaviors. Contrarily, FCT with extinction produced a mean 68.6% reduction in problem behavior with 44% of applications resulting in 90% or greater reduction. However, after schedule thinning was introduced only 41.6% of cases maintained the decreased rates of problem behavior. FCT with punishment (e.g., additional demands, time-out chair) produced a 90% or greater

reduction in problem behavior for 90.1% of applications, with one case having an 87.3% reduction. Additionally, when schedule thinning was applied in FCT with punishment conditions 100% of cases maintained the decreased rates of responding. This indicates that punishment procedures may be necessary to reduce severe problem behavior to acceptable levels with individuals with moderate/severe disabilities. However, it also exemplifies the ethical requirement to try less invasive interventions first.

In the second of two studies published in a single article, Schmidt et al. (2014) implemented an intervention using (a) behavioral indication (i.e., behaviors that reliably preceded the targeted problem behavior) as a cue for the interventionist to prompt a functional communicative response and (b) negative punishment (i.e., removing the reinforcer contingent on problem behavior). Participants were three students with autism, ages 9 to 15, who exhibited a variety of severe problem behavior including aggression, throwing objects, pica, SIB, elopement, fecal smearing, property destruction, touching others genitals, cursing, and sexual statements. The effects of the intervention were evaluated with a multiple baseline across participants design. Results indicated a functional relation with changes in the level and trend of problem behavior and FCRs for all participants.

These studies indicate that punishment procedures can be an effective addition to FCT interventions. In both studies, the addition of a punishment component resulted in acceptable levels of reduction of the problem behaviors (Hagopian et al., 1998; Schmidt et al., 2014). Further, the Hagopian et al. (1998) study showed that in some cases, punishment may be required to reduce problem behaviors. However, the Hagopian et al.

article also demonstrates the ethical requirement to attempt less intrusive interventions before resorting to punishment.

2.48 FCT and NCR. Another intervention that has been combined with FCT is NCR to effectively teach a replacement behavior while also creating an abolishing operation for the problem behavior. For example, Hagopian et al. (2001) effectively used FCT and NCR on a fixed-interval 3-min schedule to reduce the problem behavior exhibited by a 6-year-old child with diagnoses of autism, mild ID, and a severe behavior disorder. The participant exhibited aggression, disruption (e.g., screaming, throwing items), SIB, and spitting. After identifying the functions of the behaviors (i.e., escape from attention, access to tangibles), a treatment package was implemented that involved teaching an FCR for each function and an NCR component of providing 30 s of reinforcement on a fixed-interval 3-min schedule. Researchers used a multiple baseline across behavioral functions design to evaluate the effects of intervention. Because there were only two demonstrations of effects, a functional relation was not established; however, FCT and NCR resulted in more than 96% reduction in the child's displays of problem behavior.

More recently, Fritz et al. (2013) evaluated the effects of FCT and NCR on the severe problem behavior of two individuals, one of whom was diagnosed with moderate/severe disabilities. In the third of three studies, the authors applied a series of interventions for one participant with autism and severe ID and a second participant with a hearing impairment and learning disability. Initially, the researchers delivered continuous reinforcement to establish low, stable rates of behavior. Next, they systematically thinned the schedule of NCR while prompting an FCR. Though initially

effective, when the schedule began to be thinned problem behavior began to rise again. Therefore, to facilitate sufficient schedule thinning the researchers added (a) response blocking to the treatment package for the participant with autism and severe ID and (b) a 5-s changeover delay (i.e., FCRs were not reinforced until there was 5-s absent of problem behavior) for the other participant. The addition of these components led to effective schedule thinning while maintaining low rates of problem behavior. With these additional components, the NCR reinforcement schedules were able to be effectively thinned.

These studies indicate another effective treatment package that can be created with FCT. By using NCR to create an abolishing operation, thereby reducing the need to engage in problem behavior, it can allow for effective instruction of an FCR. However, the Fritz et al. (2013) study illustrated a potential concern with this package. Specifically, additional interventions may be required to thin the schedules of reinforcement to levels that are likely to be sustained in the natural setting.

2.49 FCT and concurrent schedules of reinforcement. One possible method for FCT to be sustainable in the natural setting is through the use of concurrent schedules of reinforcement. Cooper et al. (2007) define concurrent schedules of reinforcement as any arrangements in which two or more contingencies of reinforcement are operating independently and simultaneously. In terms of FCT and problem behavior, this would refer to reinforcing both FCRs and problem behaviors, but on different schedules. Borrero et al. (2010) compared several concurrent schedules of reinforcement (i.e., dense schedule for problem behavior and thin schedule for FCRs; thin schedule for problem behavior and dense schedule for FCRs; equal schedules; extinction for problem behavior

and dense schedule for FCRs) to determine what ratio was optimal for natural settings. Three students with developmental disabilities who exhibited severe problem behavior participated in the study. Researchers used a multiple treatment reversal design to evaluate the effects of FCT and various concurrent schedules of reinforcement for each participant. Results adhered to the matching law, which means the frequency of problem behavior and FCRs was directly related to the frequency of reinforcement. Specifically, when a dense schedule for problem behavior and a thin schedule for FCRs were in place, participants exhibited high rates of problem behavior and low rates of FCRs. Similarly, participants exhibited low rates of problem behavior and high rates of FCRs when a thin schedule for problem behavior and a dense schedule for FCR were in place. As such, extinction was necessary to eliminate problem behavior. This is relevant because extinction for severe problem behavior is difficult to implement in natural settings. Often the best case scenario in natural settings is a thin schedule of reinforcement for problem behavior and a dense schedule for FCR, but the results of this study showed this would not reduce the problem behavior to clinically acceptable levels.

2.50 FCT and schedule thinning. A major focus for making FCT feasible in natural settings is how to effectively thin the schedule of reinforcement for FCR. This is because in most environments, continuous reinforcement is not possible for FCR (e.g., requests to escape a necessary medical procedure, requests for tangibles that are not present). The three major types of schedule thinning procedures are multiple schedules, response restriction, and chained schedules of reinforcement.

Cooper et al. (2007) define multiple schedules of reinforcement as entailing two or more schedules of reinforcement for a behavior that occur in an alternating sequence

(e.g., 15 s of extinction, 45 s of continuous reinforcement). Additionally, each schedule is paired with an S^D (e.g., a white card presented during continuous reinforcement, a black card present during extinction). Hanley, Iwata, and Thompson (2001) compared four different types of compound schedule thinning. Following FCT, three adults with developmental disabilities who engaged in SIB and/or aggression were exposed to the following methods of schedule thinning for FCR: delay to reinforcement (i.e., after an FCR, they were prompted to wait prior to reinforcer delivery), FI (i.e., after a set amount of time has elapsed, FCR is reinforced), multiple schedules (i.e., two basic schedules that occur independently, each with an S^D associated with it), and mixed schedules (i.e., the same as multiple schedules without an S^D). Problem behavior remained on extinction during both schedules. The authors analyzed rates of problem behavior and FCR using a multiple treatment reversal design, and results favored multiple schedules. More specifically, the delay to reinforcement condition extinguished the FCR for one participant, the FI schedule resulted in inappropriately high rates of FCR for one participant, and with the mixed schedule two participants were unable to discriminate between the conditions while one participant began exhibiting SIB once again. On the contrary, multiple schedules maintained low rates of problem behavior, and reduced FCR and the need to reinforce FCR to clinically acceptable levels.

A second type of schedule thinning is FCT and schedule thinning using response restriction. FCT and schedule thinning with response restriction involves first selecting an FCR to teach that uses a tangible as the mode of communication (e.g., handing a card with “break” written on it to the caregiver). Then, two alternating schedules of reinforcement are used, typically continuous reinforcement for FCR and extinction for

FCR. When continuous reinforcement is in effect, the means of communication is available (e.g., break card). When extinction is in effect, the ability to emit the response is restricted by removing the means of communication (e.g., placing break card in a drawer).

FCT and schedule thinning were developed because individuals with more severe disabilities may have difficulty discriminating between conditions when reinforcement is and is not available even if an S^D and stimulus delta (S^Δ; i.e., a stimulus that signals reinforcement is not available) are presented. Fisher, Greer, Querim, and DeRosa (2014) investigated the effects of FCT and schedule thinning using response restriction on severe problem behavior precisely for this reason. Participants in the study were four children, ages between four and seven, with autism and/or ID. All four had previously been exposed to multiple schedules and failed to discriminate between conditions. In other words, participants continued to exhibit unacceptably high rates of FCR during conditions when reinforcement was unavailable. Through a multiple baseline across participants design with an embedded reversal design, results revealed a functional relation between the independent and dependent variables. Specifically, during the response restriction condition: (a) problem behavior remained low; (b) participants discriminated between conditions, meaning the FCR never encountered extinction as happened during multiple schedules; and (c) the schedule was thinned to 4:1 for work to reinforcement ratio.

A third method for schedule thinning is chained schedules of reinforcement. Chained schedules of reinforcement are similar to multiple schedules in that both have different reinforcement schedules occurring in succession and an S^D associated with the

different schedules. However, with chained schedules the second schedule and correlated S^D function as a reinforcer for some response requirement during the first schedule (Cooper et al., 2007). Falcomata, Roane, Muething, Stephenson, and Ing (2012) used FCT and thinning a chained schedule of reinforcement to address the severe problem behaviors (i.e., aggression, disruptive behavior, disrobing, SIB, property destruction) of two participants with autism. An FA revealed the participants' behaviors were maintained by access to preferred activities, specifically when those preferred activities were interrupted. Falcomata et al. identified an S^D for each participant (i.e., necklace, sheriff badge). When the researchers wore the S^D, they would direct the leisure activities. When the participants wore it, the participants were allowed free access to their preferred activities. Initially participants were taught the FCR of requesting the S^D, which was continuously reinforced and provided for 30 s. Following this, the researchers set a timer and followed an FI schedule of reinforcement for the FCR (e.g., after 5 min they honored the FCR for the S^D). Finally, academic demands were systematically introduced during the times when the researchers had the S^D. Using a reversal design, data indicated a functional relation in that problem behavior was reduced to zero levels and FCR and academic engagement both showed a sustained increase during FCT and schedule thinning using a chained schedule of reinforcement.

One year later, Falcomata et al. (2013) extended the research on FCT and chained schedules of reinforcement. This study included two participants with autism who engaged in aggression, disruptive behavior, and SIB that were multiply controlled by (a) escape and tangible for one participant; and (b) escape, tangible, and attention for the second. The same sequence of interventions used in the Falcomata et al. (2012) study

were applied in this study with one exception. In the final phase of intervention FCRs for the S^D (i.e., wristband) were reinforced with access to the S^D if it occurred after a FI had elapsed, but access to other reinforcers (e.g., preferred activities) was not provided. Once the participant had the wristband, requests for specific reinforcers were reinforced on a continuous schedule. Therefore, the participants had to request the wristband and then request the particular stimulus change that was valued at the time (e.g., request for wristband and then ask for a toy, have it provided, but still be required to work with limited attention). Using a reversal design, Falcomata et al. (2013) found a functional relation as challenging behavior remained at near zero levels and FCR remained at increased levels during the FCT and chained schedule conditions.

In 2011 Hagopian, Boelter, and Jarmolowicz reviewed the literature on FCT and schedule thinning to summarize the effectiveness of the various techniques. The review was not exhaustive, instead it focused on describing, providing examples, and listing the strengths and limitations of various techniques of schedule thinning (i.e., delay schedules, chained schedules, multiple schedules, response restriction). Twenty-three studies were summarized. The authors concluded that all schedules were useful depending on the situation. They recommended if thinning the schedule to durations of one min or shorter, delay to reinforcement should be used. For targeting durations longer than one min, multiple schedules should be used. Finally, they recommended using chained schedules when targeting escape-maintained behavior.

2.51 FCT and alternative reinforcement. Another strategy that has been effective when paired with FCT is providing alternative reinforcement. Alternative reinforcement involves providing individuals with a reinforcer that is functionally

different from the maintaining reinforcers (e.g., access to attention when toys are unavailable). Rooker et al. (2013) analyzed the effects of 58 applications of FCT on the severe problem behavior of individuals who received treatment at their outpatient clinic. Criteria for inclusion in the study were: (a) an FA had been conducted to identify the function of the participant's behaviors, (b) FCT with extinction had been used as a component in intervention, (c) a valid experimental design was used, and (d) interobserver agreement was conducted for at least 25% of sessions. The authors found that FCT combined with extinction and/or alternative reinforcement reduced problem behavior by at least 80% for 86% of applications and by at least 90% for 79% of applications. For cases that did not respond, punishment components were occasionally added. When punishment was combined with FCT in the nonresponding cases, it led to a 90% reduction for 54% of the cases. When punishment was combined with FCT and alternative reinforcement, it led to a 90% reduction for 60% of the applications. As with earlier studies (i.e., Hagopian et al., 1998), these results indicate that additional components such as punishment are required in some cases.

In a subsequent study, Austin and Tiger (2015) applied FCT and alternative reinforcement with a participant with an ID and conduct disorder who exhibited aggression. Problem behavior was multiply controlled by access to attention and to tangible (i.e., Xbox). After FCT, the researchers began to systematically delay reinforcement following the FCR, but were unable to successfully extend beyond 30 s. At that point they began a phase in which, after the participant exhibited the FCR for attention he was given free access to Xbox until attention was provided. The delay to attention was successfully extended to 5 min. This was then replicated across the tangible

condition (i.e., contingent on the FCR for Xbox, attention was provided until Xbox was available). Data showed the intervention to be effective as the delay was extended to 5-min while maintaining near zero levels of problem behavior. A limitation was that effects were only demonstrated across two conditions; therefore, a functional relation was not demonstrated.

Finally, Hoch, McComas, Thompson, and Paone (2002) provided another demonstration of the use of alternative reinforcement. In this study, Hoch et al. used concurrent schedules and alternative reinforcement without extinction to reduce the problem behaviors (i.e., aggression, SIB, disruptive behavior) of three children. Two participants had diagnoses of autism and the third was diagnosed with multiple disabilities (i.e., health impairments, mild to moderate ID, vision impairment, hearing impairment, language impairment). Functional analyses revealed all behaviors were maintained by escape from academic demands. When intervention began, escape was provided on a fixed ratio 1 schedule for both FCR and problem behavior while an alternative reinforcer (i.e., preferred activities) was provided for task completion. Through a reversal design, researchers found a functional relation as rates of problem behavior were reduced to near zero levels and task completion increased to nearly 100% of sessions during FCT and alternative reinforcement condition.

These studies show yet another intervention that can be combined with FCT to reduce the severe problem behavior of individuals with moderate/severe disabilities. Additionally, the results of Austin and Tiger's (2015) study indicate providing alternative reinforcers can be an effective method to facilitate schedule thinning. This likely works

by creating an abolishing operation (e.g., the reinforcing effects of attention are reduced by providing access to Xbox while waiting).

2.52 Comprehensive Assessment and Treatment

Despite the wide ranging research on assessment and treatment of problem behavior, Hanley et al. (2014) pointed out a simple flaw. Namely, the majority of research has been conducted on individual components of assessment and treatment. However, very little research has been conducted on comprehensive models for assessing and treating problem behavior. Therefore, they conducted a study to meet that need. Their method for assessment began with open-ended interviews and brief observation to identify factors that might influence problem behavior. However, these methods were meant to inform the design of idiosyncratic FAs, not identify functions. The interview inquired about the individual's abilities, topography of problem behavior, contexts for problem behavior, and responses to problem behavior. This was followed by a 15-30 min observation of the individual. Then, based on the results of the interview and observation, a single test condition and a control condition were designed to analyze the control putative reinforcers exert over problem behavior. Functionally appropriate, comprehensive interventions were then designed that (a) initially teach a simple and functionally equivalent response, (b) systematically increase the complexity of the response to developmentally appropriate levels, (c) introduce tolerance to delay and denial of reinforcement, (d) chain simple responses such as completing simple demands during delay/denial of reinforcement, (e) chain more complex responses during delay/denial of reinforcement, and (f) transition treatment to natural contexts. This method was applied with three children with autism who exhibited problem behavior

(i.e., loud vocalizations, disruption, aggression). Functions were identified for each participant, and using a changing criterion design, a functional relation was demonstrated between the intervention and reduction in challenging behaviors. The authors concluded by reaffirming the need for more of this type of comprehensive research.

2.53 Function-Based Crisis Intervention

To date, there has been no published research explicitly evaluating the effects function-based interventions implemented across all phases of crisis intervention. Although crisis intervention does advocate using behavioral techniques (e.g., mitigating triggers, teaching replacement behaviors), it restricts them to times when the student is calm. Considering the effectiveness of function-based intervention at reducing severe problem behavior and crisis intervention's demonstrated success with improving caregivers' abilities to work with individuals who exhibit these behaviors, this lack of research on how to combine them is a significant omission. With respect to function-based interventions, the literature shows decades of effective interventions, dating back to Carr and Durand (1985). Furthermore, research has shown that function-based interventions are more effective at reducing problem behaviors than non-function-based interventions (Filter & Horner, 2009). However, replicable descriptions of how safety was maintained when responding to severe problem behavior are largely absent. In the literature reviewed, the most detailed descriptions are simple statements such as contingent restraint was used as a punisher (Hagopian et al., 1998). This is concerning considering that many procedures (e.g., extinction for attention maintained behaviors) are difficult to implement with severe problem behaviors. When this is coupled with the fact that "disciplined responses are difficult to make when one's safety is threatened"

(Gilliam, 1993, p. 235), it calls into question whether natural caregivers will be able to implement the function-based interventions as they are described in the literature.

Crisis intervention has strengths and limitations that appear to complement the field of function-based intervention. For instance, where the function-based literature leads to questions of whether natural caregivers can implement the techniques, the field of crisis intervention has research showing its use leads to an increase in safety (Williams, 2009) as well as caregivers' ability to intervene with severe problem behavior (Baker & Bissmire, 2000; Dawson, 2003; Soenen et al. 2009). However, unlike the field of function-based intervention, there are serious concerns as to whether crisis intervention will actually reduce the rates of severe problem behavior exhibited by individuals with moderate/severe disabilities. This is for two reasons. First, the field of function-based intervention has shown that extinction and, sometimes, punishment is necessary to reduce severe problem behavior (Borrero et al., 2010; Hagopian et al., 1998). Further, the few crisis intervention studies to measure rates of severe problem behavior have shown mixed effects (Baker & Bissmire, 2000; Soenen et al., 2009).

With the respective strengths and limitations of research in the fields of function-based intervention and crisis intervention, it is clear the two have the potential to complement one another, if designed and implemented in a purposeful way. Although no published study has investigated a synthesized, function-based crisis intervention, Stevenson and Wood (2016) conducted a study to address this research gap. The researchers used individualized treatment packages to address the severe problem behavior of three individuals with autism. The intervention consists of function-based interventions organized by the phases of crisis identified by Colvin (2004). The

researchers first conducted an FBA to identify the controlling variables. They then designed interventions as follows. During the *calm* phase, FCR was reviewed and access to high quality reinforcement was provided to create an abolishing operation. During the *trigger* phase, strategies were implemented to make the triggers less aversive (e.g., provide verbal warnings prior to terminating preferred activities). During the *agitation* phase, the replacement behavior (e.g., FCR) was prompted. In the *acceleration* phase, increased prompting for the replacement behavior was used and access to the reinforcer was delayed. When the participants exhibited *peak* (i.e., severe problem) behaviors, the researchers planned strategies to (a) maintain safety and (b) withhold reinforcement or provide inferior quality reinforcement as compared to the reinforcement provided when *calm* or after exhibiting the replacement behavior. Next, during *de-escalation*, neutral redirection to the appropriate activity was provided along with a review of the replacement behavior. Last, during *recovery* the initial environment was recreated and a correction trial was run (i.e., reintroduce the *trigger* and immediately prompt the replacement behavior). Additionally, different methods of schedule thinning were planned for each participant. These included delay to reinforcement, fixed-interval thinning, and schedule thinning using response restriction. The intervention was applied using a delayed multiple probe across participants design, and results indicated a functional relation. Specifically, findings supported that function-based interventions were effectively organized according to the phases of crisis intervention. Social validity data indicated teachers and paraprofessionals believed the intervention was appropriate and they could feasibly implement it. These social validity results are important because they directly address the limitation of the function-based literature to offer insights

regarding whether natural caregivers can implement the function-based interventions during the cycle of crisis.

2.54 Summary

The field of function-based intervention has an extensive history of effectively reducing the severe problem behavior of individuals with moderate/severe disabilities. Though an analysis of the interventions reveals strategies that address motivating operations, antecedents, and consequences, the literature can be broken down into the two major categories of interventions targeting MOs and FCT.

The literature on interventions targeting MOs focused largely on NCR (Rush et al., 2001; Vollmer et al., 1993; Vollmer et al., 1998). By providing individuals access to reinforcers based on an interval schedule, researchers were able to abolish the effectiveness of the maintaining reinforcers, thereby reducing the frequency of severe problem behavior. Additionally, one study included strategies that reduced the discomfort of women experiencing menstruation as part of a larger treatment package (Carr et al., 2003). This also abolished the effectiveness of relevant reinforcers because reducing the discomfort reduced the need to escape demands.

The literature describing the effects of various FCT interventions on the rates of severe problem behavior to individuals with moderate/severe disabilities is much more extensive than the literature on MOs. Beginning with the study by Carr and Durand (1985), researchers have shown how effective teaching a functionally-equivalent response can be at replacing the severe problem behavior. Since that seminal article, researchers have expanded the evidence for FCT in several ways. They targeted multiply controlled problem behavior by teaching a different FCR for each function (Neidert et al.,

2005; Sigafoos & Miekle, 1996). FCT was also combined with other interventions including punishment (Hagopian et al., 1998; Schmidt et al., 2014) and NCR (Fritz et al., 2013; Hagopian et al., 2001). Last, a variety of studies have been conducted to investigate how to make FCT more possible in natural settings. This included using (a) concurrent schedules of reinforcement (Borrero et al., 2010); (b) schedule thinning via multiple schedules (Hanley et al., 2001), response restriction (Fisher et al., 2014), and chained schedules (Falcomata et al., 2012; Falcomata et al., 2013); and (c) providing alternative reinforcement (Austin & Tiger, 2015; Hoch et al., 2022; Rooker et al., 2013). These suggest many strategies that can be effective in teaching individuals with moderate/severe disabilities an FCR while reducing severe problem behavior to rates that can be tolerated in natural settings.

Despite all this promise, concerns remain regarding the feasibility of implementing function-based interventions in natural settings. Specifically, there is insufficient technical description in these studies about how safety was maintained to allow natural caregivers to replicate the interventions, and no research has been conducted to determine if training in function-based interventions increases safety or caregivers' ability to intervene with severe problem behavior. Because these limitations are directly addressed by the field of crisis intervention, research is warranted to investigate the effects of combining crisis intervention and function-based intervention (or function-based crisis intervention). Though no published studies have investigated this, one study (Stevenson & Wood, 2016) has shown the promise of function-based crisis intervention in reducing the severe problem behavior of three students with autism.

CHAPTER THREE: METHOD

3.1 Participants

There were two inclusion criteria for this study. First, students had to be diagnosed with a developmental disability. Second, students needed to exhibit crisis behavior multiple times per day, which was defined as any behavior that requires "immediate attention to protect the physical and/or psychological safety of that student, the teacher, or others" (Gilliam, 1993, p. 224). Students were identified through teacher nomination. This resulted in three students being included.

Brad was a seven year old Hispanic male. He had a diagnosis of autism. He was referred for the study because he engaged in property destruction, including pulling and pushing bookshelves over, and aggression. Jared was a six year old Caucasian male who was diagnosed with autism and Moyamoya disease. His challenging behaviors included SIB, which had led to him wearing a protective helmet, and aggression. Last, Natalie was a 13 year old African-American female. She was diagnosed with autism and was nominated for the study because she exhibited aggression, SIB, and property destruction.

3.2 Setting

The study took place in two schools in a large, urban district in the southeast United States. The first was separate public school for students with severe disabilities. There were 235 students enrolled in the 2015-2016 school year (Charlotte-Mecklenburg Schools, 2016). There were a total of 38 teachers serving those students (Faculty & Staff,

2017a). The reported student demographics are displayed in Table 1.

Table 1: School One Demographics

Gender		Ethnicity	
Male	134	African American	116
Female	91	American Indian	1
		Asian	8
		Hispanic	51
		Pacific Islander	0
		White	43
		Multi-racial	6

The second school was a middle school located within the same school district. This school had 1,422 students enrolled during the 2016-2017 school year (Charlotte-Mecklenburg Schools, 2016). These students were served by 78 teachers (Faculty & Staff, 2017b). Student demographics are presented in Table 2.

Table 2: School Two Demographics

Gender		Ethnicity	
Male	726	African American	362
Female	696	American Indian	7
		Asian	49

Table 2 continued

	Hispanic	112
	Pacific Islander	1
	White	859
	Multi-racial	32

All sessions (i.e., assessment, intervention, generalization) took place in the students' classrooms, all of which were separate classrooms. For two of the participants (i.e., Brad, Jared) the study took place during group instruction. In their class there was one teacher, two teacher's assistants, and eight students. For the third (i.e., Natalie), it took place during one-on-one instruction. In her class there was one teacher, one teacher's assistant, and eight total students.

3.3 Experimenter and Interventionists

The experimenter and primary interventionist was a doctoral student in special education, a Board Certified Behavior Analyst, and Crisis Prevention Intervention certified. He had worked with individuals with DD who exhibited crisis behavior for 12 years at the time of the study. In addition to designing the study, he was responsible for (a) conducting the FBA, (b) developing the individualized interventions, (c) implementing the interventions, (d) training and supervising each participant's teacher(s) role as secondary interventionist(s), and (e) supporting the teacher during implementation.

The students' teachers served as secondary interventionists. Both teachers were licensed special educators in the state of North Carolina to teach adapted curriculum. The

secondary interventionists' primary responsibility was to assist with intervention as needed to maintain safety (e.g., if two people were required to physically intervene).

3.4 Experimental Design

This study used a delayed multiple-probe across participants design (Cooper et al., 2007). Although the internal validity of this design is not as strong as others (e.g., reversal, multiple baseline across students), it was used because part of this study necessitated exposing students to situations that evoke dangerous behaviors. Therefore, in order to minimize risk there was a need to minimize the number of baseline sessions when effective intervention was absent. The delayed multiple-probe design did this in two ways. First, the delayed baseline minimized the chances of a prolonged baseline for the second and third students before administering the intervention. Second, the probe format ensured that if a prolonged baseline did occur, the number of sessions would be limited to the minimum number to establish internal validity.

Students entered baseline and intervention in a staggered fashion. Although their entry to baseline was staggered, entries were coordinated to ensure internal validity. Specifically, the second student's (S2) baseline began before FBCI began for the first student (S1), and the third student's (S3) baseline began prior to FBCI being introduced to S2. This overlap of baseline with the introduction of FBCI for other students allowed for verification of predictions (i.e., if a change occurred in S1's level of crisis behavior after FBCI was introduced and no change occurred in S2's level, it implied FBCI was responsible for the change). Criteria to enter all phases are described below.

The order of students was determined in consultation with the teachers. The student in the greatest need of intervention was the first student (S1) to begin the study,

the student with the second greatest need was the second (S2), and the student with the third greatest need was the third (S3). The need of the student was determined based on the following factors: (a) frequency of crisis behavior, (b) intensity of crisis behavior, (c) duration of crisis episodes, (d) danger crisis behavior presents to the student, and (e) danger crisis behavior presents to others.

The first activity to occur was conducting an FBA and creating individualized interventions for all three students. After the FBAs and interventions were completed, S1 entered baseline for three sessions. At that point, S1 entered and remained in intervention until the rates of crisis behavior decreased below the baseline mean for at least five consecutive sessions.

S2 entered baseline following S1's first baseline session. Five sessions were conducted in order to have overlap between when S1 moved from baseline to intervention and S2's baseline. After the initial probes, baseline probes were conducted once per week until (a) a demonstration of effect had occurred for the intervention on the S1's crisis behaviors and (b) prediction of S2's crisis behavior was possible. After meeting these criteria, baseline sessions were implemented with S3 to allow for overlap between S2 and S3's baselines. Then intervention was implemented with S2 until crisis behavior decreased below the baseline mean for at least five consecutive sessions.

Similarly, after the initial probes S3 received a baseline probe once per week until there was a demonstration of effect with S2 and prediction of future crisis responding for S3 was possible. Following this, S3 entered intervention until crisis behavior was reduced below the baseline mean for five consecutive sessions.

If a student's data showed an increasing or stable trend above the baseline mean for five consecutive sessions during intervention, the team would have met to determine if alterations to the intervention needed to be made or if that student should exit the study. If alterations were made, the remaining student(s) would stay in baseline until a demonstration of effect had occurred for the modified intervention. If no progress was demonstrated after 10 sessions, the student would exit the study. Additionally, any student's involvement would have been terminated if (a) the experimenter or secondary interventions felt that safety could not be maintained during two separate sessions, (b) behaviors escalated beyond what had been previously observed by staff or researchers during two sessions, or (c) someone was injured during two sessions. If it was decided the student should exit the study, then the next student would enter intervention. These procedures were included as an ethical obligation to protect the safety of all involved.

3.5 Dependent Variables and Measurements

Data were collected on three dependent variables. These included (a) crisis behavior, (b) precursor behavior, and (c) appropriate behavior. For a sample data sheet, see Appendix A.

3.6 Crisis behavior. Crisis behavior was defined as any behavior that required immediate intervention to protect the physical or psychological safety of the student or those around him (Gilliam, 1993). With this as the broad definition, each student had an individual definition corresponding to the topography of his/her crisis behavior. Individual definitions of crisis behavior were determined by the following steps: first, as part of the functional assessment interview (Hanley, 2012) the experimenter discussed the students' most challenging and dangerous behaviors with the teacher. This yielded an

initial, working definition. Next, the experimenter observed students' dangerous behaviors directly. This served to confirm and refine the definition. When multiple dangerous behaviors were identified (e.g., hitting others, hitting his own head), they were combined into one comprehensive definition (e.g., crisis behavior – anytime student hits others or hits his head).

This process resulted in specific definitions for each student. Brad's crisis behavior was defined as anytime he attempted to: (a) slap, hit, kick, or bite another person; or (b) hit, kick, push, step on, or throw an inanimate object. Jared's crisis behavior was defined as anytime he attempted to: (a) strike his head (e.g., hitting, kneeing); (b) bang his head into something (e.g., floor, wall, headrest); (c) flail his body when he is not playing with a toy (*example*: yelling, leaning forward, and slamming his back into his chair; *non-example*: holding the yoga ball, laughing, rocking back and forth as he slaps the ball); or (d) hit, kick, slap, or bite another person. Natalie's crisis behavior was defined as any time she attempted to: (a) grab, scratch, pull the hair of, or hit another person; (b) hit herself in the head; or (c) kick an inanimate object.

Partial-interval recording was used to collect data on crisis behaviors (Cooper et al., 2007). Data collection occurred during 10-min sessions with 10 s intervals totaling 60 intervals per session. For each interval, if the crisis behavior occurred at any point, the interval was scored as such. The percentage of intervals with crisis behavior was calculated by dividing the number of intervals with crisis behavior by the total number of intervals (i.e., 60).

3.7 Precursor behavior. Precursor behavior was defined as any behavior that reliably preceded the target behavior (Dracolby & Smith, 2012; Fritz et al., 2013). As

with crisis behavior, each student had an individualized definition for precursor behavior corresponding to the topographies of his/her respective behaviors (e.g., making inarticulate noises, hand flapping, pushing materials away). Partial-interval recording was also used to collect data on precursor behavior with 10 s intervals across the 10-min sessions.

Precursor behavior was determined in the following manner. First, suspected precursor behavior was identified during the functional assessment interview and observations. Then, procedures followed those outlined by Fritz et al. (2013). Specifically, trials were conducted during FA conditions. These conditions contrived antecedent events to create establishing operations thought to affect the problem behavior (e.g., if it was suspected crisis behavior was maintained by attention, the experimenter ignored the student). After crisis behavior occurred, the relevant consequence was delivered (e.g., attended to the student). There was then a 30 s intertrial interval, and the antecedent events began again. A minimum of 10 trials when the crisis behavior occurred and 10 trials when the crisis behavior did not occur across all conditions were targeted to complete the precursor analysis. FA conditions are described in more detail below.

To create operational definitions for the possible precursors for Brad and Jared, each FA session was video recorded and viewed at a later time. Behaviors that occurred immediately prior to the crisis behavior were written down with a description of the topography. Then, these responses were grouped according to (a) vocalizations, (b) facial expressions, (c) postures, (d) repetitive motor movements, (e) locomotion, (f) object manipulation, and (g) other problem behaviors. Lower intensities of the crisis behavior were excluded as possible precursor behaviors.

Next, two members of the research team viewed the recordings of trials when the crisis behavior occurred. The potential precursor behaviors were scored as either occurring or not occurring. After each trial, the two research team members compared their data, discussed disagreements, and clarified definitions as necessary. If a disagreement occurred, the team members repeated these steps until 100% agreement was obtained for each response.

Permission to video record Natalie was not given. Therefore, to create the operational definitions two members of the research team observed her in the classroom setting using the same process. Then, data were scored during the FA sessions.

Last, probability analyses were conduct for each potential precursor (Fritz et al., 2013). For a description of the probability analyses, see Table 3.

Table 3: Precursor Probability Analyses

1. Probability of crisis behavior (C) given precursor (P)	$\frac{\textit{trials with P \& C}}{\textit{trials with P}}$
2. Probability of C given the absence of P	$\frac{\textit{trials without P but with C}}{\textit{trials without P}}$
3. Probability of the C	$\frac{\textit{trials with C}}{\textit{total trials}}$
4. Probability of P given C	$\frac{\textit{trials with C \& P}}{\textit{trials with C}}$
5. Probability of P given the absence of C	$\frac{\textit{trials without C that contain P}}{\textit{trials without C}}$
6. Probability of P	$\frac{\textit{trials containing P}}{\textit{total trials}}$

Responses meeting the following criteria were defined as precursor behaviors. First, the probability of the crisis behavior and the precursor behavior both occurring was greater than the probability of the crisis behavior occurring (a) in isolation and (b) across all trials (i.e., 1 > 2, 1 > 3). Second, the probability of the crisis behavior and the precursor behavior both occurring was greater than the probability of the precursor occurring (a) in isolation and (b) across all trials (i.e., 4 > 5, 4 > 6). If multiple topographies met criteria, they were combined into a single definition.

Using this method, the following definitions were used for each student's precursor behavior. For Brad, precursor behavior was defined as anytime he (a) rested his hand or foot on another person, or (b) resisted physical prompts. Jared's precursor behavior was defined as anytime he: (a) cried; (b) resisted staff prompting by running away, dropping to the floor, or resisting physical prompts; or (c) threw, hit, or kicked an object. Precursor behavior for Natalie was anytime she: (a) made an inarticulate sound (e.g., grunt); (b) pressed her fist against her chin; (c) hit the table; or (d) cried or yelled.

3.8 Appropriate behavior. In addition to the crisis and precursor behaviors targeted for reduction, each student had a behavior that was targeted for increase. Appropriate behavior was functionally equivalent to the crisis behavior (i.e., resulted in the same reinforcer as the crisis behavior) and was initially more efficient than the crisis behavior (i.e., accessing reinforcement using the appropriate behavior required less effort than using the crisis behavior). With this as the criteria, the appropriate behavior could either be what is commonly referred to as the replacement behavior or the desired behavior. For instance, if a student's self-injury was maintained by escape from demands, a replacement behavior may be saying "break" to escape the task, whereas the desired

behavior would be completing the demand and then receiving access to a break. Whichever of these behaviors was deemed most relevant for the student was measured. Relevancy was determined by assessing which behavior was most likely to facilitate success in the setting. For instance, if a student engaged in behavior to escape an aversive task, the replacement behavior of asking for a break may not have facilitated success if the student repeatedly asked for a break and never engaged in the task. In this case, task engagement would have been measured as the desired behavior. However, asking for help to complete a difficult step, a replacement behavior, may facilitate the student completing the task. In this case, asking for help would have been tracked.

This led to the following definitions for appropriate behavior. For Brad, appropriate behavior was asking for a break and/or not exhibiting the problem or precursor behavior for the targeted interval. Jared's appropriate behavior was defined as transitioning to his seat, and either (a) independently initiating a request for his reinforcer and waiting for his reinforcer for the current interval, or (b) completing the task which resulted in delivery of his reinforcer, all without exhibiting precursor or problem behavior. Finally, Natalie's appropriate behavior was completing the tasks on her schedule without exhibiting precursor or problem behavior.

The percent of successful opportunities was used to measure appropriate behavior. Each time the contingency was introduced for a student, data were recorded as to whether or not the student successfully exhibited appropriate behavior. The number of successful opportunities was divided by the total number of opportunities, resulting in a percentage.

3.9 Procedures

The study consisted of the following phases: (a) FBA, (b) plan development, (c) training of the experimenter and teacher(s), (d) baseline, (e) function-based crisis intervention, and (f) generalization. Sessions for phases (d) through (f) were targeted for 10-min in duration. If the student was engaging in precursor or crisis behavior at the end of the 10-min interval, the intervention continued until the student was absent of either behavior for 30 s. This was to ensure the student was able to successfully reintegrate into the class activities. However, data collection only occurred for the initial 10-min. Each session involved the experimenter and the student's teacher. The experimenter was responsible for implementing the classroom intervention during baseline and FBCI. The teachers were responsible for supporting the experimenter as described in the intervention to maintain safety.

3.10 FBA. Upon participant selection, an FBA was conducted on each student's crisis behavior. FBA began with a functional assessment interview conducted with the students' teacher. Next, direct observations were conducted during activities reported as likely to evoke the crisis behaviors. Narrative recordings of the antecedents, behaviors, and consequences were completed. These observations were used to identify new and confirm previously reported variables that might have affected the crisis behaviors. Once the observations were completed, an FA was conducted because functional assessment interview observations are often unreliable (Hanley, 2012; Iwata & Dozier, 2008).

3.11 Functional assessment interview(s). Functional assessment interviews were conducted with each student's teacher. The open-ended functional assessment interview provided by Hanley (2012) was used, which took between 30-45 min. The open-ended

interview was preferred to close-ended interviews (e.g., Functional Assessment Screening Tool, Motivation Assessment Scale) because the open-ended formats allowed interviewees to describe in detail what happened before and after problem behaviors, thereby identifying both prevalent and infrequent variables, whereas close-ended interviews often refer to generic variables (e.g., Is the behavior more likely to occur when he/she is denied something?) that lack the specifics needed for creating a plan.

3.12 Direct observations. Following the functional assessment interview, direct observations were conducted with each student. Observations were conducted during times and activities that crisis behavior was reported as most frequent and lasted between 15-30 min. These were determined in collaboration with the teacher, based on questions 10-14 of the interview (i.e., determining antecedent conditions). ABC narrative recording was used, which is an open-ended method of recording (Cooper et al., 2007). Upon occurrence of the targeted crisis behavior, the experimenter documented events that occurred immediately prior to and after the crisis behavior. This process continued until the observation period ended. For example, if math instruction was identified as likely to evoke crisis behavior, narrative recording commenced upon the initial indication that math was beginning and ceased after the student was allowed to transition to the next activity. For a sample recording form, see Appendix B.

Between two and four observations were conducted with each student. The brief nature of these observations was in keeping with the recommendations by Hanley (2012), as its primary purpose was to refine definitions, confirm variables identified for FA, and identify any variables that were overlooked. Additionally, for Natalie these observations were used to create definitions for the precursor behaviors.

3.13 Functional analysis. Based on the results of the functional assessment interview and direct observations, individualized conditions were designed to isolate and experimentally test the relation between one or more variables and the crisis behavior. To accomplish this, test and control conditions were created.

Test conditions were arranged to (a) create an establishing operation for the putative reinforcer, (b) deliver the antecedent related to the establishing operation, and (c) immediately reinforce any intensity of crisis behavior with the putative reinforcer. There were three general test conditions used. These were the tangible, attention, and escape condition. During the tangible condition a student would (a) not be given access to a preferred object, (b) attempts to access the object were redirected, and (c) upon exhibiting any crisis behavior the object was immediately provided. The attention condition consisted of: (a) providing the student with a neutral activity to engage in and then ignoring the student while engaging in a task (e.g., talking with another adult); (b) redirecting any attempts the student made to interact by gesturing and avoiding verbal interaction or eye contact; and (c) immediately providing attention when the student engaged in crisis behavior in the form of blocking crisis behavior, making eye contact, and prompting the student to engage in the assigned activity. Last, the escape condition involved (a) assigning an task that teachers reported commonly evoked problem behavior, (b) prompting the student to engage in it, and (c) removing the task and allowing the student to leave the area as soon as crisis behavior occurred. Reinforcers were provided for 30 s, and then another trial began. This was to remain consistent with the precursor analysis described previously that allowed for 30 s between trials.

Control conditions consisted of free access to the putative reinforcer. For instance, if it was suspected the student engaged in crisis behavior to access preferred toys, the student was given free access to his toys. If it was suspected the crisis behavior was maintained by adult attention, the experimenter would have provided continuous attention throughout the condition.

FA conditions were delivered and analyzed using an alternating treatments design (Cooper et al., 2007). Prior to beginning a cycle of testing, a token representing each condition was created (e.g., writing the name on a slip of paper). The experimenter randomly selected the tokens (e.g., pulling from a hat), and the conditions were delivered in the order in which they were selected. After all conditions were completed, this process repeated until a functional relation had been established or it was determined the results are undifferentiated. A functional relation was determined by visually analyzing line graphs of the data from the various conditions. If the data for one or more conditions were consistently higher than the data for the control condition following three cycles, a functional relation was established between the consistently high test condition(s) and the crisis behavior. Results were deemed undifferentiated if no separation of the data occurred after all conditions had been administered four times. At this point, the team will design new test conditions in an attempt to isolate the controlling variables.

Prior to beginning the FA, the research team and teachers developed safety procedures. The teacher and experimenter were present during all FA sessions. If either determined safety could not be adequately maintained or if someone sustained an injury that required medical attention, the session was terminated. If two sessions were terminated the FA was suspended indefinitely. The team would have met to discuss

whether safety could be maintained for this student, and if so, what alterations were required to maintain safety. If it was determined safety could not be maintained, the alterations would be made and the FA would have resumed. If it was determined safety could not be maintained, the FA would have been discontinued. In this case the team would have met to decide if enough data had been collected to continue with plan development or if the student needed to exit the study. These termination criteria were used to protect those involved. If these situations occurred, it indicated safety would not be able to be maintained for all parties. Therefore, it would have been unethical to continue without major alterations to protect those involved.

3.14 Plan development. Following assessment, individualized FBCI plans were created for each student. Function-based interventions were created for each of the phases related to the crisis model described by Colvin and Scott (2015). These phases consist of (a) calm, (b) triggers, (c) agitation, (d) acceleration, (e) peak, (f) de-escalation, and (g) recovery. Additionally, a plan was created to systematically thin the schedule of reinforcement for the appropriate behavior to rates that would be feasible to implement throughout the day. For a template of an FBCI plan including the phases, definitions for the phases, and intervention foci per phase see Table 4.

3.15 Calm. Calm referred to the phase where the student was engaging in the environment without any precursor or crisis behaviors. This phase included strategies to (a) review replacement behaviors, (b) create abolishing operations for the reinforcer (e.g., reducing the duration or complexity of demands, infusing preferred elements into work tasks, providing regular access to reinforcement), and (c) ensure access to high quality reinforcement.

3.16 Triggers. Triggers referred to environmental stimuli that were known to evoke, or trigger, the crisis behavior(s). This phase included strategies to prevent the crisis behavior by minimizing the triggers present and by modifying triggering stimuli to make them less aversive (e.g., presenting a choice of activities instead of assigning one, providing reminders of upcoming reinforcement, visual schedules to display when reinforcement will be delivered).

3.17 Agitation. Agitation referred to a phase after a trigger had occurred, but before the crisis behavior had been exhibited. In this study, agitation consisted of students exhibiting behavioral indication, defined by Schmidt et al. (2013) as observable behaviors suggesting a state of deprivation or satiation that makes a reinforcer valuable. For instance, when lunch is approaching and a student has not eaten since breakfast, food is likely valuable and this might be indicated by the student reaching for food. Similarly, if the student has worked on a task for an extended period of time, escape from that task is likely valuable and this might be indicated by the student pushing materials away. Strategies in the phase were designed to teach a replacement behavior and calm the student. This included techniques such as prompting the replacement behavior (e.g., position cue with communication card) and/or reminding of upcoming reinforcement.

3.18 Acceleration. Acceleration referred to the final phase before the crisis behavior was exhibited. Acceleration was defined as the student exhibiting the identified precursor behavior(s). Strategies during this phase were intended to prevent the problem behavior by ensuring the student emitted the replacement behavior (e.g., physically guiding a student's hand to touch a "break" icon and then removing the aversive stimuli) and clearly conveying the contingencies (e.g., you need to work calmly to earn toys).

3.19 Peak. Peak referred to the phase when the student was exhibiting the crisis behavior (e.g., self-injury, aggression). Strategies were intended to keep the student safe while still implementing extinction for the problem behavior. For example, if it was determined that aggression occurred to escape a task, nonviolent physical crisis intervention might have been used to block the student from hitting staff members, but the task would not be removed until the student was calm and asked appropriately. If extinction was not possible, the quality of the reinforcement would have been minimized. For instance, if the student engaged in aggression to gain staff attention, nonviolent physical crisis intervention might have been used to block the aggression, but staff might receive training to avoid eye contact and remain silent until the student was calm.

With safety as a primary concern in this intervention, physical restraint could have been necessary during this stage. All physical restraints would have been approved prior to implementation, and practiced during role-playing to ensure competence. See "Training" below.

3.20 De-escalation. De-escalation referred to a phase after the student had ceased to exhibit the crisis behavior, but was not ready to resume the previous activity. For example, precursor behaviors might continue to be present or the student might have difficulty following directions. De-escalation strategies attempted to further calm the student while also maintaining extinction (e.g., praising for appropriate behaviors, using the high probability request sequence, maintaining the demand).

3.21 Recovery. Recovery referred to a phase after the crisis behavior had been exhibited and the student was calm again. Strategies included techniques to review what happened (e.g., did not earn the chosen reinforcer), followed by a correction trial. The

correction trial consisted of recreating the situation that initially evoked the crisis behavior and prompting the appropriate behavior, thereby ensuring the student was successful in the situation. For instance, the student might have been denied access to preferred objects, immediately prompted to touch the communication card to request toys, and then the toys would have been provided.

3.22 Schedule thinning. For all students, appropriate behavior was initially reinforced continuously (i.e., every instance results in reinforcement). However, after the appropriate behavior was established, the schedule of reinforcement was systematically thinned. The schedule was thinned after a session when appropriate behavior was exhibited for 75% of opportunities or greater and there was no break between days (e.g., the schedule would not be thinned after a weekend). An appropriate method for thinning was individually determined for each student, but all methods used either the basic (i.e., fixed interval, variable interval, fixed ratio, variable ratio) or compound (i.e., concurrent, multiple, chained, mixed, tandem, alternative, conjunctive) schedules of reinforcement described by Cooper et al. (2007).

Table 4: Function-Based Crisis Intervention Template

Phase	Definition	FBCI
Calm	Engaging in environment without behavioral indication, precursor behaviors, or crisis behaviors	• Teach replacement behaviors • Manage setting events • Ensure access to high quality reinforcement
Trigger	Stimuli known to evoke crisis behavior	• Minimize triggers • Make triggers less aversive
Agitation	Behavioral indication (i.e., behaviors suggesting an EO is in effect, Schmidt et al., 2013)	• Prompt replacement behavior

Table 4 continued

Acceleration	Precursor behavior(s)	• Prompt replacement behavior • Delay access to reinforcer
Peak	Crisis behavior(s)	• Maintain safety • Withhold or provide inferior quality reinforcement
De-escalation	Ceased crisis behaviors, but not ready to resume previous activity (e.g., still exhibiting precursor behaviors)	• Provide neutral direction • Review appropriate behavior
Recovery	Calm after exhibiting crisis behavior	• Recreate initial environment

3.23 Training. Following plan development the experimenter and the students' teacher(s), if necessary, were trained on the FBCI plan. This consisted of two phases. First, the experimenter and the teacher(s) reviewed and discussed the plans to clarify and address any questions and concerns. Next, they role played the intervention until each was able to implement the FBCI plan with 100% fidelity for two consecutive trials. Additionally, the experimenter was trained on the intervention typically used by the teacher. This is because the typical intervention was implemented during baseline. The experimenter role played this intervention until he was able to implement the intervention with 100% fidelity for two consecutive trials. Upon meeting these criteria, baseline began for the first student.

3.24 Baseline. Baseline sessions occurred during an activity or time during the school day that created the relevant EO. For instance, if the function of a student's aggression was to escape from academic tasks, a time would have been selected when the student was required to engage in academics (e.g., math class). If the function was to

access a preferred stimulus (e.g., iPad), baseline would have occurred during a time when that stimulus was typically unavailable (e.g., gym class). If a student had crisis behaviors returning from the playground, baseline sessions occurred at the end of recess. The experimenter implemented the typical behavioral intervention for each student (e.g., current crisis plan and/or behavior support plan).

For Brad, sessions were conducted when he was sitting at his table for group instruction without access to his toys. For Jared, sessions were conducted when he was prompted to his chair for group instruction without access to his preferred toys. For Natalie, sessions were conducted during one-on-one instruction next to her break area, but access to her toys was denied.

Each session was targeted for 10 min. If the student was continuing to engage in crisis or other challenging behavior at the end of the 10 min, the experimenter continued to implement the interventions until the student was absent of precursor and crisis behavior for 30 s. However, data were not collected after the intial 10 min.

3.25 FBCI. FBCI sessions occurred during the same activities identified for baseline sessions; however, the experimenter implemented the students' individual FBCI plans. The students' teacher(s) served as secondary interventionists as necessary. Their assistance, if necessary, was detailed in the FBCI plans, unless emergency assistance from a second person was needed to maintain safety. As with baseline, all sessions were targeted for 10 min. If the student was exhibiting precursor or crisis behavior at the end of the 10 min, the experimenter continued to implement the FBCI plan until the student was absent of both for 30 s. No data were taken after the initial 10 min.

Brad. Brad's plan included the following components. First, a differential reinforcement of other behaviors with a variable interval schedule was used. If he completed the interval without exhibiting crisis behavior, he was provided a token on a token board, and upon filling the board was provided an edible reinforcer. The reinforcement schedule was thinned if he exhibited appropriate behavior for 75% of opportunities or more. The thinning steps were VI10, VI15, VI20, VI30, VI 45, VI60, VI90. With respect to the phases of crisis, during the calm phase Brad was provided praise for appropriate behaviors and periodic reminders that he could (a) earn his reinforcer with calm hands, and (b) ask for a break if he needed it. Reminders were made vocally and by gesturing to his reinforcement board and communication card. If he asked for a break, it was provided on a continuous schedule. Triggers were minimized by providing verbal cues prior to transitions, reminders about his reinforcer and ability to request a break, and allowing him to take a toy with him to the table where he worked. If he became agitated, gesture and verbal prompts were made to request a break using his communication card. Upon moving to acceleration phase by exhibiting precursor behaviors, access to his toys was blocked and he was physically prompted to request a break. In the peak phase, Brad was taken to the work table or maintained there. His reinforcer board and communication card were removed. During the de-escalation phase, when Brad had ceased crisis behavior for 15 s, simple commands were given and least to most prompting was used to ensure compliance. Upon completing those demands vocal praise was provided. Last, when Brad had not exhibited crisis or precursor behavior for 30 s, recovery strategies would be implemented. These consisted of reviewing the contingencies to earn reinforcement and the interval was started again.

Jared. When Jared was calm he was provided verbal praise for being calm and, if he was not engaged in an activity, was given a leisure or academic activity to engage in depending on whether he was on a break or in a lesson. If he used his communication card to request his reinforcer (i.e., ball, break), it would be delivered after he waited for the current target. Jared's wait times were systematically increased (i.e., 0 s, 2 s, 5 s, 10 s, 15 s, 20 s, 40 s, 60 s) after a session in which he exhibited appropriate behavior for 75% of opportunities or more. For triggers, Jared was given verbal warnings prior to removing a preferred item and reminded of his communication card. When agitated, gesture prompts would be made to his communication card, or if he was waiting for reinforcement reminders were given to wait or stay calm to access his reinforcer. When he began to accelerate, he was physically prompted to his communication card, or reminded to wait or stay calm to access his reinforcer. However, reinforcement would not be delivered while he was in this phase. Reinforcement would continue to be delayed until he had not exhibited precursor behavior for 15 s. Upon reaching peak, the communication card was removed, his lap belt to his chair was secured, and attempts at self-injury were physically blocked. Periodically reminders were given to be calm to access his reinforcer. When Jared was de-escalating he was redirected back to the current activity with further reminders to be calm to earn his reinforcer. Upon being calm (i.e., absent of crisis and precursor behavior for 15 s) his communication card would be returned, he would be prompted to use his card, and then he would be required to wait for the entire duration of the interval.

Natalie. Natalie was given a visual schedule and a differential reinforcement of alternative behaviors procedure was used. Specifically, if she completed the tasks on her

schedule without exhibiting crisis behavior, she would move the icons to a reinforcement board. Upon completing the schedule, she could earn her reinforcer. Next the strategies for each crisis phase were reviewed. When Natalie was calm her plan called for setting up her visual schedule, allowing her to choose her reinforcer by placing an icon on her reinforcement board, providing verbal praise and reminders of upcoming reinforcement for appropriate behavior, and providing reinforcement after completing her schedule without crisis behavior. Triggers were addressed by providing warnings of upcoming transitions and reminders of how she could access reinforcement. When she became agitated she was prompted to request what she wanted or, if she needed to complete her schedule before her request could be honored, she was redirected to her schedule and the contingency for reinforcement was reviewed. Upon completing her schedule, she would be given reinforcement. If Natalie began to accelerate, the procedures mirrored agitation except reinforcement would not be provided until she was absent of precursor behavior for 15 s. This means, if she completed her schedule but was still grunting and pressing her fist to her chin, the final activity would not be removed. Instead, they would restart the final activity, and only end it after Natalie was calm. During the peak phase, physical intervention would be used to block aggression and maintain Natalie at the activity. The reinforcer icon would be removed from her reinforcement board, and she would be prompted to continue engaging in the current activity. During de-escalation, physical intervention would be faded out and she would be asked “are you ready?” periodically. This phrase was reported as one she knew and responded to. Finally, in the recovery phase she would be praised for being calm, the contingency for reinforcement would be

reviewed, and she would be prompted to complete her schedule without the ability to earn her reinforcer.

3.26 Maintenance. Maintenance sessions were planned to occur once per week for 3 weeks following FBCI. Procedures were the same as in FBCI. Due to time constraints, maintenance sessions were not conducted in this study.

3.27 Extension. Extension sessions were planned to occur once per week for 3 weeks following maintenance. Procedures would remain the same as FBCI and Maintenance. However, the students' teacher(s) would assume responsibility for implementing FBCI plan. The experimenter would support the teacher(s) as the secondary interventionist described in each students' plan and as needed to maintain safety.

The teacher would be trained on the FBCI plan prior to baseline. However, between Maintenance and Extension, the experimenter would have reviewed the FBCI plan with the teacher and role played it until the teacher implemented it with 100% fidelity. Due to time constraints, extension sessions were not conducted in this study.

3.28 Generalization. Generalization across settings occurred by observing the teacher work with the student in the same conditions used for the other phases. Generalization sessions were planned once during Baseline, Maintenance, and Extension. During each phase the teacher was allowed to intervene as he/she chose.

3.29 Social Validity

Social validity was assessed via a survey delivered to the teachers. The survey was a mixture of open-ended questions and statements rated using a five-point Likert scale with one meaning "strongly disagree" and five meaning "strongly agree." The

following topics were assessed: (a) appropriateness of behaviors targeted for decrease, (b) appropriateness of behaviors targeted for increase, (c) acceptability of FBCI methods, (d) extent to which safety was maintained, (e) significance of behavior change, and (f) feasibility for implementation by school staff. The questionnaire was delivered to the teachers after all participants had exited intervention. For a sample of the social validity form, see Appendix C.

3.30 Interobserver Agreement

Interobserver agreement (IOA) was conducted on a minimum of 30% of sessions across all phases of the study. Another research team member viewed recordings of the sessions or, in the case of Natalie, observed the actual sessions. Data on the dependent variables were recorded. Percent agreement was determined using the interval-by-interval method (Cooper et al., 2007). Specifically, the two data collectors compared the score for each interval and determined if the scores were the same. Percent agreement was calculated by dividing the number of intervals agreed upon by the total number of intervals.

3.31 Procedural Fidelity

During the baseline, intervention, and maintenance phases, procedural fidelity was conducted on a minimum of 30% of sessions. After developing each individual's intervention, a checklist was created to record whether each component was implemented as designed (e.g., upon the student displaying agitation, the interventionist prompts him to request a break using gesture cues: Yes/No/Not Applicable). See Appendix D for a sample checklist. Another member of the research team viewed recordings of the sessions, or observed the session, and used the respective checklist to record whether the

interventionist delivered each component as described. Percent of steps implemented correctly was calculated by dividing the number of steps implemented correctly by the total number of applicable steps. Each opportunity for each step in the FBCI plan was scored. Percent of steps implemented correctly was calculated by adding the total number of steps implemented correctly and dividing that by the total number of opportunities to implement a step.

During the extension phase, when the students' teachers were supposed to implement the intervention, procedural fidelity was planned to be measured for all sessions. The experimenter and a second research team measure were going to measure this using the same method described above (i.e., viewing recordings of sessions and completing the student's checklist). Agreement on fidelity would have been be calculated by adding the number of items agreed upon and dividing that sum by the total number of items. Due to time constraints, fidelity data on the teachers' implementation of FBCI was not collected.

CHAPTER FOUR: RESULTS

This chapter includes the results of the study. It begins by providing the interobserver agreement and procedural fidelity data. Following this, the outcomes for each specific research question will be detailed. Research questions pertaining to the direct effects of FBCI on students' crisis, precursor, and appropriate behavior are described first. Next, questions regarding generalization and maintenance of effects are addressed. Finally, questions regarding teacher capabilities and perceptions are described.

4.1 Interobserver Agreement

Interobserver agreement data were collected for 34% of sessions. This included 28% of sessions during the functional analyses, 30% during baseline, 34% during FBCI, and 40% during generalization. Across all of these phases, IOA averaged 88% with a range from 33% to 100%.

For Brad there was a mean IOA of 93% with a range from 77% to 100%. This included a mean agreement of 93%, ranging from 77% to 98%, for crisis behavior. Regarding precursor behavior, the mean IOA was 96% and the range went from 78% to 100%. Finally, the mean IOA for Brad's appropriate behavior was 91%, with a range from 78% to 100%.

Jared's data had a mean IOA of 91%, ranging from 33% to 100%. There was a mean IOA of 94% for his crisis behavior, which also ranged from 90% to 100%. Precursor behavior data had a mean IOA of 92% and a range from 80% to 100%. The

mean IOA for Jared's appropriate behavior was 84%, and it ranged from 33% to 100%.

Last, all IOA data on Natalie's crisis, precursor, and appropriate behaviors was 100%.

4.2 Procedural Fidelity

Procedural fidelity data were collected on 28% of sessions. There was a mean of 99.6% of steps implemented correctly. These data ranged from 96% to 100%.

4.3 Research Question 1 - To what extent does FBCI reduce students' level of crisis behavior in the school setting?

The results of the effects of FBCI on students' crisis behavior are presented below. Prior to beginning baseline a FA was conducted to determine the function of each student's crisis behavior. Therefore, each student's FA results are discussed first, followed by the effects of FBCI on students' crisis behavior. At the end of this section, a graphic display of the effects of FBCI on the crisis behavior for the students are displayed in Figure 6 as closed circles.

FA Results. The results for the FAs are described below. For each student the is a description of the conditions used in the FA, any variations to the traditional FA process, the results, and graphic representation(s) of the results.

Brad. The FA for Brad included three conditions: control, attention, and escape. The alone condition was not implemented because it was not possible to isolate him alone in a room given the constraints of the school. Crisis behavior occurred at higher rates during the escape condition, with separation of the data paths occurring after the first round of FA conditions. Brad exhibited crisis behavior for a mean of 15% of intervals during the escape condition, with a range from 0% to 25%. In comparison, he exhibited

crisis behavior during 4.25% of intervals in the other conditions with a range from 0% to 12%. These data are displayed in Figure 1.

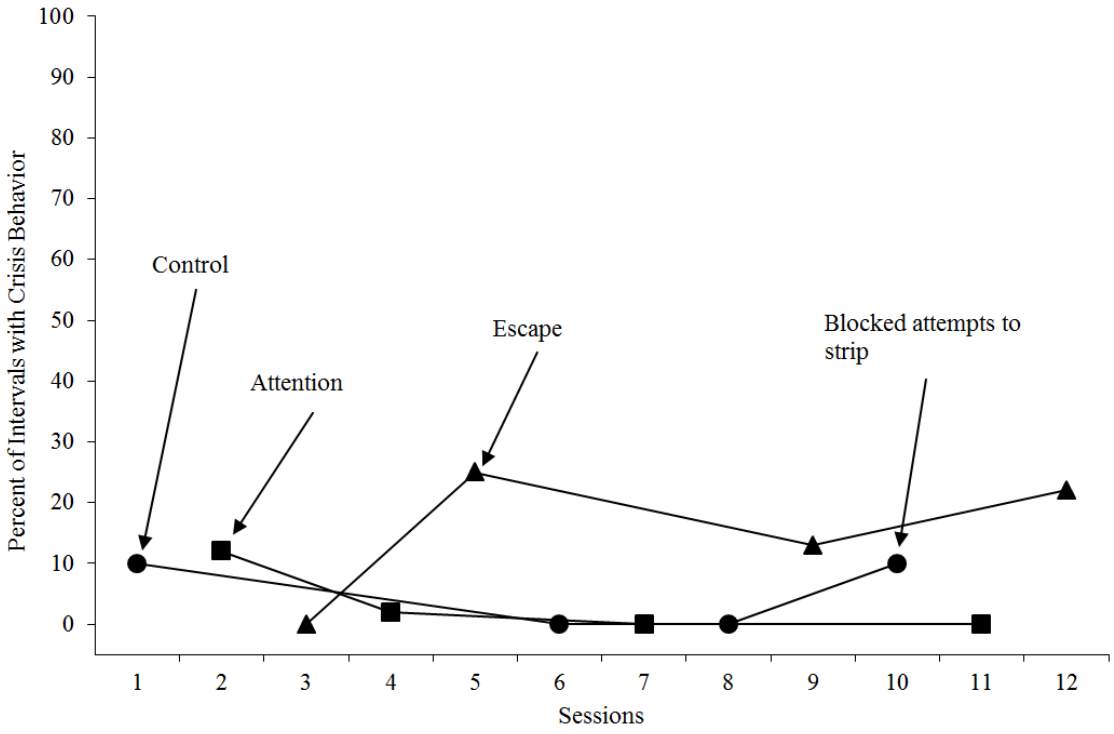

Figure 1: Functional Analysis of Brad's Crisis Behavior

During the interview, the teachers identified two primary topographies of crisis behavior for Brad: aggression and property destruction (e.g., pushing over book cases, flipping tables). During the FA, only aggression was observed. Teacher interviews revealed that his property destruction often occurred when they were distracted or far away from him. Therefore, it is possible property destruction was not observed because the researcher's close proximity served as an S^{Δ}, signaling reinforcement was unavailable because attempts at property destruction would be blocked. This would suggest that

property destruction was maintained by automatic reinforcement, but because an alone condition was not implemented this could not be directly tested. However, Brad did engage in responses that were topographically similar to the crisis level property destruction during the FA. Specifically, he would hit inanimate objects such as table tops with the same motion he used to push over bookshelves. As such, the FA sessions were viewed a second time, and data were collected on the percent of intervals Brad hit objects using the same 10 s partial-interval recording system.

The results of data collection on hitting objects indicate property destruction was maintained by automatic reinforcement. This is because the data paths do not separate. During the control condition, Brad hit objects for a mean of 16.75% of intervals ranging from 3% to 43%. In the attention condition Brad hit objects for a mean of 29.75% of intervals, with a range of 12% to 43%. Last, there was a mean of hitting objects for 19.75% of intervals during the escape condition and a range from 7% to 42%. These data are displayed in Figure 2.

Although control and escape conditions show initially lower levels, it is likely this is due to the fact the researcher was engaged with Brad for a greater proportion of these sessions than the attention condition. Therefore, engaging Brad in a task or play would interfere with his opportunities to engage in hitting objects. As Brad escaped the task more frequently during the escape condition, he began exhibiting higher rates of hitting objects. Similarly, when he avoided the researcher during the last session of the control condition, his rates of hitting objects increased. Therefore, the researcher concluded that property destruction was maintained by automatic reinforcement.

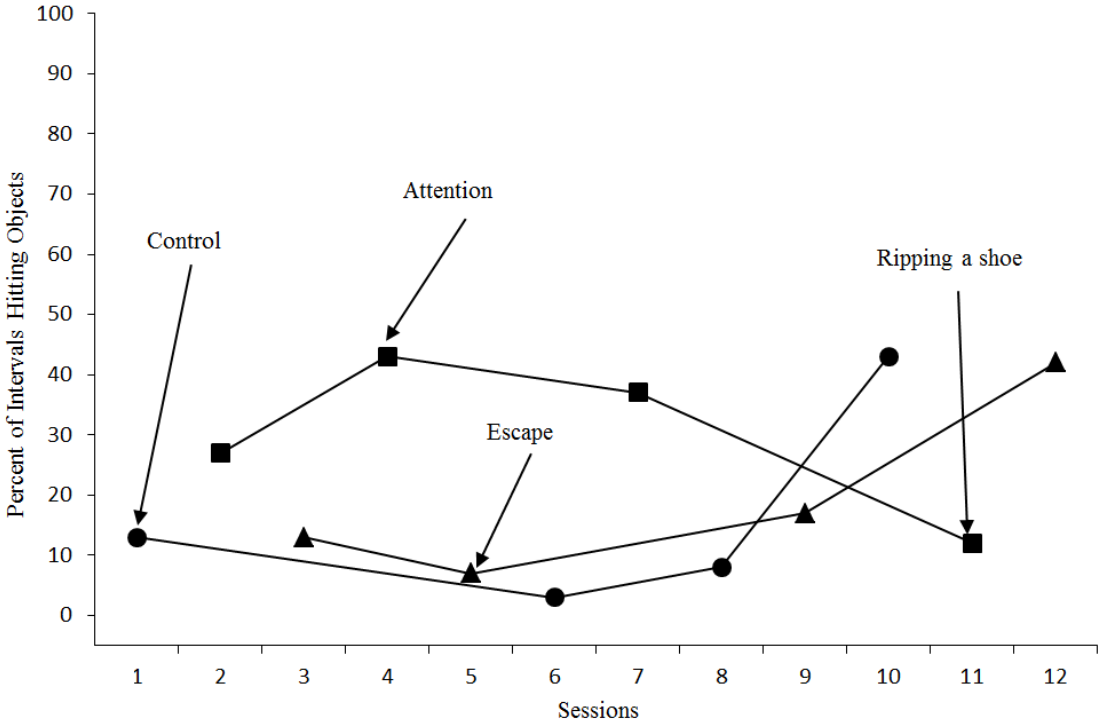

Figure 2: Percent of Intervals Brad Hit Objects during FA

Jared. The FA for Jared consisted of a control, escape, attention, and tangible condition. Jared's crisis behavior occurred at higher rates during the tangible condition and, to a lesser degree, the escape condition than the control condition. Jared did not exhibit any crisis behavior in the control condition sessions. During the tangible condition, Jared exhibited crisis behavior for a mean of 28.3% of intervals and a range from 25% to 33%. The escape condition showed a smaller increase over the control condition with a mean of 6% of intervals, ranging from 0% to 10%. Last, he exhibited crisis behavior for a mean of 0.7% of intervals during the attention condition, ranging from 0% to 2%. This suggests Jared's crisis behaviors were primarily maintained by access to tangibles, and secondarily by escape from his work area. These results are visually displayed in Figure 3.

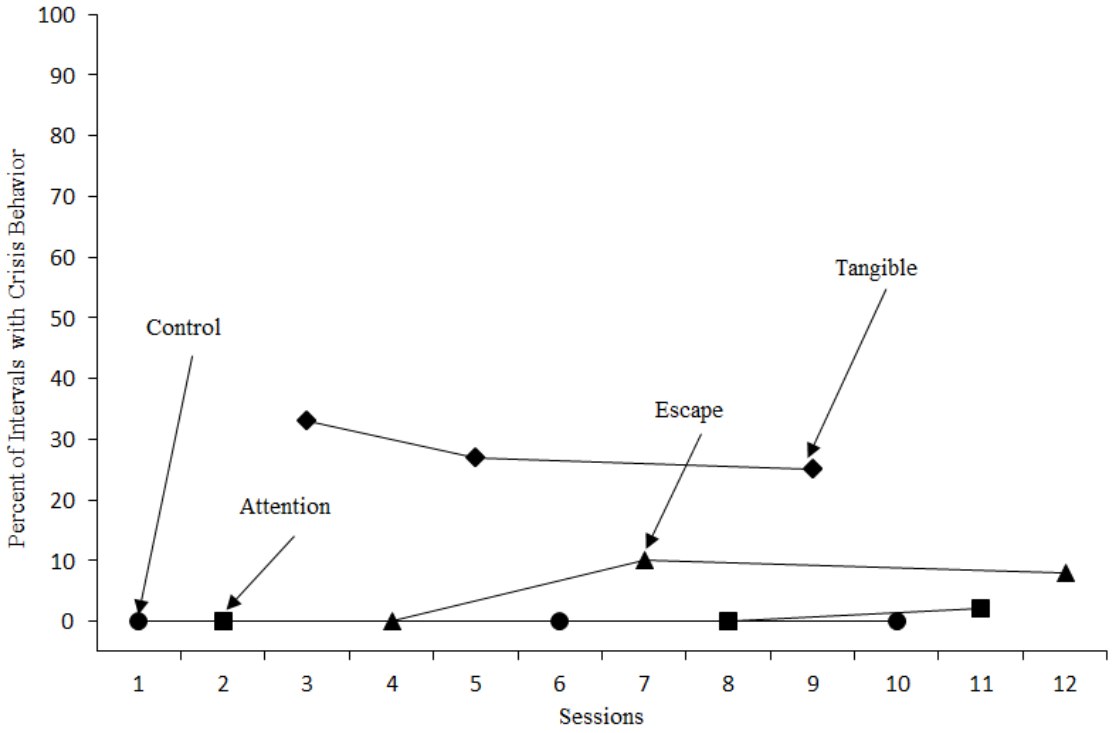

Figure 3: Functional Analysis of Jared's Crisis Behavior

Natalie. The FA for Natalie included a control, escape, attention, and tangible condition. Because permission was not granted for Natalie to be recorded, event recording was used during her FA. Visual analysis of the FA data reveals that no condition resulted in higher rates of crisis behavior than the control condition. No crisis behaviors were exhibited during the control condition. Both the escape and attention conditions had a mean of 0.3 crisis behaviors per session, ranging from 0 to 1. The tangible condition had a mean of 3.3 instances of crisis behavior, with a range from 0 to 9. The elevated mean for the tangible condition are due primarily to the final session. These data are displayed in Figure 4.

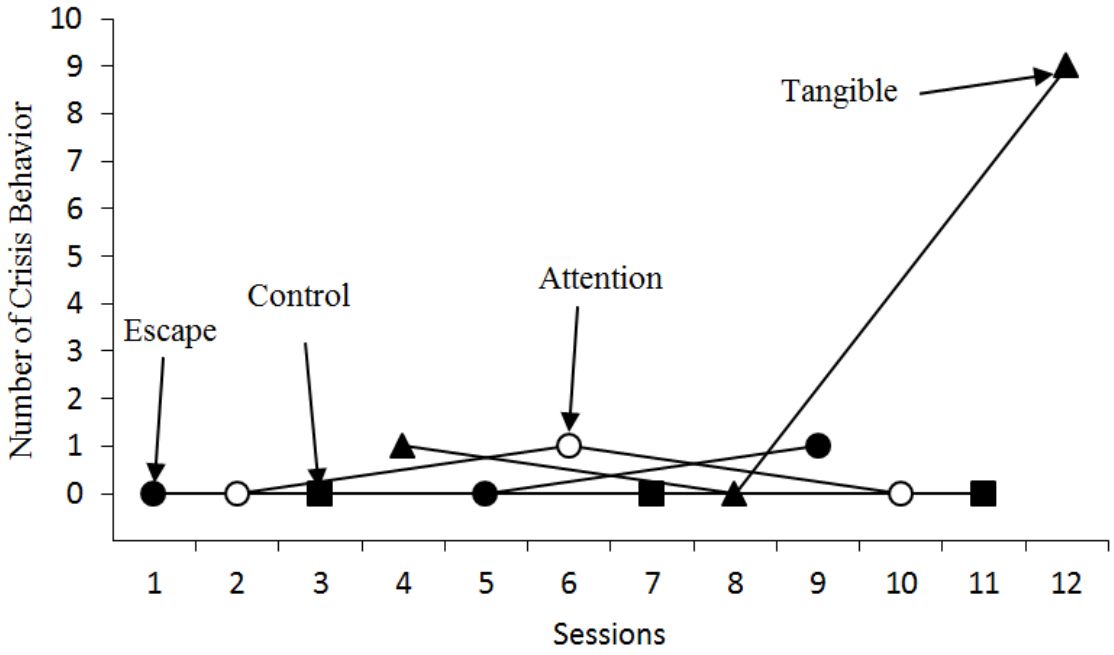

Figure 4: Functional Analysis of Natalie's Crisis Behavior

Because there was no clear function when analyzing the crisis behavior data, an analysis of the rates of precursor behavior during the FA was conducted. Precursor behaviors were consistently higher in the escape and tangible conditions when compared to the control condition. Similar to crisis behavior, no precursor behaviors were exhibited during the control condition. In contrast, she exhibited a mean of 2.7 precursor behaviors during the escape condition, ranging from 2 to 3. Similarly she exhibited a mean of 4.7 precursor behaviors during the tangible condition, ranging from 1 to 10. These data can be seen in Figure 5. As stated previously, research suggests that precursor behaviors are members of the same response class as crisis behaviors (Fritz et al., 2013). Because these were demonstrated to be precursors to her crisis behavior through the precursor analysis, the researcher hypothesized that Natalie's crisis behaviors were maintained by both access to tangibles and escape from demands.

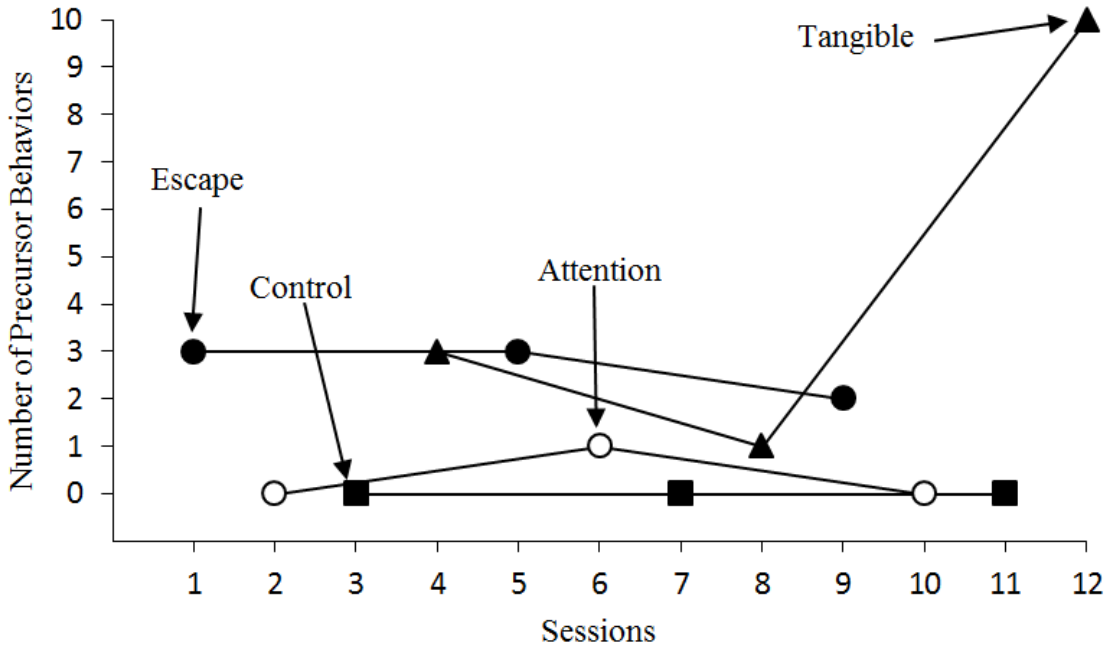

Figure 5: Number of Precursor Behaviors during Functional Analysis of Crisis Behaviors

Effects of FBCI on crisis behavior. What follows is a description of how FBCI affected each student's crisis behavior. A figure is presented at the end of the section that visually displays all three student's results.

Brad. The effects of FBCI on Brad's crisis behaviors showed a change from a moderate level with an increasing trend in baseline to a low, stable level in intervention. During baseline, Brad engaged in crisis behavior for a mean of 30.8% of intervals, ranging from 25% to 40%. Upon introduction of FBCI, Brad exhibited crisis behavior for a mean of 6% of intervals and a range from 0% to 28%.

Jared. Regarding the effects of FBCI on Jared's crisis behavior, there was a change in the level and variability of the data when FBCI was implemented. During baseline Jared's crisis behavior data showed a stable, increasing trend. He exhibited crisis

behavior for a mean of 42.4% of intervals and a range from 33% to 55%. When FBCI was introduced the level immediately changed to a low level. However, there was initially an increasing trend. Upon changing the request from “ball” to “break,” the data returned to a low level, with some variability that correlate to schedule thinning and/or having a medical assessment of his foot that resulted in it being placed in a cast. In total, Jared exhibited crisis behavior for a mean of 10.2% of intervals during FBCI. These data ranged from 0% to 42% of intervals.

Natalie. The effects of FBCI show a change in crisis behavior from low, variable rates during baseline to lower, stable rates during FBCI. During baseline she exhibited crisis behavior for a mean of 5.6% of intervals and a range between 0% and 38%. When FBCI began Natalie ceased exhibiting crisis behaviors at all, with a mean of 0% of intervals.

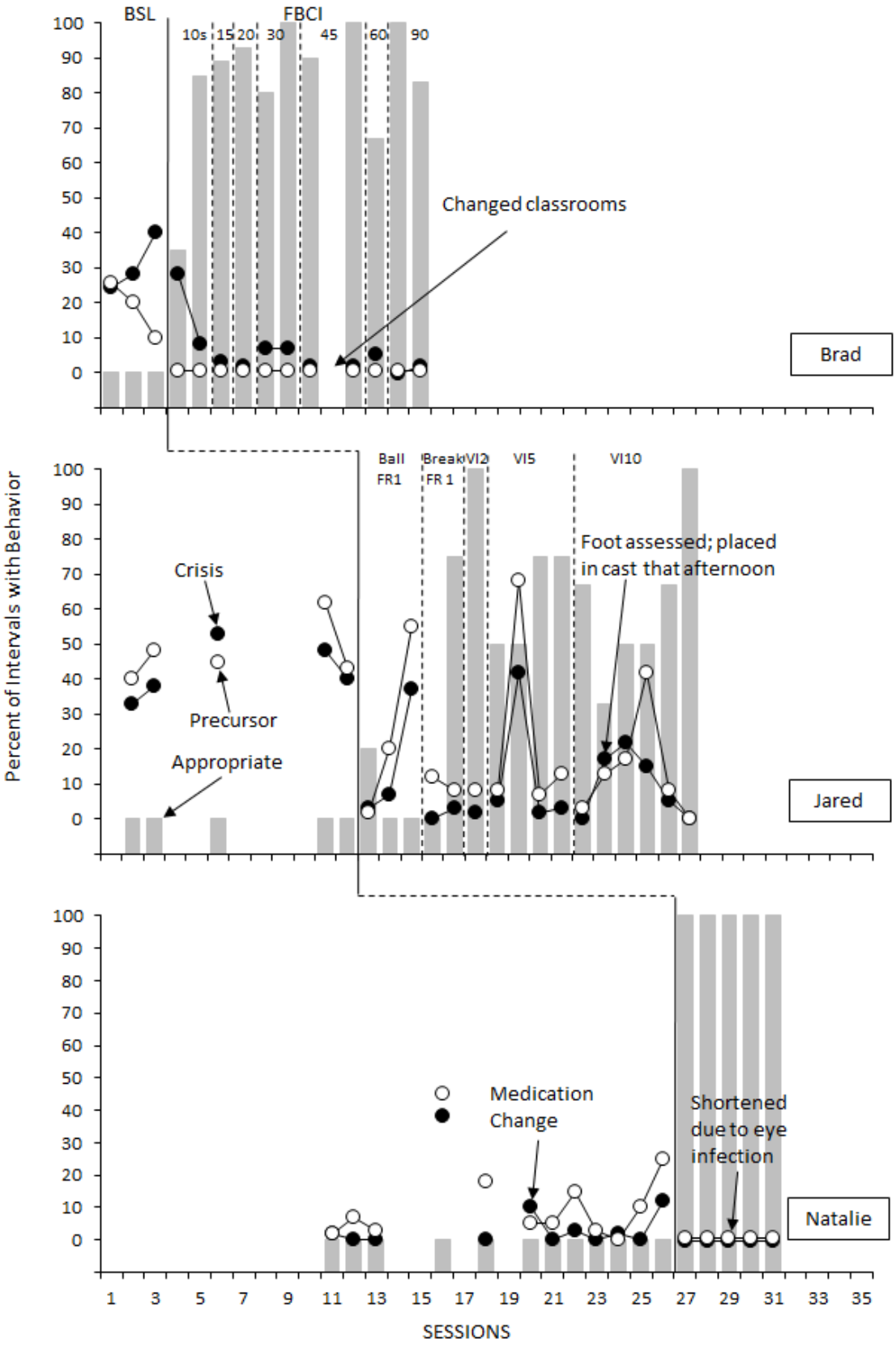

Figure 6: Effects of Function-Based Crisis Intervention on Targeted Student Behaviors

4.4 Research Question 2 - To what extent does FBCI reduce students' level of precursor behavior in the school setting?

The results for the second research question regarding the effects of FBCI on students' precursor behaviors are presented below. Similar to crisis behaviors, this section is organized by student. For each student two sets of data are discussed. First, the results of the precursor analysis to identify precursor behaviors are reported. Second, the effects of FBCI on those behaviors identified as precursors, which are displayed as the open circles in Figure 6.

Brad. Teacher interview, observation, and the review of video recordings with a second observer identified five potential precursor behaviors for Brad. These precursor behaviors were as follows: laughing, touching another person, physically resisting prompts, scanning or looking around the room, and hitting objects. Probability analyses identified touching another person and physically resisting prompts as precursors. This was because they met the two criteria. First, the probability a crisis behavior would occur during an interval that touching (0.88) or resisting (1.00) was greater than (a) the probability crisis behavior would occur during intervals without touching (0.58) or resisting (0.52), and (b) the probability crisis behavior would occur at all (0.76). The second criteria was the probability touching or resisting would occur in intervals with crisis behavior (0.68 and 0.65 respectively) was greater than the probability of (a) touching (0.30) or resisting (0.00) occurring absent crisis behavior, and (b) the probability of touching (0.59) or resisting (0.49) occurring at all. For the complete results see Table 5.

Table 5: Brad's Precursor Analysis

	Laugh	Touch	Resist	Scan	Hit Objects
1. Probability of crisis behavior (C) given precursor (P)	.071	0.88	1.00	0.58	0.50
2. Probability of C given the absence of P	0.80	0.59	0.52	0.95	1.00
3. Probability of the C	0.76	0.76	0.76	0.76	0.76
4. Probability of P given C	0.48	0.68	0.65	0.39	0.32
5. Probability of P given the absence of C	0.60	0.30	0.00	0.90	1.00
6. Probability of P	0.51	0.59	0.49	0.51	0.49
Determination*	N	Y	Y	N	N

**A behavior is identified as a precursor if 1>2, 1>3, 4>5, and 4>6*

During baseline Brad's precursor behaviors showed a decreasing trend. He exhibited precursor behaviors for a mean of 18.5% of intervals and a range from 10% to 25%. When FBCI was introduced precursor behaviors decreased to zero levels with a mean of 0% of intervals. See Figure 6.

Jared. The initial analysis identified four possible precursor behaviors for Jared. These included crying, reaching for something, resisting prompts, and throwing objects. Of these crying, resisting, and throwing objects met criteria to be considered a precursor behavior. They met the first criterion because the probability crisis behaviors occurred during trials in which these behaviors occurred (crying: 0.93, resisting: 0.92, throwing: 0.93) were higher than the probability (a) crisis behavior occurred in trials absent of these

behaviors (crying: 0.86, resisting: 0.87, throwing: 0.86), and (b) crisis behavior occur at all (0.88). Second, the probability crying, resisting, and throwing would occur during trials with crisis behavior (crying: 0.27, resisting: 0.22, throwing: 0.25) was higher than the probability (a) these behaviors occurred in trials without crisis behavior (crying: 0.14, resisting: 0.14, throwing: 0.14), and (b) these behaviors would occur overall (crying: 0.26, resisting: 0.21, throwing: 0.24). The complete results of Jared's precursor analysis are displayed in Table 6.

Table 6: Jared's Precursor Analysis

	Cry	Reach	Resist	Throw
1. Probability of crisis behavior (C) given precursor (P)	0.93	0.71	0.92	0.93
2. Probability of C given the absence of P	0.86	0.90	0.87	0.86
3. Probability of the C	0.88	0.88	0.88	0.88
4. Probability of P given C	0.27	0.10	0.22	0.25
5. Probability of P given the absence of C	0.14	0.29	0.14	0.14
6. Probability of P	0.26	0.12	0.21	0.24
Determination*	Y	N	Y	Y

**A behavior is identified as a precursor if 1>2, 1>3, 4>5, and 4>6*

During baseline, Jared's precursor behavior data were stable and slightly increasing. He exhibited precursor behavior for a mean of 47.6% of intervals, ranging from 40% to 62%. When FBCI was introduced, Jared's precursor immediately decreased in level, but then increased on a steeper trend. Once the communication card was

switched to “break” the data returned to a low level, with some variability correlated with times the reinforcement schedule was thinned and when he had his medical assessment and foot placed in a cast. In all, during FBCI precursor behavior was exhibited for a mean of 17.8% of intervals. This ranged from 0% to 68%. For a visual display of the data, refer to the open circles in the middle tier of Figure 6.

Natalie. Five potential precursor behaviors were identified for Natalie. These five precursor behaviors were as follows: grunting, pressing her fist against her chin, hitting the table, stomping her foot, and yelling. The following four met both criteria to be identified as precursor behaviors: grunting, fist to chin, hitting the table, and yelling. Regarding the first criterion, the probability of a crisis behavior occurring in trials when these four behaviors occurred (grunt: 0.44, fist to chin: 0.50, hit table: 0.67, yell: 1.00) was greater than the probability that (a) crisis behavior occurred in trials without these four (grunt: 0.14, fist to chin: 0.13, hit table: 0.10, yell: 0.27), and (b) crisis behavior occurred at all (0.31). Additionally, they met the second criterion by having the probability of one of these four behaviors occurring in trials when crisis behaviors occurred (grunt: 0.8, fist to chin: 0.8, hit table: 0.8, yell: 0.2) was greater than the probability that (a) these behaviors would occur in trials when crisis behavior did not (grunt: 0.45, fist to chin: 0.36, hit table: 0.18, yell: 0.00), and (b) these behaviors would occur at all (grunt: 0.56, fist to chin: 0.50, hit table: 0.38, yell: 0.06). Natalie’s complete precursor analysis data are displayed in Table 7.

Table 7: Natalie Precursor Analysis

	Grunt	Fist to Chin	Hit Table	Stomp	Yell
1. Probability of crisis behavior (C) given precursor (P)	0.44	0.50	0.67	0.00	1.00
2. Probability of C given the absence of P	0.14	0.13	0.10	0.38	0.27
3. Probability of the C	0.31	0.31	0.31	0.31	0.31
4. Probability of P given C	0.80	0.80	0.80	0.00	0.20
5. Probability of P given the absence of C	0.45	0.36	0.18	0.18	0.00
6. Probability of P	0.56	0.50	0.38	0.13	0.06
Determination*	Y	Y	Y	N	Y

**A behavior is identified as a precursor if 1>2, 1>3, 4>5, and 4>6*

During baseline Natalie exhibited precursor behavior for a mean of 11.5% of intervals. The data ranged from 0% to 45% of intervals. This represented a low, but variable level. After FBCI was introduced Natalie's precursor behavior immediately decreased and maintained at zero levels for the duration of FBCI. See Figure 6.

4.5 Research Question 3 - To what extent does FBCI increase level of students' appropriate behavior in the school setting?

In addition to challenging behaviors, the effects of FBCI on students' appropriate behaviors were evaluated. The data are displayed in Figure 6 as the solid gray columns.

Brad. During baseline Brad was unable to complete an interval without exhibiting problem or precursor behavior. Therefore, he exhibited appropriate behavior in this phase

for a mean of 0% of opportunities. When FBCI was introduced the level of appropriate behavior increased to a mean of 83.8% of opportunities, ranging from 35% to 100%.

Jared. Jared did not exhibit appropriate behavior in any baseline session. This resulted in a mean of 0% successful opportunities. Upon implementing FBCI, there was a slight increase of appropriate behavior on the first session to 20%, but it then returned to 0% for the next two sessions. However, after changing his request from ball to break, appropriate behavior increased. For the entire FBCI phase, appropriate behavior was exhibited for a mean of 50.8% of opportunities, ranging from 0% to 100%. If only the data after the request was changed are included, then appropriate behavior was successfully exhibited for a mean of 60.9% of opportunities and a range from 0% to 100%.

Natalie. Natalie exhibited appropriate behavior for 0% of opportunities in baseline. During FBCI she exhibited appropriate behavior for 100% of opportunities.

4.6 Research Question 4 - To what extent do the effects of FBCI maintain after intervention?

Due to time constraints, student absences, and school vacations maintenance data were unable to be collected.

4.7 Research Question 5 - To what extent do the effects of FBCI generalize to other settings?

Generalization data during baseline and intervention were collected for Jared and Natalie. Generalization data were only collected during baseline for Brad. This is because he changed settings part way through the study, and though he was initially able to continue with the study, scheduling conflicts made continued participation increasingly

difficult. Additionally, consent was not obtained for Brad's new teacher for participation or video recording, which would have been necessary to collect generalization data given. During his baseline generalization probe Brad exhibited crisis behavior for 30% of intervals, precursor behavior for 0% of intervals, and appropriate behavior for 0% of opportunities. In baseline Jared exhibited crisis behavior for 2% of intervals, precursor for 2% of intervals, and appropriate behavior for 0% of opportunities. When data were collected during FBCI crisis behavior was exhibited for 17% of intervals, precursor for 8% of intervals, and appropriate behavior for 0% of opportunities. Natalie's data are similar in that she exhibited crisis behavior for 0% of intervals, precursor for 10% of intervals, and appropriate behavior for 0% of opportunities during the baseline generalization probe. In the FBCI generalization probe she exhibited crisis behavior for 0% of intervals, precursor behavior for 0% of intervals, and appropriate behavior for 100% of opportunities. These data are shown in Table 8.

Table 8: Generalization Data

	Brad		Jared		Natalie	
Behavior	Baseline	FBCI	Baseline	FBCI	Baseline	FBCI
Crisis	30	-	12	17	0	0
Precursor	0	-	2	8	10	0
Appropriate	0	-	0	0	0	100

4.8 Research Question 6 - To what degree of fidelity can teachers implement FBCI after transfer from the researcher?

For the same reasons as question four (i.e., maintenance) transfer of FBCI implementation to the teacher was unable to be completed. Therefore, this question still remains unanswered.

4.9 Research Question 7 - What are teachers' perceptions of FBCI?

The social validity measure was completed by two teachers. The first teacher was Jared's teacher who was also Brad's initial teacher. The second was Natalie's teacher. They responded to the first six questions using the Likert scale, one meaning strongly disagree and five meaning strongly agree. They agreed (4, 5) the crisis behaviors targeted for decrease were appropriate, agreed (4, 5) the appropriate behaviors targeted for increase were appropriate, agreed (4, 5) the procedures were appropriate and acceptable, strongly agreed (5, 5) safety was maintained, and agreed (4, 4) the change in behavior was significant. Regarding whether they could implement FBCI on a daily basis one teacher was neutral (3) while the other agreed (4). For their individual responses, see Table 9.

In response to the open-ended questions they identified several relevant points. They listed two disadvantages to FBCI. The first was the need for dedicating one staff member to the student when other students may be exhibiting challenging behaviors. The second disadvantage identified was that training all the staff who interact with the student to implement FBCI with fidelity would be difficult. In contrast, they each identified benefits to using FBCI. The first teacher noted that FBCI was effective at reducing challenging behavior while teaching appropriate behavior. The second teacher noted

several advantages including: (a) the plan was function based, meaning the target challenging behaviors were not reinforced; (b) operational definitions for crisis, precursor, and appropriate behavior would lead to greater consistency; (c) the inclusion of functional communication training with tolerance training for denial of reinforcement; and (d) increasing safety for staff and students. Regarding factors that could inhibit the use of FBCI, they reported that not having enough staff could make implementation difficult, the need to attend to other students, and coordinating with related services. Last, in answering what could facilitate the use of FBCI the teachers listed training, sufficient staff to student ratios, and data sheets that match the FBCI components.

Table 9: Social Validity Responses

	Teacher 1	Teacher 2
1. The behavior(s) targeted for decrease were appropriate	4	5
2. The behavior(s) targeted for increase were appropriate	4	5
3. The procedures were appropriate and acceptable for the student.	4	5
4. Safety was adequately maintained.	5	5
5. The change in behavior was significant.	4	4
6. I could implement FBCI on a daily basis	3	4

CHAPTER FIVE: DISCUSSION

The purpose of this study was to evaluate the effects of FBCI on the crisis, precursor, and appropriate behaviors of students with developmental disabilities (DD). To accomplish this, FBCI was administered to three students with DD who exhibited crisis behaviors using a delayed multiple-probe across participants design. When FBCI was introduced, results showed a decrease in crisis behavior and an increase in appropriate behavior for all three students. Therefore, a functional relation was demonstrated between FBCI and these two dependent variables. Although FBCI led to a decrease in precursor behavior for all three participants, a functional relation was not demonstrated because the first student had a decreasing trend during baseline. The effects of FBCI did not generalize consistently.

A secondary purpose of this study was to evaluate the fidelity with which teachers could implement FBCI and their opinions on the study. Unfortunately, due to time constraints teacher fidelity was unable to be assessed. Regarding their opinions, the teachers expressed approval of the goals, procedures, and results of FBCI. Even though they said they could implement FBCI, they noted staffing ratios and having other students who exhibit challenging behaviors would be challenges to implementing with fidelity. The following sections will interpret the results of the study by discussing each research question, detailing the specific contributions of the study, noting the limitations, making

suggestions for future research, and describing implications for practice.

5.1 Research Question 1: To what extent does FBCI reduce students' level of crisis behavior in the school setting?

Implementing FBCI resulted in a decrease in all students' crisis behaviors. Since the study adhered to a valid experimental design, these effects established a functional relation between FBCI and crisis behavior.

Brad. During baseline Brad's crisis behavior began at a moderate level and showed an increasing trend. When FBCI was introduced, his crisis behavior immediately changed to a decreasing trend until it stabilized at low levels. During FBCI, the schedule of reinforcement was gradually thinned until Brad received reinforcement on a VI 90 s schedule. The DRO with the token board appeared to have had the greatest effect. This is because after the initial FBCI session when reinforcement was withheld following crisis behavior, but provided following appropriate behavior, rates of crisis behavior decreased while appropriate behavior increased. This indicates he discriminated which responses reinforcement was available for and allocated his responses accordingly.

There are a few considerations from Brad's results. First, his functional analysis (FA) posed an interesting challenge because not all topographies of crisis behavior were observed. Aggression was observed, and the FA showed his aggression was escape maintained. However, his property destruction was not observed, possibly because the researcher's close proximity indicated that attempts at property destruction would be blocked. Conducting an alone condition would have addressed this, but an alone condition was not possible in the school setting for multiple reasons including (a) not having access to a room that would allow for him to be observed while alone (e.g., room

with a one-way mirror), and (b) the behavior led to the destruction of expensive furniture and materials. As such, data for Brad were collected on hitting objects, which was a topographically similar response. Property destruction was not initially included in the FA because the teacher reported this behavior was not a primary concern. Data indicated that property destruction was maintained by automatic reinforcement. Given that these two topographies of crisis behavior were maintained by different reinforcers, it may be necessary in future applications to conduct independent FAs for the different topographies of crisis behavior if all topographies are not observed during the initial analysis.

A second facet worthy of note from applying FBCI with Brad was that prompting and reinforcing the replacement behavior of requesting a break was not necessary. The DRO with the token board was used in order to have a reinforcer compete with the automatic reinforcement obtained from hitting objects, which data indicated was effective. In addition to this function, the DRO also appeared to serve as an abolishing operation, reducing the value of escape from the task. This is because he never requested a break or exhibited any indications that would lead to prompting the break request (e.g., attempting to leave the area). This suggests that all components of the FBCI plan may not be necessary for every student.

Jared. Jared's data were at a moderate level during baseline and on a slightly increasing trend. When FBCI was introduced the data changed to a low level, but with a steeply increasing trend initially. After the third session of FBCI his request was changed from "ball" to "break." At that point his crisis behavior reduced to low levels, with some

variability that correlated with (a) a session when extinction was implemented, and (b) when his foot was assessed and placed in a cast.

The request targeted for Jared is worth discussing. “Ball” was initially taught because during baseline and assessment, he played with the ball almost exclusively. However, when FBCI was introduced it became clear his preferences were shifting as he would push the ball away and reach for other items. Given the short 10 min sessions used in this study, and his physical limitations, it was determined that a more comprehensive program teaching him requests for individual items was not plausible. Therefore, an omnibus “break” request was taught that resulted in him being granted free access to all of his preferred stimuli. The fact that this change led to the desired reductions in crisis behavior supports Hanley et al.’s (2014) method of teaching an omnibus request when intervening with severe problem behavior.

Natalie. Natalie had low levels of crisis behavior in the baseline phase, but there was some variability as she ranged from exhibiting crisis behavior during 0% to 38% of intervals in a given session. This low level corresponded to her teachers’ description of her pattern of behavior, as they specifically stated she was unpredictable and something that triggered her crisis behavior (e.g., being denied access to a requested item) one time would not have any effect the next time. With this description in mind, it would be expected that her baseline data would have sessions with minimal crisis behavior interspersed with occasional sessions with increased levels, especially when working for only 10 min at a time. With that being said, the introduction of FBCI had the noticeable effect of stabilizing the data at zero levels, as she did not exhibit a single instance of crisis behavior during intervention.

Both Natalie's assessment and intervention produced aspects worthy of discussion. Regarding her assessment, the FA was unable to establish a function for her crisis behavior due to low levels of responding. In this case, one option would have been to extend the FA by adding additional sessions until stable responding occur. However, given time constraints this was not plausible. Alternatively, prior researchers have simply extended conditions to durations as long as 7 hours (Davis et al., 2012; Kahng et al., 2001). However, this was not feasible given the resources at hand (e.g., the researcher had to work with other students, teachers are not trained in FA) and because Natalie had to participate in her school activities. Therefore, it was decided to analyze the precursor data behavior during the FA sessions. Precursor behaviors were elevated during the escape and tangible conditions, which allowed the researcher to infer that crisis behaviors were maintained by escape and access to preferred items. This is in line with the suggestion by Fritz et al. (2013) that analysis of precursor function can identify crisis behavior function.

Regarding intervention, Natalie never exhibited precursor or crisis behavior. Therefore, she was never prompted to exhibit the replacement behavior and never experienced extinction. Simply making the contingencies more clear and providing reinforcement more frequently than in the typical setting was sufficient to affect behavior change. It would seem the visual supports clearly depicting the contingencies for accessing reinforcement and the ability to access reinforcement on a denser schedule served as an abolishing operation, thus making crisis behavior irrelevant.

Conclusions. Multiple conclusions can be made from these results. First, FBIs were able to be incorporated throughout all phases of a crisis. It had been previously

suggested that behavioral interventions be limited to pre-crisis phases (Colvin & Scott, 2014; Gilliam, 1993; Simonsen, Sugai, Freeman, Kern, & Hampton, 2014). This study demonstrates the opposite. While each intervention was not necessary for all students, each phase was crucial for at least one student. This is most notable during the peak phase when authors have said function-based interventions should be abandoned in the interest of safety. However, extinction was an essential component to Brad and Jared. While safety was the primary focus of intervention, it was possible to implement extinction while maintaining safety. Additionally, extinction was not necessary for Natalie, which supports previous studies that have demonstrated extinction can be a necessary component, but is not always required (Fisher et al., 1993; Hagopian et al., 1998; Wacker et al., 1990).

Second, intervening early in the phases of crisis was able to prevent crisis behavior in many instances. For Brad and Natalie, preventative intervention was most effective during the calm phase using interventions that created abolishing operations for crisis and precursor behaviors. For Jared, intervention during precursor behavior was essential to teaching a replacement behavior that competed with crisis and precursor behaviors. This supports the recommendations by the field of crisis intervention (e.g., Colvin & Scott, 2014), as well as many studies using function-based interventions (e.g., Carr et al., 2003; Fritz et al., 2013) that preventative interventions are essential to reducing crisis behaviors.

5.2 Research Question 2: To what extent does FBCI reduce students' level of precursor behavior in the school setting?

The data indicate that after FBCI began, each student's precursor behavior decreased. However, a functional relation was not demonstrated because one student, Brad, had a decreasing trend of precursor behavior in baseline.

Brad. Brad's precursor behavior had a stable decreasing trend in baseline. After FBCI was introduced, Brad's precursor behavior reduced to zero and stayed at zero throughout the entire phase. As stated previously, this reduction cannot be definitively ascribed to the effects of FBCI due to the decreasing baseline trend. When interpreting these data, it is worth noting that during baseline, crisis behavior increased at approximately the same rate as precursor behavior decreased. The mean of crisis and precursor behavior per session was 25%, 24% and 25%, showing the amount of intervals with problem behavior remained constant throughout baseline. However, it seems that Brad simply allocated his responses to crisis behavior instead of precursor behavior as baseline continued. This can most simply be explained by the two functions of his crisis behavior: escape for aggression and automatic reinforcement for property destruction. During baseline his teacher's interventions were followed. Thus he was maintained in his chair for aggressive behavior, effectively placing his behavior on extinction. However, his property destruction was ignored unless it endangered another student. As such, property destruction was automatically reinforced, so he simply began to immediately exhibit property destruction.

Jared. Throughout the study Jared's precursor behavior largely mirrored his crisis behavior. In baseline, precursor behavior was at a moderate level and had a slightly

increasing trend. When FBCI was introduced precursor behavior immediately decreased to a lower level, but began to sharply increase. When the request was changed from ball to break, precursor behavior reduced to and maintained at low levels, with some variability corresponding to a session with an extinction burst and the medical procedure on his foot.

The fact that Jared's precursor behavior mirrored responding for crisis behavior makes sense given they are part of the same response class. Therefore, as the EO for the response class weakened and appropriate behavior began competing with the response class, it would be expected for both crisis and precursor behavior to decrease. Similarly, since crisis and precursor behavior were not incompatible, increases in crisis behaviors (e.g., self-injury) corresponded with increases in certain precursor behaviors (e.g., crying).

With that being said, in most FBCI sessions Jared's precursor behavior was higher than crisis behavior. This could be attributed to the fact that upon precursor behavior he was prompted to request a break, which made the crisis behavior irrelevant. This supports Fritz et al.'s (2013) study showing that interventions targeting precursor behaviors can reduce both precursor and crisis behavior.

Natalie. Natalie's precursor behavior also mirrored her crisis behavior generally, with increases in one corresponding to increases in the other. As with Jared, this would be expected if the responses were members of the same response class. Her precursor behavior began at a low, variable level in baseline. The introduction of FBCI led to an immediate reduction to zero for the entire FBCI phase. Once again, making the contingency explicit that having "nice hands" would result in a reinforcer and providing

reinforcement on a denser schedule seemed to function as an abolishing operation that made precursor behavior irrelevant.

Conclusions. The results of precursor behaviors largely reflect those of crisis behavior. As stated, this would be expected for behaviors of the same response class. However, this supports the findings by previous studies that interventions reducing precursor behavior will also reduce more severe members of that response class (e.g., Borrero & Borrero, 2008; Dracolby & Smith, 2012; Fritz et al., 2013). However, it should be noted the lack of a functional relation weakens this claim.

5.3 Research Question 3: To what extent does FBCI increase level of students' appropriate behavior in the school setting?

A functional relation was demonstrated between FBCI and the students' appropriate behavior. No student exhibited appropriate behavior during baseline. However, upon introducing FBCI all students' appropriate behavior increased.

Brad. During baseline Brad did not exhibit appropriate behavior. Upon the introduction of FBCI, appropriate behavior changed to a high level with some variability as the schedule was thinned. Brad did not exhibit the replacement behavior of asking for a break. Because he did not exhibit precursor behavior, this behavior was never prompted, but simply reviewed periodically. He simply attended to and completed his work without any property destruction or aggression. It is possible that as the schedule was thinned further, the establishing operation would increase and the need for prompting and teaching his break request would occur. However, the differential reinforcement program was sufficient for him to increase his ability to sit and respond to academic demands calmly for the majority of the 10-min session.

Jared. During baseline Jared did not exhibit appropriate behavior for any opportunity. When FBCI was first introduced, his level of appropriate behavior did not increase. When his request was changed from "ball" to "break," appropriate behavior increased to a moderate level that was variable. It seems this is because preference changed during the study. Initially "ball" was chosen because he played exclusively with a yoga ball during baseline. However, even though he was prompted to request the ball and received it, this did not result in his independent use of the request. As such, the change was made to "break" to allow him free access to any leisure item he wanted in that moment. At that point he began to independently make requests, and schedule thinning was able to be implemented. This reflects Hanley et al.'s (2014) recommendation to use an omnibus request when targeting severe problem behavior.

The variability with Jared's appropriate behavior data can be attributed largely to schedule thinning and the medical issue with his foot. Upon achieving exhibiting appropriate behavior for 75% of opportunities or more, the delay to reinforcement was increased for the next session. This corresponded with a slight decrease in appropriate behavior. Additionally, there was a dip in appropriate behavior on the day he required an assessment for his foot that led to his foot being placed in a cast.

Natalie. Natalie's appropriate behavior increased from zero levels during baseline to 100% of opportunities for every session during FBCI. This seemed to simply be controlled by setting an achievable requirement for her to receive reinforcement and making the contingency of having "nice hands" during work to earn her chosen reinforcer explicit. Once this was done, she simply worked calmly for the duration of the task,

occasionally pointing at her chosen reinforcer, at which point she would be told she could access it if she worked with nice hands.

Conclusions. These data show that FBCI can lead to increases in appropriate behavior along with decreases in challenging behavior. In this study appropriate behavior was more complex than simply identifying a replacement behavior (e.g., requesting a break). This is because teaching a student to request a break would not necessarily lead to the most desired outcomes. Jared's behavior exemplifies this point. After he mastered the break request, he began requesting breaks as soon as he sat at his work area. Thus, while his crisis behavior reduced, which is important, he still did not participate in academic instruction. Since appropriate behavior required him to exhibit the replacement behavior, wait until a break was allowed, and respond to researcher directions while waiting, the measure showed that he increasingly took part in academic instruction as the schedule was thinned.

Expanding on the topic of schedule thinning, this was an important part of the intervention for two of the three participants. Both Brad and Jared's initial intervention was intensive, requiring one-to-one attention in Brad's case and preventing any engagement with academic demands for Jared. However, as the schedule thinned, the intervention became more feasible in the classroom setting. Brad was able to sit appropriately for 90 s before requiring interaction. At that point a teacher or assistant would simply need to provide him with his reinforcer or a token for appropriate behavior. Similarly, initially Jared would not engage in the academic task. However, as the delay to reinforcement increased he was prompted to respond while waiting. This small delay

allowed him to engage in the academic lesson and complete the required trials during the 10-min session.

Conversely, schedule thinning was not required for Natalie. Upon setting up her reinforcement board she completed all tasks appropriately. This suggests that systematically thinning the schedule of reinforcement may be critical to achieving the optimum outcomes for some participants. However, for other students such as Natalie, once a contingency is established the terminal schedule of reinforcement could be reached quickly. This supports use of the practice Hagopian et al. (2011) described to periodically probe the terminal reinforcement schedule to determine if a student can tolerate the schedule or if it will cause ratio strain.

Finally, Jared's data support Schmidt et al.'s (2014) suggestion that using behavioral indicators as a cue to prompt replacement behaviors is an effective way to teach functional communication. They posited this was because behavioral indication acts as a signal that an establishing operation is in effect, and therefore the putative reinforcer has value at that point. For Jared, this was borne out as he mastered the break request when prompted upon exhibiting precursor behavior.

5.4 Research Question 4: To what extent do the effects of FBCI maintain after intervention?

This question remains unanswered. Time constraints combined with student absences and school holidays prevented maintenance data from being collected. As such, it cannot be stated whether the effects of the intervention will maintain across time.

5.5 Research Question 5: To what extent do the effects of FBCI generalize to other settings?

Generalization was assessed by recording data on the students' crisis, precursor, and appropriate behavior when they were working with their teacher. For Jared, the effects did not generalize to working with his teacher. He did not exhibit any challenging behaviors during the baseline generalization probe and he did exhibit some challenging behaviors during the FBCI generalization probe. The effects did appear to generalize for Natalie, as her baseline generalization probe and FBCI generalization probe were consistent with the rest of the data in those phases. Specifically, she had low levels of precursor behavior and did not exhibit appropriate behavior during baseline, but had zero precursor or crisis behavior during FBCI and exhibited appropriate behavior for 100% of opportunities.

It is difficult to draw conclusions from these data. This is because of the contradicting results of Jared and Natalie, but for other reasons as well. For instance, the interventions with Jared were not consistent in the generalization settings. During the baseline generalization probe Jared sat at his work area without any preferred items and only was required to press a Big Mac button once during the 10 min probe. In contrast, during the FBCI probe he had a bottle to play with, which was a preferred item, and he was required to respond seven times in various ways (e.g., touching a card, imitating a motor movement). During each trial, the teacher or teacher's assistant would also block him from playing with his bottle.

With Natalie, her data appear to suggest the improvements generalized. However, permission to video record her for data collection was not given. Therefore, the

researcher was still present during the generalization probes, and could have therefore served as a discriminative stimulus that evoked the appropriate behavior.

5.6 Research Question 6: To what degree of fidelity can teachers implement FBCI after transfer from the researcher?

Due to delays in the study, this question was not addressed. Therefore, the extent to which teachers can implement FBCI with fidelity is not known.

5.7 Research Question 7: What are teachers' perceptions of FBCI?

Teachers' perceptions of FBCI were positive. They agreed to strongly agreed the targeted behaviors were appropriate, the procedures were appropriate, safety was maintained, and the change in behavior was significant. Regarding whether they could implement FBCI, one teacher agreed she could while the other was neutral.

Open-ended questions were also included in the social validity measure. Regarding the benefits, both teachers noted the effectiveness of FBCI as a benefit, and the comprehensiveness of the plan was a positive. A common concern raised in multiple open-ended questions was whether FBCI would be implemented with fidelity. Specifically, the teachers saw two barriers to implementing FBCI with fidelity. First, they did not know if they had the staff to student ratios needed to implement FBCI with fidelity given that it would require a one-to-one ratio at times. This is a legitimate concern. However, it is worth nothing that when students exhibit dangerous behaviors it often requires these ratios anyways. Additionally, while FBCI is typically intensive initially, schedule thinning allows for it to become less intensive over time. It is possible that because they associate this intensity because as students became successful on

thinner schedules of reinforcement, they exited the study. Therefore, the majority of teachers' experience with FBCI was when there was a dense schedule of reinforcement.

The second major concern the teachers expressed regarding implementing FBCI with fidelity was the training necessary. FBCI is a comprehensive model of intervention, and therefore has several components. This means, as the teachers noted, that adequate training would be necessary for all staff involved with the student to implement it correctly. Research shows that coaching is an effective method for increasing practitioners' abilities to implement interventions with fidelity. Therefore, coaching procedures such as those used by Bethune and Wood (2013) may be necessary for FBCI to be used consistently with fidelity in the school setting.

5.8 Specific Contributions of the Study

This study makes multiple contributions to the literature. First, previous experts have suggested that FBI and crisis intervention could complement one another (Duggan & Dawson, 2004; Marston, 2001). However, to date there are no published studies evaluating the effects of an intervention that combines FBI and crisis intervention. This study achieved this combination by implementing FBCI. Further, the results suggest these two models of intervention are compatible as FBCI led to a decrease in challenging behavior and an increase in appropriate behavior.

This study also fills a gap in the FBI literature. Both Hanley et al. (2014) and Carr and Carlson (1993) have pointed to the need to study the effects of comprehensive, synthesized treatment packages on challenging behavior. Hanley et al. specifically point to a gap in the behavior analytic literature for this type of research, as it focuses almost exclusively on the effects of individual components on behavior. This study addresses

that gap by demonstrating an effective method for creating comprehensive, synthesized intervention for addressing dangerous behavior.

Last, there is a paucity of experimental research on the effects of crisis intervention for students with DD. To date the only study using crisis intervention with students with DD was conducted by Baker and Bissmire (2000), and it did not lead to reductions in challenging behavior. By using a valid, single-case research design this study not only adds to the total amount of research on crisis intervention for individuals with DD, but also demonstrates a potentially effective model for employing crisis intervention with individuals with DD.

5.9 Limitations of the Study

The results of this study should be interpreted with the following limitations in mind. First, FBCI was only implemented for 10 min per day. This was done intentionally, as there is not an expansive research base supporting its effectiveness. Therefore, the 10-min sessions were intended to minimize any negative effects that may have occurred. Because of the time limits on sessions, it is not known how students would respond if FBCI was in effect throughout their day.

A second limitation is that natural interventionists were not used. In a typical setting the teacher and the paraprofessionals would have the primary responsibility for implementing any intervention. In this study, the researcher, who has a background working with this population and advanced training in applied behavior analysis and special education, had the primary responsibility for assessment, planning, and implementation. The intent was to transition responsibility for implementing FBCI to the teacher after the maintenance phase. However, due to time constraints this was not

possible. Thus, it is still not known whether natural interventionists will be able to assess, design, or implement FBCI for the 10-min sessions, much less the entire day.

Third, FBCI is a synthesized package that combines several different interventions. As with any complex treatment package different components will exert more control than others for different individuals. This means it is not possible to determine the control exerted on students' behaviors by the various components. As such, some components may be unnecessary while others are essential, and this study did not identify either.

Last, generalization and maintenance sessions were not completed for all students. Generalization data during FBCI was not able to be collected for Brad. No maintenance data were collected. Thus, it is not known if the effects generalize to the natural environment for Brad, or if the effects were maintained for any of the students.

5.10 Suggestions for Future Research

This study leads to several suggestions for future research. First, as has been said previously, no published studies have combined FBI and crisis intervention. Therefore, replications are necessary to establish the effectiveness of FBCI.

Next, future studies should extend the research to more typical settings. This could be done in one of many ways. Future research could expand the duration FBCI is implemented beyond 10 min. Studies could also look to transition the responsibility of FBCI to teachers and paraprofessionals to see how much expert involvement is necessary for it to be effective. This could be done by first having teachers and paraprofessionals implement an FBCI plan developed by a researcher. Then, teachers and paraprofessionals could assist with the assessment and planning process prior to implementing an FBCI

plan themselves. These would be significant steps to understanding how FBCI could be most effective for use in schools. As indicated by the social validity measure, sufficient training may be necessary for practitioners to implement FBCI with fidelity. Therefore this line of research could also investigate what method and intensity of training is necessary for practitioners to implement FBCI with fidelity (e.g., coaching, Bethune & Wood, 2013).

Finally, future research should examine several of the components used in this study. It was mentioned in the limitations that it is not possible to determine which components of FBCI were necessary and which were superfluous. Although it was not demonstrated experimentally, clearly some students benefitted from certain parts of the intervention more than others. For instance, neither Natalie nor Brad received prompting during the acceleration phase because they never exhibited precursors during intervention. Therefore, these components likely had no effect on them. However, Jared did exhibit precursors and did receive prompting during acceleration, suggesting this phase was important for his behavior change. Future research could conduct component analyses on the FBCI model to determine which components are necessary and which are unnecessary.

5.11 Implications for Practice

Although additional research is needed to establish the evidence base for FBCI, the results of this study still have implications for practice. First, this study showed that FBI and crisis intervention can complement one another. Therefore, when practitioners are planning for crisis behaviors they should incorporate elements from both methods. If practitioners are planning a crisis plan, they should ensure each phase uses FBI.

Similarly, if they are creating a function-based plan, they should follow crisis intervention recommendations of describing the interventions in in step-by-step detail and organize interventions according to students' escalation.

Second, practitioners should intentionally target students' ability to tolerate delays or denial of reinforcement by initially providing reinforcement on a dense schedule, and then systematically thinning that schedule. For two out of the three participants the initial intervention would have been unsustainable given the amount of time required. Brad was requiring reinforcement every 10 s, and Jared would not engage in any academic work. By thinning the schedule of reinforcement, both achieved more manageable interventions as Brad required only the delivery of a token or reinforcer once every 90 s and after Jared asked for a break, he would complete the required trials before taking it.

With that being said, unlike Brad and Jared, Natalie did not require any schedule thinning. She was able to exhibit appropriate behavior 100% of the time at the terminal schedule from the beginning. Therefore, while systematically thinning the reinforcement schedule should be planned, probes should be conducted periodically to see if the student can tolerate the terminal reinforcement schedule. This could accelerate the process to achieving the desired outcomes of reduced problem behavior and increased engagement in educational activities.

Last, in implementing this study it was clear that different components had different effects for each student. This indicates the optimum plan for any of the students would not include every single component planned. However, given the fact that dangerous behavior is being addressed, it is recommended that initial plans target all phases and use every component possible. Once the crisis behavior is reduced to an

acceptable level, practitioners could systematically phase out different components. This would allow only the critical components of FBCI in place for a particular student, making the intervention less complex for practitioners when implementing it.

5.12 Summary

The purpose of this study was to examine the effects of FBCI on the behaviors of three students with DD who exhibited dangerous behaviors. The specific dependent variables were crisis behavior, precursor behavior, and appropriate behavior. Each student began with an assessment to determine the function of their crisis behavior and to identify precursor behaviors. Once this was done, a plan was developed for them that developed FBIs for each phase in the cycle of acting out behavior (Colvin & Scott, 2015). The intervention was delivered using a delayed-multiple-probe across participants design. Results of the study demonstrated a functional relation between FBCI and (a) a reduction in crisis behavior, and (b) an increase in appropriate behavior. A functional relation was not demonstrated between FBCI and precursor behavior because one participant's behavior showed a decreasing trend in baseline. Teachers reported they thought FBCI was appropriate and effective. They also said they felt they could implement FBCI, but identified lack of staffing and the need for training as potential barriers to implementing it with fidelity.

In sum, this study has demonstrated an effective way to combine FBI with crisis intervention models. Until this point, formally combining these two models was something experts had suggested (Duggan & Dawson, 2004; Marston, 2001), but had yet to be formally examined via a rigorous research design. Given the potentially complimentary benefits of the two models, FBI effectively reducing problem behaviors

and crisis intervention increasing practitioners' ability to intervene safely, and the dangers associated with working with individuals with DD who exhibit crisis behavior, this study fills an important gap in the literature.

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APPENDIX A – FBCI DATA SHEET

Student: Date (Condition):

Target Behaviors

- **Crisis Behavior** – (insert individual student definition)
- **Precursor Behavior** – (insert individual student definition)
- **Appropriate Behavior** – (insert individual student definition)

Recording Method:

- **Crisis and Precursor:** *10 second partial interval* – Start the video. At the end of 10 s record a "Y" if the target behavior occurred at any point during the interval. Record a "N" if the target behavior did not occur during the 10 s. Repeat every 10 s for 10 min.
- **Appropriate Behavior:** *Percent independent* – For every opportunity, record a + if the appropriate behavior occurred without prompting or crisis behavior; record a – if prompted or if crisis behavior occurred. If no opportunity occurred, record "n/a".

	Crisis	Pre	Repl		Crisis	Pre	Repl		Crisis	Pre	Repl
0:10				3:30				6:50			
0:20				3:40				7:00			
0:30				3:50				7:10			
0:40				4:00				7:20			
0:50				4:10				7:30			
1:00				4:20				7:40			
1:10				4:30				7:50			
1:20				4:40				8:00			
1:30				4:50				8:10			
1:40				5:00				8:20			

1:50				5:10				8:30			
2:00				5:20				8:40			
2:10				5:30				8:50			
2:20				5:40				9:00			
2:30				5:50				9:10			
2:40				6:00				9:20			
2:50				6:10				9:30			
3:00				6:20				9:40			
3:10				6:30				9:50			
3:20				6:40				10:00			

# with SPB		# with precursor		# ind replace	
% with SPB		% with precursor		% ind replace	

APPENDIX B – FUNCTIONAL ASSESSMENT OBSERVATION FORM

Establishing Operations	Antecedent	Behavior	Consequence

APPENDIX C – SOCIAL VALIDITY QUESTIONNAIRE

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The behavior(s) targeted for decrease were appropriate	1	2	3	4	5
2. The behavior(s) targeted for increase were appropriate	1	2	3	4	5
3. The procedures were appropriate and acceptable for the student.	1	2	3	4	5
4. Safety was adequately maintained.	1	2	3	4	5
5. The change in behavior was significant.	1	2	3	4	5
6. I could implement FBCI on a daily basis	1	2	3	4	5

What disadvantages or complications do you see with using FBCI?

What benefits do you see in using FBCI?

Please list any relevant factors you see that would *inhibit* the use of FBCI.

Please list any relevant factors you see that would *facilitate* the use of FBCI.

APPENDIX D – SAMPLE PROCEDURAL FIDELITY CHECKLIST

Behavior Maintained by Access to Toys

Student	Staff	Procedural Fidelity		
Calm	1. Provide specific verbal praise.	1. Yes	No	N/A
	2. Ensure student has access to his communication card/book.	2. Yes	No	N/A
	3. Ensure position to be able to intervene between Student and his preferred items, so FCT can be prompted.	3. Yes	No	N/A
Triggers – Removing or denying access to preferred objects	1. Provide a 1-minute and 30-second warning prior to removing preferred items.	1. Yes	No	N/A
	2. Provide a verbal reminder that student can ask for what student wants.	2. Yes	No	N/A
Functional Communication – Student exhibits a functional	1. Provides enthusiastic verbal praise.	1. Yes	No	N/A

communication response	2. Honors request according to current delay-to-reinforcement step (e.g., reinforce immediately, reinforce after 2 s). 2a. If delay-to-reinforcement trial is implemented, states "nice job asking for toys. Wait."	2. Yes	No	N/A
	3. Provide a 1-minute warning (e.g., 1-minute and it's my turn) and follow procedures in the "Triggers" section.	3. Yes	No	N/A
Agitated – reaches for or approaches items after being blocked and/or directed away from them	1. Ensure correct body positioning.	1. Yes	No	N/A
	2. Block access to preferred items.	2. Yes	No	N/A
	3. Redirect to his communication card and prompt student to touch it using least to most prompting. 3a. Verbal and gesture → Physical prompting	3. Yes	No	N/A

	4. Upon touching card provide enthusiastic verbal praise and access to chosen item. Follow procedures in "Functional Communication" section.	4. Yes	No	N/A
	If implementing delay-to-reinforcement 3. State "you need to wait, and then you can have your toys." Continue to block access.	3. Yes	No	N/A
Acceleration – exhibits	1. Ensure correct body positioning.	1. Yes	No	N/A

precursor behavior(s)				
	2. Block access to preferred items.	2. Yes	No	N/A
	3. Redirect to his communication card and *physically* prompt student to touch it.	3. Yes	No	N/A
	4. Upon touching card provide verbal praise and access to chosen item. Follow procedures in "Functional Communication" section.	4. Yes	No	N/A
	If implementing delay-to-reinforcement 3. Pause the timer. State "you need to wait, and then you can have your toys." Continue to block access.	3. Yes	No	N/A
	4. Upon waiting calmly (i.e., absent of precursor behavior), provide specific verbal praise and resume the timer.	4. Yes	No	N/A
Peak –exhibits aggression	1. Implement non-violent physical intervention to block attempts at	1. Yes	No	N/A

	aggression and escort student to the table.			
	2. Maintain at the table until student is absent of aggression for 30 seconds, blocking attempts to leave or engage in aggression. 2a. If student does not exhibit aggression for 30 seconds, but continues to exhibit precursor behaviors, implement procedures in "De-escalation" section. 2b. If student demonstrates calm, implement procedures in "Recovery" section.	2. Yes	No	N/A
De-escalation – absence of aggression for 30 seconds but still be resisting	1. Continue to stand behind student, maintaining student in his chair.	1. Yes	No	N/A

direction, crying, or whining	2. Provide a neutral task for student to engage in (e.g., puzzle, insertion task), using least to most prompting to complete it. 2.a. *Least to most* – verbal → gesture → light physical → full physical	2. Yes	No	N/A
	3. Provide verbal praise for engaging in the task.	3. Yes	No	N/A
	4. If student completes the task but is still exhibiting precursor behaviors, reset the task and begin again.	4. Yes	No	N/A
	5. Upon completing the task and exhibiting calm, provide verbal praise and implement procedures in "Recovery."	5. Yes	No	N/A
Recovery – calm	1. State "you need to ask for ____."	1. Yes	No	N/A

	2. Redirect student back to original location.	2. Yes	No	N/A
	3. Use least to most prompting to ensure student requests the item.	3. Yes	No	N/A
	4. Provide verbal praise and honor request. Follow procedures in the "Functional Communication Training" section.	4. Yes	No	N/A
Procedural Fidelity Percentage	_____/_____ x 100 =_____ (# of steps completed) (total # of steps) (Percentage)			

APPENDIX E – LETTER TO PARENTS

Dear Parents and Guardians,

My name is Bradley Stevenson. I am a doctoral student at the University of North Carolina – Charlotte. I am writing to inform you about an upcoming study that I will be conducting at the Metro School with my advisor Dr. Charles Wood titled "Effects of Function Based Crisis Intervention on the Crisis Behavior of Students with Developmental Disabilities."

Purpose

This study is intended to improve the services for students who engage in dangerous behaviors such as aggression, self-injury, and/or property instruction. These behaviors pose a risk to both students and staff. Therefore, interventions that are effective, safe, and that staff can implement with confidence are needed.

Interventions based on a functional behavior assessment (FBA) have been proven to be effective at reducing problem behaviors of all types. Crisis intervention has also shown to increase safety and staff confidence. Although FBA and crisis intervnention could be combined into a single plan, there has been minimal research done in this area. As a result, research in this area is needed to improve services for students who engage in these types of behaviors.

Investigators

Dr. Wood and I are qualified to design this plan and work with these students based on our training and experience. I (Bradley Stevenson) have been in the special education for 12 years working with individuals with dangerous behaviors, am a Board Certified Behavior Analyst, and am trained in crisis intervention by the Crisis Prevention Institute. Dr. Charles Wood from the special education program at UNC Charlotte serves as my advisor and will supervise the study. Dr. Wood has over 20 years of experience working with students with special needs, is a Board Certified Behavior Analysis – Doctoral Level, and has taught university courses on classroom management and applied behavior analysis for several years.

Eligibility

Eligible students will (a) be diagnosed with a developmental disability, and (b) exhibits problem behavior that threatens the safety of that student or others. Due to the nature of the behaviors we are targeting, there will be associated risks. However, safety is our primary concern, and every effort will be taken to minimize these risks.

If you are interested in having your child participate or have further questions you can proceed in one of following ways.

1. You can find our contact information at the end of this letter. Feel free to reach out to us directly to discuss the study.
2. Sign and return the attached "Parental Informed Consent" form.

Thank you very much for your consideration, and we look forward to hearing from you.

Sincerely,

Bradley Stevenson, MTS, BCBA

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APPENDIX F – PARENTAL INFORMED CONSENT

Parental Informed Consent for
Effects of Function Based Crisis Intervention on the Crisis Behavior of Students with Developmental Disabilities

Project Purpose:

Your child is invited to participate in a research study titled "Effects of Function Based Crisis Intervention on the Crisis Behavior of Students with Developmental Disabilities." Some students with developmental disabilities have dangerous behaviors such as aggression, destructive behavior, and/or self-injury. These behaviors can be a risk to students and staff. Therefore, interventions that are effective, safe, and that staff can implement with confidence are needed.

Description of Participation:

Assessment: If selected, an assessment will be conducted with your child in order to determine the cause of his or her behavior. This will consist of one 30 to 45 minute interview with teachers and 2-4, 30 to 45 minutes observations of your child during challenging times that are naturally occurring. Next, a "functional analysis" will be conducted which involves briefly exposing your child to situations that could trigger the behavior. For example, if it is not clear if your child is engaging in the behavior to gain attention or to get a preferred item, we will set up situations where (a) he/she is given lots of attention but does not have the preferred item and (b) he/she is not given attention but has the preferred item. We will then compare how often the behavior occurs in each of these situations to determine the cause of the behavior. This assessment will provide the information necessary to create a new "function based crisis intervention" that includes strategies to decrease the challenging behavior, increase an appropriate replacement behavior, and maintain safety for all parties.

Intervention: Following assessment, your child will begin participating in 10 minute sessions between three to five times per week. During the first phase, the original behavior/crisis plan created by the school will be used to respond to challenging behavior. The purpose of this is to establish how often the dangerous behavior occurs with the current plan, so we can compare this with how often the behavior occurs with the function based crisis intervention. After initial performance is established, the new function based crisis intervention will be implemented. We will collect data every session to assess the effectiveness of the function based crisis intervention. If the data indicates that the intervention is ineffective, your child will exit the study so he/she is not exposed to unnecessary risks. Additionally, if it is ever determined that safety cannot be maintained during a session, the current session will be immediately terminated and the team will meet to determine if adjustments can be made to ensure safety. If the team decides these adjustments are not possible, your child will exit the study as it will be the safest course of action. Finally, if your child is engaging in challenging behaviors at the end of the 10 minute session, we will continue to work with your child until he/she is calm and able to be reintegrated into the daily activities.

All data will be kept confidential and your child's name will not appear in any data collection sheet or report. Data will be stored in a locked file cabinet at the University of North Carolina Charlotte. Electronic data will be stored on a university computer that is password protected. Any personal information will only be given to the research team, and will be given directly by school personnel. The research team will be the only ones to have access to the collected data. Pseudonyms will be used to maintain the confidentiality of the participants. Data will be disposed of after six years. All paper data will be shredded, and electronic data will be dismantled and, or rendered useless.

Length of Participation:

It is anticipated that this study will begin in January of 2015 and it is anticipated that it will be completed by May, 2015. If you decide to grant consent for your child to participate, your child will be one of three to four participants in this study.

Risks of Participation:

There are several risks associated with this study that need to be considered.

- Because of the nature of behaviors we will be targeting with your child (i.e., dangerous, crisis level behaviors) there is a risk of pain and physical injury to all parties involved including the participant, the investigator, and any supporting school staff members. We will attempt to mitigate these risks in several ways.
    - First, your child will undergo a careful review process to ensure his/her behaviors can be safely managed. If the research team or school staff do not believe this is possible, your child will not be included.
    - Second, the interventionist and any supporting staff are trained in nonviolent physical intervention. This ensures they have the skills that will make them most able to maintain everyone's safety.
    - Third, there is already a behavior support plan and crisis plan in place for your child by the school. While this may not be successful at reducing the behaviors, it is designed to keep all parties safe which is important during baseline.
    - Fourth, the intervention will be a combination of function-based interventions and crisis intervention. This means that the variables that trigger and maintain the challenging behavior will be carefully analyzed to ensure the chances of triggering it are minimized and step by step instructions will be planned to maintain safety as best as possible. For example, the interventions will focus on the precursor behaviors (i.e., behaviors that occur directly before the challenging behavior) to teach alternative behaviors. This means that if it is seen that your child is upset, he or she will be taught in that moment to get what they want appropriately (e.g., signing for a break and immediately providing a break). Hopefully this will preempt the challenging behavior, making it unnecessary.

    - Finally, if at any time the interventionist or supporting staff feel that safety cannot be maintained, the session will be terminated.

- There is a risk of experiencing psychosocial harm and emotional distress for all parties involved. This is because your child will be placed in situations that have historically evoked his/her crisis behaviors in order to study the effectiveness of the intervention in those situations. This will potentially be a stressful situation for your child, the investigator, and the supporting staff. This will be minimized through the functional behavior assessment planning.
    - Conditions that trigger the behavior will be carefully analyzed, and modifications will be made to reduce the aversion of those situations. For example, if it is determined that your child engages in behaviors to escape academic demands, the demands may be infused with preferred topics, shortened, and reinforcers provided for briefly engaging in the activity.
    - With respect to the investigator and support staff, extensive training will take place to ensure they are confident in their ability to effectively and safely implement the intervention. This will include reviewing videos of the sessions to debrief.
- There is risk of increasing or intensifying the challenging behavior. By placing your child in situations that have historically evoked the challenging behavior it is likely the behavior will be exhibited. If the behavior is particularly resistant to intervention or safety cannot be maintained which leads to terminating the intervention, an intensified level of behavior may be reinforced making it more likely to occur again. This will be minimized in multiple ways.
    - Students who have an internal medical condition such as Crohn's Disease will not be included in the study because we are unable to control the condition’s impact on behavior.
    - Your child’s behaviors will be reviewed to ensure safety can be maintained, as mentioned above. This increases the likelihood that the intervention will not result in accidental reinforcement (e.g., if your child engages in challenging behaviors to escape a task so intensely he/she cannot be safely maintained at the task).

<u>Benefits of Participation:</u>

In addition to the potential risks, there are significant potential benefits.

- If the intervention is effective it means the dangerous, crisis behaviors decrease. This would result in greater safety for your child, the school staff, and any other caregiver in your child’s life.
- If effective it is likely that your child’s functional skills will have increased as well, since those skills will be taught. This will provide your child with an extremely valuable skill that allows him/her to meet a need appropriately, thereby reducing the need for the dangerous behaviors. This may open additional opportunities to participate more fully in educational programming, improve

social relationships, increase community/social inclusion, and reduce the stress of your child and caregivers.

- If effective it will provide the staff with an effective model for intervening with other students that exhibit dangerous behaviors, thereby increasing their ability to provide services to this population and making the entire school environment a safer place for your child.

Volunteer Statement:

Your child is a volunteer. The decision to participate in this study is completely up to you and your child. If you and your child decide for your child to be in the study, your child may stop at any time. Your child will not be treated any differently if you and your child decide not to participate, or if your child stops once your child has started.

Confidentiality:

The data collected by the Investigator will be kept confidential to the extent possible. The following steps will be taken to ensure this confidentiality:

- No participant will ever be mentioned by name in the reported results, pseudonyms will be used
- Participants can end their participation at any time
- Only the principal investigator and his research staff will have access to the raw data. All gathered data will be stored in a locked cabinet and on a password protected computer.
- Data will be disposed of after six years.

Fair Treatment and Respect:

UNC Charlotte wants to make sure that you are treated in a fair and respectful manner. Contact the University's Research Compliance Office (704-687-1871) if you have any questions about how you are treated as a study participant. If you have any questions about the project, please contact Brad Stevenson, 704-687-8562, or Dr. Charles Wood, 704-687-8395.

Parental Consent for Participation in Study:

I have read the information in this consent form. I have had the chance to ask questions about this study and about my child's participation in the study. My questions have been answered to my satisfaction. I am at least 18 years of age, and I agree to allow my child to participate in this research project. I understand that I will receive a copy of this form after it has been signed by me and the principal investigator of this research study.

I consent to my child's participation in this study: ___YES ___ NO

I consent to the use of videotape during this study: ___YES ___ NO

_____

Student Name (print)

_____

Parent Name (print)

_____ _____

Parent Signature DATE

_____ _____

Investigator Signature DATE

This form was approved for use on *Month, Day, Year* for a period of one (1) year.