

THE EFFICACY OF A SYSTEMATIC PROCESS FOR DESIGNING FUNCTION-  
BASED INTERVENTIONS FOR ADULTS IN A COMMUNITY SETTING

by

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## DEDICATION

I dedicate this dissertation to my family. First, to my husband, Dan Cancio, whose loving and unfailing support made possible the successful completion of my studies. Second, to my two extraordinarily wonderful and delightful children, Aiya and Zak, who have most patiently endured my pursuit of this degree during the early years of their lives. And finally, to my parents and brother, who have always stood steadfast in their love and encouragement of me both professionally and personally.

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## ABSTRACT

The *Function-based Intervention Decision Model* (Umbreit, Ferro, Liaupsin, & Lane, 2007) (*Decision Model*), is a straightforward technique to link the function of a behavior to an intervention. Although this technique has been found to be significantly effective with school-age disability populations, it has not been tested with adults who have cognitive disabilities and significant behavioral problems in non-school settings.

This study explored the efficacy of the *Decision Model* (Umbreit et al., 2007) as a method for matching behavioral interventions to assessed function(s) of the target behavior by extending its practices to adults with developmental disabilities in a community-based day program. The participants were three adults with moderate mental retardation and problematic behavior, displayed by inappropriate social interactions. The research design was a multiple baseline across subjects. A notable benefit to this design is that there was no need to withdraw treatment, an important ethical consideration because each of the problem behaviors presented with some form of *self-injury, aggression to others, and/or property destruction*.

The study had four phases: (a) conducting the functional behavioral assessment to identify the function of the participant's problem behavior, (b) utilizing the *Decision Model* (Umbreit et al., 2007) to link the function to the behavioral intervention plan (BIP), (c) applying the intervention, and (d) and maintenance. Several research questions were posed: (a) Do interventions developed using the *Decision Model* produce positive results for adults who have developmental disabilities and significant behavior problems in a non-school setting? (b) Will the application and maintenance of each BIP result in

decreased exhibition of assessed problem behaviors? (c) Will the application and maintenance of each BIP result in increased exhibition of identified replacement behaviors? (d) Will the day program support staff and behavioral support team view the outcomes as socially valid? The results indicated a decrease in problem behaviors (socially inappropriate interactions) and an increase in replacement behaviors (socially appropriate interactions). Results of this study influenced positive intervention strategies that were easily maintained and viewed as socially valid by the direct support staff, evidenced by the results of the Treatment Acceptability Rating Form-Revised (Reimers, Wacker, Cooper, & DeRaad, 1992).

## CHAPTER 1

### INTRODUCTION

Direct service providers are continually challenged in providing positive and socially acceptable support to individuals who have profound disabilities and behavioral problems. Sometimes the problem behaviors are so severe that the individuals exhibiting them may not progress in acquiring needed independent living skills, such as appropriate social interactions. As a result, they may be ostracized by their peers (Carr, 1977; Carr, Levin, McConnachie, Carlson, Kemp, & Smith, 1994; Durand, 1990, 1999; Durand, & Carr, 1991; Durand & Merges, 2001). Common examples of challenging behavior include self-injury, aggression to others and property destruction. The critical and very demanding task for support personnel is two-fold: to not only decrease the problematic behavioral responses, but also to teach new, more acceptable replacement behaviors. Therefore, appropriate behavioral interventions that can be developed, implemented, and maintained by caregivers, classroom aides, and/or program support staff are an integral element of effective behavior support (Durand & Carr, 1991; Durand & Carr, 1992; Horner & Carr, 1997; Horner, Dunlap & Koegel, 1988; Jolivette, Scott, & Nelson, 2000).

Fortunately, over the last three decades, substantial progress has been made in the delivery of behavioral support strategies for persons with such significant challenges in many different environments. Some of these advances have included improved methods of implementing functional behavioral assessments (FBA), functional analyses (FA), and the provision of more comprehensive support practices that involve environmental manipulations and function-based interventions (Carr, 1977; Carr et al., 1994; Durand,

1990, 1999; Durand, & Carr, 1991; Foster-Johnson, & Dunlap, 1993; Kern, Delaney, Clarke, Dunlap, & Childs, 2001; & Sugai, 1996; Koegel, Koegel, & Dunlap 1997; Umbreit, 1995, 1996, 1997; Umbreit et al. 2007).

Carr (1977) was the first to hypothesize that problem behavior might be purposeful. Specifically, Carr suggested that self-injurious behavior might be learned and maintained by one or more of four contingent consequences: (a) social reinforcement, (b) termination of an aversive stimulus, (c) provision of sensory stimulation, and (d) the need for physiological or psychodynamic processes. Since that original study, behavioral research has been driven to assess the function of problem behavior in order to facilitate methods for reducing those behaviors and replacing them with more effective socially acceptable behavior.

In a review of behavioral support practices, Horner and Carr (1997) attributed the progress in behavioral intervention practices to a refocused value that behavioral support for persons with severe disabilities is much more than a process of reducing problem behaviors simply by rewarding a desired behavior and ignoring an undesired behavior. Horner and Carr emphasized that the use of FBAs to guide clinical intervention and claim effective behavioral support practices must address the restructuring of environments so that problem behaviors are no longer necessary. They also contended that intervention methods should use teaching plans that emphasize the acquisition of new, more socially appropriate skills that can generalize across settings. Per these researchers, it is these comprehensive strategies of support that most often result in positive changes in behavior that can then be maintained and generalized over time.

Specifically, the FBA is a method of identifying the function of a problem behavior by studying the consequence of that behavior as well as noting the predictor events that precede the behavior (Sugai et al., 2000). Horner and Carr (1997) suggested that a FBA improves the efficiency of an intervention through (a) understanding what maintains the problem behavior, (b) predicting when a problem behavior may occur, (c) identifying ways to prevent occurrence of the problem behavior, and (d) designing procedures for positive responses to the problem behavior when it occurs. Examining consequences allows for hypothesizing the purpose of the behavior. Observing antecedents and setting events can facilitate predicting when a problem behavior is likely to occur. This information drives successful development of prevention and intervention strategies, otherwise termed *function-based interventions*.

Umbreit et al. (2007) suggested that a complete FBA identifies (a) a clear definition of the problem behavior, (b) the antecedent conditions that exist when the behavior occurs and when it does not occur, (c) the consequences that maintain the behavior, (d) a clear definition of the replacement behavior, and (e) a statement of the behavioral function. These authors also defined function-based intervention as the development of behavioral support strategies that are clearly based on the results of the FBA and, in turn, are directly linked to the function of the behavior. Umbreit et al. developed the *Function-based Intervention Decision Model* to guide the identification of appropriate interventions. In short, this straightforward process helps practitioners identify whether an intervention should emphasize (a) teaching a positive replacement behavior, (b) improving the environment by manipulating antecedent events, and/or (c)

adjusting contingencies of reinforcement to eliminate any consequences that maintain the problem behavior and provide them instead for the replacement skill.

### Statement of the Problem

Function-based intervention is considered to be the most effective way to positively change problem behavior for individuals with various categories of disability (Carr et al., 1994; Durand, 1990, 1999; Durand & Carr, 1991; Foster-Johnson, & Dunlap, 1993; Kern et al., 2001; Koegel, et al., 1997; Lewis & Sugai, 1996; Umbreit, 1995, 1996, 1997; Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993). The research is scant, however, across all disability categories with regard to exactly how the resulting intervention plans should be developed. For example, in a discussion of the link between FBA data and behavioral intervention plans, Jolivette et al. (2000) emphasized that the FBA should not stand alone as the intervention and should only be conducted with the intent of developing a Behavior Intervention Plan (BIP) based on the FBA data. In their research, these authors found that individuals who conducted FBAs often failed to incorporate these data into a student's BIP.

Further evidence of this problem was exemplified in Van Acker, Boreson, Gable, and Potterton's (2005) three-year critical review of 71 FBAs and BIPs developed by school teams in the State of Wisconsin. These researchers found serious flaws in the majority of submitted plans. Not only was there a general failure by the majority of teams to identify and verify the hypothesized function of the behavior before developing an

intervention, but also there were a significant number of plans that failed to utilize the FBA identified functions of behavior when developing BIPs.

To address this issue, Umbreit et al. (2007) suggested that researchers and practitioners should use a clearly defined method for applying the FBA results to the intervention plan. These authors purported that without clear and replicable methods for using FBA data to design effective interventions, researchers and practitioners were left with very little guidance on how to develop an effective intervention plan. Therefore, Umbreit et al. developed the *Function-based Intervention Decision Model* to link function(s) of behavior directly to the intervention plan. For the purposes of this study, this model will be herein referred to as the *Decision Model*. This methodology has been used and tested exclusively with school-age students in academic settings, but has not been studied with adult populations in non-school environments.

### Research Questions

The purpose of this study was to apply the *Decision Model* (Umbreit et al., 2007) as a method for matching interventions for three adult day program participants to the assessed functions of their target problem behaviors. Ultimately, the study was conducted to explore the generality of the methodology of the *Decision Model* with an untested population, adults with developmental disabilities and significant behavior problems. More specifically, the direct support staff in a non-academic environment, i.e., an adult day support setting, utilized this model with guidance by the study's principal investigator to address the following research questions:

1. Do interventions developed using the *Decision Model* produce positive results for adults who have developmental disabilities and significant behavior problems in a non-school setting?
2. Will the application and maintenance of each intervention result in decreased exhibition of the assessed problem behaviors?
3. Will the application and maintenance of each intervention result in increased exhibition of the identified replacement behaviors?
4. Will the day program support staff and behavioral support team view the outcomes as socially valid?

## CHAPTER 2

### REVIEW OF THE LITERATURE

This chapter reviews relevant research on function-based interventions and the application of the *Decision Model* (Umbreit et al., 2007).

#### Function-Based Interventions

The beneficial effects of function-based interventions have been reported in the literature for many years (Carr et al., 1994; Durand, 1990, 1999; Durand & Carr, 1991; Foster-Johnson & Dunlap, 1993; Kern et al., 2001; Lewis & Sugai, 1996; Umbreit, 1995, 1996; Vollmer et al., 1993). Function-based interventions are guided by data from a functional behavioral assessment (FBA). Per Lane, Weisenbach, Little, Phillips, and Wehby (2006), function-based interventions have been found effective across a wide scope of target behaviors, with a variety of populations and in many different environments.

The earliest function-based intervention research was conducted in residential and community-based settings, rather than in schools. Some of this work focused on communication-based interventions to reduce the occurrence of severe behavior problems with individuals who have severe disabilities (e.g., Carr 1977, Carr & Durand, 1985; Carr et al., 1994; Durand, 1990, 1999; Durand & Carr, 1991; Durand & Kishi 1987). Other work addressed self-injurious behaviors in clinical environments (e.g., adult day program units designed for treatment of these problem behaviors; Vollmer et al., 1993). Some

work focused on function-based intervention for aggressive behaviors in natural settings (e.g., Umbreit, 1997, Durand & Merges, 2001).

Before long, researchers began conducting work in school settings. For example, Burke, Hagan-Burke, and Sugai (2003) explored the use of functional assessment with a student with learning disabilities who exhibited off-task behavior in a classroom environment. Other researchers (e.g., Dunlap, & Kern, 1999; Foster-Johnson & Dunlap, 1993; Kern et al., 2001; Lewis & Sugai, 1996; Umbreit, 1995; 1996; Umbreit & Blair, 1996) also conducted studies in school settings across a variety of disability categories. Although all of these studies used assessment data to design interventions, none included clear descriptions of the exact procedures that were used to formulate the resulting interventions.

When providing function-based interventions for individuals with severe disabilities, Horner and Carr (1997) emphasized that “Clear procedures should exist for moving the assessment data to interventions” (p. 7) and that one element of a comprehensive intervention is that it must be driven by the functional assessment data. They further suggested that a single intervention component is not likely to be sufficient. In most cases, researchers and practitioners need a set of components that are technically consistent with the functional assessment, yet practical in application and based on the resources of the support environment.

Although the process of developing intervention strategies based on functional assessments has been emphasized as a practice by leading researchers, and evidently has produced positive results, there is little research on how to apply FBA data to design

successful intervention plans. As Liauspin, Umbreit, Ferro, Urso and Upreti (2006) pointed out, “Although researchers have clearly described the interventions used, they provided little detail about how they used FBA data to develop the interventions” (p.573).

Some researchers have attempted to address this weakness in the research literature. For example, Jolivette et al. (2000) presented a 10-step process to help behavioral support teams correctly apply FBA data to the BIPs in an effort to better link assessment processes to intervention practices:

1. Determine the function of the undesired behavior.
2. Determine an appropriate replacement behavior.
3. Determine when the replacement behavior should occur.
4. Design a teaching sequence.
5. Manipulate the environment to increase the probability of success.
6. Manipulate the environment to decrease the probability of failure.
7. Determine how positive behavior will be reinforced.
8. Determine consequences for instances of problem behavior.
9. Develop a data collection system.
10. Develop behavioral goals and objectives.

Despite an increase in practical and theoretical suggestions, such as the process listed above, recent evidence indicated that practitioners still have difficulty incorporating FBA data into an actual BIP.

These challenges are made clear when Van Acker et al. (2005) conducted an extensive review of 71 FBAs and their matching BIPS. Assessments and corresponding

plans came from 70 schools drawn from 21 different school districts across the State of Wisconsin. Along with seven experts in the field of *applied behavioral analysis* and *functional behavioral assessment*, Van Acker et al. devised a Likert-type rating scale to analyze each FBA/BIP submission. Every FBA/BIP was assessed in the following areas:

1. Make-up and training of the members of the Individual Educational Plan team.
2. Identification of the target behavior(s).
3. Identification of the hypothesized function(s).
4. Data collection procedures.
5. Examination of context variables that impact the behavior.
6. Verification of the hypothesized function.
7. Connection of the BIP to the FBA.
8. Use of positive behavior supports.
9. Monitoring of implementation and effectiveness of the BIP.

More than 70% of the plans failed to adequately define the target behavior, 61% indicated no verification of hypothesized functions prior to the development of the BIP, and 46% of the BIPs incorporated the use of aversive strategies as the sole means of addressing the target behavior. Furthermore, in almost two-thirds of the plans submitted, there was very little indication that the teams used information related to the function of the target behavior when designing the BIP. In fact, many plans recommended interventions that included practices similar to those used before conducting the FBA.

Practitioners had demonstrated a thorough lack of understanding functional assessment principles and their importance for successful intervention planning.

In consideration of these ideas, Newcomer and Lewis (2004) compared the efficiency and efficacy of function-based interventions to traditional intervention approaches. Working with three elementary students, all with high counts of office referrals for behavioral infractions, the researchers found that behavioral interventions clearly based on functional assessment data were more effective than the alternative interventions. Newcomer and Lewis emphasized the importance of conducting FBAs that

1. Clearly establish the operational definitions of target behaviors;
2. Define the relationships between behaviors, the antecedents and the consequences; and
3. Use interview and observational data to further determine setting events and maintaining consequences.

They also recommended that function-based interventions should

1. Change environmental antecedents that trigger problem behavior;
2. Increase contingent access to reinforcement following presentation of a replacement behavior; and
3. Minimize access to the consequences that maintained problem behavior.

Newcomer and Lewis's (2004) synthesis of intervention methodologies closely aligned with prior recommendations by Sugai et al. (2000). In a report for the Office of Special Education Programs (OSEP) Center on Positive Behavior Interventions and

Supports, these behavioral researchers recommended that practical intervention methods must include

1. Manipulation of antecedent conditions to reduce or prevent the likelihood that a problem *behavior* will occur,
2. Development of new social and communication skills that make problem behaviors irrelevant, and
3. Careful redesign of consequences to eliminate factors that maintain problem behaviors and to encourage more acceptable replacement social skills and behaviors. (p. 135)

Consistent with these recommendations, Umbreit et al. (2007) developed a systematic and practical process for developing appropriate interventions. Based on the results of an FBA and a *Decision Model*, the process leads the user to identify which of three intervention methods is most appropriate for a given situation. These methods, which are described in further detail in Chapter 3, Method, focus on

1. Teaching a positive replacement behavior;
2. Improving the environment by manipulating relevant antecedent events;  
and/or
3. Adjusting contingencies of reinforcement to eliminate consequences that maintain a problem behavior and providing them instead for a replacement behavior.

The following section highlights some of the recent studies utilizing this model.

### Application of the Decision Model

In 2004, Umbreit, Lane, and Dejud examined the relationship between the behavioral performance of a typically developing 10-year-old student and the level of task difficulty in a classroom setting. By determining whether the student could (a) perform the replacement behavior and (b) whether the antecedent conditions reflected best practice, a successful function-based intervention was developed. In this study, the student's on-task behavior improved when he was assigned more challenging academic tasks that matched his ability. The intervention produced higher levels of task engagement and increases in appropriate social behavior. This was one of the first studies to use early components of the *Decision Model* (Umbreit et al., 2007) to formulate a function-based intervention.

Liaupsin et al. (2006) also examined the application of the *Decision Model* (Umbreit et al., 2007) through a multiple baseline across settings design with a typically developing seventh grade student who exhibited frequent behavioral problems. The study was conducted in two phases: the assessment, and then the function-based intervention. The student's problem behavior was labeled *off-task* and defined as "refusing to follow classroom procedures, rules, or school code of conduct" (p. 575). After identifying avoidance of tasks and activities as the function of the problem behavior, the researchers proceeded to the two key questions of the *Decision Model*:

1. Can the student perform the replacement behavior?
2. Do antecedent conditions represent best practice?

In this case, the answers led the researchers to different answers in different settings. In one class (social studies), the intervention focused on teaching the replacement behavior. However, in another class, different problems existed, so it was necessary that the intervention focus on teaching new behavior *and* improving existing environmental conditions. In a third class (science), the student displayed high levels of *on-task* behavior, so no intervention was required. Specific intervention elements were derived from the components for each intervention method. High levels of *on-task* behavior resulted in each class when the function-based intervention was implemented.

Other examples of recent research contributing to the use of the *Decision Model* (Umbreit et al., 2007) for designing function-based interventions were conducted by Stahr, Cushing, Lane, and Fox (2006), and Lane et al. (2006). Stahr et al. successfully applied the *Decision Model* to design a function-based intervention for a young student with ADHD. Lane et al. were interested in whether teacher-led application of the *Model* produced positive results in the cases of two typically developing second grade students who did not receive special education services but were at-risk for emotional and behavioral disorders. Teachers were able to learn this systematic approach and successfully designed, implemented, and monitored function-based interventions in the general education classroom.

### Summary

Advances in the application of function-based interventions have been noted in the literature across disability categories, types of behavior problems, and environmental

settings. Nevertheless, the field has suffered because there has been no clear replicable method by which these function-based interventions were designed. Over the past few years, a systematic method for matching an intervention to the assessed function of a problem behavior has emerged. This method, the *Decision Model* (Umbreit et al., 2007), simplified the assessment and intervention processes. The straightforward technique facilitates the design of a behavioral intervention that directly addresses the function of a behavior in order to decrease occurrences of problem behavior and increase the presence of an acceptable replacement behavior.

## CHAPTER 3

### METHOD

#### Setting and Participants

This study was conducted in an adult day program housed in a commercial storefront in a centrally located strip mall in Southern Arizona. Other businesses located nearby included a small restaurant, a loan corporation, and a chiropractor's office. At the time data were collected, the program site, financially supported by a statewide private for-profit agency, provided services for approximately 15 adults with developmental disabilities. The hours of service were Monday through Friday from 8:00 am to 4:00 pm. The day program incorporated a structured schedule of on-site activities, community events, and individualized instruction plans for each adult participant.

This particular program was chosen because the agency had historically been very receptive to research and outside consultation. Because the agency received funding from the Division of Developmental Disabilities (DDD) of the Arizona Department of Economic Security (AZ DES), approval was necessary at the local and state levels. Specifically, the provider agency's administrators, the local Human Rights Committee of DDD's District II, and the statewide DDD Human Rights Committee were required to endorse the project because the primary study participants were considered vulnerable and "at risk."

There were two distinct participant groups involved in this study. The first group comprised three adult men with mental retardation who attended the day program; the second group included five direct support staff members, one man and four women.

The study participants were selected from the group of day program adult attendees ranging in age from 19 to 63 years. Additionally, all day program participants had a diagnosis of a developmental disability as defined by the Arizona Department of Economic Security/Division of Developmental Disabilities (DDD):

DDD provides needed supports to people who meet the following eligibility requirements:

- Is a resident of Arizona;
- Voluntarily applies;
- Is at risk of having a developmental disability (up to age 6), or;
- For people over the age of six years, has a diagnosis of
  - epilepsy,
  - cerebral palsy,
  - mental retardation, or
  - autism.
- The disability occurred prior to the age of 18 and
- Has substantial functional limitations in three of the seven major life areas which include:
  - Self-care: Eating, hygiene, bathing, etc.
  - Receptive and expressive language: communicating with others.

- Learning: Acquiring and processing new information.
- Mobility: Moving from place to place.
- Self-direction: Managing personal finances, protecting self-interest, or making independent decisions, which may affect well-being.
- Capacity for independent living: Needing supervision or assistance on a daily basis.
- Economic self-sufficiency: Being able to financially support oneself (Arizona Department of Economic Security, Division of Developmental Disabilities [AZDES-DDD], 2005).

Some of the individuals attending the day program may have also required medication throughout the day for medical and/or psychological needs. If assessed as having a behavioral problem associated with these needs, the individual may have had a formal Behavioral Intervention Plan (BIP) in place. A team of support personnel ordinarily including the individual, his/her parent or guardian, the caseworker, and pertinent support staff from day program and residential settings would have developed this plan.

Typical problem behaviors observed at this day program were *self-injurious behavior, aggression to others, and property destruction*. *Self-injurious behavior* included tantrums exhibited by hitting oneself with either an open or close-fisted hand, scratching or biting one's own hand, arm, or other part of the body to elicit redness, swelling, and/or abrasions. *Aggression to others* involved striking out so as to make or

attempt to make contact with another person's body with one's hands, arms, or legs, or thrown objects, spitting at others, or shouting loudly at others, sometimes with profane language. *Property destruction* included throwing an object, stomping on or kicking an object, biting an object not intended for such action, or any other behavior resembling a purposeful attempt to destroy a material item. In most of the observed cases, further inspection revealed that each of these three specific behaviors was a manifestation of some inappropriate social interaction either with a staff member or day program peer.

The selection process involved a committee consisting of the agency associate director, the program coordinator, the lead staff, four direct support staff, and the principal investigator (PI) of the study. Other pertinent team members (e.g., available family members or case workers) were also included to discuss and assess potential research participants with the criteria that any behavioral problems being addressed for this study were operant, i.e., learned behaviors not solely manifest through his/her psychiatric diagnosis such as hearing voices or professing obsessive or psychotic thoughts, similar in definition, and appropriate for behavioral intervention strategies.

The *first participant group* of three men (two who were 48 years old and one who was 63 years old) not only met the prior mentioned 2005 AZDES DDD criteria of having a developmental disability, but also displayed at least one problematic behavior. Each man had the diagnosis of moderate mental retardation, and their IQs ranged from 35-55 (Ysseldyke & Algozzine, 1995).

The problem behavior in all three cases was identified as some form of *inappropriate social interaction*. As stated earlier, each socially inappropriate interaction

may have been exhibited with some form of aggression, self-injury, or destruction of property. Because none of the individuals selected for this study had been taking psychotropic medication at that time, they were not required to have formal BIPs in place. However, because these participants' problem behaviors were long-standing and occurred frequently (at an overall average rate of 12 events per hour or once every 5 minutes), the support staff had developed informal methods of intervention. Per the support staff members' own admissions and this researcher's observations, however, these procedures were inconsistently implemented.

The first participant, Louis, 48 years old, frequently displayed socially inappropriate interactions with others by thrusting his hand or fist into others' faces or upon others' upper bodies. He also occasionally displayed self-injurious behavior, hitting himself in the head, when verbally corrected for socially inappropriate interactions.

The second participant, John, also 48 years old, typically interacted with others by repeatedly mentioning and/or questioning about past or future events. This was reported to occur at a steady rate of 20 isolated conversational attempts per hour. Sometimes, John, like Louis, would hit himself when his attempts at social interaction were dismissed, occasionally directing self-deprecating expletives.

The third participant, Max, 63 years old, was often verbally or physically aggressive. He would shout "no" loudly, push another out of his way, or throw an object in response to almost anyone who approached him with a greeting, question, or offer of participation. The operational definitions of each of these behaviors are presented below in the section entitled *Dependent Variables: Behavioral Definitions*.

The *second participant group* consisted of the five support staff currently serving as on-site direct caregivers. The employees, four women and one man, ranging in age from the early 20s to late 40s, had varying levels of experience, education, and training. Though all staff had completed agency-required trainings such as CPR, First-Aid, and pre- and in-service guidance regarding the individual needs of each participant, only three had received any behavioral intervention training. Each direct care provider readily gave consent for his/her involvement in the project and remained employed for the length of the study.

#### Dependent Variables: Behavioral Definitions

The dependent variables were the target and replacement behaviors exhibited by the three primary subjects, Louis, John, and Max. It was critical for accurate data collection that the behavioral support team (comprising the PI, immediate support staff, and pertinent family or team members) properly assessed for each subject which specific behavior would be the target behavior and how best to define and measure it. Equally crucial was their concurrence on clear definitions of the replacement behaviors.

Outlined by Umbreit et al. (2007), behaviors can be described in terms of their dimensions. These can be (a) frequency; (b) duration; (c) latency, i.e., how long before the subject begins the behavior; (d) topography, i.e., the shape of the behavior; what it looks like; (e) locus, i.e., where it actually occurs; and/or (f) force, i.e., the strength or intensity of the behavior.

As noted earlier, the target behaviors were forms of inappropriate social interaction that differed by operational definition and sometimes were paired with forms of aggression, self-injury, or property destruction. Examples of the replacement behaviors included appropriate social interactions such as greeting others calmly with a verbal, physical, or low-tech communication aid, or rejecting participation in a new activity by using verbal communication skills. Table 1 lists each subject's operationally defined behaviors are operationally.

### Procedure

The study was conducted in four phases: (a) functional behavioral assessment (FBA), (b) development of the function-based intervention, i.e., applying the *Decision Model* (Umbreit et al., 2007) (see Figure 1), (c) implementation of the intervention, and (d) maintenance. The next sections include the specific procedures of each phase.

#### *Phase I: Functional Behavioral Assessment (FBA)*

A FBA of the target behavior identified for each study participant involved the PI conducting structured interviews and collecting direct observational data. The assessment process took place for each participant within a maximum of four hour-long sessions during the regular day program hours in one week (Monday-Friday). Interviews were conducted using the *Preliminary Functional Assessment Survey* (Dunlap, et al., 1993; see Appendix A) with key staff and caregivers. Direct observations involved collecting **A-B-C** data (Bijou, Peterson, & Ault, 1968). These initial observational sessions, which

Table 1  
Behavioral Definitions

	Target Behavior Inappropriate Social Interaction	Replacement Behavior Appropriate Social Interaction
Louis	Placing his hands in others' faces, making a fist and placing it near to or on other's shoulders, or kissing others' heads, arms, or hands without their permission. <sup>1</sup>	Verbal interacting with "hello", "how are you?" or an appropriate gestured request for a handshake, with his hand open, extended below the waist of the other person, but making no contact until the other responds.
John	Making impertinent statements (e.g., about past or future holidays, events) and/or asking repetitive questions about future events (e.g., upcoming holidays, team meetings, parties). <sup>1</sup>	Verbalizing statements and/or questions regarding current events, what is happening that day, or a brief review of the prior day's activities.
Max	Shouting loudly enough to be heard throughout entire day program space, yelling "no," "get away," or other negative responses to questions, hitting and/or pushing another person, and grabbing an object out of another's hands.	Verbal greetings such as "hello," "how are you?" delivered in a calm, even-toned manner or responding politely and calmly with "no," "no thanks," "not right now," or "maybe later."

<sup>1</sup> Though both Louis and John's behaviors were sometimes coupled with displays of self-injury, for clarity of data collection, only the listed behaviors in Table 1 were counted.

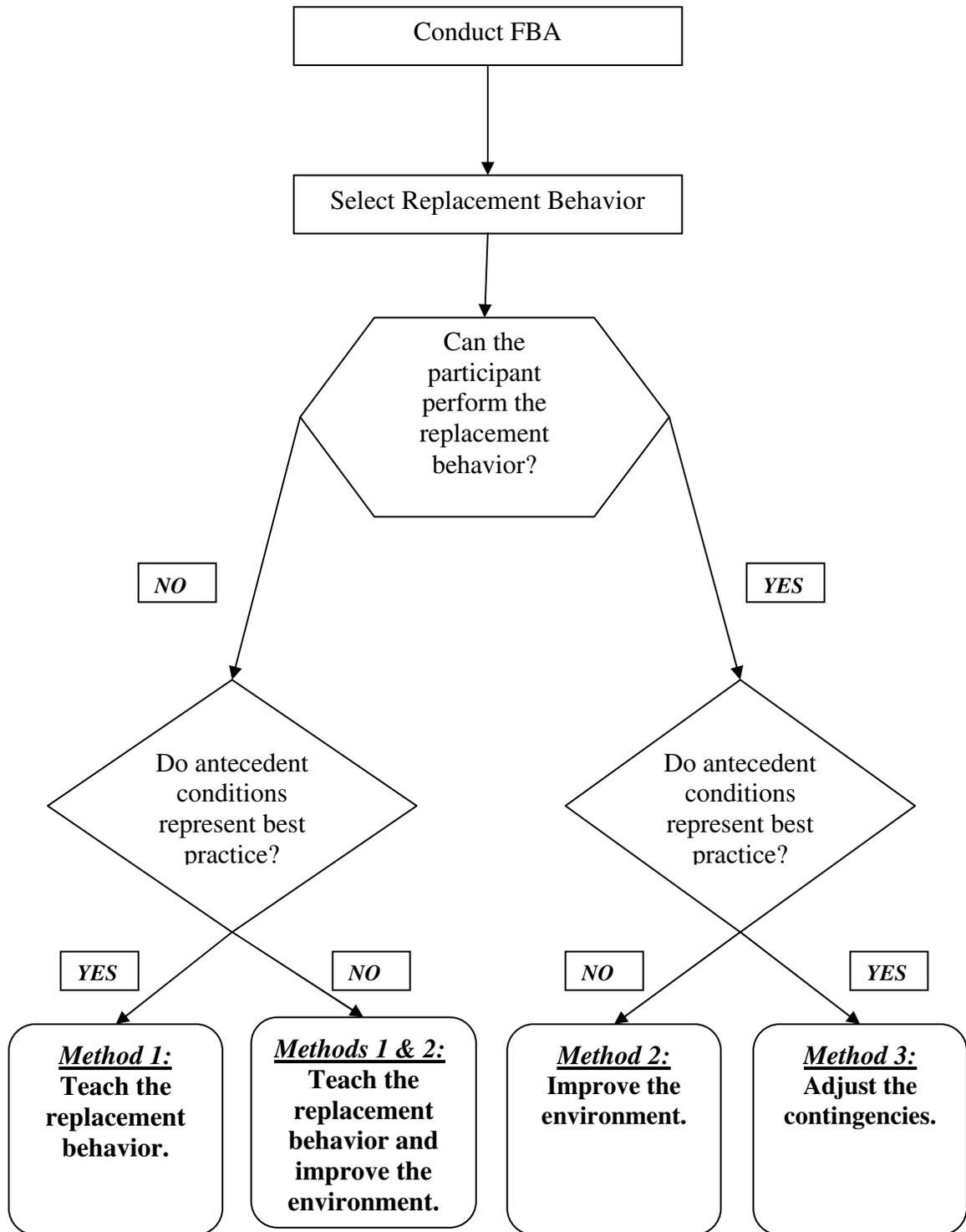


Figure 1. Decision Model (Umbreit et al., 2007).

were based upon each participant's daily routine, occurred at various times during the day to allow for adequate observation of relevant antecedent conditions (**A**), the specific problem behavior (**B**), and the consequences applied by support staff before any new intervention was introduced (**C**).

For Louis, the interviews and initial observational information indicated that when he presented socially inappropriate behavior, he often received attention as a consequence. When staff members actually saw Louis perform the problem behavior, they either gave immediate verbal reminders to refrain and shake hands instead, or they simply ignored the behavior and redirected him to a new activity. Also, the other day program participants, mostly females, were the objects of his social attempts. These women usually reacted with a physical response, such as a smile, a shudder, or even a verbalized retort, such as "go away," or "no kissing," whenever Louis approached them. It was evident that Louis purposefully elicited some type of reaction from others. Finally, because there were often so many other things to attend to during day program hours, his socially appropriate actions were mostly overlooked.

John's early FBA data included similar trends in consequential treatment. At times, the staff listened and responded to his persistent commentary about some future event. For example, John might have said, "My team meeting's coming up soon. You gonna' be there? My mom and case manager will be there won't they? Can I call my case manager?" Or, though it was only September, he may have made repeated and frequent mentions of future holidays like "Thanksgiving and Christmas are gonna be here soon."

At other times, per their own reports and by the PI's observation, most staff members became irritated by John's persistent verbalizations and either ignored his attempt to socialize or said, for example, "John, we've already talked about this. Please have a seat." The intermittent reaction to his communicative attempts seemed to strengthen their occurrence. It appeared that John just wanted to connect with someone about something. Per the FBA observational data, his speech was unclear, his vocabulary limited, and he appeared to lack the social and communication skills needed to adequately socialize with others.

Staff reported Max's problem behavior as follows:

Max wants everything on his own terms. He rarely participates in "group" activities and will shout "no" loudly in response when we try to encourage him. So, we just leave him alone. We'd like to see him involved in more new activities but never know what kind of response we'll get.

Interestingly, Max sat at a table facing the wall and often had many of his preferred activities on hand, like favorite magazines, markers, and puzzles. Per the **A-B-C** data, others approached him from behind, tapping his back or shoulder while offering a new activity or simply saying hello. Max's explosive responses were most often treated gingerly, with acknowledging statements like, "Okay Max, I get the picture. I'll leave you alone. You can join the activity later, if you'd like." Typically, after one these displays of the target behavior, no one interacted with him for hours. Though Max did

have the ability to socialize appropriately with others, as in Louis's case, his few attempts were sometimes received warmly and at other times ignored completely.

The end of *Phase I* incorporated the behavioral support team's analysis and synthesis of each subject's gathered information to identify the functions of their target behaviors. Specifically, the PI and the behavioral support team assessed the function(s) of a behavior by examining the observed **A-B-C** data, the staff interviews and finally by application of the *Function Matrix* (Umbreit et al., 2007; see Appendix B).

Possible functions included accessing attention, a tangible item or specific activity, and/or sensory stimulation; or avoiding attention, a particular object or activity, and/or sensory stimulation. By using the *Function Matrix*, the possibility of multiple functions of each target behavior was considered. This tool can account for six combinations of functions and either positive or negative reinforcers:

1. Positive reinforcement – Attention
2. Negative reinforcement – Attention
3. Positive reinforcement – Tangibles/Activities
4. Negative reinforcement – Tangibles/Activities
5. Positive reinforcement – Sensory stimulation
6. Negative reinforcement – Sensory stimulation

Tables 2, 3, and 4 present the identified functions for each subject.

Table 2

Function Matrix, Louis

	Positive Reinforcement (Access Something)	Negative Reinforcement (Avoid Something)
Attention	X	
Tangibles/Activities	X	
Sensory Stimulation		

Table 3

Function Matrix: John

	Positive Reinforcement (Access Something)	Negative Reinforcement (Avoid Something)
Attention	X	
Tangibles/Activities	X	
Sensory Stimulation		

Table 4

Function Matrix: Max

	Positive Reinforcement (Access Something)	Negative Reinforcement (Avoid Something)
Attention		X
Tangibles/Activities	X	X
Sensory Stimulation		

Equipped with clear operational definitions of both the target and replacement behaviors and the properly assessed functions of the behaviors for each participant, the research team proceeded to *Phase II*, the development of the individually designed function-based interventions.

#### *Phase II: Applying the Decision Model*

The application of the *Decision Model* allowed the team to decide which one or combination of the tool's three methods would facilitate the most appropriate function-based intervention (Umbreit et al., 2007.) The three basic methods are to

1. Teach the replacement behavior,
2. Improve the environment, or
3. Adjust the contingencies.

Led by the PI, the behavioral support team followed the series of questions in the flow chart depicted in Figure 1. The methods could be used singly or in combination resulting in four basic options summarized as follows:

1. If the participant cannot perform the replacement behavior but the antecedent conditions represented best practice, the intervention would be to teach the replacement behavior.
2. If the participant cannot perform the replacement behavior and the antecedent conditions do not represent best practice, the intervention would be a combination of teaching the replacement behavior and improving the environment.
3. If the participant can perform the replacement behavior but the antecedent conditions do not represent best practice, the intervention would be to improve the environment.
4. If the participant can perform the replacement behavior and the antecedent conditions represent best practice, the intervention would be to adjust the contingencies.

Because Louis could not easily produce socially appropriate interactions and antecedent conditions did not represent best practice, the behavioral support team chose Methods 1 and 2, teaching the replacement behavior and improving the environment. John also could not fluently display his replacement behavior, and antecedent conditions were assessed as needing some changes. Therefore, Methods 1 and 2 were also selected.

Max, on the other hand, was able to interact appropriately with others, but some environmental alterations were necessary. Method 2 was the best choice in his case.

The final step in *Phase II* was for the team to develop intervention strategies, the *independent variables* of the study. Guided by the methods chosen, the required intervention components were individually designed for each participant. These components are outlined in Tables 5, 6, and 7. With well-defined target and replacement behaviors and intervention strategies in place, the next part of the study, *Phase III*, commenced.

### *Phase III: Intervention*

Because this study was designed as a multiple baseline across subjects, all the participants were in the same setting. Therefore, the collection of baseline data for each participant began at the same time. However, the individualized interventions were introduced sequentially and in random order. Once a steady pattern of responding was established for at least one week for the first participant, Louis, his intervention was introduced. (More detailed information about the design of the study is provided in a subsequent section entitled *Research Design*.)

An abrupt and observable change in Louis's behavior response pattern was the determining factor for implementing the intervention for the second participant, John. Meanwhile, baseline conditions were maintained with Max. The PI and support team planned that if there were no positive response, i.e., a reduction in the problem behavior

Table 5

## Louis, Methods 1 and 2: Teach Replacement Behavior/Improve the Environment

Method Elements	Intervention Components
<p>The antecedent conditions are adjusted so new behaviors are learned and aversive conditions are avoided. (Method 1)</p>	<ol style="list-style-type: none"> <li>1. Interact with Louis with 1:1 conversation, or simply verbally acknowledge him once every five minutes.</li> <li>2. Provide Louis at least one opportunity to greet another person per 30-minute session, modeling correct method of greeting others as described in replacement behaviors.</li> </ol>
<p>Adjust antecedent variables so the conditions that set the occasion for the target behavior are eliminated and new conditions are established in which the replacement behavior is more likely to occur. (Method 2)</p>	<ol style="list-style-type: none"> <li>3. Change staff seating so that Louis is in view at all times.</li> <li>4. Provide Louis with his own designated work area.</li> <li>5. Provide accessible closet space for Louis's preferred activities (art supplies, puzzles, books).</li> </ol>
<p>Provide appropriate reinforcement for the replacement behavior.</p>	<ol style="list-style-type: none"> <li>6. Verbally acknowledge each appropriate social interaction.</li> </ol>
<p>Withhold the consequence that previously reinforced the behavior.</p>	<ol style="list-style-type: none"> <li>7. If inappropriate behavior occurs, ignore initially (at least 30 seconds), then ask him to return to his work area. After Louis is seated for a minute, offer a choice of preferred activities.</li> </ol>

Table 6

## John, Methods 1 and 2: Teach Replacement Behavior/Improve the Environment

Method Elements	Intervention Components
The antecedent conditions are adjusted so new behaviors are learned and aversive conditions are avoided. (Method 1)	<ol style="list-style-type: none"> <li>1. Interact with John with 1:1 conversation for at least 3 minutes and use picture cards to help John discuss and create his daily schedule.</li> <li>2. Provide John the opportunity to assist with morning scheduling group for all day program participants using his photo cards, allowing John to present and discuss daily activities and events.</li> </ol>
Adjust antecedent variables so the conditions that set the occasion for the target behavior are eliminated and new conditions are established in which the replacement behavior is more likely to occur. (Method 2)	<ol style="list-style-type: none"> <li>3. Keep John's augmentative communication aid, his photo/schedule box, accessible.</li> <li>4. Remind John to create and discuss activities from his daily schedule.</li> <li>5. Provide current events, topics, and activities and update picture activity cards as needed.</li> </ol>
Provide appropriate reinforcement for replacement behavior.	<ol style="list-style-type: none"> <li>6. Verbally interact with John after each appropriate social interaction.</li> </ol>
Withhold the consequence that previously reinforced the behavior.	<ol style="list-style-type: none"> <li>7. Ignore John when he engages in inappropriate social interactions. Then, after a minute, direct him to his picture photo box or daily schedule to discuss the day's events.</li> </ol>

Table 7

## Max, Method 2, Improve the Environment

Method Elements	Intervention Components
Adjust antecedent variables so the conditions that set the occasion for the target behavior are eliminated, and new conditions are established in which the replacement behavior is more likely to occur.	<ol style="list-style-type: none"> <li>1. Reposition Max's desk/seating so it faces the day program group.</li> <li>2. Approach Max from the front to ask him a question or offer a new activity.</li> <li>3. Provide new activities in a group setting.</li> <li>4. Offer a choice of doing something new at least twice per session.</li> </ol>
Provide appropriate reinforcement for the replacement behavior.	<ol style="list-style-type: none"> <li>5. Acknowledge and respect Max's negative responses when delivered calmly and politely and let him continue with what he is doing.</li> </ol>
Withhold the consequence that previously reinforced the behavior.	<ol style="list-style-type: none"> <li>6. If Max inappropriately interacts with someone, remind him by modeling a calm way of responding, and then leave him alone.</li> </ol>

as well as an increase in the replacement behavior, within two days of implementing an intervention, the treatment was temporarily suspended and the intervention redesigned.

Fortunately, this practice was only required once during the initial session of *Phase III* for Louis. This practice is specified more clearly in the *Treatment Integrity* section near the end of this chapter.

The observed and measured interventions continued for the first participant, Louis, for five weeks; for John, three weeks; and for Max, two weeks. The expectation was, however, that once the study ended, the day program support staff would maintain these positive interventions as elements of each participant's Individual Support Plan (ISP). The intervention strategies could then be easily revisited and redesigned as necessary to continually improve the positive behaviors as well as reduce the problem behaviors.

Data on the dependent measures, the inappropriate and appropriate social interactions, were collected by an event recording method, also referred to as a frequency count. During baseline and intervention conditions, 20–30 minute sessions were conducted once daily for seven weeks. The pertinent observational sessions, determined by the staff during the initial FBA, were the periods with the greatest occurrence of the problem behaviors.

Prior to introduction of an intervention for a participant, the PI established an *Emergency Procedure Plan* for each participant to ensure the safety of everyone involved (see Appendix C.) The *Emergency Procedures* were based on the positive behavioral support practices of the support agency, as well as the proactive intervention methods promoted by the Division of Developmental Disabilities.

#### *Phase IV: Maintenance*

Data were also collected once per week for three weeks after completion of the intensive intervention periods of Phase II. The staff participants were once again directed

to implement the intervention throughout day program hours, even when the PI was not present.

### Research Design

The design was a multiple baseline across subjects. Per Richards, Taylor, Ramasamy, and Richards (1999), this design is the best way to observe a specific intervention, i.e., treatment, on different subjects of low-incidence populations such as adults with moderate- to -severe cognitive disabilities. Richards et al. further suggested the following critical issues should be addressed to implement a successful multiple baseline across subjects design:

1. Individual participants should display similar target behaviors in the same setting.
2. Individuals should be similar enough to one another to expect each would change his/her behavior in response to the same intervention specifically implemented to treat his/her behavior.
3. There is a reasonable expectation that the same variables will exert the same influence on each of the subjects.
4. Selection of an independent variable would likely have a similar effect on each subject.
5. There is a consistent recording procedure for all subjects' behavior and a criterion level for decision-making.

6. The PI is confident that the resources will be available to maintain data collection and intervention across the life span of the study.

To the extent that it was possible, these guidelines were considered when participants were selected for this study. The three participants chosen by the selection committee had similar diagnoses, were identified as exhibiting forms of inappropriate social interactions and attended the same day support setting. Furthermore, the interventions were established for all subjects with the intent of reducing problematic social interactions, and increasing more desired social interactions. Lastly, consistent recording procedures were established early in the study facilitating accurate data collection throughout the entire study. The last procedure is further discussed in the following section, entitled, *Interobserver agreement (IOA)*.

Additionally, a multiple baseline design is an effective design for establishing a functional relationship between the intervention and any systematic changes in behavior. A major advantage is that it allows the researcher to demonstrate the effectiveness of an intervention with more than one individual who displays a similar need for behavior change (Richards et al., 1999). Another important consideration for applying the design with vulnerable subjects is there is no need to withdraw treatment, which in this study could have posed significant ethical issues if the problem behavior escalated to either self-injury or harm to others or was increasing as a result of the intervention.

### Interobserver Agreement (IOA)

During all phases of the study, a research assistant familiar with the behavioral definitions and the intervention components participated in data collection by on-site direct observation. Each observer (both the PI and the independent observer) recorded data regarding target and replacement behavioral responses. The percentage of interobserver agreement (IOA) was calculated by dividing the lower frequency of occurrences by the higher frequency and multiplying the result by 100%. It was critical that IOA was determined for each of the participants' target and replacement behaviors in order to ensure the operational definitions were comprehensive and accurate.

An independent observer was present for 50% of Louis's baseline conditions, 50% of his intervention conditions, and 100% of his maintenance conditions. An independent observer was present for 63% of John's baseline conditions, 25% of his intervention conditions, and 100% of his maintenance conditions. An independent observer was present for 50% of Max's baseline conditions, 50% of his intervention conditions, and 100% of his maintenance conditions.

Mean percentage IOA scores for *Phase I* baseline conditions were

1. Louis's target behavior, 92%
2. Louis's replacement behavior, 100%
3. John's target behavior, 95%
4. John's replacement behavior, 100%
5. Max's target behavior, 96%
6. Max's replacement behavior, 100%

Mean IOA percentages for *Phase III* intervention conditions were

1. Louis's target behavior, 100%
2. Louis's replacement behavior, 96%
3. John's target behavior, 100%
4. John's replacement behavior, 95%
5. Max's target behavior, 100%
6. Max's replacement behavior, 100%

Mean IOA percentages for *Phase IV* maintenance were

1. Louis's target behavior, 100%
2. Louis's replacement behavior, 100%
3. John's target behavior, 100%
4. John's replacement behavior, 100%
5. Max's target behavior, 100%
6. Max's replacement behavior, 100%

### Treatment Integrity

The degree to which the intervention plan and its components were consistently implemented as intended was also assessed to verify that observed effects could be attributed to the intervention. To report treatment integrity, the PI followed the recommendations of Gresham, Gansle, and Noell (1993) to provide clear, unambiguous, and comprehensive operational definitions of all dependent and independent variables. These specific measures were based on a checklist of six or seven required components

for each subject's intervention. These required components are presented in Tables 5, 6, and 7.

The PI was responsible for monitoring the treatment integrity for every session by directly observing all data collection sessions and attending regular staff meetings regarding plan implementation practices. During baseline, treatment integrity for the first participant, Louis was 7%, for John 8%, and for Max, 5%. During intervention, treatment integrity for Louis, was 91%; for John 98%, and for Max, 100%. During maintenance, treatment integrity for the Louis was 88%, for John 98%, and for Max 100%.

Whether treatment integrity procedures were implemented as proscribed by the PI was also measured with an IOA percentage. The independent observer provided assessment of intervention implementation for 25% of the sessions, randomly selected across all phases. This was important for averting improper assessment of intervention implementation by the PI. To calculate IOA for treatment integrity, the lower percentage score for each intervention plan was divided by the higher score and then multiplied by 100% to derive a percentage score. Regarding treatment integrity of baseline conditions, the mean IOA percentage score for Louis was 100%, for John 100 %, and for Max 100%. Regarding intervention conditions, the mean IOA percentage score for treatment integrity for Louis was 96%, for John 100%; and for Max 100%. During maintenance conditions, IOA for treatment integrity was 100% for all three subjects. If the integrity of the intervention were substantially compromised in any way, that treatment session would cease. The PI and staff then reassessed the intervention at the soonest appropriate time.

Fortunately, as mentioned earlier, this only happened once during the first intervention session with the first participant, Louis.

### Social Validity

To address whether the intervention(s) targeted socially significant goals, if the procedures were acceptable to the participants, and whether the outcomes were deemed socially important, rating scales can be used as appropriate evaluation tools (Lane & Beebe-Frankenberger, 2004). One such survey, the Treatment Acceptability Rating Form-Revised (TARF-R) (see Appendix D), revised by Reimers et al. in 1992, included a total of 17 items, with multiple items addressing each of the following areas: reasonableness, effectiveness, side effects, disruptiveness/time required, cost, and willingness. Each item was rated on a 7-point Likert-type scale. Scores could range from 17 to 119, with higher scores representing greater acceptability.

In this study, this particular survey was directed at both baseline and intervention conditions. Specifically, prior to baseline data collection and again upon completion of intervention data collection, four staff members who were subjects in the *Second Participant Group*, independently completed the TARF-R. The preliminary scores were directed at the procedures used prior to study inception and during baseline conditions. The post-intervention scores were based on the function-based interventions that resulted from following the *Decision Model* guidelines. The entire 17-point survey is included as Appendix D.

## CHAPTER 4

### RESULTS

#### Visual Analyses and Descriptive Statistics

The results of a multiple baseline study are best presented with visual analyses and descriptive statistics. Per Richards et al. (1999), “Visual analysis of data is used generally when continuous numerical data are gathered, data are graphically depictive and the researcher wants to make formative as well as summative analyses of study outcomes” (p. 267). The data for this study graphically present both the rate of appropriate and inappropriate social interactions per hour (Figure 2) and the percentage of appropriate responses (see Figure 3.)

#### *Rate of Appropriate and Inappropriate Social Interactions per Hour*

As shown in Figure 2, Louis’s appropriate behavior changed from a low rate during the baseline phase ( $M = 5$  occurrences per hour,  $SD = 1.15$ , range = 4-6 per hour) to a high rate during intervention conditions ( $M = 10.53$  per hour,  $SD = 3.19$ , range = 4-14 per hour). During maintenance conditions, a high rate of occurrence continued ( $M = 13.33$  per hour,  $SD = 3.05$ , range = 14-16 per hour.) Additionally, rates of Louis’s inappropriate behavior decreased as a result of the intervention. He displayed a much higher rate during baseline conditions ( $M = 14.25$  occurrences per hour,  $SD = 4.35$ , range = 8-16 per hour) than during the intervention and maintenance conditions (Intervention:  $M = 1.79$ ,  $SD = 1.47$ , range = 0-16 per hour; Maintenance:  $M = 2$ ,  $SD = 0$ ; range = 2 per hour.)

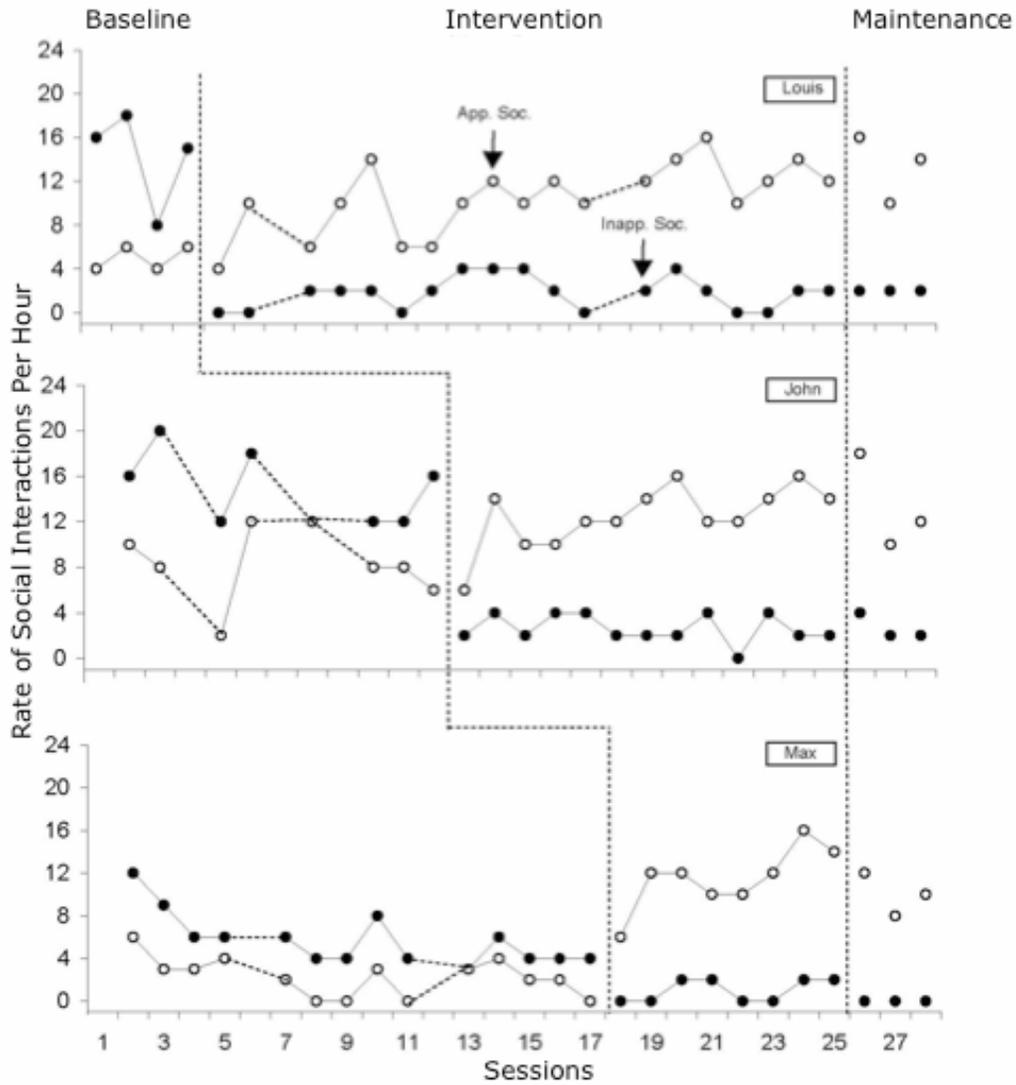


Figure 2. Rate of appropriate and inappropriate social interactions per hour.

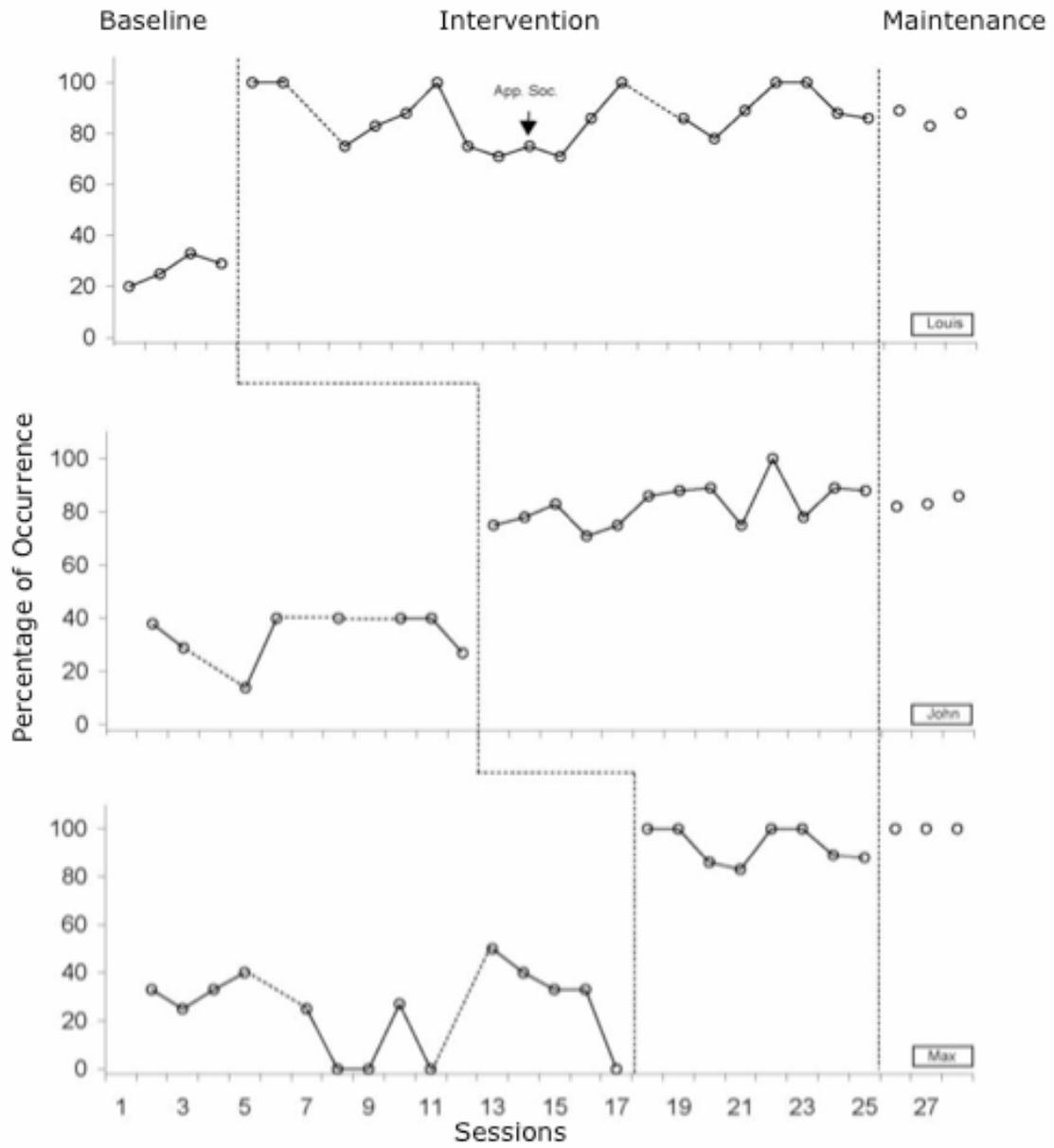


Figure 3. Percentage of appropriate responses.

Similarly, Figure 2 depicts John's increase in appropriate social responses across phases of the study (Baseline:  $M = 8.25$ ,  $SD = 3.28$ , range = 2 – 12; Intervention:  $M = 12.46$ ,  $SD = 2.73$ , range = 6-16 per hour; Maintenance:  $M = 13.33$ ,  $SD = 4.16$ , range = 10–16 per hour), also indicating a decrease in inappropriate social interactions (Baseline:  $M = 14.75$ ,  $SD = 3.2$ , range = 12–20; Intervention:  $M = 2.61$ ,  $SD = 1.26$ , range = 0–4 per hour; Maintenance:  $M = 13.33$ ,  $SD = 4.16$ , range = 10–16 per hour.)

Finally, the data for Max's appropriate and inappropriate responses indicate a similar trend across study conditions. Appropriate interactions increased (Baseline:  $M = 2.29$ ,  $SD = 1.82$ , range = 0-6; Intervention:  $M = 11.5$ ,  $SD = 2.98$ , range = 6–16 per hour; Maintenance:  $M = 10$ ,  $SD = 2$ , range = 8-12 per hour), and inappropriate interactions decreased (Baseline:  $M = 5.71$ ,  $SD = 2.49$ , range = 3-12; Intervention:  $M = 1$ ,  $SD = 1.07$ , range = 0-2 per hour; Maintenance:  $M = 0$ ,  $SD = 0$ , range = 0 per hour).

The changes in the study conditions from baseline to intervention and then to maintenance are noted with vertical dotted lines in *Figure 2*. Upon close inspection, the observable changes in response patterns are clearly delineated between the intervention and baseline phases.

#### *Percentage of Appropriate Responses*

To further illustrate the effect of the changes in behavioral responses, a second graph, *Figure 3*, presents the percentage of appropriate responses for each participant. The data reflected increases of appropriate responses as a percentage of overall response data collected during each session across all phases of the study. Louis exhibited an

increase from an average of 26% appropriate responding during baseline conditions, to 87% during intervention conditions, to 89% during maintenance. The percentage of appropriate interactions for John increased from an average of 35% during baseline, to 85% during intervention, leveling off at 82% during maintenance. Max's percentages of appropriate behavior increased from an average of 24% during baseline conditions, to 93% during the intervention phase, to 100% during maintenance.

#### Treatment Integrity Data

Treatment integrity for Louis' intervention components increased from an average of 7% for baseline conditions to 91% during intervention conditions, leveling off at 88% during maintenance. Treatment integrity for John's intervention increased from an average of 8% for baseline conditions to 98% during intervention, to 100% during maintenance. Treatment integrity for Max's intervention increased from an average of 5% for baseline conditions to 100% during intervention conditions, continuing at 100% during maintenance.

#### Social Validity Data

Four day program employees completed the TARF-R survey (Reimers et al., 1992) prior to baseline data collection and again at the end of the study. The TARF-R includes a total of 17 items with multiple items addressing each of the following areas: reasonableness, effectiveness, side effects, disruptiveness/time required, cost, and willingness. The total possible score is 119, and higher scores indicate greater

acceptability. In each participant's case, higher scores were given to the function-based intervention than to the practices in effect during baseline. The TARF-R scores regarding Louis's intervention increased from a mean preliminary score of 76.5 out of a total 119 to a mean post-survey score of 93.5, a 15% increase. For John, the TARF-R mean scores went from 75.5 to 105.25, a 23% increase. For Max, the mean scores increased from 85 to 112.5, a 24% increase.

## CHAPTER 5

### DISCUSSION

The present study examined the efficacy of a systematic process for matching behavioral interventions to the assessed functions of target behaviors of adults with developmental disabilities in a community-based day program. Specifically addressed were whether the interventions would produce positive results, including decreases in target behaviors and increases in replacement behaviors, and whether consumer ratings would indicate acceptable social validity.

#### Analysis of Results

Visual inspection of Figures 2 and 3 in Chapter 3, *Results*, shows that the mean response rates of all three subjects' replacement behaviors increased after intervention was introduced, whereas the mean response rates of their target behaviors decreased. In addition, staff gave the interventions high acceptability ratings, signifying they viewed the interventions as being socially valid and preferable to the procedures they used before intervention. These findings clearly indicated positive behavioral changes for all subjects as measured in their day program setting.

Each participant's behavior improved with the introduction of the intervention specific to the conditions of his behavior. Data on treatment integrity (level of implementation) collected for every session documented that the interventions were implemented with high levels of fidelity. Therefore, a clear functional relationship was established between the independent variables (each subject's individually designed

intervention) and the dependent variables (appropriate and inappropriate social interactions). These data provided strong support for the *Decision Model* (Umbreit et al., 2007), indicating it can be effective when used to develop individualized interventions for adults with developmental disabilities in community-based settings.

### Relationship to Existing Literature

This study extends the application of the *Decision Model* to an untested population, adults with developmental disabilities. The findings contributed to an increasing body of literature examining the positive effects of applying this systematic process to design function-based interventions (e.g., Lane et al., 2006; Liaupsin et al., 2006; Umbreit et al., 2004). The study further strengthened this existing research by exploring the applicability of the *Decision Model* not only with a different population, but by its investigation in an alternative environment, i.e., a community-based day program. Previous studies (Lane et al., 2006; Liaupsin et al., 2006; Stahr et al., 2006; Umbreit et al., 2004) were conducted with children, either typically developing students with behavioral problems or those with emotional behavioral disorders, and all were conducted in school settings.

In addition, this study emphasized the importance of treatment acceptability. Whether an intervention is considered appropriate, effective, fair, and socially valid has become a critical part of effective behavioral intervention (Finn & Sladeczek, 2001; Horner, Carr, Halle, McGee, Odom, & Wolery, 2005; Newcomer & Lewis, 2004; Reimers et al., 1992). In fact, Horner et al. (2005) listed assessment of social validity as

one of the indicators of quality in single-subject research. The present results included data on the application of the TARF-R (Reimers et al., 1992) with direct care personnel. Although this particular survey had been featured extensively in treatment acceptability research, it had most often been used with parents of children with behavioral disorders (Finn & Sladeczek, 2001).

Finally, the frequent measurement of treatment integrity and the high level that was documented were significant. Horner et al. (2005) suggested that fidelity of implementation was of great concern in single-subject research because interventions were delivered over time. Effective analysis of behavior depended upon accurate measurement of both the dependent and the independent variables. Data from the present study indicate that frequent measurement of the fidelity of implementation was highly desirable.

### Limitations

This study included only three participants. Additionally, the interventions focused only on one particular type of behavior, social interactions. Adults with developmental disabilities and behavioral problems are considered to be a low-incidence population. Therefore, large subject pools are not available, a limitation to the study. The effectiveness of the intervention methods studied here with other individuals and with other types of behavior remains a question for further research.

When using the multiple baseline design, it is important to identify subjects who are functionally similar yet independent of one another. Although this appears to have

occurred in the present study, the fact that the subjects were from a low-incidence population makes it difficult to be certain this criterion was met. Another potential disadvantage when using the multiple baseline design across subjects is that covariance among subjects may emerge if individuals learn vicariously through the experiences of others. Though this was not apparent in this study, it is a potential limitation that must be acknowledged.

### Implications

The present study focused on improving the quality of life for adults with cognitive disabilities. The decrease in exhibition of their problem behaviors and increase in the presentation of positive replacement behaviors demonstrated a significant improvement in each participant's social interactions. Additional studies of this approach with other adults with developmental disabilities would seem warranted.

Though this study highlighted the application of the *Decision Model* (Umbreit et al., 2007) to match interventions to functions of target behaviors, the lack of social skill curricula for adults with developmental disabilities emerged as an underlying issue. There is some current research regarding social skill instruction for adults with developmental disabilities (e.g., LeBlanc, Hagopian, & Maglieri, 2000; Griffiths, Feldman, & Tough, 1997; Bidwell & Rehfeldt, 2004), but none incorporate functional assessment data into their research. More research is needed therefore, on how best to embed age-appropriate social skill instruction within the typical routine in an adult day program. This study demonstrated that if social skill instruction can be matched to a function-based

intervention, the results could be extremely beneficial not only to the individuals served but also to the direct care workers. More research is needed to explore the generalization of these skills to different settings and circumstances, e.g., in individual homes or with other friends and family members.

The results of this study unmistakably indicated that the process used produced positive intervention strategies that were easily maintained by direct support staff. As such, the *Decision Model* (Umbreit et al., 2007) became a useful guide for assessing and developing BIPs for individuals served by the agency. This study incorporated a maintenance period of three weeks. Future research can better examine the long-term generalization of new behaviors, as well as support staff's continued implementation of intervention strategies when longer maintenance sessions are included. Clearly, additional studies will be needed to firmly establish this approach as a successful practice in the field of developmental disability support services.

Finally, continued assessment of social validity is of great importance not only to individuals with developmental disabilities, but also to their caregivers and direct care workers. Future research about the social relevance of treatment goals could greatly impact an individual's quality of life. If local, state, and national agencies were exposed to more studies of effective intervention, overall systems of support services could be positively influenced to better serve the complex needs of this under-researched population.

APPENDIX A

PRELIMINARY FUNCTIONAL ASSESSMENT SURVEY

(Dunlap, Kern-Dunlap, dePerczel, Clarke, Wilson, Childs, White, & Falk, 1993)

Participant:\_\_\_\_\_ Age:\_\_\_\_\_ Sex: M F

Date:\_\_\_\_\_

Interviewer:\_\_\_\_\_

Respondents:\_\_\_\_\_

\_\_\_\_\_

1. List and describe behaviors of concern.

- A.
- B.
- C.

2. Prioritize the behaviors of concern.

- A.
- B.
- C.

3. What procedures have you followed when the behavior has occurred?

- A.
- B.
- C.

4. What do you think causes (or motivates) the behavior?

- A.
- B.
- C.

APPENDIX A (*continued*)

5. When do these behaviors occur?

A.

B.

C.

6. How often do these behaviors occur?

A.

B.

C.

7. How long has this/these behavior(s) been occurring?

A.

B.

C.

8. Is there any circumstance under which the behavior does not occur?

A.

B.

C.

9. Is there any circumstance under which the behavior always occurs?

A.

B.

C.

10. Does the behavior occur more often during certain times of the day?

A.

B.

C.

APPENDIX A (*continued*)

11. Does the behavior occur only with certain people?
- A.
  - B.
  - C.
13. Does the behavior occur only during certain subjects?
- A.
  - B.
  - C.
14. Could the behavior be related to any skill deficits?
- A.
  - B.
  - C.
15. What are identified reinforcers for this participant?
- A.
  - B.
  - C.
15. Is the individual taking any medications that might affect his/her behavior?
- A.
  - B.
  - C.
17. Could the individual's behavior be signaling some deprivation conditions, e.g. thirst, hunger, lack of rest?
- A.
  - B.
  - C.

APPENDIX A (*continued*)

18. Could the behavior be the result of any form of discomfort, e.g. headaches, stomach aches, blurred vision, ear infection?
- A.
  - B.
  - C.
19. Could the behavior be caused by allergies, e.g., food, materials in certain environments?
- A.
  - B.
  - C.
20. Do any other behaviors occur along with this behavior?
- A.
  - B.
  - C.
21. Are there any observable events that signal the behavior of concern is about to occur?
- A.
  - B.
  - C.
22. What are the consequences when the behavior(s) occurs?
- A.
  - B.
  - C.

APPENDIX B  
THE FUNCTION MATRIX  
(Umbreit et al., 2007)

	Positive Reinforcement (Access Something)	Negative Reinforcement (Avoid Something)
Attention		
Tangibles/Activities		
Sensory Stimulation		

The possibility of multiple functions of the behavior may also be considered. The tool's design can account for six combinations of functions and reinforcers:

1. Positive reinforcement – Attention
2. Negative reinforcement – Attention
3. Positive reinforcement – Tangibles/Activities
4. Negative reinforcement – Tangibles/Activities
5. Positive reinforcement – Sensory stimulation
6. Negative reinforcement – Sensory stimulation

## APPENDIX C

### EMERGENCY PROCEDURES

Per Umbreit et. al. (2007), *Emergency Procedures* are planned procedures that can be implemented if the need arises. They are not intended to be punitive and should not be used for that purpose. The purpose is to reestablish order while protecting everyone from harm, so that the function-based intervention can be properly implemented. If it becomes necessary to utilize an emergency procedure frequently when an intervention session begins, most likely it is the intervention that has not been adequately developed or is not being applied correctly. At this point, it is critical for the support to reevaluate the function-based intervention. Therefore, examples of *Emergency Procedures* for the three problem behaviors likely to be assessed in this study follow:

1. **Self-injurious Behavior (SIB):** SIB can include violent tantrums as exhibited by head banging on a wall or table; hitting self with either an open or close-fisted hand; scratching so as to cause red marks and/or drawing blood, and/or biting hand, arm, or other part of the body to elicit redness, swelling, and/or broken bleeding skin. If the participant displays an increase in SIB, the support staff must stop all intervention procedures at that time and minimally block access to serious injury by using a soft object such as a pillow or cloth. At this time, minimal verbal or other physical interaction should take place, only enough to block serious injury. Once the participant has calmed down for a period of a few minutes, the

APPENDIX C (*continued*)

function-based intervention can be reintroduced. If it becomes necessary to utilize an emergency procedure frequently when intervention sessions begin, most likely it is the intervention that has not been adequately developed or is not being applied correctly. At this point, it is critical for the support staff to reevaluate the function-based intervention.

2. Aggression to Others (ATO): ATO can include violent tantrums such as striking out so as to make or attempt to make contact with another person's body with one's hands, arms, legs, or thrown objects and/or spitting at others. If the participant displays an increase in ATO, the support staff will stop the intervention immediately and assist others in leaving the area as quickly and calmly as possible. The staff will also remove any objects that can be thrown. Securing the safety of other day program participants and staff while ensuring the safety of the aggressive participant until the situation deescalates is necessary before the function-based intervention can be reintroduced. At this time, minimal verbal or other physical interaction should take place. Once the participant has calmed down for a period of a few minutes, the function-based intervention can be reintroduced. If it becomes necessary to utilize this emergency procedure frequently, most likely the intervention has not been adequately developed or is not being applied correctly. At this point, it is critical for the support staff to reevaluate the function-based intervention.

APPENDIX C (*continued*)

3. Property Destruction (PD). PD can include the throwing of an object, stomping on an object, biting an object not intended for such action, or any other behavior resembling purposeful attempt to destroy a material item. If the participant displays an increase in ATO, the support staff will stop the intervention immediately and remove any objects that can be thrown or destroyed. Securing the safety of other day program participants and staff while ensuring the safety of the aggressive participant until the situation deescalates is necessary before the function-based intervention can be reintroduced. At this time, minimal verbal or other physical interaction should take place. Once the participant has calmed down for a period of a few minutes, the function-based intervention can be reintroduced. If it becomes necessary to utilize this emergency procedure frequently, most likely the intervention has not been adequately developed or is not being applied correctly. At this point, it is critical for the support staff to reevaluate the function-based intervention.

## APPENDIX D

## TREATMENT ACCEPTABILITY RATING FORM – REVISED (TARF-R)

(Reimers, T., Wacker, D., Cooper, L., &amp; DeRaad, A., 1992)

Please complete the items listed below by placing a check mark on the line under the question that best indicates how you feel about the treatment.

1. How acceptable do you find the treatment to be regarding your concerns about this individual?

_____	_____	_____	_____	_____	_____	_____
Not at all acceptable			Neutral			Very acceptable

2. How willing are you to carry out this treatment?

_____	_____	_____	_____	_____	_____	_____
Not at all willing			Neutral			Very willing

3. Given this individual's behavioral problems, how reasonable do you find the treatment to be?

_____	_____	_____	_____	_____	_____	_____
Not at all reasonable			Neutral			Very reasonable

4. How costly will it be to carry out this treatment?

_____	_____	_____	_____	_____	_____	_____
Not at all costly			Neutral			Very costly

5. To what extent do you think there might be disadvantages in following this treatment?

_____	_____	_____	_____	_____	_____	_____
None are likely			Neutral			Many are likely

APPENDIX D (*continued*)

6. How likely is this treatment to make permanent improvements in this individual's behavior?

_____	_____	_____	_____	_____	_____	_____
Unlikely			Neutral			Very
acceptable						likely

7. How much time will be needed each day for you to carry out this treatment?

_____	_____	_____	_____	_____	_____	_____
Little time			Neutral			Much time
will be needed						will be needed

8. How confident are you that this treatment will be effective?

_____	_____	_____	_____	_____	_____	_____
Not at all			Neutral			Very
confident						confident

9. How disruptive will it be to carry out this treatment?

_____	_____	_____	_____	_____	_____	_____
Not at all			Neutral			Very
disruptive						disruptive

10. How effective is this treatment likely to be for this individual?

_____	_____	_____	_____	_____	_____	_____
Not at all			Neutral			Very
effective						effective

11. How affordable is this treatment?

_____	_____	_____	_____	_____	_____	_____
Not at all			Neutral			Very
affordable						affordable

12. How much do you like the procedures used in the proposed treatment?

_____	_____	_____	_____	_____	_____	_____
Do not like			Neutral			Like them
them at all						very much



## REFERENCES

- Arizona Department of Economic Security, Division of Developmental Disabilities (2005). Retrieved May 1, 2006 from [http://www.de.state.az.us/ddd/EligibilityReferral/frm\\_EligibilityRequirements](http://www.de.state.az.us/ddd/EligibilityReferral/frm_EligibilityRequirements)
- Bidwell, M. A., & Rehfeldt, R. A. (2004). Using video modeling to teach a domestic skill with an embedded social skill to adults with severe mental retardation. *Behavioral Interventions*, *19*, 263-274.
- Bijou, S. W., Peterson, R. F., & Ault, M. H. (1968). A method to integrate descriptive and experimental field studies at the level of data and empirical concepts. *Journal of Applied Behavioral Analysis*, *1*, 175-191.
- Burke, M. D., Hagan-Burke, S., & Sugai, G. (2003). The efficacy of function-based interventions for students with learning disabilities who exhibit escape-maintained problem behaviors: Preliminary results from a single-case experiment. *Learning Disability Quarterly*, *26*, 15-25.
- Carr, E. G. (1977). The motivation of self-injurious behavior: A review of some hypotheses. *Psychological Bulletin*, *84*, 800-816.
- Carr, E.G., & Durand, V. M. (1985). Reducing behavior problems through functional communication training. *Journal of Applied Behavioral Analysis*, *18*, 111-126.
- Carr, E. G., Levin, L. McConnachie, G., Carlson, J. I., Kemp, D. C. & Smith, C. E. (1994). *Communication-based intervention for problem behavior: A user's guide for producing positive change*. Baltimore: Paul H. Brookes.
- Dunlap, G., Kern-Dunlap, L. dePerczel, M., Clarke, S., Wilson, D., Childs, K. E., White, R., & Falk, G. (1993). *Preliminary functional assessment survey*. Unpublished document, Division of Applied Research and Educational Services, University of South Florida, Tampa.
- Dunlap, G., & Kern, L. (1999). Modifying instructional activities to promote desirable behaviors: A conceptual and practical framework. *School psychology Quarterly*, *11*(40), 297-312.
- Durand, V. M. (1990). *Severe behavior problems: A functional communication training approach*. New York: Guilford.

## REFERENCES (continued)

- Durand, V. M. (1999). Functional communication training using assistive devices: Recruiting natural communities of reinforcement. *Journal of Applied Behavior Analysis, 32*(3), 247-267.
- Durand, V. M. & Carr, E. G. (1991). Functional communication training to reduce challenging behavior; Maintenance and application in new settings. *Journal of Applied Behavior Analysis, 24*, 251-264.
- Durand, V. M., & Carr, E. G. (1992). An analysis of maintenance following functional communication training. *Journal of Applied Behavior Analysis, 25*, 777-794.
- Durand, V.M., & Kishi, G. (1987). Reducing severe behavior problems among persons with dual sensory impairments: An evaluation of a technical assistance model. *Journal of the Association for Persons with Severe Handicaps, 12*(1), 2-10.
- Durand, V. M., & Merges, E. (2001). Functional communication training: A contemporary behavior analytic intervention for problem behaviors. *Focus on Autism and Other Developmental Disabilities, 16*(2), 110-119, 136.
- Finn, C. A., & Sladeczek, I. E. (2001). Assessing the social validity of behavioral interventions: A review of treatment acceptability measures. *School Psychology Quarterly, 16*(2), 176-206.
- Foster-Johnson, L.F., & Dunlap, G. (1993). Using functional assessment to develop effective individualized interventions for challenging behaviors. *Teaching Exceptional Children, 25*, 44-50.
- Gresham, F., Gansle, K., & Noell, G. (1993). Treatment integrity in applied behavior analysis with children. *Journal of Applied Behavioral Analysis, 26*(2), 257-263.
- Griffiths, D., Feldman, M. A., & Tough, S. (1997). Programming generalization of social skills with developmental disabilities: Effects of generalization and social validity. *Behavior Therapy, 28*, 253-269.
- Horner, R., & Carr, E. (1997). Behavioral support for students with severe disabilities: Functional assessment and comprehensive intervention. *Journal of Special Education, 31*(1), 84-104.
- Horner, R. H., Carr, E. G., Halle, J., McGee, G., Odom, S., & Wolery, M. (2005). The use of single-subject research to identify evidence-based practice in special education. *Exceptional Children, 71*(2), 165-179.

## REFERENCES (continued)

- Horner, R. H., Dunlap, G., & Koegel, R. (1988). *Generalization and maintenance: Lifestyle changes in applied settings*. Baltimore: Paul H. Brookes.
- Jolivet, K., Scott, T. M., & Nelson, C. M. (2000). *ERIC clearinghouse of disabilities and gifted education*. Council for Exceptional Children. (ERIC Document Reproduction Service No.E592)
- Kern, L., Delaney, B., Clarke, S., Dunlap, G., & Childs K. (2001). Improving the classroom behavior of students with emotional and behavioral disorders using individualized curricular modifications. *Journal of Emotional and Behavioral Disorders*, 9, 239-247.
- Koegel, L. K., Koegel, R. L., & Dunlap, G. (1997). *Positive behavioral support: Including people with difficult behavior in the community*. Baltimore: Paul H. Brookes.
- Lane, K. L., & Beebe-Frankenberger, M. E. (2004). *School-based interventions: The tools you need to succeed*. Boston: Allyn & Bacon.
- Lane, K. L., Weisenbach, J. L., Little, M. A., Phillips, A., & Wehby, J. (2006). Illustrations of function-based interventions implemented by general education teachers: Building capacity at the school site. *Education and Treatment of Children*, 29(4), 549-571.
- LeBlanc, L. A., Hagopian, L. P., & Maglieri, K. A. (2000). Use of token economy to eliminate excessive inappropriate social behavior in an adult with developmental disabilities. *Behavioral Interventions*, 15, 135-143.
- Lewis, T. J. & Sugai G. (1996). Descriptive and experimental analysis of teacher and peer attention and the use of assessment-based intervention to improve pro-social behavior. *Journal of Behavioral Education*, 6, 7-24.
- Liaupsin, C. J., Umbreit, J., Ferro, J. B., Urso A., & Upreti, G. (2006). Improving academic engagement through systematic, function-based intervention. *Education and Treatment of Children*, 29(4), 573-591.
- Newcomer, L. L. & Lewis, T.J. (2004). Functional behavioral assessment: An investigation of function-based interventions. *Journal of Emotional and Behavioral Disorders*, 12(3), 168-181.

REFERENCES (*continued*)

- Reimers, T., Wacker, D., Cooper, L., & DeRaad, A. (1992). Acceptability of behavioral treatments for children: Analog and naturalistic evaluations by caregivers, *School Psychology Review*, *21*, 628–644.
- Richards, S., Taylor, R., Ramasamy, R., & Richards, R. (1999). *Single Subject Research; Applications in educational and clinical settings*. San Diego: Singular.
- Stahr, B. K., Cushing, D., Lane, K. L., & Fox, J. (2006). Efficacy of a function-based intervention in decreasing off-task behavior exhibited by a student with attention deficit hyperactivity disorder. *Journal of Positive Behavior Interventions*, *8*, 201-211.
- Sugai, G., Horner, R., Dunlap, G. Hienman, M., Lewis, T., Nelson, C. M., et al. (2000). Applying positive behavior support and functional assessment in schools. *Journal of Positive Behavior Interventions*, *2*(3), 131-143.
- Umbreit, J. (1995). Functional assessment and intervention in a regular classroom setting for the disruptive behavior of a student with attention deficit hyperactivity disorder. *Behavioral Disorders*, *20*, 267-278.
- Umbreit, J. (1996). Functional analysis of disruptive behavior in an inclusive classroom. *Journal of Early Intervention*, *20*, 18-29.
- Umbreit, J. (1997, December). Eliminating challenging behaviors in multiple environments throughout the entire day. *Education and Training in Mental Retardation and Developmental Disabilities*, 321-330.
- Umbreit, J. & Blair, K. S. (1996, June). The effects of preference, choice, and attention on problem behavior at school. *Education and Training in Mental Retardation and Developmental Disabilities*, 151-161.
- Umbreit, J., Ferro, J., Liaupsin, C., & Lane, K. (2007). *Functional behavioral assessment and function-based intervention: An effective, practical approach*. Upper Saddle River: Prentice-Hall.
- Umbreit, J., Lane, K., & Dejud, C. (2004). Improving classroom behavior by modifying task difficulty: The effects of increasing the difficulty of too-easy tasks. *Journal of Positive Behavior Interventions*, *6*, 13-20.

REFERENCES (*continued*)

- Van Acker, R., Boreson, L., Gable, R., & Potterton, T. (2005). Are we on the right course? Lessons learned about current FBA/BIP practices in schools. *Journal of Behavioral Education, 14*(1), 35-56.
- Vollmer, T., Iwata, B., Zarcone, J., Smith, R., & Mazaleski, J. (1993). The role of attention in the treatment of attention-maintained self-injurious behavior: Non-contingent reinforcement and differential reinforcement of other behavior. *Journal of Applied Behavioral Analysis, 26*(1), 9-21.
- Ysseldyke, J. & Algozzine, B. (1995). *Special Education; A Practical Approach for Teachers*. Boston: Houghton Mifflin Company.