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Functional Assessment of Problem Behavior in Children with Autism Spectrum Disorders: A Review of 32 Cases

by

Jessa R. Love

A Thesis
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Functional Assessment of Problem Behavior in Children with Autism Spectrum Disorders: A Review of 32 Cases

Jessa R. Love, M.A.

Western Michigan University, 2007

The prevalence of autism spectrum disorders among children aged 4 to 17 years is approximately 5.5 to 5.7 out of 1000 children (Centers for Disease Control, 2006). It is not uncommon for children with these disorders to display a wide range of problem behavior (e.g., Farrar-Schneider, 1992; Oswald et al., 1992). While a number of studies have reported aggregated data on the reinforcement functions of such problem behavior, none have reported the distribution of functions with a sample comprised solely of individuals on the autism spectrum. Thus, the purpose of this study was to examine individual client data from an outpatient clinic serving children with autism spectrum disorders to investigate potential relations between the function of problem behavior and several variables: diagnosis, behavioral topography, functional assessment method, and intervention recommended. Results indicate that social reinforcement was involved in the maintenance of problem behavior for the vast majority of cases, suggesting that these individuals lack socially appropriate responses to gain access to such reinforcement, or that their social environments are not adequately responsive to less problematic behavior (Iwata et al., 1994).

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CHAPTER I

AUTISM SPECTRUM DISORDERS

History

The disorder currently referred to as autism was first described by Kanner in 1943 (Eisenberg & Kanner, 1957). Based on his observations of 11 children, Kanner coined the term "infantile autism" and described four important characteristics of children with such a disorder (Tidmarsh & Volkmar, 2003). Specifically, Kanner noted that these children demonstrated an apparent inability to "relate themselves in the ordinary way to people and to situations" (p. 556), failed to use language for the purpose of communication, exhibited an obsessive desire for the maintenance of sameness, and often displayed a fascination for objects or parts of objects (Eisenberg & Kanner). Unfortunately, this paper did not receive much attention by clinicians, and most children with these problems were diagnosed with childhood schizophrenia. One cause of this relatively minor response may have stemmed from Kanner's choice of the term "autism," as the term had already been used to describe a fantastical, self-centered mental state that is symptomatic of schizophrenia. Ultimately, autism did not become its own diagnostic entity until the *DSM-III* was published in 1980 (Tidmarsh & Volkmar).

Around the same time that autism appeared in the *DSM-III*, Wing (1981) published a paper in which she discussed the work of Hans Asperger with respect to his observation of four young boys who demonstrated similar characteristics to those observed by Kanner, which had previously only been published in its original German. There are several important differences, however, between Kanner's early

clinical descriptions of autism and Asperger's observations. The individuals described by Asperger did not demonstrate clinically significant delay in the development of spoken language or substantial cognitive impairment. Further, while these individuals displayed many of the same social difficulties as those observed by Kanner, Asperger noted that they often demonstrated a desire to interact socially with others but did not possess the necessary skills to do so. Consequently, Asperger believed he was describing a distinct clinical condition from Kanner's infantile autism (Myles & Simpson, 2002). While Wing's article brought Asperger's disorder to the attention of clinicians and researchers, it was not classified as a pervasive developmental disorder along with autism until the *DSM-IV* was published in 1994.

Current Diagnostic Criteria

Currently, there are three pervasive developmental disorders that are typically considered autism spectrum disorders: Autism, Asperger's disorder, and Pervasive developmental disorder – Not otherwise specified (PDD-NOS). While all pervasive developmental disorders involve impairment in reciprocal social interaction skills, impairment in communication skills, and the presence of stereotyped behavior, interests, and activities, each of the autism spectrum disorders is associated with a slightly different set of diagnostic criteria. Each of the three autism spectrum disorders will be considered in turn.

According to the *DSM-IV*, the essential features of autistic disorder include the presence of markedly abnormal or impaired development in social interaction and communication and a markedly restricted repertoire of activity and interests (American Psychiatric Association, 1994). While the manifestations of this disorder

vary greatly in terms of the degree of impairment, individuals must meet two criteria in the realm of impaired social interaction, and one criterion each in the areas of impairments of communication and restricted, repetitive or stereotyped patterns of behavior to qualify for a diagnosis. Further, the onset of abnormal functioning must occur before the age of three years.

The criteria for a diagnosis of Asperger's disorder are similar, with a few important differences stemming from Asperger's original observations. To qualify for a diagnosis of Asperger's disorder, an individual must meet at least two of the criteria in the area of impaired social interaction, and one criterion in the area of restricted, repetitive, and stereotyped patterns of behavior such that social, occupational or other areas of functioning are clinically impaired. In order for such a diagnosis to be appropriate, however, the individual must also demonstrate no clinically significant delay in language skills, as well as no clinically significant delay in cognitive development or in the development of age-appropriate self-help skills or adaptive behavior (American Psychiatric Association, 1994).

Finally, a diagnosis of PDD-NOS is used when an individual displays a severe impairment in the development of reciprocal social interaction associated with either verbal or nonverbal communication skills, or with the presence of stereotyped behavior, interests, and activities, but without meeting criteria for another pervasive developmental disorder (American Psychiatric Association, 1994). Thus, an individual diagnosed with PDD-NOS may exhibit behavior very similar to individuals diagnosed with autism or Asperger's disorder, but not to the extent that he meets the criteria for one of those disorders.

While problem behavior is not an explicit requirement for a diagnosis of an autism spectrum disorder, it is easy to see how the combination of impaired social skills, impaired language skills, and repetitive or restricted behaviors could lead to the development of problem behavior in these children. A substantial number of individuals with autism spectrum disorders display problem behaviors of concern, including aggression and noncompliance (Farrar-Schneider, 1992), stereotypy (American Psychiatric Association, 1994), and self-injurious behavior (Oswald, Ellis, Singh, & Singh 1992). For example, in an analysis of the role of perseverative behavior in the problem behavior of children diagnosed with autism, Reese, Richman, Zarcone, and Zarcone (2003) discovered that gaining access to preferred perseverative activities and escaping other demands while engaged in such activities frequently contributed to problem behavior as a maintaining variable. Based on the results of a functional assessment interview conducted with parents or other primary caregivers, the authors found that interrupting repetitive behavior contributed directly to problem behavior in 70 out of 100 children with autism.

In a continuation of that study, Reese, Richman, Belmont, and Morse (2005) compared the functional characteristics of problem behavior in children with and without autism. The authors conducted functional assessment interviews with the parents or primary caregivers of 23 children diagnosed with autism, as well as 23 children without autism who were pair-matched for chronological age, developmental age, and sex. It should be noted that children in the control group who did not have a diagnosis of autism were developmentally delayed and were reported to exhibit daily occurrences of disruptive behavior. The results indicated that among children with

autism, problem behavior often occurred to gain or maintain access to items with which to engage in repetitive behavior, while among children without autism problem behavior occurred for more common social functions such as gaining caregiver attention or escaping caregiver demands. Therefore, the authors recommended that diagnostic information be incorporated into any functional assessment of problem behavior, in order to individualize the functional assessment to more accurately distinguish between subtle differences in social functions for problem behavior. An understanding of the essential characteristics of autism spectrum disorders might contribute to the efficient and successful assessment and treatment of undesired behavior.

Prevalence

Two important measures are commonly used when conducting epidemiological research – incidence and prevalence. Incidence refers to new events occurring over time among members of a population of individuals who are candidates for such an event (Zahner, Hsieh, & Fleming, 1995). In other words, the number of individuals who receive a given diagnosis over the course of a year would represent an incidence rate for that diagnosis. Prevalence, on the other hand, refers to the proportion of a population who have a particular health condition at a given point or period of time (Zahner et al.).

A recent evaluation of the prevalence of autism spectrum disorders was conducted by the Centers for Disease Control (CDC, 2006). This report showed estimates that, among children aged 4 to 17 years, 5.5 to 5.7 children out of 1000 are affected. This is much higher than the previous estimate around 5 cases per 10,000

individuals (American Psychiatric Association, 1994). The recent CDC estimate is similar to the prevalence of mental retardation, which is estimated at 3 to 4 children per 1000 (Leonard & Wen, 2002). By comparison, a recent evaluation of attention-deficit/hyperactivity disorder estimated that as many as 17 females and 41 males out of every 1000 are affected by ADHD (Cuffe, Moore, & McKeown, 2005). It is important to note, however, that the CDC estimate for the prevalence of autism is based on parental report of their child having received a diagnosis. Thus, while the researchers asked parents if their child had ever been diagnosed with autism, it is unclear whether the parents of children who had been diagnosed with Asperger's Disorder or PDD-NOS answered positively. Consequently, these CDC data are somewhat ambiguous in that it is unclear whether they apply to autism alone or to all three autism spectrum disorders.

A more recent study also conducted by the Centers for Disease Control addressed this ambiguity by actually evaluating clinical records for over 1200 children aged 8 years across the country (CDC, 2007). Specifically, educational or medical records of children born in 1992 with at least one parent living in one of the six surveillance areas were reviewed. Clinicians classified children as having an autism spectrum disorder if their records indicated that they displayed behaviors between 1992 and 2000 that were consistent with the criteria for diagnosing autism, Asperger's disorder, or PDD-NOS according to the DSM-IV-TR, or if any prior evaluation included in the records contained a diagnosis for an autism spectrum disorder from a professional examiner qualified through both education and training to evaluate the development of children. Results indicated that the prevalence of

autism spectrum disorders among children aged 8 years ranged from 4.5 to 9.9 per 1000 children, with an average prevalence of 6.7 per 100 children.

CHAPTER II

FUNCTIONAL ASSESSMENT

Background

In 1977, Carr proposed five hypotheses with regards to potential motivators for self-injurious behavior. Three of these five hypotheses suggested that such problem behavior could be acquired and maintained through reinforcement contingencies. In other words, Carr proposed that self-injury could be operant behavior. The three sources of reinforcement that he proposed were: (1) attention from others, (2) escape from aversive situations, and (3) sensory stimulation resulting from the behavior itself. These hypotheses represent an important milestone in the assessment and treatment of problem behavior, as Carr's operant reinforcement contingencies suggest that once the contingency maintaining the problem behavior is identified, the contingency can be altered so as to reduce or eliminate the behavior.

Iwata, Dorsey, Slifer, Bauman, and Richman (1994/1982) subsequently developed an experimental procedure known as the *functional analysis* to determine whether the self-injury of nine children was indeed maintained by the operant variables that Carr (1977) had proposed. This was an important milestone in the subsequent movement away from topographical to functional approaches in the selection of treatment for problem behavior. It should be noted, however, that the functional analysis procedure is only one of a family of three basic procedures that are used when assessing the function of a given behavior, namely, *functional assessment*. Therefore, before discussing the specific steps involved in conducting an

experimental functional analysis, the other two assessment procedures involved in a functional assessment shall be addressed.

Non-experimental Approaches

Informant functional assessment, often in the form of interviews or rating scales with caregivers, is often the first step of a functional assessment of problem behavior. The purpose of such assessments is to collect information about the specific behavior of concern as well as potentially influential events. Questioning informants about when, where, and with whom the behavior typically occurs, common antecedents and consequences, and any external conditions such as sleep habits and dietary issues that might affect the behavior helps create a broad picture of the factors that could impact problem behavior. Thus, the clinician can begin to identify the variables that may be incorporated later either in a descriptive assessment or functional analysis (O'Neill et al., 1997).

Another method of assessing behavioral function is known as descriptive assessment, in which the behavior is directly observed in the natural environment. Two different methods can be used when conducting a descriptive assessment, namely, scatterplots and antecedent-behavior-consequence (ABC) assessments. When using scatterplots, occurrences of problem are plotted on a chart according to the day and time such that a temporal depiction of the behavior is created. When using ABC assessments, however, the events that occur immediately before and after each occurrence of problem behavior are recorded. The results of an informant assessment are often used to guide the choice as to which form of descriptive assessment will be conducted. If an interview indicates that there is a temporal

relationship with the problem behavior, for example, the scatterplot method will likely be used.

When an ABC assessment has been chosen, a method of data collection must also be selected. The most common form of ABC assessment employs response-dependent data collection in which data are collected on the environmental events that occur contiguously with the problem behavior as it occurs. This data collection method typically takes one of two forms, narrative or structured. When collecting narrative data, the observer simply records a brief narrative record of what happened immediately before and after the behavior. When collecting structured data, the observer is provided with a list of several potential antecedents and consequences, typically developed based on information gathered during informant assessment, and simply records which of those events occurred each time the problem behavior was emitted.

Descriptive assessment methods represent an improvement over informant methods as the behavior is directly observed in the natural environment. The behavior-environment relations that are identified, however, are only correlational, and consequently, do not provide the strength of evidence that can be provided by a functional analysis. Thus, if it is feasible to conduct a functional analysis, successful results will provide the strongest evidence available about the function of problem behavior.

Functional Analysis

A functional analysis involves repeated observations of an individual across several well-defined analogue conditions (Iwata et al., 1994/1982). The necessary

components of each test condition include: (1) the relevant establishing operation (e.g., an aversive demand situation present within the session), (2) the relevant discriminative stimulus (e.g., the presence of another individual), and (3) the putative reinforcer delivered contingent on the behavior (Carr & LeBlanc, 2003). The combination of these three elements is meant to replicate the problem behavior's reinforcement contingency. Thus, the behavior is evoked and then exposed to different consequences such that its rate should increase when it is exposed to the maintaining reinforcer. The three test conditions used in the original application of the procedure were social disapproval, academic demand, and alone (Iwata et al. 1994/1982).

In the social disapproval condition, the experimenter and participant were in a small room together, where several toys were available. The participant was instructed to play with the toys while the experimenter did some work. Attention was provided to the participant contingent upon the occurrence of self-injury in the form of statements of disapproval or instructions to stop engaging in the behavior. This condition was meant to approximate the potential reinforcement contingency of attention from others that might maintain self-injurious behavior. Therefore, if attention from others was the true maintaining variable with respect to the problem behavior, the behavior should increase during this condition relative to the control condition.

In the academic demand condition, the experimenter and participant were seated at a table and the experimenter presented demands using a graduated three-prompt procedure. The experimenter immediately terminated the demand trial and

turned away from the participant for 30 s contingent on the occurrence of self-injury, with an additional 30-s delay for repeated self-injury (Iwata et al., 1994/1982). This condition was designed to assess a potential negative reinforcement function based on Carr's (1977) hypothesis of escape from aversive situations.

In the alone condition, the participant was placed in the room alone, without access to toys or any other sources of external stimulation. This condition was meant to replicate an impoverished environment that may serve as an establishing operation for self-injury maintained by sensory stimulation (i.e., automatic reinforcement).

While only the aforementioned three test conditions were utilized in the original functional analysis (Iwata et al., 1994/1982), conditions may be added or altered in order to best assess the problem behavior of a given individual. The results of informant and descriptive assessment can be very helpful in this regard. For example, if it was noted during descriptive assessment that a common consequence for the problem behavior of a child is to gain access to a specific toy, a tangible condition may be included in the functional analysis. When using such a condition, the child would have access to the relevant toy before the session. Upon beginning the session, the toy would be withdrawn such that the relevant establishing operation is present. The toy would be returned to the child contingent upon problem behavior to assess a potential tangible function. So, an ideal functional assessment would rely on the results of both informant and descriptive assessment to guide the development of the appropriate conditions for use in a functional analysis.

The last, and critical, component of a functional analysis is a control condition. Iwata et al. (1994/1982) referred to this condition as "unstructured play,"

because no academic demands were presented and a variety of toys were available. Social praise and brief physical contact were provided contingent upon appropriate behavior (including the absence of self-injury), and self-injurious behavior was ignored. The control condition of any functional analysis procedure must include a control for the primary stimulus in each test condition. For example, if an attention test condition is being used, attention must be freely available during the control condition, and if a demand test condition is being used, no demands must be present during the control condition. This is meant to simulate an enriched environment in which the motivation for problem behavior should be relatively low. The frequency of behavior observed in the control condition is used as a comparison for each test condition, such that test conditions in which the behavior is observed at higher rates than in the control condition represent maintaining functions. For example, if the rates of behavior in an attention condition are higher than the rates of behavior in the control condition, it is likely that attention serves a positive reinforcement function for the problem behavior.

Benefits of a Function-based Intervention Approach

The use of functional assessment to determine the motivation for problem behavior and guide treatment selection has several important benefits. First, by investigating the function of a behavior and developing a treatment plan accordingly, clinicians are able to directly address or even eliminate the response-reinforcer contingency, rather than simply overpower it, as is the case with many treatments that are matched solely to behavioral topography (Carr, Coriaty, & Dozier, 2000). While many of the function-based interventions may be similar to those previously used

with topographical approaches, when those interventions are based on functional assessment results, we can be much more confident in their selection and success. Further, functional assessment provides us with more information than simply the behavioral function. Functional assessment can identify treatment approaches that are irrelevant or even contra-indicated (Iwata, Vollmer, & Zarcone, 1993). For example, if a functional assessment indicated that a given problem behavior was maintained by escape from demands, we would know not only that escape extinction would be an important component to the treatment plan, but also that attention extinction, or planned ignoring, would actually be contraindicated as such a procedure allows the individual to temporarily escape both the demand and social interaction (Iwata, Pace, Cowdery, & Miltenberger, 1994). Finally, by identifying the way behavior problems are acquired and maintained, we will be able to develop a comprehensive approach to preventing such behaviors (Iwata et al., 1993).

Empirical Support for Functional Analysis Procedures

The individuals that receive treatment for self-injury or other problem behavior, as with all individuals, have a right to the most effective treatment procedures available (Van Houten et al., 1988). Therefore, it is important to evaluate the empirical support that is available for functional analysis procedures. Iwata, Pace, Dorsey et al. (1994) demonstrated that functional analyses are highly successful in producing differentiated data that indicate a clear behavioral function. Specifically, of the 152 functional analyses the authors investigated, 138 (91%) of them resulted in differentiated outcomes. Thus, while there are a few situations in which the use of functional analyses are contraindicated (e.g., low-rate behavior or life-threatening

behavior; Carr & LeBlanc, 2003), with respect to the situations in which a functional analysis can be appropriately conducted, it is a highly effective procedure for determining behavioral function. Further, Iwata, Pace, Cowdery et al. (1994) found that when using extinction as treatment for self-injurious behavior, the treatment was only successful when the specific form of extinction was matched to the function of the behavior. For example, one participant exhibited head hitting maintained by sensory stimulation. In his case, the implementation of sensory extinction (i.e., wearing a helmet to reduce sensory stimulation) was successful in reducing the rates of head hitting, while the implementation of escape extinction or attention extinction did not result in any reductions. Thus, it is reasonable to predict that clinicians will see better treatment effects when they use functional analyses (or other functional assessments) to match their treatment recommendations to behavioral function.

CHAPTER III

A BRIEF SUMMARY OF EPIDEMIOLOGICAL ANALYSIS

Recently, several large-n descriptive epidemiological studies have been conducted within the field of developmental disabilities. The purpose of this chapter is to provide the reader with a brief primer on epidemiological research, including a brief history and basic research designs. Epidemiology is defined as the study of the distribution and determinants of health-related conditions or events in a specified population, as well as the application of this study to important health problems (Szklo & Nieto, 2000). Two important measures are commonly used when conducting epidemiological research – incidence and prevalence.

While these two measures have always been the focus of epidemiological research, the methods researchers use have not been as consistent. The earliest psychiatric epidemiological studies each created and used its own methods, including diagnostic criteria, with little attention being paid to the overall validity of the study (Dohrenwend, 1995). Matters have improved significantly since the appearance of the *DSM-III*, which provided researchers with a consistent method for diagnosis and identification of participants. Such consistency is particularly important for epidemiological research in psychiatry, which depends on the accuracy of the diagnostic method. Further, epidemiological research has improved with the development of standard diagnostic interviews and rating scales (Dohrenwend). The specific designs that are typically utilized in epidemiological research will now be discussed.

Epidemiological research studies are typically classified as either descriptive or analytic. Descriptive studies make use of available data to examine how incidence or prevalence rates vary according to demographic variables (Szklo & Nieto, 2000). Analytic studies, on the other hand, assess potential associations between suspected risk factor exposures with specified health outcomes (Szklo & Nieto). Within these broad classifications, there are several strategies or research designs typically used for assessing epidemiological associations. These strategies are classified as ecologic or individual–based. Traditionally, in ecologic studies, two variables are compared to examine a possible association (Szklo & Nieto). For example, researchers may compare exposure to a given environmental contaminant with a measure of disease or mortality in order to assess a potential association between those two variables. Such studies typically rely on aggregate data.

Individual-based studies, on the other hand, use individuals as observation units, and include three basic designs – cohort studies, case-control studies, and cross-sectional designs (Szklo & Nieto, 2000). Cohort studies identify a group of people, a cohort, and follow it for a certain time period to assess the occurrence of a given health-related event. Case-control studies compare the odds of past exposure to a suspected risk factor between case individuals and control individuals. Finally, cross-sectional studies examine a sample of a reference population at a given point of time to assess associations between exposure and health-related events. This is likely the most common design used in psychiatric epidemiological research, and although the prevalence rates for most psychiatric disorders are relatively low, the number of cases that can be detected using a cross-sectional survey of a decent size is more than

sufficient to calculate accurate estimates of rates of association (Zahner et al., 1995). It should be noted, that while this design shares the name with a research strategy commonly used in developmental psychology, the two are entirely different. The distinguishing feature of an epidemiological cross-sectional design is that the data on exposure and health-outcomes are obtained at the same point in time for a single group of individuals (Zahner et al.).

As mentioned previously, several large-n descriptive epidemiological studies have been conducted within the field of developmental disabilities. Specifically, several researchers have used cross-sectional designs to examine the functions of problem behavior frequently exhibited by individuals with developmental disabilities. These studies will be reviewed in depth in the next chapter.

CHAPTER IV

FUNCTIONAL ANALYSIS OF PROBLEM BEHAVIOR IN INDIVIDUALS WITH DEVELOPMENTAL DISABILITIES: A REVIEW OF EPIDEMIOLOGICAL RESEARCH

A significant advantage of aggregating data across a large number of participants is that it may greatly enhance the external validity of the findings (Hagopian, Fisher, Sullivan, Acquisto, & LeBlanc, 1998). Further, in reference to functional analysis data, aggregated data allow us to predict the probability of given behavioral functions under certain conditions, including the topographies evaluated, the method of functional analysis conducted, the population used, and so forth. By investigating studies with aggregate data, we may evaluate consistency in function across these conditions, which may then allow us to generalize the results to other similar conditions. Consequently, in clinical situations in which functional analyses cannot be conducted (e.g., with low-rate behavior), the results of epidemiological reports may allow us to make educated hypotheses about the function of a given behavior and develop treatment accordingly. Further, results of aggregate functional analysis data may allow clinicians or educators to design conditions in the home or classroom to prevent the occurrence of problem behavior. The current chapter reviews the published literature reporting aggregate functional analysis data of problem behavior for 15 or more individuals, evaluates potential comparisons across conditions, and discusses directions for future research.

Variables Reviewed

Each study was evaluated based on five variables: participants, setting, duration of analysis, behavioral topographies, and behavioral functions. Relevant

information regarding participants included age and diagnosis (e.g., developmental delay or mental retardation). The setting used in each study was coded as inpatient, outpatient, or home. The duration of the functional analysis was coded based on the criteria used by Hanley, Iwata, and McCord (2003). Thus, a functional analysis was considered brief if it included two or fewer observations per condition, and full if it included three or more observations in at least two conditions. Behavioral topographies and functions were evaluated as a percentage of participants, and are reported utilizing the terms used by the authors of the individual study. The test conditions included in the functional analyses were not evaluated as they often varied across individual participants. See Table 1 for a summary of each study included in this review.

Review of the Literature

Asmus et al. (2004). To evaluate the use of a short-term inpatient model to evaluate problem behavior, Asmus et al. (2004) presented aggregate functional analysis results for 138 individuals. Both individuals with and without a diagnosis of developmental disability were included in this study, although only 20 of the participants did not have a diagnosis. Participants represented individuals for which outpatient evaluation and treatment of problem behavior had failed to reduce behavior to acceptable levels and were consequently admitted for inpatient treatment. Therefore, treatment resistance was a potentially important variable in this study. The behaviors evaluated included a range of problem behaviors including disruption, aggression, self-injury, destruction, and stereotypy. Data from the functional analyses

were evaluated using visual inspection, and the most common behavioral function was social negative reinforcement.

Hagopian et al. (1998). In an evaluation of the effectiveness of functional communication training, Hagopian et al. (1998) presented functional analysis data for 21 individuals aged 2-16 who had a diagnosis of mental retardation and displayed severe problem behavior. This study was conducted on an inpatient unit specializing in the treatment of severe behavior disorders. The authors found social positive reinforcement to be the most common behavioral function, with social negative reinforcement being only slightly less common. The results of functional analyses were first evaluated using visual inspection, but were then further validated by two independent raters according to structured criteria in which each test condition was compared to the control condition (see Hagopian et al., 1997). The range of most data points in the control condition was defined by drawing upper and lower criterion lines approximately one standard deviation from the mean of the control condition. The number of data points from each test condition that fell outside this range were then counted and evaluated based on specific rules. Since participants for this study were selected specifically for the use of functional communication training (a treatment primarily reserved for social functions) and do not represent a general sample of individuals receiving treatment through the inpatient unit, the study will not be included in later between-study syntheses.

Iwata, Pace, Dorsey et al. (1994). In an attempt to evaluate common functions of self-injurious behavior, Iwata, Pace, Dorsey et al. (1994) presented functional analysis data for 152 individuals treated in an inpatient unit. All

participants had a diagnosis of mental retardation and demonstrated self-injurious behavior in some form. Results of functional analyses were evaluated using visual inspection, and the most common function was social negative reinforcement, although a fairly high number of social positive reinforcement functions were identified as well. It is important to note that this study also reported that treatment plans were developed for each participant based on the results of their functional analysis and observed success rates above 80% for almost all function-based interventions.

Derby et al. (1992). Several studies have also been published presenting aggregate data for functional analyses conducted in an outpatient setting. Derby et al. (1992) published the aggregated functional analysis results for 79 individuals who were evaluated by an outpatient problem behavior clinic. No specific information about participant diagnosis was provided. Brief functional analyses were conducted and evaluated using visual inspection, followed by brief replications in which a contingency reversal was implemented such that the consequence identified by the functional analysis as the maintaining variable was provided for an alternative response. The most common function found in this study was social negative reinforcement.

Kurtz et al. (2003). Similarly, Kurtz et al. (2003) presented aggregate functional analysis data for 30 young children who displayed self-injurious behavior (although many displayed other problem behavior as well). Most participants were diagnosed with mental retardation or a developmental disability. For this study primary caregivers were trained to serve as therapists for the functional analysis for

27 of the participants. Results of the functional analyses were evaluated using visual inspection and were reported separately for self-injurious and problem behavior. The most common behavioral function for both self-injury and problem behavior was social positive reinforcement.

Piazza et al. (2003). In the final study reviewed that reported functional analysis data from an outpatient setting, Piazza et al. (2003) presented the results of the evaluation of inappropriate mealtime behavior in 15 children. Results of the functional analyses were evaluated using visual inspection, and differentiated results were demonstrated for only 10 of the 15 participants. The most common function for the inappropriate mealtime behaviors evaluated was social positive reinforcement. Since participants for this study represent a very select group of children - those with inappropriate mealtime behavior - the study will not be included in later between-study syntheses.

Wacker et al. (1998, 2005). Two studies have also evaluated the use of functional analysis procedures conducted by parents in the home for those individuals who were unable to regularly attend a clinic for services. To evaluate the function and long-term treatment of problem behavior of young children, Wacker et al. (1998) taught parents to conduct functional analyses and functional communication training and presented data for 28 cases. Children participating in this study were ages 1-6 and had a diagnosis of developmental delay or multiple disabilities. Results of the functional analyses were evaluated using visual inspection and then guided the development of a treatment plan. The duration of the analyses is not reported, although all but 3% of the analyses resulted in differentiated data. The most common

behavioral function identified was social negative reinforcement. Similarly, Wacker et al. (2005) used the same methods with another set of 26 children. The distribution of behavioral topographies for these participants was slightly different than in the previous study, and the most common behavioral function was social positive reinforcement as compared to social negative reinforcement in the earlier study.

Between-study Synthesis

Participant diagnosis. Although most authors reported the diagnoses of participants or the percentage of participants with a given diagnosis when multiple diagnoses are included, the results of the functional analyses were not reported according to diagnoses. Therefore, it is impossible to make any comparisons in terms of the common behavioral functions seen across diagnostic categories. There does appear to be a relation, however, between the presence of a diagnosis at all and the functions of problem behavior. Although only one study included typically developing participants with no diagnoses, it is interesting to note that the participants without a diagnosis never demonstrated a social positive reinforcement function for problem behavior (Asmus et al., 2004). One potential explanation for this result is that typically developing individuals simply may not engage in problem behavior for something that is often freely available, such as attention from others, or that they possess a number of other skills capable of soliciting attention from others. This finding must be viewed with caution, however, as only 20 participants in the study fell into the no-diagnosis category.

Behavioral topography. Although every study reviewed evaluated multiple behavioral topographies, not all provided specific data on the proportion of

participants exhibiting a given topography and none reported behavioral function or diagnosis according to specific behavioral topographies. Therefore, no between-study comparisons or conclusions were possible with respect to this variable.

Setting. It is interesting to note that all of the studies that were conducted in inpatient settings report social negative reinforcement as the most common contingency maintaining problem behavior, while results were mixed for outpatient settings with respect to social positive versus social negative reinforcement functions. There is at least one explanation for this relation. Many individuals who receive services for problem behavior in an inpatient setting have likely already attempted outpatient services without success. It is possible that more severe behaviors that require inpatient evaluation and treatment tend to be maintained by social negative reinforcement. One potential explanation for this finding stems from the fact that caregiver behavior is also negatively reinforced when they provide social negative reinforcement for a problem behavior and consequently, successfully escape from having to deal with the problem behavior. This cycle of social negative reinforcement for both the child and caregiver may lead to less successful interventions in outpatient settings that commonly require the caregiver to implement some form of an extinction procedure. Thus, such behaviors may require an inpatient setting for treatment in which a trained staff member is implementing the intervention. It should be noted that this cycle of reinforcement for both the child and caregiver could also occur within the context of providing social positive reinforcement for the child, however the severe problem behaviors typically treated with inpatient services may not be as sensitive to contingencies of social positive

reinforcement as social negative reinforcement. In others words, it is possible that caregivers also provide social positive reinforcement for these severe behaviors, but if that consequence does not actually maintain the behavior and therefore will not result in negative reinforcement for the caregiver, the cycle will likely not develop.

Duration. Although the duration of functional analyses was not always reported, there appears to be a relation between the length of the analyses and the percentage of undifferentiated outcomes. Specifically, studies that report having conducted full functional analyses present relatively small percentages of undifferentiated outcomes in relation to all of the studies reviewed. For example, both Asmus et al. (2004) and Iwata et al. (1994) conducted full functional analyses and only reported 4% of cases resulting in undifferentiated outcomes. One potential explanation for this is that participants may require repeated exposure to each condition before programmed contingencies acquire control over the problem behavior such that differential rates emerge.

Recommendations for Future Research

As noted previously, there are several potential advantages to evaluating studies presenting aggregate functional analysis data for the evaluation of problem behavior, including the ability to predict the probability of behavioral function based on certain conditions, to guide treatment for cases in which functional analyses cannot be conducted, and to design conditions so as to potentially prevent problem behavior from occurring. From the existing literature, we can conclude several things: (1) individuals with developmental disabilities more commonly exhibit problem behavior than individuals without such disabilities, (2) there appears to be a

relation between the setting of functional analyses and the most common behavioral function, such that behaviors assessed in inpatient settings are most often maintained by social negative reinforcement while the results are mixed for outpatient settings, and (3) full functional analyses (as compared to shorter assessments) result in quite small proportions of undifferentiated results. However, several improvements in future investigations would permit the drawing of more detailed inferences from the literature. Several such improvements are discussed below.

Report referral information. Few studies report detailed information regarding why the participants were receiving treatment, or who may have provided referrals for such treatment. It is possible that behaviors that result in referrals from psychologists, teachers, or parents vary in terms of topography, severity, or function. For example, a teacher or parent may provide referrals for less severe problem behavior, as even mild problem behavior can be greatly disruptive to the home or classroom. Thus, it would be helpful for authors presenting aggregate functional analysis data to include information about the conditions that led to participants receiving treatment for problem behavior, including the source of any referrals and the reported reasons behind those referrals.

Include descriptive assessment results. Several studies included in the current review report using some form of descriptive assessment before functional analyses were conducted, but the results of such descriptive assessment were not included. It would be helpful to compare the results of descriptive assessment and functional analyses in order to evaluate the similarities in behavioral functions identified and the validity of descriptive assessment results. Furthermore, it would allow us to

determine to what extent the descriptive assessment contributed to successful functional analysis outcomes.

Report behavioral functions according to diagnosis. Although the populations used in several studies included several diagnoses, functional analysis results were not reported according to those different diagnoses. Future research ought to report behavioral functions separately for each diagnosis. In this way, comparisons can be made across studies in order to evaluate the consistency of results and across diagnoses to evaluate differences in the frequencies of certain behavioral functions.

Report behavioral functions according to topography. Every study in this review evaluated multiple behavioral topographies, but functional analysis results were rarely reported according to those specific topographies. Future research ought to report behavioral functions separately for each topography for the same reasons mentioned previously in reference to diagnosis - such that comparisons can be made across studies in order to evaluate consistency of results and across topographies to evaluate differences in the frequencies of certain behavioral functions.

Table 1. Summary of studies including aggregate functional analysis data.

Authors	*Year*	*n*	*Participants*	*Setting*	*Duration*	*Topographies Evaluated*	*Functions Identified*
Asmus et al.	2004	138	Individuals with developmental delay (DD), and individuals with no diagnosed delay (ND)	Short-tern inpatient unit	Full	Disruption: DD–70% ND-95% Aggression: DD-81% ND-85% SIB: DD-64% ND-25% Destruction: DD-37% ND-55% Stereotypy: DD-19% ND-15% Other: DD-11% ND-10%	Social positive & negative: DD-39% ND-50% Social negative: DD-27% ND-40% Social positive: DD-14% ND-0% Automatic: DD-7% ND-10% Auto & Social: DD-9% ND-0% Undifferentiated: DD-4% ND-0%
Derby et al.	1992	79	Clients of Self-Injurious & Aggressive Behavior Service	Outpatient	Brief	Aggression: 61% Self-Injury: 77% Stereotypy: 24% Other: 24%	Escape: 48% Sensory: 34% Attention: 24% Tangible: 12%
Hagopian et al.	1998	21	Children age 2-16, diagnosed with mental retardation and a severe behavior disorder.	Inpatient	Unknown	Self-Injury: 67% Aggression: 100% Disruption: 90% Pica: 5% Elopement: 5%	Escape: 29% Attention: 33% Tangible: 5% Multiple: 33%

Table 1 - continued

Authors	*Year*	*n*	*Participants*	*Setting*	*Duration*	*Topographies Evaluated*	*Functions Identified*
Iwata et al.	1994	152	Individuals diagnosed with mental retardation.	Inpatient	Full	Self-Injury	Social positive: 26% Social negative: 38% Automatic positive: 19% Automatic negative: 1% Multiple: 5% Cyclical/Unpredictable: 4%
Kurtz et al.	2003	30	Children under age 5 with diagnosis of developmental delay or mental retardation	Outpatient	Unknown	Self-Injury (SIB) Aggression Disruption Dangerous Behavior Tantrums (Final four classified as Problem behavior – PB)	Social positive: SIB-37% PB-62% Social negative: SIB-3% PB-4% Social positive & negative: SIB-7% PB-16% Automatic: SIB-13% PB-4% Undifferentiated: SIB-37% PB-12%
Piazza et al.	2003	15	Children with feeding problems	Outpatient	Full	Inappropriate mealtime behavior. (Batting, head turning, negative vocalizations, throwing food, covering face, self injury, hand mouthing, aggression)	Escape: 60% Attention: 53% Tangible: 13%

Table 1 - continued

Authors	*Year*	*n*	*Participants*	*Setting*	*Duration*	*Topographies Evaluated*	*Functions Identified*
Wacker et al.	2005	26	Children age 1-6, with diagnosis of developmental delay or multiple disabilities, & disruptive behavior.	Homes	Unknown	Self-Injury: 50% Aggression: 73% Destruction: 62%	Social positive: 25% Social negative: 8% Social positive & negative: 56% Undifferentiated: 16%
Wacker et al.	1998	28	Children age 1-6, with diagnosis of developmental delay, multiple disabilities & aberrant behavior.	Homes	Unknown	Self-injury: 75% Aggression: 57% Destruction: 71%	Social positive: 21% Social negative: 46% Social positive & negative: 17% Undifferentiated: 3% Assessment not completed: 7% No Behavior observed: 3.6%

CHAPTER V

RATIONALE FOR THE PRESENT STUDY

In an earlier chapter, it was noted that the Centers for Disease Control (2006) estimated the prevalence of autism spectrum disorders among children aged 4 to 17 years to be 5.5 to 5.7 out of 1000 children. This is significantly higher than previous estimates, and clearly indicates that this population of individuals is one that requires attention in the research literature. Further, problem behavior is a common occurrence for individuals diagnosed with an autism spectrum disorder (e.g., Farrar-Schneider, 1992; Oswald et al., 1992). As was noted earlier, an important benefit of epidemiological investigations of functional assessment data is that they allow us to understand and possibly predict the probability of given behavioral functions under certain conditions, including the topographies evaluated, the method of functional analysis conducted, the population used, and so forth. It should be noted that such combined data represent collections of single-case experiments, and are therefore not subject to the criticisms of group-design data. In order for us to reap the full benefits of such aggregated data, however, more comprehensive and detailed data must be reported. For example, no quality epidemiological data exist with respect to autism spectrum disorders alone. Most studies report results across all participant diagnoses, typically a variety of several developmental disabilities. Further, no studies have been published in which participants with autism spectrum disorders are specifically classified as being diagnosed with autism, Asperger's disorder, or PDD-NOS. Therefore, no conclusions can be made with respect to potential differences in problem behavior across these disorders. For example, while all three disorders are

classified as autism spectrum disorders, it is possible that the problem behavior of individuals diagnosed with autism differs from the problem behavior of individuals with Asperger's disorder or PDD-NOS. Finally, although some researchers include descriptive assessments in their functional assessment procedures, none of the reviewed studies reported the results of those assessments or aggregated descriptive assessment data from several cases.

The purpose of this study is to examine individual client data from an outpatient clinic serving children with autism spectrum disorders to investigate potential relations between the function of problem behavior as determined by a functional assessment and the following variables: diagnosis, behavioral topography, functional assessment method, and intervention recommended. Further, aggregated data will be presented for both descriptive assessment results and functional analysis results.

CHAPTER VI

METHOD

Cases Reviewed

All of the cases reviewed for this study represent clients of a small, university-based outpatient training clinic in Michigan serving children aged 2 to 12 years who have been diagnosed with autism, Asperger's disorder, or PDD-NOS. These cases were drawn from the problem behavior service of the clinic, in which the problem behaviors of the client are evaluated using functional assessment, and then function-based treatment recommendations and proficiency-based training are provided for parents or other caregivers. See Appendix A for a visual depiction of the problem behavior service. Thirty-two cases were available for review.

Variables Coded

Each case was coded for several demographic variables, including age of the client at intake, diagnosis, and the topography of the target problem behavior. See Table 2 for a summary of some of these demographic variables. Two variables were coded with respect to the results of informant assessment, which was conducted for every case. First, parents or caregivers were often asked to complete the Functional Assessment Screening Tool (FAST; Iwata, 1995). Therefore, the results of this rating scale were coded by recording the score for each potential behavioral function endorsed by each informant. Second, the results of the clinic's functional assessment interview were also recorded. The results of these two forms of informant assessment were used to identify the hypothesized behavioral function.

Descriptive assessment was typically conducted by parents or caregivers who collected data in the form of either narrative or structured, response-dependent ABC assessment. The mean number of events recorded among cases utilizing descriptive assessment was 18.1, with a range of 5 to 34 events. Such data were collected for low-rate problem behavior. Thus, for cases in which descriptive assessment was conducted, the identified function(s) of the target behavior was recorded. For those cases in which a functional analysis (i.e., cases with high-rate problem behavior) was conducted, the behavioral function(s) was also coded. Finally, for each of the behavioral functions identified with respect to a target problem behavior, the intervention(s) selected to address that function was coded.

Table 2. Case characteristics.

		Number of Cases	*Percentage of Total Sample*
Diagnosis	Autism	23	71.8
	Asperger's	5	15.6
	PDD-NOS	4	12.5
Problem Behavior	Aggression	16	50
	Tantrums	6	18.8
	Self-injury	3	9.4
	Vocal Stereotypy	3	9.4
	Pica	2	6.3
	Property Destruction	2	6.3
	Dropping to Floor	1	3.1
	Elopement	1	3.1
	Food Refusal	1	3.1
	Food Stealing	1	3.1
Assessment	Descriptive Assessment	10	31.3
	Functional Analysis	22	68.7

Coding Procedure

All variables were coded by examining the individual records for each case. See Appendix B for the coding datasheet. In order to determine the behavioral function according to the descriptive assessment or functional analysis results, the results were examined during the time of service delivery by one or both of the two co-directors of the clinic. One director was a Ph.D.-level Board Certified Behavior Analyst, and the other director was a Ph.D.-level licensed clinical psychologist. With respect to descriptive assessment results, the directors evaluated graphs indicating the frequency of each antecedent-consequence pair (i.e., putative contingency) identified in order to determine the likely function(s) of the target behavior. See Figure 1 for an example of such a graph depicting a social positive reinforcement function.

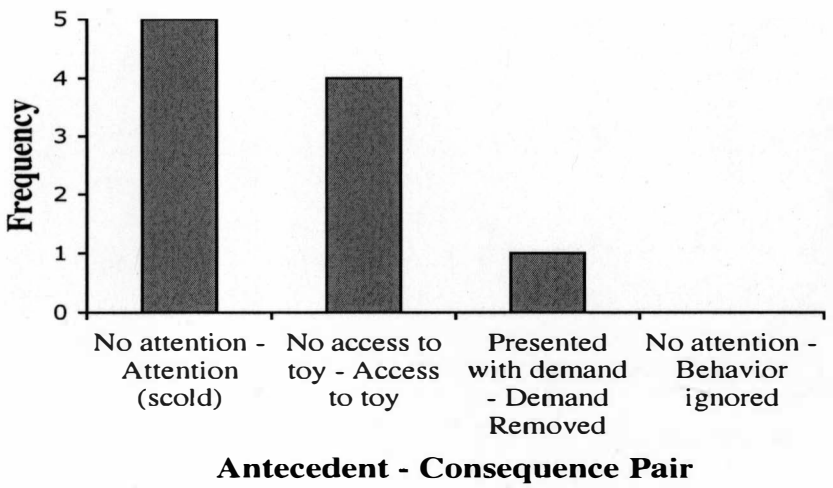

Figure 1. Hypothetical individual descriptive assessment results.

To determine behavioral function from functional analysis results, the directors evaluated graphs depicting the target behavior during each session of the

analysis, and compared the rate of behavior in each test condition to the control condition. Specifically, the directors looked for consistent separation between the test-condition data path and the control-condition data path, such that there was no overlap in the two data paths. See Figure 2 for an example of such a graph depicting a social negative reinforcement function.

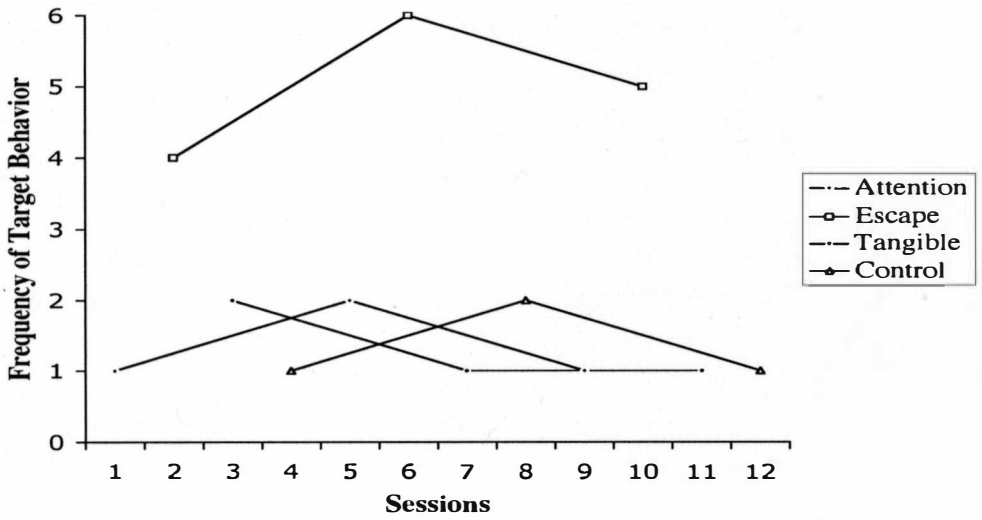

Figure 2. Hypothetical individual functional analysis results.

Interobserver Agreement

Interobserver agreement on coding was assessed for all variables for 31% of cases and was calculated using point-by-point agreement (number of agreements divided by the number of agreements plus disagreements, multiplied by 100%) for each case. Mean interobserver agreement was 95.4% (range, 81.8% to 100%).

CHAPTER VII

RESULTS

Distribution of Functions in the Total Sample

The overall distribution of behavioral functions from the total sample of 32 cases is presented in two ways. First, the pie chart in Figure 3 indicates the proportion of cases displaying each behavioral function, with 45% of cases displaying multiple behavioral functions. In addition, the bar graph in Figure 3 depicts the proportion of cases displaying each behavior function, but with the 45% of cases displaying a multiple behavioral function separated into the individual functions that comprised the multiple function. That is, a case for which both an attention and escape function was identified would be counted in the proportion for each of those individual functions. Note that this method of breaking down identified multiple functions into their component functions is used in all subsequent figures in which the percentage of cases displaying a given behavioral function is depicted.

There are two important findings worth noting in the results depicted in Figure 3. First, problem behavior in children with autism spectrum disorders seems to be maintained largely by social reinforcement. This may be a result of the fact that these individuals have not acquired socially appropriate means to gaining access to social reinforcement, or that the environments in which they behave are not responsive to less troublesome forms of behavior (Iwata et al., 1994). Second, these results indicate a fairly high proportion of multiply controlled behaviors as compared to the epidemiological data reviewed in an earlier chapter. While it is possible that these results are characteristic of problem behaviors in this population (i.e., these

individuals are sensitive to many types of consequences that may come to maintain problem behavior and potentially lack the skills to contact these consequences in socially appropriate ways), it is also possible that they are an artifact of the functional analysis methodology used.

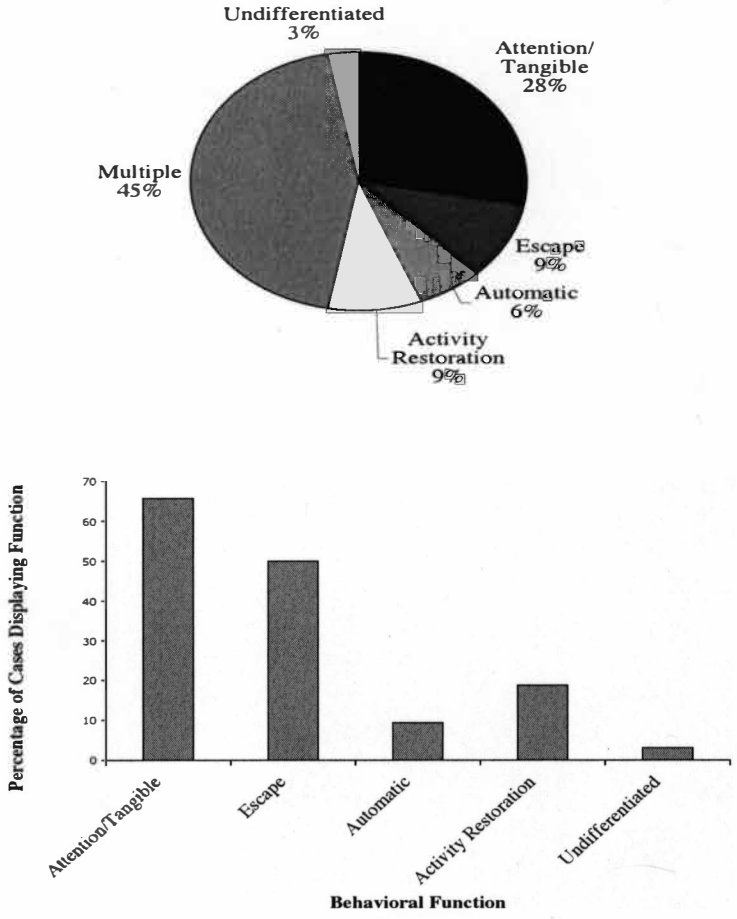

Figure 3. Distribution of behavioral functions from total sample.

More than two-thirds of these cases were assessed with a brief functional analysis, which may falsely identify multiple behavioral functions. Kahng and Iwata (1999) examined the correspondence between full functional analysis and brief

functional analyses. The authors found that while results from brief functional analyses corresponded with results from full functional analyses for 66% of cases, results from brief functional analyses were more likely to identify behavioral functions that were not supported by the results of full analyses (i.e., false positives). Thus, it is possible that with longer functional analyses, some of the behavioral functions that appear to be relevant at the beginning of the analysis may actually drop out as the analysis continues and the individual has more contact with the experimental conditions.

Descriptive Assessment vs. Functional Analysis

The distribution of behavioral functions from cases utilizing descriptive assessment and cases utilizing functional analysis are quite similar (see Figure 4).

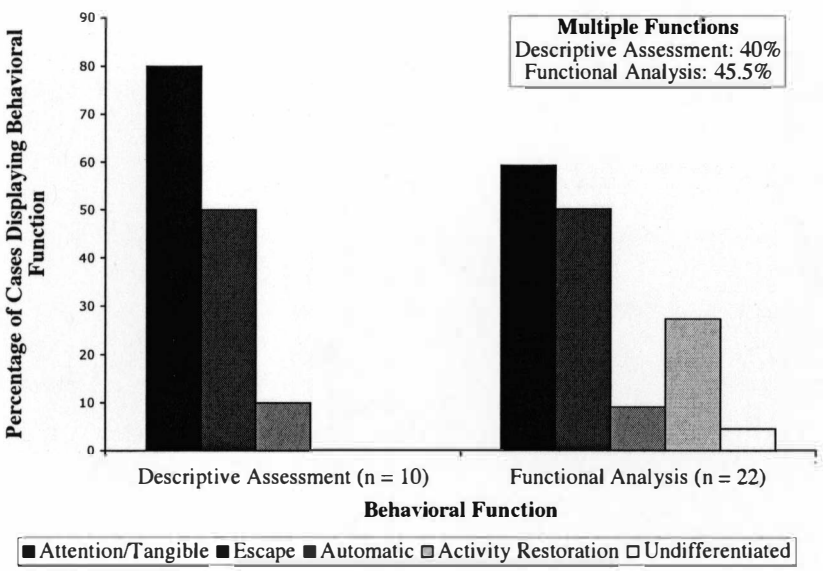

Figure 4. Distribution of behavioral function for cases assessed with descriptive assessment compared to cases assessed with functional analysis.

The one notable difference in the results from these two methods of assessment is in the lack of identified activity-restoration functions identified with descriptive assessment. It should be noted, however, that descriptive assessment and functional analysis are not simply different methods of assessing the function of a given behavior, but, at least within this clinic, are also associated with different rates of problem behavior. That is, low-rate problem behavior was assessed using descriptive assessment while high-rate problem behavior was assessed using functional analyses. Thus, the lack of identified activity-restoration functions from descriptive assessments may indicate that behavior maintained by restoration of an activity or ritual typically occurs at high rates.

Diagnosis

The distribution of behavioral function by diagnosis is presented in Figure 5. Cases involving children with Asperger's disorder and PDD-NOS have been combined to increase the sample size for this sub-sample and allow for a more valid comparison to individuals with autism. There are two notable differences between these sub-samples with respect to the distribution of behavioral function. First, individuals with Asperger's disorder or PDD-NOS seem less likely than individuals with autism to display problem behavior maintained by escape. This may stem from the fact that individuals with Asperger's disorder or PDD-NOS, as a group, tend to be higher functioning than individuals with autism, and typically have more developed language skills. Therefore, these individuals may be better equipped to deal with demands and be more likely to have a socially appropriate escape response in their repertoire. Second, individuals with Asperger's disorder or PDD-NOS seem more

likely than individuals with autism to display problem behavior maintained by activity restoration. Age may play a role in this, in that older children tend to display more developed rituals, the disruption of which may lead to problem behavior. For example, Gray and Tonge (2001) found that infants and preschool aged children rarely exhibit ritualistic or stereotyped behaviors, while older children and adults tend to exhibit those behaviors more frequently. Further, younger children with autism often display motor and sensory stereotypic behavior while older children display more complex ritualized behavior such as obsessions and compulsions (Militerni, Bravaccio, Falco, Fico, & Palermo, 2002). While the average ages in the two sub-samples in the present study did not differ substantially, it is interesting to note that of the 6 cases displaying an activity restoration function, only one case involved a child under the age of 6.

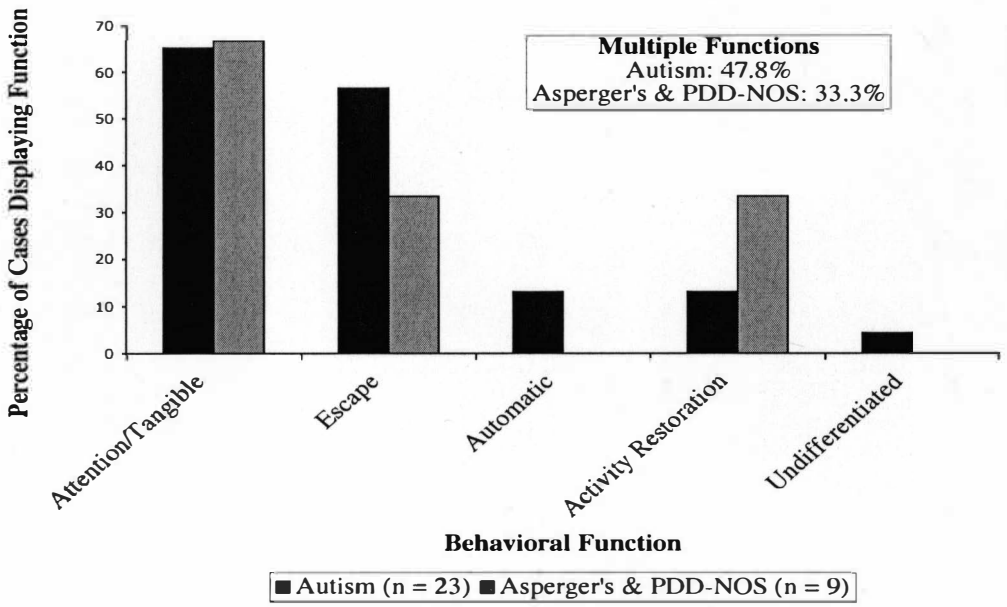

Figure 5. Distribution of behavioral function by diagnosis.

Hypothesized vs. Identified Behavioral Function

The relationship between the behavioral functions hypothesized based on results from informant assessments and the behavioral functions identified through subsequent assessment (i.e., descriptive assessment or functional analysis) was analyzed using a signal-detection approach within each behavioral function category. The results are presented in Table 3. Results are not presented for the activity restoration function as this function was never presented as a hypothesis following informant assessment. Rather, this condition was selected for inclusion in functional analyses only after informant assessment results were discussed during clinic staff meetings. A result was determined to be a "true positive" if the informant assessment identified the function and it was supported in a subsequent assessment. Similarly, a result was coded as a "true negative" if informant assessment did not identify the function and the function was not identified in subsequent assessment. A "false positive" was coded for cases in which a function was identified by informant assessment but was not found in subsequent assessments. Finally, a "false negative" was coded for cases in which a function was not identified in informant assessment but was supported by subsequent assessment.

Table 3. Relationship between behavioral function hypothesized from informant assessment and behavioral function identified through descriptive assessment or functional analysis (percentage of cases).

Relationship	*Attention/Tangible*		*Escape*		*Automatic*	
True Positive	61.3		41.9		9.7	
True Negative	12.9		25.8		80.6	
False Positive		19.4		22.6		9.7
False Negative		6.5		9.7		0
Total	74.2	25.9	67.7	32.3	90.3	9.7

These results are promising in that the proportion of cases in which the relationship can be described as a true positive or true negative are relatively high as compared to false positives and false negatives. The finding that the proportions of false positives are higher than the proportions of false negatives suggests that the informant assessment is thorough in identifying all potential antecedents or consequences relevant to the target problem behavior, and that subsequent assessments are successful in discounting the consequences that are not actually involved in the maintenance of problem behavior.

Behavior Topography

Of the 32 cases coded for this study, only one behavioral topography occurred frequently enough to warrant an analysis of any potential relationship between that topography and the distribution of behavioral function – aggression. In 2001, Marcus, Vollmer, Swanson, Roane, and Ringdahl assessed the operant functions of aggression displayed by eight children and adolescents with developmental disabilities using functional analyses. The results from the 32 cases analyzed in the current study as well as the Marcus et al. (2001) study are presented in Table 4.

Table 4. Percentage of cases of aggressive behavior displaying each behavioral function in the current study compared to Marcus et al. (2001).

Behavioral Function	*Current Study: DA & FA Cases (n=16)*	*Current Study: FA Cases Only (n=12)*	*Marcus et al. (2001) (n=8)*
Attention/Tangible	50	41.67	50
Escape	50	50	37.5
Activity Restoration	25	33.33	N/A
Multiple	31.25	33.33	0
Undifferentiated	6.25	8.33	12.5

It should be noted that Marcus et al. (2001) utilized the same experimental conditions for each participant (i.e., attention, escape, tangible, no interaction, and control) while the current study determined which conditions to include in the functional analyses based on informant assessment. This procedural difference explains the lack of identified activity restoration in the Marcus et al. results, in that such a condition was never included in their functional analyses. It is interesting to note, however, that Marcus et al. did not identify any participants for whom aggression was multiply controlled. This may also be a result of methodological differences. Marcus et al. used a three-phase progression to extend brief functional analyses when necessary to better identify operant functions. Specifically, the three phases were (1) brief multielement design with within-session data analysis, (2) extended multielement design with overall session means used in data analysis, and (3) pairwise test-control multielement design. Thus, it is possible that the extended analyses utilized by Marcus et al. eliminated some of the behavioral functions initially identified in brief analyses that may be contributing to the high rates of multiply controlled aggression seen in the current study. Taken together, the results of these two studies lend further support to the notion that problem behavior, and specifically aggression is maintained largely by social reinforcement.

Recommended Intervention

Once the relevant behavioral functions had been identified, clients of the clinic utilized for this study were provided with treatment recommendations and training on their implementation. The mean number of intervention components recommended was 2.9, with a range of 1 to 6 components. Table 5 presents the

percentage of cases for which a given intervention was recommended, for both the total sample and the sub-samples grouped by behavioral function. It is important to note that the form of extinction recommended varied according to the behavioral function identified, as it is vital that the specific form of extinction match the type of reinforcement shown to be maintaining the behavior (Iwata, Pace, Cowdery et al., 1994). See Appendix C for a glossary of the terms in this table.

There are a few findings with respect to intervention recommendations that are worth noting. First, the finding that interventions such as functional communication training (FCT) and noncontingent reinforcement (NCR) are recommended for such high proportions of cases lends support to the notion that many of these individuals lack socially appropriate skills to access social reinforcement, and that their current environments might be likely to provide that reinforcement contingent on problem behavior.

Table 5. Percentage of cases for which specific interventions were recommended.

Intervention	*Total Sample (n=32)*	*Attention/ Tangible (n=21)*	*Escape (n=16)*	*Automatic (n=3)*	*Activity Restoratio n (n=6)*
Extinction	93.8	85.7	62.5	0	33.3
NCR	53.1	44.4	31.3	100	16.67
DRA	43.8	44.4	31.3	0	16.7
FCT	43.8	28.6	37.5	0	33.3
Guided Compliance	40.6	9.5	50	0	50
Signalled Interruption	25	9.5	6.3	0	83.3
Curricular Revision	9.4	4.8	12.5	0	0
Signalled Availability of Attention	9.4	14.3	0	0	0
Token Economy	9.4	9.5	6.3	0	0
Environmental Cleaning	6.3	4.8	0	33.3	0
Choice Procedure	3.1	4.8	0	0	0
Demand Fading	3.1	0	6.3	0	0
Discrimination Training	3.1	0	0	33.3	0

Table 5 - continued

Intervention	*Total Sample (n=32)*	*Attention/ Tangible (n=21)*	*Escape (n=16)*	*Automatic (n=3)*	*Activity Restoration (n=6)*
Errorless Prompting	3.1	0	6.3	0	0
Punishment	3.1	0	0	33.3	0

Second, the percentage of cases for which extinction was recommended varies considerably across behavioral functions. For example, extinction was recommended for relatively fewer cases in which escape or activity restoration functions were identified, as compared to cases in which attention or tangible functions were identified. This may be a result of the fact that escape extinction can be difficult to implement consistently, as it requires caregivers to continue presenting a demand in the face of ongoing problem behavior, which creates a very aversive situation for the caregiver. Further, it is possible that antecedent interventions such as guided compliance or signaled interruptions are often successful in such cases. Guided compliance, for example, may decrease the aversiveness of demands from the child's perspective in that prompts are provided that allow the child to more easily comply with the demand, and therefore decrease the motivation for escape. Similarly, signaled interruptions may decrease the aversiveness of transitions from one activity to another and therefore decrease the likelihood of problem behavior occurring during those transitions.

CHAPTER VIII

DISCUSSION

Results of the present study in which the individual client data from the problem behavior service of an outpatient clinic were assessed indicate that social reinforcement was involved in the maintenance of problem behavior for the vast majority of cases. These findings lend further support to the notion that functional assessment methodologies are useful not only in identifying the contingencies of reinforcement that maintain problem behavior, but also during epidemiological analysis of behavioral function for a large group of individuals (Iwata et al., 1994). Based on the two main purposes of such epidemiological research – description and prediction – such data allow us to better understand and possibly predict the likely function of problem behavior under certain conditions. Specifically, the data analyzed in this study help us to understand that the problem behavior exhibited by individuals with autism spectrum disorders is largely maintained by social reinforcement, suggesting that these individuals lack socially appropriate responses to gain access to such reinforcement, or that their social environments are not adequately responsive to less problematic behavior (Iwata et al., 1994). It should be noted that this study does represent a type of group design research in which a fairly heterogeneous sample was used. Therefore, results ought not be generalized to specific individuals but rather groups of individuals. That is, one might use the data presented here in order to predict the functions of problem behavior that might occur within a classroom of children diagnosed with autism spectrum disorders.

Further, with respect to the purpose of description, the finding that these data are quite similar to the findings of other epidemiological research involving individuals with a variety of developmental disabilities suggests that the problem behavior exhibited by children diagnosed with autism spectrum disorders can be treated similarly to the problem behavior of children with other developmental disabilities. This is likely a result of the fact that all of these children generally have communication deficits as well as adaptive behavior deficits, and that caregivers within this culture provide relatively similar consequences to the problem behavior of these children. These findings emphasize the importance of teaching such individuals socially appropriate responses to gain access to social reinforcement, as well as carefully designing their environments (e.g., instructional settings) so as to avoid creating conditions that make the occurrence of problem behavior more likely.

Strengths and Limitations

The present study provides some noteworthy improvements over previously published studies of epidemiological data on problem behavior. First, this study provides data from individuals with a single class of diagnoses, and further analyzed results according to sub-classes of diagnosis. As compared to previous studies in which the data from individuals with multiple types of developmental disability were analyzed together, the approach taken here allows us to draw conclusions regarding relationships that may exist between an individual's diagnosis and the function of the problem behavior they exhibit. Findings from the current study, for example, provide preliminary support for the conclusion that the problem behavior of individuals with

Asperger's disorder or PDD-NOS is less likely to be maintained by escape and more likely to be maintained by activity restoration than individuals with autism.

Second, the current study included data from descriptive assessments, procedures commonly used for low-rate behavior that cannot be easily assessed through functional analysis. The finding that the distribution of behavioral function from cases utilizing descriptive assessment was similar to the distribution of behavioral function from cases utilizing functional analysis provides preliminary indirect support for this descriptive assessment methodology (i.e., response-dependent ABC recording) in identifying the function(s) of low-rate problem behavior.

Despite these strengths, there are some important limitations to the present study that must be noted. First, the conditions utilized in the functional analyses were determined based on information collected during informant assessment. Therefore, it is possible that other behavioral functions were present and were simply not analyzed in the functional analysis if those potential functions were not identified through informant assessment. Second, the cases assessed in this study represented families who willingly sought services for their children. It is quite possible that the distribution of behavioral functions as well as the relationship between hypothesized and identified functions would look different if our sample had included cases involving milder problem behaviors that might not motivate parents or caregivers to seek services. Third, the brief functional analysis methodology used might have resulted in inflated identification of problem behavior maintained by multiple functions. It is possible that more extended analyses would have eliminated some of

these potentially inaccurate identifications of function. In previously published epidemiological data on problem behavior, however, the rates of multiply controlled problem behaviors vary considerably across studies utilizing both brief and extended analyses (e.g., Asmus et al., 2004; Hagopian et al., 1997; Iwata et al., 1994). Thus, no firm conclusions can be made at this time regarding the relationship between the duration of the analysis and the identification of multiple behavioral functions. Fourth, the case files assessed in this study did not provide any follow-up data with respect to the success of the interventions recommended. Thus, although the recommendations provided were based on the behavioral function(s) identified, no conclusions can be made about the success of those interventions. Next, the co-directors of the clinic may have exhibited some personal influence over the interventions selected. That is, interventions were selected based on the behavioral function(s) identified, but it is possible that the specific intervention procedure selected was influenced by the personal preference of one of the co-directors. Finally, this study relied on a relatively small sample size of cases that represents a heterogeneous group of individuals, precluding generalization of the results to other individuals. A larger sample size would have provided more power, and a more homogeneous group would have allowed to potential generalization of results to similar individuals.

Future Research and Clinical Recommendations

An important benefit of epidemiological investigations of functional assessment data is that they allow us to understand and potentially predict the probability of behavioral functions under certain conditions. In order to reap the most

benefit of such data, it is recommended that future researchers continue to analyze aggregate data in this manner. Specifically, in order to evaluate differences in the distribution of behavioral function across diagnoses, future investigations ought to assess and present data according to specific diagnoses. Second, research comparing the distributions of behavioral function from individuals referred for services or whose families willingly sought services and those individuals whose families did not seek services might indicate important relationships between the severity of problem behavior and its corresponding function. Such analyses could easily be conducted in clinical or educational settings in which a wide range of problem behaviors are likely to occur. Third, based on the finding that brief functional analyses are more likely to result in false identification of behavioral functions while within-session analyses are more likely to result in false failure to identify behavioral functions, future research and clinical practice could benefit from combining these two methods in order to increase the accuracy of functional analyses (Kahng & Iwata, 1999). Finally, as mentioned previously the overwhelming proportion of cases displaying problem behavior maintained by social reinforcement emphasizes the importance of clinicians or other educators teaching these individuals socially appropriate responses to gain access to social reinforcement, or teaching parents how to teach their children basic communicative responses, as well as carefully designing their environments so as to avoid creating conditions that make the occurrence of problem behavior more likely.

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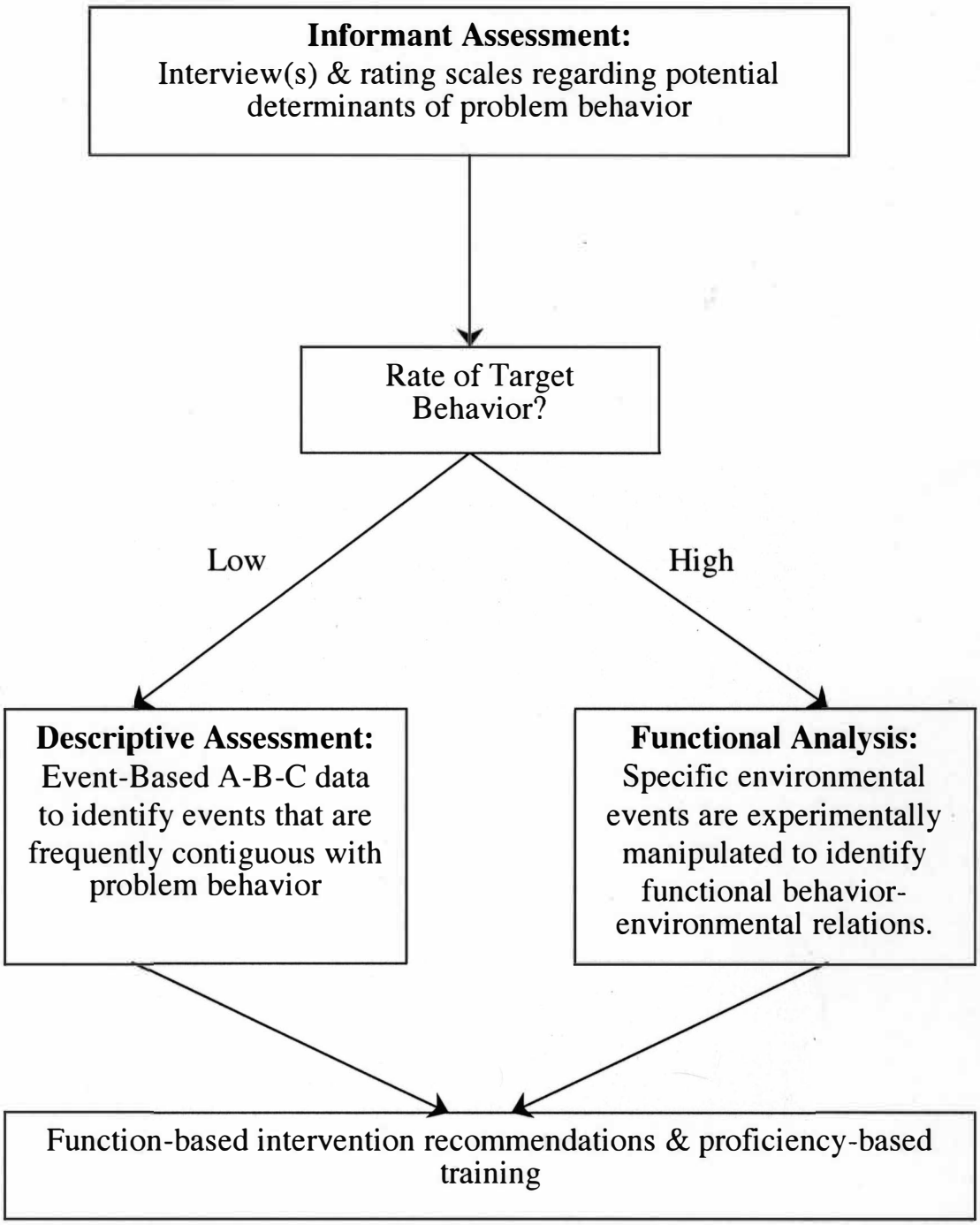
Appendix A

Problem Behavior Service Flowchart

Problem Behavior Service Flowchart



Appendix B

Coding Datasheet

Coding Datasheet

General Case Information:

Case Number: _____ Gender: ❑ Male ❑ Female

Date of Intake: _____ Age at Intake: _____ Years _____ Months

Referral Source: ❑ Pediatrician ❑ SLP ❑ OT ❑ Parent ❑ School
❑ Psychologist/Psychiatrist
❑ Other: _____

Diagnosis: Date of Diagnosis: _____ ❑ Unknown
❑ DSM-based diagnosis ❑ Educational Evaluation ❑ Unknown
❑ Autism ❑ Asperger's ❑ PDD-NOS
❑ Other:

_____

If CFA conducted the Diagnostic Evaluation and we have the information:

GADS/ GARS * Scores that match diagnosis (i.e. GARS-Autism)	**Informant**	**Quotient**	**Probability**
ADOS Module # _____	**Domain**	**Score**	**Autism/Spectrum Cut-off**
	Communication		
	Reciprocal Social Interaction		
	Communication + Social		
	Imagination/Creativity		N/A
	Stereotyped Behaviors / Interests		N/A
ADI-R	**Category**	**Score**	**Cut-off Score**
	Reciprocal Social Interaction		10
	Communication		8
	Restricted, repetitive and stereotyped behavior		3
	Abnormality at or before 36 months		1
PPVT Form ❑ A ❑ B	Standard Score:	Age Equivalent:	
EVT	Standard Score:	Age Equivalent:	
IQ Test	Assessment:	Full Scale IQ Score:	

Vineland	**Domain**	**Standard Score**	**Percentile Rank**	**Adaptive Level**
	Communication			
	Daily Living Skills			
	Socialization			
	Motor Skills			
	Composite			

Functional Assessment

Target Behavior: ❑ Aggression ❑ Tantrums ❑ Vocal Stereotypy
❑ Motor Stereotypy ❑ Self-injury ❑ Elopement
❑ Other: _____

Informant Assessment

Therapist-hypothesized function from interview and/or rating scale:
❑ Social + ❑ Social - ❑ Undifferentiated
❑ Automatic + ❑ Automatic –

	Informant	Social +	Social -	Automatic +	Automatic -
FAST or MAS (Circle one)					

Descriptive Assessment ❑ *Not conducted*

Data Collector: ❑ Mother ❑ Father ❑ Grandparent
❑ Other: _____

Total occurrences recorded: _____

Type: ❑ Narrative ABC ❑ Structured ABC

Behavioral Function(s): (check all that apply)

❑ Social +:
- ❑ Attention
- ❑ Tangible interaction

❑ Social –
- ❑ Escape from demand
- ❑ Escape from

❑ Automatic +

❑ Automatic –

❑ Undifferentiated

Functional Analysis ❑ *Not conducted*

Conditions: Check all that apply, and record number of sessions.

❑ Control _____ ❑ Attention _____ ❑ Escape _____

❑ Tangible _____ ❑ Alone _____

❑ Other: _____ # _____

Duration of sessions: _____ minutes

Who ran the sessions? ❑ Caregiver ❑ CfA Staff ❑ Unknown

IOA: Mean _____ Range _____ ❑ Not conducted

Behavioral Function(s): (check all that apply)

- ❑ Social +:
  - ❑ Attention
  - ❑ Tangible interaction
- ❑ Automatic +
- ❑ Undifferentiated
- ❑ Social –
  - ❑ Escape from demand
  - ❑ Escape from
- ❑ Automatic –

Please fill in the interventions selected for each behavioral function identified.

Behavioral Function	Intervention(s) Selected
Social +	❑ Extinction ❑ 3-step Guided Compliance ❑ FCT ❑ NCR ❑ Antecedent Manipulation ❑ DRA ❑ Sensory Stimulation ❑ Demand Fading ❑ Errorless Compliance Training ❑ Other: _____
Social -	❑ Extinction ❑ 3-step Guided Compliance ❑ FCT ❑ NCR ❑ Antecedent Manipulation ❑ DRA ❑ Sensory Stimulation ❑ Demand Fading ❑ Errorless Compliance Training ❑ Other: _____
Automatic +	❑ Extinction ❑ 3-step Guided Compliance ❑ FCT ❑ NCR ❑ Antecedent Manipulation ❑ DRA ❑ Sensory Stimulation ❑ Demand Fading ❑ Errorless Compliance Training ❑ Other: _____
Automatic -	❑ Extinction ❑ 3-step Guided Compliance ❑ FCT ❑ NCR ❑ Antecedent Manipulation ❑ DRA ❑ Sensory Stimulation ❑ Demand Fading ❑ Errorless Compliance Training ❑ Other: _____

Appendix C

Glossary of Intervention Terms

Glossary of Intervention Terms

Choice procedure. This procedure involves presenting an individual with a choice between two alternatives (e.g., activities) so as to potentially decrease the aversiveness of committing to either of the two choices.

Curricular revision. Curricular revision involves modifying aspects of an individual's curriculum or educational plan so as to decrease occurrences of problem behavior during instruction. Characteristics of the curriculum that might be changed include setting, rate of demands, difficulty of demands, instructional content, and so forth.

Demand fading. This procedure involves gradually introducing demands into a situation in which the probability of problem behavior occurring is low, so that an individual's tolerance of demands is gradually increased.

Differential reinforcement of an alternative behavior (DRA). DRA typically involves providing reinforcement for one or more socially appropriate responses, while reinforcement is not provided for other responses such as problem behavior.

Discrimination training. This training teaches an individual to respond differently to two different stimuli, or classes of stimuli. For example, an individual who engages in pica might be taught to accurately discriminate food items from non-food items.

Environmental cleaning. This procedure is typically recommended to address pica, and involves clearing an individual's environment of any non-food items such

that the opportunity to consume these items is eliminated or substantially decreased.

Errorless prompting. This prompting procedure involves initially providing immediate prompts so that the opportunity for error is virtually eliminated. Typically, these prompts are later faded as an individual displays signs of acquisition on the target skill or response.

Extinction. This procedure involves breaking the contingency between a response and its consequence. Specifically, the consequence that has been identified as maintaining a behavior is no longer provided.

Functional communication training (FCT). FCT involves teaching an individual a socially appropriate response to gain access to a given consequence. Often the consequence is one that was previously provided contingent on problem behavior. For example, the functional communication response "break" might be trained in an intervention for escape maintained problem behavior.

Guided compliance. This procedure provides an individual with graduated assistance in order to comply with an instruction or demand. For example, if an individual does not comply with an instruction, a gestural or visual prompt might be provided, followed by a physical prompt until the individual complies.

Noncontingent reinforcement (NCR). NCR involves providing reinforcement freely, rather than contingent on some behavior. In addressing problem behavior, this often involves providing the reinforcers that maintain problem behavior freely, perhaps on a fixed-time schedule.

Punishment. This procedures involves presenting some aversive condition or stimulus contingent on the occurrence of a behavior such that the future likelihood of the occurrence of that behavior is reduced.

Signalled availability of attention. This procedure involves a multiple schedule of reinforcement in which two schedules of reinforcement are in place and are each signaled by a discriminative stimulus. In addressing problem behavior in children, for example, this may involve a caregiver wearing a green bracelet during times when attention is readily available, and a red bracelet with attention is unavailable.

Signalled interruption. This intervention is typically recommended to address problem behavior that occurs during transitions, and involves providing an individual with several warnings about an upcoming transition before the transition is actually required.

Token economy. This system allows an individual to earn tokens for engaging in certain behavior, and then exchange the tokens at a later time for back-up reinforcers. Thus, the tokens serve as conditioned reinforcers.

Appendix D

Approval Letter From the Human Subjects Institutional Review Board

WESTERN MICHIGAN UNIVERSITY

Human Subjects Institutional Review Board

Date: September 29, 2006

To: James Carr, Principal Investigator
Linda LeBlanc, Co-Principal Investigator
Jessa Love, Student Investigator for thesis

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number: 06-09-24

This letter will serve as confirmation that your research project entitled "Functional Assessment of Problem Behavior in Children with Autism Spectrum Disorders: A Summary" has been **approved** under the **exempt** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note that you may **only** conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: September 29, 2007

Walwood Hall, Kalamazoo, MI 49008-5456
PHONE: (269) 387-8293 FAX: (269) 387-8276