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Relationship between problem behaviors, function, and adaptive skills in individuals with intellectual disabilities

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RELATIONSHIP BETWEEN PROBLEM BEHAVIORS, FUNCTION, AND
ADAPTIVE SKILLS IN INDIVIDUALS WITH INTELLECTUAL DISABILITIES

A Dissertation
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Abstract

The problem behaviors of self-injury, aggression, and stereotypies are among the most troubling and difficult to treat behaviors in individuals with intellectual disability (ID). One factor that has been implicated in the etiology and maintenance of problem behaviors in individuals with ID is adaptive skills deficits. However, the nature of the relationship between problem behaviors and adaptive skills deficits is not well understood. This relationship was assessed in two experiments. In Experiment 1, the researcher found an inverse, curvilinear relationship between problem behaviors (as identified by the Behavior Problems Inventory; BPI), and adaptive skills (as measured by the Vineland Adaptive Behavior Scale; VABS). In Experiment 1, the author also assessed the extent to which communication, socialization, and daily living skills predicted the presence of problem behaviors. The author found a significant multiple regression model that included all three domains, but the individual domains were not found to significantly predict problem behaviors independently. In Experiment 2, the researcher assessed whether specific adaptive behavior deficits (as measured by the VABS subscales) were differentially associated with the hypothesized functions maintaining problem behaviors, (i.e., social attention, access to tangible items, escape, physical pain, and nonsocial reinforcement), as measured by the Questions About Behavior Functions (QABF). The researcher found that individuals with a physical or nonsocial function engaged in significantly fewer communication, socialization, and daily living skills than the other groups. Implications and limitations of the study are discussed.

History of Intellectual Disability

The present study deals with an issue of great importance in the field of intellectual disabilities (ID): problem behaviors. The term ‘problem behaviors’ is used in relation to a number of behaviors, namely self-injury, aggression, and stereotypies. The present study investigated the relationship between problem behaviors and adaptive skills in individuals with ID. A brief overview of the history, prevalence, and etiology of ID, as well as information regarding the nature and assessment of adaptive skills and problem behaviors, will be provided.

ID has existed throughout history, although the attention paid to its study has varied. In the middle ages, physical disorders were given more attention than mental conditions. At this time, doctors began reporting cases of hydrocephalus and epilepsy (Scheerenberger, 1983). In the sixteenth century, Paracelsus, a Swiss physician, made the first distinction between mental illness and ID (Fiedler, 1978). Paracelsus noted that a high degree of variability existed in each. Declared to be “idiots” or “feeble-minded,” individuals with ID began receiving more attention during this time. However, persons with ID were deemed untrainable and little treatment occurred.

The 1800s proved to be a period of great optimism and progress in the field of ID. A physician named W.J. Little was the first to draw attention to the deleterious effects of premature birth (Leakey & Lewin, 1977). Little provided case studies that demonstrated the consequences of labor difficulties, hypoxia, and mechanical injuries during birth. Around the same time, Edouard Seguin divided idiocy (i.e., ID) into four categories: idiocy, imbecility, backwardness or feeblemindedness, and simpleness (Abt, 1965). Seguin was also the first to advocate for the training of these individuals, suggesting work that required simple, repetitive movements.

At the end of the 19th and beginning of the 20th centuries, interest in ID increased dramatically. The establishment of professional organizations, journals, and international conferences marked this period. In 1877, the American Association of Mental Deficiency (AAMD) officially endorsed its first definition of ID (Scheerenberger, 1983). The AAMD stated that idiocy was a lack of natural development of the mental and moral (i.e., social) powers, usually accompanied by a physical defect. The other hallmark of this time period was the advent of special education in the public schools. The Providence, Rhode Island public school system is credited with establishing the first public special education classroom (Elkin, 1977). Intended for individuals with mild ID, special education services included both regular academic courses and physical education.

The creation of public special education increased the need for standardization in the psychological measurement of ID. In 1905, the first standardized test of intelligence, the Binet-Simon Individual Tests of Intelligence, was created (Scheerenberger, 1983). The Binet-Simon Individual Tests of Intelligence was intended to distinguish between school-aged children with normal and below normal intelligence. Scoring of the test fell into three levels of ID: idiocy, imbecility, and moronity. In addition to test standardization, the beginning of the 20th century was characterized by an increase in social control over individuals with ID. Laws prohibited the marriage of two people with ID and many people endorsed sterilization. These negative attitudes carried over into the proliferation of institutions for individuals with ID.

The next period of reform in the study of ID came in the 1950s and 1960s. The revised Stanford-Binet Intelligence Test introduced new terminology for classification and the term intelligence quotient (IQ) was used. The new classification of ID consisted of borderline (IQ of 83-67), mild (IQ of 66-50), moderate (IQ of 49-33), severe (IQ of 32-16), and profound (IQ of

16). Researchers focused on behavioral aspects of ID, such as learning, motivation, and attention. With this research came a rapid expansion of special education classrooms across the United States.

In 1961 the AAMD revised its definition of ID, changing the definition to the “...sub average general intellectual functioning, which originates in the developmental period and is associated with impairment in adaptive behavior” (Hayes, 1969, p.17). Borderline ID was excluded from this definition, making mild ID an IQ of 67-52, moderate an IQ of 51-36, severe an IQ of 35-20, and profound an IQ of 19 and below. In addition, the AAMD definition added a new feature to the understanding of ID: impairment in adaptive behavior. Adaptive behavior consists of basic motor skills, self-help skills, learning, and social adjustment. Adaptive behavior and the instruments used for its assessment will be discussed in greater detail later in this literature review.

Current Diagnostic Criteria

The history of the classification of ID has led to our current understanding of the disorder. In 2000, the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR; APA, 2000) defined mental retardation (i.e., ID) as significantly subaverage intellectual functioning accompanied by limitations in at least two of eight adaptive behavior domains: communication, self-care, home living, social/interpersonal skills, work, leisure, health, and safety. Onset of these deficits must occur prior to the age of 18. Sub average intelligence is characterized by an IQ of below 70 or two standard deviations below the mean on a standardized intelligence test. Adaptive behavior is defined as a person’s effectiveness in meeting the standards expected for his or her age (APA, 2000).

ID is currently divided into the same four categories as proposed by the AAMD in 1961. An individual meets the diagnosis of Mild Mental Retardation if (s) he has an IQ of approximately 70 to 50-55. Persons with Mild Mental Retardation make up 85% of all individuals with ID (APA, 2000). Children with Mild Mental Retardation usually develop appropriate social and communicative skills in preschool and are not identifiable until their late teenage years. As adults, these individuals often acquire sufficient social and vocational skills as to require minimal assistance to live independently or in a group-home setting (APA, 2000). The next category is moderate mental retardation. Moderate Mental Retardation is diagnosed when IQ falls between 55-50 and 35-40. Persons with Moderate Mental Retardation make up 10% of all individuals with ID (APA, 2000). An individual with Moderate Mental Retardation rarely progresses past the second-grade level of schooling, and often exhibits difficulty in social situations. These individuals may benefit greatly from social and vocational training. An IQ of 35-40 to 20-25 characterizes the third category, Severe Mental Retardation. Severe Mental Retardation constitutes only 2-3% of individuals with mental retardation. A child with Severe Mental Retardation will usually acquire little or no communicative speech, but may eventually learn limited speech and basic self-help skills. The final category is Profound Mental Retardation. Profound Mental Retardation constitutes the remaining 1-2% of individuals with ID. Profound Mental Retardation is diagnosed when IQ falls below 20 or 25, and is usually accompanied by deficits in sensorimotor functioning, communication, and motor development (APA, 2000). For many persons with Profound Mental Retardation, a specific neurological condition can be identified that accounts for the mental retardation. Most of these individuals require highly supervised and individualized care (APA, 2000).

Prevalence and Etiology of ID

ID is believed to occur at a rate of approximately 1% in the general population (APA, 2000). The 1994/1995 National Health Interview Survey (Larson et al., 2001) estimated the rate of ID to be 0.78%, the rate of developmental disabilities to be 1.13%, and the rate of combined ID and developmental disabilities to be 1.49%. Bernsen (1976) and Darragh (1982) reported the prevalence of an IQ below 50 to be three to four per 1,000. The rates vary when this category is divided into moderate, severe, and profound levels of ID. The prevalence of moderate impairment has been found to be two per 1,000, and that of severe impairment to be 1.3 per 1,000 (Fishbach & Hull, 1982; McQueen, Spence, Garner, Pereira, & Winsor, 1987). Reported prevalence of profound ID is 0.4 per 1,000 (Baird & Sadovnick, 1985; McQueen et al., 1987).

The prevalence of ID across gender has also been investigated. Authors of the DSM-IV-TR reported a male to female ratio of 1.5:1 (APA, 2000), which is similar to that reported by other studies (e.g. Laxova, Ridler, & Bowen-Bravery, 1977; Lindsey & Russell, 1981). However, the reasons for an increased rate of ID among males are not clear. Further study into the role of gender, degree of ID, and etiology are necessary to begin to understand the relationship between gender and ID (McLaren & Bryson, 1987).

The final subject under review in this section is the etiology of ID, which is as broad as the disorder itself. In approximately 30-40% of individuals with ID there is no known etiology (APA, 2000). Furthermore, as many as 50% of individuals with ID present with more than one potential causal factor (Gustavson et al., 1977; McQueen et al., 1986). For the remaining portion of the population, etiological factors include heredity, genetics, prenatal and perinatal conditions, and general medical conditions acquired in infancy and early childhood.

Several genetic causes of ID exist. Some heritable forms of ID include: Tay-Sachs disease, tuberous sclerosis, fragile X syndrome, and phenylketonuria. In addition, early alterations in embryonic development, such as those seen in Down's Syndrome and Fetal Alcohol Syndrome, can also predispose an individual to ID. Other common predisposing factors are conditions that arise during prenatal and perinatal development. These conditions include fetal malnutrition, prematurity, hypoxia, trauma, and viral infection. Prenatal factors are thought to be the cause of 20% to 30% of the cases of ID (Gustavson, Hagberg, Hagberg, & Sars, 1977; McQueen et al., 1986) and are considered to be more common than perinatal and postnatal factors combined (McLaren & Bryson, 1986). Finally, general medical conditions that occur in infancy and early childhood, such as infection, trauma, and lead poisoning, are also contributing factors.

Adaptive Behavior

The present study is focused on the relationship between adaptive skills and problem behavior in individuals with ID. As was mentioned in the discussion of the history of ID, deficits in adaptive behavior are a crucial component to the functioning of these individuals. Therefore, an appreciation of the definition of adaptive behavior, as well as the methods used to assess these behaviors, is important to the current study and to one's understanding of ID in general.

In the early history of the study of ID, the definition of ID relied entirely on intellectual functioning (Bruininks, Thurlow, & Gilman, 1987). The inclusion and emphasis on adaptive behavior within ID began to develop in 1936 when Edgar Doll designed the first formal instrument to measure adaptive behavior, the Vineland Social Maturity Scale (Doll, 1936). In 1959, Heber was the first researcher to formally incorporate the term 'adaptive behavior' into the definition of ID. This attention to adaptive behavior has continued and is reflected in the American Association of Mental Retardation's (AAMR) most recent definition of ID. The AAMR currently defines ID as "...a disability characterized by significant limitations both in intellectual functioning and in adaptive behavior as expressed in conceptual, social, and practical adaptive skills" (AAMR, 2002). More specifically, the authors of the DSM-IV-TR (APA, 2000) defined mental retardation (i.e., ID) as significantly sub average intellectual functioning accompanied by limitations in at least two of eight adaptive behavior domains: communication, self-care, home living, social/interpersonal skills, work, leisure, health, and safety.

A further distinction to be made within the definition of adaptive behavior is the different types or components of adaptive skills. Holman and Bruininks (1985) attempted to identify the dimensions of adaptive behavior by conducting an analysis of adaptive behavior research and assessment instruments. This analysis yielded 10 broad clusters of adaptive behavior and 45

more specific skill areas. The broad clusters and their specific skills were: 1) self-help (feeding, dressing, toileting, grooming); 2) physical development (fine and gross motor skills); 3) communication (expressive and receptive language); 4) social skills (play skills, interaction skills, group participation, social amenities, sexual behavior, responsibility, leisure activities, emotional expression); 5) cognitive functioning (pre-academics, reading, writing, numbers, time, money, measurement); 6) health care and personal welfare (treatment and prevention of health problems, personal safety, child-care); 7) consumer skills (money handling, purchasing, banking, budgeting); 8) domestic skills (cleaning, property maintenance, clothing care, kitchen skills, household safety); 9) community orientation (travel skills, telephone usage, community safety, community resources); and, 10) vocational skills (work habits, job search skills, work performance, social vocational behavior, work safety).

Relationship to Cognitive Functioning

An important area for consideration when studying adaptive behavior is its relationship to cognitive functioning (i.e., intelligence). As was previously discussed, the diagnosis of ID as stated in the DSM-IV-TR (APA, 2000) is an intelligence test score below 70 and significant deficits in adaptive skills. The inclusion of both of these variables in the definition of ID indicates the presence of a relationship between the two constructs.

Many researchers have reported moderate correlations between adaptive behavior and intelligence test scores. Dacey, Nelson, and Stoeckel (1999) reported a moderate correlation between the Stanford-Binet IV Intelligence Test (SB-IV; Thorndike, Hagen, & Sattler, 1986) composite scores and the Vineland Adaptive Behavior Scale (VABS; Sparrow, Balla, & Cicchetti, 1984) total score in adults ($r = 0.52$). Correlations were reported between the SB-IV composite score and the domains of the VABS. The Communication domain was correlated at

0.65, the Daily Living Skills domain at 0.37, and the Socialization domain at 0.40. Carpentieri and Morgan (1996) reported similar results in a comparison of VABS and SB-IV scores for children with intellectual and developmental disabilities. These researchers reported a correlation of $r = 0.58$ between the VABS total score and SB-IV composite score. The correlation between the SB-IV composite and VABS Communication domain was again found to be the highest at $r = 0.66$. Furthermore, the authors of the VABS (Sparrow et al., 1984) reported a correlation of $r = 0.28$ between the VABS total score and the Peabody Picture Vocabulary Test—Revised (Dunn & Dunn, 1981) and $r = 0.52$ with the Wechsler Intelligence Scale for Children—Revised (Wechsler, 1974).

The relationship between adaptive behavior and intelligence has also been shown to vary at different levels of functioning and across different types of developmental disabilities. For example, Vig and Jedrysek (1995) reported a higher correlation between intelligence and adaptive skills for children with lower intelligence quotients and diagnoses of Autistic Disorder than for higher functioning children with no comorbid diagnoses. In addition, Liss et al. (2001) found that IQ was highly predictive of adaptive behavior in their low functioning group (defined as having an IQ below 80) and not in their high functioning group (IQ above 80). These relationships continue to be explored and their full meaning is still unknown.

Knowledge that there is a moderate correlation between cognitive functioning and adaptive behavior has led many researchers to hypothesize that a similar construct underlies both. The construct that appears to have the greatest likelihood of underlying both cognitive functioning and adaptive behavior is verbal or communication skills (Bolte & Poustka, 2002; Lambert, 1981). Specifically, Lambert (1981) hypothesized that verbal comprehension is the component of intelligence that underlies an individual's ability to understand and express social

and adaptive behavior. In keeping with this theory, communication has been shown in many studies to have a stronger relationship to intelligence than other adaptive skill domains (e.g., Bolte & Poustka, 2002; Carpentieri & Morgan, 1996; Dacey et al., 1999).

Assessment

Doll (1936) recognized that if an emphasis was to be placed on adaptive behavior in the definition of ID, standardized methods of assessing adaptive functioning were necessary. Holman and Bruininks (1985) outlined the important outcomes of adaptive behavior assessment. These outcomes included identifying and diagnosing ID, assisting in making service eligibility and placement decisions, developing of individualized treatment and educational programs, planning and evaluating services, and describing populations. In order to assist clinicians and researchers in achieving these outcomes, several standardized instruments have been developed to assess adaptive skills. A brief overview of two of these instruments, the AAMR Adaptive Behavior Scale-Residential and Community, Second Edition (ABS-RC:2; Nihira, Leland, & Lambert, 1983), and the Scales of Independent Behavior-Revised (SIB-R; Bruininks, Woodcock, Weatherman, & Hill, 1996) is provided. The present study involves the use of the Vineland Adaptive Behavior Scales (VABS; Sparrow, Balla, & Cicchetti, 1984). Therefore, the VABS will be reviewed in greater detail.

ABS-RC:2. The ABS-RC:2 was first designed in 1969 and has undergone several extensive revisions (Nihira et al., 1975; 1993a; 1993b). The ABS-RC:2 was designed to evaluate personal independence and daily living scales. The scale is composed of 73 items in 10 domains: 1) Independent Functioning; 2) Physical Development; 3) Economic Activity; 4) Language Development; 5) Numbers and Time; 6) Domestic Activity; 7) Prevocational and Vocational Activity; 8) Self-Direction; 9) Responsibility; and, 10) Socialization. The psychometric

properties of the ABS-RC:2 have generally been shown to be good. Internal consistency of the scale ranges from .80 to .99. In addition, test-retest correlation coefficients range from .81 to .99 and interrater reliability ranges from .83 to .99 (Nihira et al., 1993b).

SIB-R. The SIB-R (Bruininks et al., 1996) was initially developed in 1984 as a component of the Woodcock-Johnson Psychoeducational Battery (Ipsen, 1986). The SIB-R was intended to provide information about an individual's ability to conform to society's expectations (Bruininks, Woodcock, Weatherman, & Hill, 1985). The SIB-R contains the following four clusters: 1) Motor Skills; 2) Social Interaction and Communication Skills; 3) Personal Living Skills; and, 4) Community Living Skills. Each of the 259 items on the SIB-R are rated on a scale of '0' to '3', with '0' being never or rarely performs a task, '1' being does the task but not well or about one fourth of the time, '2' being does the task fairly well or about three fourths of the time, and '3' being performs the task well always or almost always. The SIB-R, like the VABS, can be administered as a standardized interview or as a checklist (Bruininks et al., 1996).

The SIB-R was standardized on 2,182 individuals ranging from 3 months to 90 years of age (Bruininks et al., 1996). In addition, 1,681 children and adults with ID and physical handicaps were also included as a supplemental standardization group. The SIB-R's psychometric properties have been well established and are generally acceptable. Median split-half reliabilities for the four clusters and full-scale score ranged from .89 to .98 and split-half reliabilities for children with ID were in the .90s (Bruininks et al., 1996).

VABS. The VABS is an informant-based measure of adaptive skills of individuals from birth to adulthood (Sparrow et al., 1984). The VABS was designed for several different purposes. The first purpose of the VABS is diagnostic evaluations. The VABS was normed on a national (United States) sample of individuals with varied levels of adaptive functioning, not just those

with ID. These norms allow the clinician to compare an individual's adaptive behavior to both the national normative sample and to individuals with different disabilities (e.g., blind, nonambulatory) and placements (e.g., residential facilities, community). The second purpose of the VABS is individual educational and treatment planning. The VABS provides information about an individual's specific skill strengths and weaknesses. Using this information, a clinician can identify activities that should be incorporated into a treatment plan. Finally, the VABS was intended for use in research on the development and functioning of individuals with and without ID. The VABS can also be used as a measure of treatment efficacy, longitudinal changes in adaptive behavior, and, as was the case in the present study, as a means of determining the relationship between adaptive behavior and levels of clinical, cognitive, or educational functioning (Sparrow et al., 1984).

The VABS consists of 225 items divided into three domains, each with three subdomains. The Communication domain is composed of the subdomains of receptive communication, expressive communication, and written communication. The Socialization domain consists of the subdomains of interpersonal relationships, play and leisure time, and coping skills. The Daily Living Skills domain has subdomains of personal daily living skills, domestic daily living skills, and community daily living skills. In addition, a Motor Skills domain is included but may only be administered to individuals under the age of 6 years. Finally, an Adaptive Behavior Composite score is produced by adding individual items from the entire instrument. Each item on the VABS is scored on a three-point Likert scale: '0' = no, never; '1' = sometimes or partially; '2' = yes, usually. In addition, a code of 'N' is provided for items on which the individual has 'no opportunity' to engage in and a code of 'DK' is provided for items on which

the informant 'does not know' whether the individual is capable of performing the action or activity.

Another important feature of the VABS is the use of developmentally appropriate administration. Because the items on each domain of the VABS are listed in developmental order, administration of the items can be restricted based on an individual's level of development (Sparrow et al., 1984). This is accomplished through the use of basal and ceiling rules. Within each adaptive behavior domain, the seven highest consecutive items scored with a '2' by the informant constitute the basal and the seven lowest consecutive items scored with a '0' is the ceiling. Therefore, when scoring the VABS, all items below the basal are assumed to have scores of '2' and all items above the ceiling are assumed to have scores of '0' (Sparrow et al., 1984). The use of basal and ceiling rules allow for more efficient administration of the instrument, which results in an economical use of the clinician and informant's time and other resources.

The psychometric properties of the VABS have been well researched. The standardization of the VABS was conducted on a sample of 3,000 people between birth and 18 years, 11 months of age. Participants were stratified based on geographical location in the United States, age, parental education, race, and community size. Internal consistency of the Adaptive Behavior Composite score was .94 and the internal consistency of the individual domains ranged from .83 to .90 (Sparrow et al., 1984). Test-retest reliability data was collected for 484 individuals and was found to be .88 for the composite score and between .81 and .86 for the domain scores. In addition, Sparrow et al. (1984) reported excellent interrater reliability coefficients of .99 for the Communication domain, .98 for the Daily Living Skills domain, and .96 for the Communication domain. A principle component analysis was used to demonstrate the construct validity of the VABS. Criterion-related validity has also been demonstrated through

concordance with other measures of adaptive behavior (Oakland & Houchins, 1985) and tests of intellectual functioning (Sparrow et al., 1984).

The VABS has several advantages that make this scale suitable for use in research on individuals with ID and for inclusion in the present study (Beail, 2003). The first advantage of the VABS is the extensive psychometric analyses performed which have demonstrated satisfactory to high levels of test-retest reliability, interrater reliability and internal consistency. Another advantage is that the VABS was designed for use via interview with an informant. Questions were written in a manner that makes them easy for informants to understand, regardless of their educational, social, or cultural background (Sparrow et al., 1984). The VABS interview format also lends itself to a short administration time and a general ease of administration. This aspect is of importance in clinical assessments of large research populations and in most real-world clinical settings where time and resources tend to be limited. In addition, the three domains of the VABS (Communication, Socialization, and Daily Living Skills) provide a comprehensive method of assessing the key components of adaptive behavior. The DSM-IV-TR (APA, 2000) defined eight major areas of adaptive behavior: communication, self-care, home living, social/interpersonal skills, work, leisure, health, and safety. The VABS covers each of these major areas in a relatively brief manner. Finally, while the other adaptive behavior measures discussed have psychometric properties that make them satisfactory for use in research of this nature, the VABS was the most appropriate scale for this study because it has become the most widely used adaptive behavior scale both within and outside of the United States (Beail, 2003).

The previous sections of this paper covered general topics related to the definition and assessment of ID and adaptive behavior. Understanding of these areas provides a basis upon

which the present study was built. The primary focus of this study was problem behaviors in ID as they relate to adaptive skills. The remainder of this literature review thus concentrates on problem behaviors, their prevalence, etiology, assessment, and treatment.

Problem Behaviors in Intellectual Disability

An area of profound importance within the field of ID is assessment and treatment of the three types of ‘problem behaviors’: self-injury, aggression and stereotypy. These three problem behaviors are not isolated types of behavior. They often co-occur and are also comorbid with other psychiatric disorders. For example, individuals who engage in self-injury also display high rates of aggression (Winchel & Stanley, 1991) and all three types of problem behavior are displayed at a significantly greater rate in individuals with comorbid psychiatric diagnoses (Sovner & DesNoyers-Hurley, 1986). Problem behaviors also have the potential to be life threatening to the individual who engages in the behaviors and places others around him or her at risk for harm (Gardner, Graeber-Whalen, & Ford, 2001). In addition, individuals with problem behaviors are more likely to be placed in residential, as opposed to community, settings (Borthwick-Duffy, Eyman, & White, 1987; Intagliata & Willer, 1981). This section will review the definition and prevalence of the three types of problem behaviors under investigation in the present study: self-injury, aggression, and stereotypy. In addition, the learning-based etiology of problem behaviors will be discussed at the end of the section.

Self-injurious behaviors are among the most dangerous problem behaviors evinced by individuals with ID. In an early description of self-injury, Tate and Barroff (1966) stated that self-injury produces physical injury to an individual’s own body. In addition, self-injury has been further defined as lacking intent or willful self-harm (Barroff, 1974), which distinguishes self-injury from other forms of self-inflicted injury, such as self-mutilation and suicidal gestures (Fee & Matson, 1992; Feldman, 1988). Another component to the definition of self-injury is that the behaviors are severe enough to cause tissue damage, such as bleeding or scarring (Winchel & Stanley, 1991). Furthermore, self-injury has marked negative effects on other people in the

environment (e.g., parents, caretakers) and on the individual's future environmental placements (e.g., community group homes, residential settings).

Self-injurious behaviors are largely idiosyncratic and consist of a wide variety of behaviors that range from mild to life threatening. Iwata et al. (1994) reported that the most commonly occurring topographies (i.e., forms) of self-injury in individuals with ID are hitting or banging the hand directly against the head or face and biting oneself. Scratching, pinching, and poking are other frequently occurring topographies (Rojahn & Esbensen, 2002), as are face slaps (Szymanski, Kedesdy, Sulkes, Cutler, & Stevens-Our, 1987), and lip destruction (Anderson, Dancis, & Alpert, 1978).

Aggressive behavior has been defined by Campbell, Cohen and Small (1982) as physical attacks on people or property with intent to cause harm. Most episodes of physical aggression involve punching, slapping, and kicking (Allen, 2000). However, 17% to 29% of individuals with ID who present with physical aggression use weapons (Emerson et al., 1988; Sigafos, Elkins, Kerr, & Atwood, 1994). While aggressive behavior can potentially begin at a young age, aggression appears to peak in late adolescence (Davidson et al., 1994) and remains stable over time (Kiernan & Alborz, 1996). In addition, aggression may be episodic, in that the frequency of aggressive outbursts is low, although these incidents can potentially be of high intensity and cause significant damage or harm (Sigafos et al., 1994). Also included under the category of aggressive behaviors are those actions that cause destruction to the environment. Destructive behavior is typically referred to as 'property destruction' and includes the serious and minor damage to an individual's physical surroundings (Borthwick-Duffy, 1994).

Aggressive behavior in individuals with ID can result in a number of deleterious effects. The presence of aggressive and destructive behavior in individuals with ID has been shown to

significantly affect their relationships with others, as others will limit interaction with these individuals in order to avoid or reduce the potential for physical harm (Danforth & Drabman, 1989). Therefore, aggression can further limit the social and adaptive development of a population already defined by its deficits in these areas (Marcus, Vollmer, Swanson, Roane, & Ringdahl, 2001). In addition, the presence of aggressive behavior increases the cost of services for individuals with ID. Increased costs come in the form of support and supervision increases, as well as increased staff injuries and high staff turnover rates (Sigafoos et al., 1994). Therefore, the appropriate assessment and treatment of aggressive behavior has implications far beyond the individual with ID.

The third type of problem behavior is stereotypy. Stereotypies, or stereotyped behaviors, have been defined as movements that are "...repetitive, purposeless, and involuntary, often interfering with normal behavior" (Stossel, 1990; p. 260). In addition, stereotypies are movements that appear to be unrelated to particular external goals (Berkson, 1983; Cooper & Dourish, 1990). Like self-injury and aggression, stereotypy consists of a variety of idiosyncratic behaviors. Some common categories of stereotypy include body rocking, hand waving, facial grimacing, and head banging (Stossel, 1990). However, body rocking is the most prevalent form of stereotypy in individuals with ID (Berkson & Gallagher, 1986). Stereotyped behavior has become the focus of clinical and research attention over the years because these behaviors appear to have no value in everyday life and are not a part of the public behavior of individuals without ID or psychopathology (Berkson, Gutermuth, & Baranek, 1995).

Stereotyped behaviors are not unique to ID or developmental disabilities. In fact, typically developing children often evince less severe forms of stereotypy (Werry, Carlielle, & Fitzpatrick, 1983; Thelen, 1996). Approximately 3% to 15% of infants engage in head banging,

usually within their cribs, and approximately 20% of infants engage in body rocking (Berkson & Tupa, 2002). These stereotyped behaviors in infants have been implicated in basic reflexive behavior (Piaget, 1952), although the manner in which these early stereotyped behaviors are related to the stereotyped and self-injurious behaviors seen later in development remains unknown (Symons, Sperry, Dropik, & Bodfish, 2005).

Current Diagnostic Criteria

The authors of the DSM-IV-TR (APA, 2000) recognized the potential clinical severity of problem behaviors and included a diagnosis of Stereotypic Movement Disorder (SMD) within the category of disorders usually first diagnosed in infancy, childhood, or adolescence. SMD is diagnosed when an individual displays repetitive, nonfunctional motor behaviors (e.g., body rocking, hand shaking, self-hitting). This behavior must interfere significantly with normal activities or result in self-inflicted injury that requires medical attention. SMD should not be diagnosed when the behaviors are better accounted for by a compulsion, such as Obsessive-Compulsive Disorder, a Tic Disorder, or Trichotillomania. Additionally, the behavior cannot be a stereotypy that is associated with a Pervasive Developmental Disorder (e.g., autism). This criterion is due to the presence of stereotypic movements (e.g., body rocking, hand flapping) as part of the diagnosis of these disorders. Finally, the behavior must be present for at least four weeks and cannot be the result of the direct physiological effects of a substance or a general medical condition. The specifier of “with self-injurious behavior” is provided when bodily injury occurs or would occur if preventative measures were not utilized (APA, 2000).

Prevalence

Among the types of problem behaviors, self-injury appears to be the least prevalent. A consistent trend found in the epidemiological data is that higher rates of self-injury occur in

individuals placed in residential facilities versus those in community group homes. Hill and Bruininks (1984) estimated that 17% of individuals in residential facilities engaged in some form of self-injury. By comparison, Rojahn (1986) reported that only 1.7% of individuals living in community settings engaged in self-injury.

Recent studies on the prevalence of aggression have indicated that it is amongst the most frequently occurring problems in individuals with ID (Gardner & Griffiths, 2005) and the most common type of problem behavior referred to behavioral support services (Maguire & Piersel, 1992). Harris (1993) reported that 50% of adults receiving special services displayed aggressive behavior and Kiernan and Kiernan (1994) found a rate of aggression in 40% of children in special education schools. However, when acute or high impact aggression (defined as seriously disruptive, threatening or causing more than minor injury) is considered, a considerably lower prevalence rate of 2% was reported (Kiernan & Querishi, 1993). Furthermore, males with ID display higher rates of aggression than females (Smith, Branford, Collacott, Cooper, & McGrother, 1996). Overall, stereotypies are the most prevalent problem behavior seen in individuals with ID (Bodfish et al., 1995). In a survey of 25,872 individuals with ID in institutional settings, Rojahn (1986) found that 62% of participants engaged in some form of stereotypy. A prevalence rate for stereotypy of nearly 80% was reported by Bodfish, Symons, Parker and Lewis (2000) in a sample of 34 adults with ID.

Several studies have assessed the relationship between problem behaviors and level of intellectual functioning. Researchers have found that both self-injury and stereotyped behaviors are negatively correlated with intellectual functioning, in that higher rates of these problem behaviors are seen in individuals with lower levels of intellectual functioning (McClintock, Hall & Oliver, 2003; Rojahn & Esbensen, 2002). Rojahn, Borthwick-Duffy and Jacobson (1993)

further studied this relationship and found that 4% of individuals with mild ID in their sample evinced self-injury, compared to 7% of those with moderate ID, 16% with severe ID, and 25% with profound ID. Similarly, Schroeder (1991) reported that 40% of adults with severe ID engage in stereotypies as compared to 18% of adults with mild ID.

When looking at the prevalence of problem behaviors in ID, it becomes apparent problem behaviors affect a large number of individuals with ID. The impact of problem behaviors is even greater when one considers the number of family members, care providers, and other related people who are affected by problem behaviors on a daily basis. Therefore, problem behaviors are presently a valid and necessary topic for both research and clinical attention in the field of ID.

Learning Theory Etiology of Problem Behaviors

Proponents of a learning etiology suggest that problem behaviors are typically shaped, strengthened, and maintained through positive and negative reinforcement across an individual's lifetime (Carr, 1977; Guess & Carr, 1991). Therefore, self-injury, aggression, and stereotypies are generally the result of the interaction between the environment, the individual, and the consequences surrounding the behavior. Two hypotheses have been proposed to account for the initial development and the maintenance of problem behaviors.

The first learning-based hypothesis of problem behaviors' etiology states that problem behaviors develop in response to an impoverished (i.e., low stimulation) environment. Based on this theory, problem behaviors emerge as a mechanism for an individual to produce his or her own stimulation (i.e., self-stimulation). Support for this theory comes in the appearance of stereotypies in individuals with congenital blindness or deafness, as well as from animal studies (Berkson & Gallagher, 1986). For example, social isolation has been reported to increase the likelihood of self-injury, aggression, and stereotypies in animals (e.g., Kraemer & Clarke, 1990).

Problem behaviors become a means of compensating for lack of stimulation or reinforcement available in the environment in the absence of more appropriate adaptive skills (Tessel, Schroeder, Stodgell, & Loupe, 1995).

In some cases, self-injury and stereotypies may provide sufficient sensory stimulation to make the behavior itself reinforcing (Favell, McGimsey, & Schnell, 1982; Wolery, Kirk, & Gast, 1985; Vollmer, 1994). More common consequences or functions of problem behaviors, however, are the social attention (Carr & Durand, 1985; Iwata et al., 1982) and access to preferred tangible items (Durand & Crimmins, 1988) that are provided contingent upon the occurrence of problem behaviors. This contingent positive reinforcement increases the likelihood that the behavior will reoccur in the future (Kazdin, 2001). These problem behaviors can also serve multiple functions for an individual (Wacker et al., 1990).

Proponents of the second learning hypothesis state that problem behaviors reduce levels of arousal, stress, discomfort, or frustration (Guess & Carr, 1991). Engaging in these behaviors may dissipate arousal and stress created by the environment or internal stimuli. This theory of problem behaviors stems from studies of animals subjected to enclosure in confined spaces. The origin of stereotypies in these animals appears to be related to early attempts to escape confinement (Dantzer, 1986). As confinement continues, the behavioral repertoire of the animal becomes further restricted and these behaviors eventually become stereotypic. Additionally, this hypothesis has been supported by research indicating that the rate of problem behaviors increases following the induction of frustration (Baumeister & Forehand, 1971) and that engaging in these maladaptive behaviors may temporarily attenuate physical discomfort (Rincover & Devany, 1982). Problem behaviors may therefore function as a means of escaping or avoiding aversive internal and environmental stimuli (Carr, 1977). Over time, these behaviors are further shaped

through negative reinforcement, commonly in the form of escape or avoidance of demands (Kazdin, 2001). These learning theories for the development and maintenance of problem behaviors have greatly influenced the field of intellectual disabilities in general, as well as how researchers and clinicians approach the assessment and treatment of problem behaviors in this population.

Based on these etiological hypotheses of problem behaviors, behavioral researchers began the systematic study of the variables that serve to maintain problem behaviors. Lovaas and Simmons (1969) were among the first researchers to analyze problem behaviors and their relationship to environmental variables. They demonstrated that in some individuals self-injurious behaviors ceased when they were isolated from other people and therefore received no social attention. Other researchers have conducted similar studies and found that problem behaviors could be increased or decreased based on the presentation or removal of difficult tasks (Carr, Newsom, & Binkoff, 1976, 1980; Sailor et al., 1986; Weeks & Gaylord-Ross, 1981) and by allowing access to preferred tangible items, such as food or toys (Durand & Crimmins, 1988). In addition, problem behaviors have also been shown to be unrelated to environmental factors (e.g., attention, escape from demands, access to tangible items) in some individuals. Instead, problem behaviors can be maintained by the positive sensory reinforcement that the behavior itself invokes (Favell, McGimsey, & Schell, 1982). This function is typically referred to as ‘nonsocial’ or ‘automatic’ reinforcement based on the lack of external stimulation and reliance on internal sensory stimulation.

In addition, researchers have begun to investigate whether pain or physical discomfort can also serve as a setting event for problem behaviors. Carr et al. (2003) found that four women with intellectual disability engaged in higher rates of problem behavior during the premenstrual

phase of their menstrual cycle. Other physical problems, such as ear infections (deLissoyoy, 1962), fatigue (Gardner et al., 1986), and constipation (Lekkas & Lentino, 1978), have also been shown to be associated with the presence of problem behaviors.

In summary, several functions have emerged as the most common in individuals with intellectual and developmental disabilities. These functions have been named based on the type of reinforcement an individual receives for engaging in a problem behavior. The primary types of reinforcement received are social attention (i.e., attention) from others, escape from demands (i.e., escape), access to preferred tangible items (i.e., tangible), nonsocial or automatic (i.e., nonsocial), and attenuation of physical pain or discomfort (i.e., physical). In a recent review of single-subject research studies, Hanley, Iwata, and McCord (2003) reported that 25.3% of studies found that problem behaviors were maintained by attention, 15.8% by nonsocial, and 10.1% by access to tangible items. In addition, 14.6% of studies identified multiple functions in that participants engaged in problem behaviors for more than one reason. The treatment of problem behaviors is based on the function (s) that are maintaining an individual's problem behaviors. Therefore, accurate assessment of problem behaviors is vital to developing an effective intervention.

Assessment of Problem Behaviors

The assessment of problem behaviors in individuals with ID has received a great deal of attention from researchers. Depending on the purpose of the evaluation, several different forms of problem behavior assessment are available. The first type, topographical assessment, is focused on obtaining information about the topography (i.e., type) of problem behavior exhibited by an individual. The other forms of problem behavior assessment are dominated by the learning theory model of the maintenance of problem behaviors. The term ‘functional assessment’ is used to describe methods of evaluating the function that a behavior serves for a particular individual. The goal of a functional assessment of a problem behavior is to ascertain the antecedents and consequences that maintain the behavior. Depending on the needs of the individual client and the resources available to the clinician, a variety of functional assessment methods exist. The functional assessment of problem behaviors can be grouped into four general categories: interviews, descriptive assessments, experimental functional analysis (EFA), and rating scales.

The present study incorporated the topographical assessment of problem behaviors, as well the evaluation of the function of the problem behavior. This section will review the assessment instruments available for determining the specific topographies of problem behavior exhibited by an individual and the various forms of functional assessment, as well as the instruments chosen for inclusion in the present study.

Topographical Assessments

The first step to assessing problem behaviors in an individual with ID is to obtain information on the topography (i.e., type) of behaviors the individual engages in. Topographical assessments provide clinicians and researchers with a standardized method of obtaining this information. These assessments typically measure the frequency and severity of individual

topographies of problem behavior, such as how often an individual engages in self-biting, and the degree to which this behavior interferes with the daily activities of the individual or the people around him or her. Topographical assessment instruments serve the important purpose of allowing clinicians and researchers to reliably measure problem behaviors. The information obtained from these instruments can then be used to guide further functional assessment, plan treatments, and can serve as a valuable source of data for research on the nature of problem behaviors in ID. Two topographical assessment instruments are currently available. The first to be reviewed here is the Challenging Behaviour Interview (CBI; Oliver et al., 2003). The CBI was recently developed and lacks sufficient empirical data to support its use in research at this time. The second instrument reviewed is the instrument chosen for inclusion in the present study, the Behavior Problems Inventory (BPI; Rojahn, Matson, Lott, Esbensen, & Smalls, 2001).

CBI. The CBI is an informant-based interview protocol designed to measure the severity of problem behaviors. The CBI is composed of two parts. In Part I, respondents are queried as to whether the individual in question has engaged in any of the following five types of problem behavior in the prior month: ‘self-injury’, ‘physical aggression’, ‘verbal aggression’, ‘disruption of environment’, or ‘inappropriate vocalizations’. An operational definition is provided for each category of problem behavior, as well as example topographies. Part II of the CBI consists of 14 questions intended to ascertain the severity of each topography of problem behavior identified in Part I. Each question is rated on a four- or five-point Likert scale.

The psychometric properties of the CBI were tested on a small sample. The CBI sample consisted of 22 individuals with moderate to severe ID and known problem behaviors. Participants resided in both residential and community settings. Interviews were conducted with staff members who had worked with the participant for at least three months prior to the study.

Interrater and test-retest reliability for Part I of the CBI were .67 and .86 respectively. Interrater and test-retest reliability for Part II ranged from .28 to 1.00 for the 14 severity questions. The authors of the CBI suggest that the instrument could be used for initial and treatment-outcome assessments, although only one peer-reviewed study using the CBI is available to date (Ross & Oliver, 2002). Currently, the CBI lacks sufficient empirical research supporting its use as a topographical assessment of problem behaviors in ID. The CBI also has yet to be tested on a large sample capable of demonstrating its psychometric properties. For these reasons, the CBI is not an appropriate assessment instrument for the present study.

BPI. The instrument used in the present study was the BPI. The BPI is an informant-based behavior rating scale that assesses behavior problems in individuals with ID. The BPI was designed for use as a clinical assessment tool to identify individuals at risk for behavior problems and as a method for analyzing the epidemiology of behavior problems (Rojahn et al., 2001). The BPI was initially developed in Germany in the 1980s as a measure of self-injury and stereotypies (Rojahn, 1984). Items were selected based on a literature review. The BPI was translated into English and expanded to include items related to aggressive/destructive behaviors. The initial five stereotyped behavior items were expanded into a stereotyped behavior subscale (Rojahn, Matlock, & Tasse, 2000; Rojahn, Tasse, & Sturmey, 1997). In 2001, Rojahn et al. conducted the most recent revision of the BPI.

The BPI is composed of three subscales (self-injury, aggressive/destructive behavior, and stereotypy) and a total behavior problems score, which is a composite of all three subscales. Each subscale is prefaced by a generic definition that applies to all of the items in the subscale and then individual behaviors are listed. The self-injury subscale has 14 items, each of which is labeled and operationally defined. Items on the self-injury subscale include self-biting, vomiting

and rumination, pulling finger or toenails, and self-scratching. The aggressive/destructive behavior subscale consists of 11 items, including hitting others, being verbally abusive to others, destroying things, and pinching others. Finally, the stereotyped behavior subscale consists of 24 items, including rocking back and forth, rolling head, waving or shaking arms, and pacing. Each behavior has to have been present within the two months prior to administration in order to be scored. Each item is scored on a five-point frequency scale (0 = never, 1 = monthly, 2 = weekly, 3 = daily, 4 = hourly) and a four-point severity scale (0 = no problem, 1 = a slight problem, 2 = a moderate problem, 3 = a severe problem).

The psychometric properties of the BPI were assessed with a sample of 432 adults with ID in a residential facility. BPI data was collected using direct-care staff members as informants. Rojahn et al. (2001) tested the factor structure of the BPI using an *a priori* three-factor confirmatory factor analysis. The three hypothesized factors were self-injury, aggression/destruction, and stereotypy. Rojahn et al. (2001) reported that the items of the BPI were considered to be a “reasonable fit” with the three-factor model. Reliability between informants was assessed using intraclass correlation coefficients and was reported to be .86 for stereotyped behaviors, .97 for self-injury, .87 for aggression/destruction, and .92 for the full scale score. Retest reliability was reported as .72 for self-injury, .79 for stereotyped behaviors, .64 for aggression/destruction, and .76 for the full-scale score (Rojahn et al., 2001). Finally, criterion validity was evaluated by comparing BPI scores with psychiatric diagnoses that are associated with the presence of problem behaviors, such as pervasive developmental disorders (PDD) and stereotypic movement disorder (SMD).

Since its development, the BPI has been used for a number of clinical and research purposes. The BPI has been utilized as a survey for assessing problem behaviors in individuals

with ID in a number of different settings (e.g., Hayden & Stevens, 2004; Mulick, Dura, Rasnake, & Wisniewski, 1988). In addition, the BPI has recently been used as a treatment-outcome measure in studies on the effects of psychotropic medications on problem behaviors (Gagiano, Read, & Thorpe, 2005; Snyder, Turgay, & Aman, 2002). Furthermore, the BPI was the most appropriate instrument for the present study for several reasons. First, the BPI was designed for use with individuals with ID in research regarding the nature of problem behaviors (Rojahn et al., 2001). Second, the BPI provides a comprehensive, empirically based listing of self-injurious, aggressive, and stereotyped behaviors in a straightforward format. Third, the psychometric properties of the BPI have been well documented and are satisfactory for use in research. The informants utilized in the evaluation of the BPI's psychometrics were similar to the informants used in the present study, as both were direct-care staff members at a large residential facility. In addition, operational definitions are provided for each problem behavior, which improves the reliability of individual items (Rojahn et al., 2001).

Interview

One method of assessing the function of problem behaviors is through a functional assessment interview. A functional assessment interview is intended to provide a description of the problem behavior, the settings and situations in which the behavior frequently and infrequently occurs, as well as the antecedents and consequences surrounding the problem behavior (Iwata, Vollmer, & Zarcone, 1990). One of the most comprehensive functional assessment interviews was created by O'Neill, Horner, Abin, Storey and Sprague (1991). Following O'Neill et al.'s (1991) interview structure, problem behaviors are identified and defined by the informant (e.g., parent, teacher, direct care staff) with the help of the clinician/interviewer's questioning. Additional information regarding environmental variables,

daily activities, medication regimens, and medical problems are also obtained. The clinician is then responsible for incorporating all of the information into a hypothesized function(s) that maintains the behavior for the individual. Finally, O'Neill et al. (1991) recommend that the hypotheses developed during the interview be further explored and refined through the use of additional functional assessment methodologies. Functional assessment interviews are therefore not appropriate for research on large numbers of individuals with problem behaviors because of the lack of standardization and exploration of psychometric properties.

Descriptive Functional Assessment

Descriptive functional assessments consist of the observation of target behaviors (e.g., aggression) in the individual's natural environment. Descriptive assessments include a variety of data collection methods, including frequency counts (Kazdin, 2001), partial interval recording (Pace et al., 1986), and scatter plot analysis (Touchette, MacDonald, & Langer, 1985). Data on the occurrence of the problem behavior is then combined with data on antecedent-behavior-consequence (ABC) observations in the natural environment. ABC recording systems entail the accumulation of information on the events that precede a behavior (i.e., antecedents), the behavior itself, and the consequences received by the individual immediately after engaging in the problem behavior. Once sufficient information regarding the problem behavior has been collected, the clinician then analyzes the data to determine how often the target behavior was preceded by a specific antecedent or followed by a specific consequence. Probabilities or percentages are then used to summarize how often the behavior occurred under each antecedent and consequence condition (Feldman & Griffiths, 1997). Descriptive functional assessments are more commonly utilized in treatment planning and are rarely used in large-scale research

projects. This is due to the lack of standardization and empirical data regarding the reliability and validity of these methodologies.

Experimental Functional Analysis (EFA)

The primary limitation of indirect and descriptive assessments is that these methods are incapable of determining a direct causal relationship between environmental factors and the behavior (Feldman & Griffiths, 1997). Experimental Functional Analysis (EFA) was designed to address this limitation by providing a systematic and controlled study of the relationship between different antecedents or consequences and the target behavior. Iwata et al. (1982; 1994) are credited with developing the most commonly used EFA methodology. An EFA consists of presenting individuals with problem behaviors with a number of antecedents and consequences that are known to maintain problem behaviors, such as attention, escape from demand, access to tangible objects, and sensory or automatic reinforcement (Iwata et al., 1994). This experimentation takes place in a controlled (i.e., analogue) environment, usually a small room void of any other stimuli. Each time the individual engages in the target behavior, (s) he receives the consequence indicated by the presenting condition. For example, in the tangible condition, the individual would receive brief access to a preferred item contingent on exhibiting the target behavior (i.e., hitting the therapist). A control condition is also presented, during which the individual has access to items and attention, but has no demands placed on him or her.

These conditions are presented in a reversal or multi-element design in order to establish replication of effects (Gresham, Watson, & Skinner, 2001). In each condition, the frequency of the problem behavior is recorded and the conditions are graphed in order to assess in which condition or conditions the target behavior occurs most frequently. This condition(s) is then considered to be the function maintaining the target behavior for the individual.

EFA methodology has a number of limitations that make it inappropriate for determining the function of problem behaviors in research such as the present study. The first criticism of EFA is that an EFA can only be conducted if the problem behavior occurs at a high frequency, such as several times per day (Sturmev, 1995). When a problem behavior occurs at lower rates, such as once a week, the clinician conducting the EFA may never observe the problem behavior during the assessment session (Whitaker, 1993). Furthermore, extending the EFA to include longer periods of time in order to capture the low frequency problem behavior is highly problematic due to the large amount of resources (e.g., time, money) and clinician training required for conducting even a brief EFA (O'Neill et al., 1990). The external validity of EFA has also been criticized. EFAs are conducted in analogue settings that are considerably different than the individual's natural environment. The lack of external validity makes the generalizability of EFA results difficult (Martin, Gaffan, & Williams, 1999).

Finally, several ethical concerns regarding EFA make it inappropriate for use in the present study. The primary concern in using EFA technology for severe problem behaviors such as self-injury and aggression is the risk of assessment-induced injury. For especially severe problem behaviors, there is no time during which the individual should be allowed to freely engage in the behavior. Allowing a person to engage in these dangerous behaviors, even for the sake of assessment and treatment planning, is exceedingly hazardous and unnecessary (Sturmev, 1995). Furthermore, allowing the individual to engage in the problem behavior in different EFA conditions could lead to the establishment of new reinforcement contingencies maintaining the behavior. This could lead to an increase in the frequency of the problem behavior. Based on these criticisms of EFA, the use of naturalistic assessments, such as rating scales, are not only a

more efficient use of resources, but also allow for the assessment of low rate problem behaviors and reduces the risk of injury to the individuals involved in the assessment.

Rating Scales

Several rating scales have been developed for the functional assessment of problem behaviors in individuals with ID. These rating scales were designed to evaluate the presence of the functions of problem behaviors established by the EFA literature (i.e., attention, escape, tangible, nonsocial, and physical), while attempting to avoid the limitations inherent in EFA methodology. The two rating scales that have received the most research are the Motivation Assessment Scale (MAS; Durand & Crimmins, 1992) and the Questions About Behavior Functions (QABF; Matson & Vollmer, 1995). The four categories of reinforcement assessed by the MAS are: 1) access to tangible items or activities; 2) attention; 3) escape from demands; and, 4) sensory or automatic reinforcement. The initial studies on the psychometric properties of the MAS were conducted on small samples of children. Durand and Crimmins (1988) found high interrater and test-retest reliability, good factor structure, and good psychometrics for the MAS. However, attempts to replicate Durand and Crimmins' (1988) findings with individuals residing in residential facilities reported poor internal consistency and poor interrater reliability (Zarcone et al., 1991). As a result, the QABF was developed to assess the function of problem behaviors in a standardized, psychometrically sound method.

The QABF is an informant-based questionnaire developed in 1995 by Matson and Vollmer. The QABF was created to address the problems with EFA technology, namely that the amount of time, money, and expertise required to complete an EFA make the technology difficult to apply in clinical settings (Matson & Vollmer, 1995). The goal of the QABF was to provide a reliable and valid means for determining the functions of behavior problems in a time

and cost-efficient manner. The types of behaviors that can be assessed using the QABF include aggression, self-injury, property destruction, and stereotypes.

The QABF consists of five factor-analyzed subscales: 1) attention; 2) escape from demand; 3) access to tangible reinforcers; 4) physical discomfort; 5) nonsocial reinforcement (Matson & Vollmer, 1995). These subscales were determined through exploratory factor analysis of 462 individuals with ID at a state residential facility (Matson et al., 1996). Results of the factor analysis indicated that these five factors accounted for 74.5% of the variance in QABF data (Matson et al., 1996). This factor structure has been supported by confirmatory analyses conducted with children with ID (Nicholson, Konstantinidi, & Furniss, 2006) and individuals with mental illness (Singh et al., in press).

The psychometric properties of the QABF have also been studied. Paclawskyj et al. (2000) reported that among individuals with ID in residential facilities, the QABF has good test-retest and interrater reliability. Spearman rank-order correlations for the retest reliability of individual items and for each of the subscales the total score were all high (Paclawskyj et al., 2000). Interrater reliability has been assessed using multiple direct-care staff members in residential facilities as the informants. Pearson product-moment correlations for the interrater reliability of the subscales and total score ranged from 0.79 to 0.99 (Paclawskyj et al., 2000). In another study, agreement between raters on the primary function of problem behaviors was found to be 91% (Nicholson et al., 2006). Furthermore, the validity of the QABF has been evaluated through comparison to EFA-derived functions (Paclawskyj et al., 2001) and examination of the effectiveness of treatments based on functions identified by the QABF (Matson, Bamburg, Cherry, & Paclawskyj, 1999).

One component of the present study was the assessment of the functions maintaining problem behaviors in individuals with ID. The QABF was chosen to assess problem behavior function for several reasons. The QABF has strong psychometric properties that have been demonstrated in a number of different settings. The initial evaluation of the QABF's psychometrics was conducted using direct-care staff members as informants. The present study also uses direct-care staff members as informants, thus the psychometric properties of the QABF could be reasonably expected to extend to the current study. In addition, the QABF addresses several of the limitations inherent in EFA technology. The QABF requires a smaller amount of time, money, and training for accurate administration (Matson & Vollmer, 1995). This lends the QABF to use in large-scale functional assessment-based research and intervention planning (Nicholson et al., 2006). Furthermore, the QABF is completed by informants who interact with the individual with ID on a daily basis in his or her natural environment, which improves the generalizability of the results of the functional assessment (Paclawskyj et al., 2001).

Treatment of Problem Behaviors

The treatment of problem behaviors is an area that has received a great deal of attention in the ID literature due to the clinical and social significance of these behaviors. The prescription of medication and behavioral interventions are the most commonly utilized forms of treatment. A brief review of pharmacology and the components of behavioral treatment of problem behaviors in individuals with ID are provided.

Pharmacological Interventions

Pharmacological interventions are the most commonly used treatments in the field of ID in general (Baumeister & Sevin, 1990). Furthermore, a strong positive correlation exists between the presence and severity of problem behaviors and the administration of psychotropic medications (Aman & Singh, 1988). Several classes of psychotropic medications have been used in individuals with problem behaviors. Naltrexone, an opioid antagonist, has been used in the treatment of self-injurious behavior with mixed results. Some studies have shown a significant decrease in self-injury following the administration of naltrexone (Taylor et al., 1991; Walters, Barrett, Jeinstein, Mercurio & Hole, 1990), while others have shown no effect (Willemsen-Swinkels, Buitelaar, Nijhof & van Engeland, 1995).

Another class of medication that has been used to treat problem behaviors is antidepressant medication. Selective Serotonin Reuptake Inhibitors (SSRIs) have been used in a few studies related to problem behaviors in individuals with intellectual disability. The rationale for the use of SSRIs is based on the similarity between some patterns of stereotypy and self-injury in individuals with intellectual disability and the patterns of perseverative behavior seen in anxiety disorders such as Obsessive Compulsive Disorder and the success that SSRIs have shown in this population (Aman, Arnold, & Armstrong, 1999). In a study on the effects of SSRIs

on aggression, Davanzo et al. (1998) reported a reduction in the severity of aggression over a four-month period. In addition, Garber et al. (1992) reported that 10 out of 11 patients showed a greater than 50% decrease in the rate of chronic stereotypies and self-injury.

Antipsychotic medications, which were previously reserved for use in psychosis and schizophrenia, have become the most frequently prescribed class of drugs in ID (Ellis, Singh, & Singh, 1997). Several studies have reported a decrease in problem behaviors following administration of antipsychotic medications (e.g., Cohen, Ihrig, Lott & Kerrick, 1998; Crossland et al., 2003; Khan, 1997). However, the reason for the decrease in problem behavior is more likely attributed to general sedation and behavioral suppression (Aman & Singh, 1988; Matson et al., 2000). Additionally, antipsychotic medications can produce a number of negative side effects (Ellis et al., 1997) that can range from mild (e.g., dry mouth, weight gain, blurred vision) to severe (e.g., akathisia, tardive dyskinesia).

Behavioral Interventions

A wide variety of behavioral treatments for problem behaviors have been proposed and are supported by empirical research. These techniques are based on their ability to increase positive behavior (i.e., reinforcement) and/or decrease undesirable behaviors (i.e., aversives). The behavioral treatment of problem behaviors can be divided into those based on general behavioral principles, without regard for function (i.e., behavior modification), and techniques based on the results of functional assessment. However, a great deal of overlap exists in the procedures used.

Behavior Modification. In behavior modification, interventions are selected based on their ability to promote or decrease behavior and not based on their relationship to the behavior's function. A behavior modification component that is common to many treatment plans is

differential reinforcement. In the differential reinforcement of other behaviors (DRO), an individual is reinforced for not engaging in problem behaviors for a set period of time (Harris & Ersner-Hershfield, 1978). Other variations include the differential reinforcement of incompatible behaviors (DRI) and the differential reinforcement of low rates of behavior (DRL). Reinforcement can come in the form of social attention, access to preferred items or activities, or a brief break from demands (Wacker, Northrup, & Lambert, 1997).

Several aversive interventions have also been efficacious in treating of problem behaviors. The key to the use of aversives in behavior modification is that the punishing stimuli (e.g., water mist) or event (e.g., time-out from positive reinforcement) must be strong enough to override the variables maintaining the behavior (Iwata et al., 1990). Foxx and Azrin (1972) demonstrated the effectiveness of overcorrection and restitution procedures in decreasing self-biting and physical aggression. Overcorrection for self-biting consisted of oral hygiene training and restitution was in the form of reassuring the victim after aggression. However, the most prevalent aversive intervention used in the field of ID is physical restraint (Favell, McGimsey, Jones & Cannon, 1981) provided either contingent or noncontingent on the behavior.

Function-based Treatment. Commonly, the treatment of a problem behavior is based on the results obtained by the functional analysis. The goal of functional behavioral treatments of problem behaviors is twofold. The first goal is to disrupt the contingencies surrounding the function of a problem behavior in order to reduce the frequency of the behavior. The second goal of behavioral treatment is to train adaptive replacement behaviors (Mace & Roberts, 1993).

This first goal of disrupting the contingencies that maintain problem behaviors can be accomplished in several different ways and is dependent on the function of the problem behavior. For example, when a problem behavior is related to reinforcement in the form of

contingent attention, time-out from positive reinforcement has proven to be successful in decreasing maladaptive behaviors (e.g., Harris & Ersner-Hershfield, 1978). Similarly, when the target behavior is negatively reinforced by escape from demands, extinction procedures are highly effective (e.g., Thompson et al., 2003). Protective equipment has also been utilized as methods of reducing behavior maintained by sensory reinforcement (e.g., Dorsey et al., 1982).

The second goal of function-based interventions is to train an adaptive behavior that can serve as a replacement for the problem behavior. The basis for this form of treatment comes from the learning theory etiology of problem behaviors. As was discussed earlier, some behaviorists theorize that problem behaviors are evinced by individuals who lack the appropriate adaptive skills to interact with their environment (Carr & Durand, 1985; Durand & Crimmins, 1988). Through positive and negative reinforcement, problem behaviors become a learned mechanism for soliciting attention, accessing preferred tangible items, escaping from demands, indicating physical discomfort, or providing self-stimulation (Iwata et al., 1990).

The area of adaptive behavior that has received the most attention in relation to problem behaviors is communication skills. Carr and Durand (1985) proposed a communication-based hypothesis for problem behaviors, however, observations of the communicative quality of nonverbal behaviors is centuries old (Durand, 1990). According to the functional communication theory, problem behaviors are similar to other nonverbal behaviors, such as crying in an infant. For a person with limited communication skills, problem behaviors may provide a manner of expressing his or her wants or needs (Durand, 1990). A successful method of training appropriate behaviors, functional communication training (FCT; Carr & Durand, 1985), has stemmed from this communication hypothesis. The goal of FCT is to teach a communicative behavior that is functionally equivalent to the problem behavior for that individual. Researchers have shown the

effectiveness of FCT in reducing a number of maladaptive behaviors, such as self-injury (Carr & Durand, 1985; Durand & Kishi, 1987), aggression (Bird et al., 1989), and stereotypic behaviors (Durand & Carr, 1987).

In recent years, a growing number of researchers and clinicians have begun to shift intervention selection away from behavioral treatments designed to decelerate or suppress problem behaviors and towards the exclusive use of strategies that promote positive skill acquisition (Carr et al., 2002). This movement, sometimes called Positive Behavior Supports, focuses on improving the quality of life of individuals with ID through the development of positive behaviors, such as recreational, occupational, or communication skills. While an emphasis on skill building is hardly new to behavioral interventions for problem behaviors (Mulick & Butter, 2005), entirely dispensing with aversive interventions is troublesome. Some individuals with ID engage in problem behaviors of sufficient severity to threaten their own lives or the lives of their caregivers. To eliminate the use of aversive interventions in these individuals is considered by some to be dangerous and unethical (Foxy, 2005).

The movement towards skill building and away from aversive interventions highlights the importance of understanding the relationship between problem behaviors and adaptive skills. Do people with problem behaviors actually engage in fewer adaptive behaviors than those without problem behaviors? Individuals with ID and problem behaviors are known to display deficits in adaptive skills, but these deficits are inherent in the definition of ID (AAMR, 2002; APA, 2000). An understanding of the strength of the relationship between problem behaviors and adaptive skills deficits is made difficult by the fact that majority of the literature available on this topic comes from single-subject research. Therefore, the strength of this relationship in a large sample of individuals with ID is unclear. In addition, an area that has yet to be explored is

whether the presence of specific adaptive skills deficits differs depending on the function of problem behaviors. Thus, the present study investigated the relationship between problem behaviors, their functions, and adaptive skills in individuals with ID.

Purpose

The presence of the problem behaviors of aggression, self-injury, and stereotypy is among the most pressing issues in working with individuals with intellectual disability (ID). Problem behaviors are significant because at their most extreme they place both the individual with ID and the people around him or her at risk for physical harm (Gardner, Graeber-Whalen & Ford, 2001). Individuals with problem behaviors are also more likely to be placed in residential settings, as opposed to potentially less restrictive community placements (Borthwick-Duffy, Eyman & White, 1987; Intagliata & Willer, 1981). Therefore, a comprehensive knowledge of the factors associated with problem behaviors, as well as accurate assessment and effective treatment techniques, is imperative (Gardner et al., 2001; Mace, Lalli & Shea, 1992).

Adaptive skills are the first step to independent living and are therefore of critical importance. In addition to promoting independence, adaptive behavior deficits may lead to the skill void being replaced with the problem behaviors of aggression, self-injury, and stereotypy (e.g., Cipani & Spooner, 1997). Therefore, establishing whether a link exists between adaptive skills deficits and the variables that maintain problem behaviors is of great value. This information will not only lead to a better understanding of these behavioral deficits, but will also aide in establishing methods to assess and treat problem behaviors through enhancing adaptive skills.

The purpose of this study was to examine the relationship between adaptive skills and problem behaviors in individuals with ID. This relationship was explored by assessing the broad construct of adaptive skills, as well as the three primary forms of adaptive behavior: social, communication, and daily living skills. This study was divided into two experiments. In Experiment 1, the researcher examined the relationship between problem behaviors and adaptive

skills and whether communication, social, and daily living skill deficits were predictive of problem behaviors. Knowledge of this relationship will further our understanding of a significant issue in the field of developmental disabilities.

In Experiment 2, the researcher investigated the specific types of adaptive skills deficits and their possible relationship to the variables that maintain problem behavior. The primary method used for the assessment and treatment of problem behaviors is based on the hypothesized “function” that the maladaptive behavior serves for an individual. This methodology is based on the theory that an individual with ID who engages in problem behaviors lacks more appropriate adaptive behaviors. Therefore, if an adaptive behavior is taught to replace the maladaptive one, the individual may engage in lower rates of the problem behavior. While replacement adaptive behaviors are often selected based on the function of an individual’s problem behaviors (e.g., teaching an individual who engages in aggression to obtain attention how to appropriately request attention through verbal or nonverbal communication), it was unknown whether individuals with different functions of behavior problems exhibited different types of adaptive skills deficits. Prior researchers have shown that teaching specific adaptive behaviors can be successful in reducing problem behaviors maintained by attention, tangible, and escape functions (e.g., Adelinis, Piazza, & Goh, 2001; Durand & Merges, 2001). The purpose of Experiment 2 was to establish whether differences in adaptive behavior actually exist when individuals were compared based on the function of their problem behavior.

Experiment 1

In Experiment 1 the researcher sought to characterize the nature of the relationship between adaptive skills deficits (as measured by the VABS composite score) and problem behaviors (as measured by the BPI total score) in order to determine if lower adaptive skills were associated with greater problem behaviors. Furthermore, the contribution of communication, social, and daily living skills to the prediction of problem behavior frequency was also examined.

Hypothesis 1

Many researchers within the field of ID believe that problem behaviors are at least partly related to deficits in adaptive skills (e.g., Achenbach & Ziegler, 1968; Durand, 1990). According to these researchers, some individuals with ID engage in problem behaviors as a means of interacting with their environment due to a lack of more appropriate skills (e.g., Guess & Carr, 1991; Sovner, 1986). It was therefore hypothesized that a negative correlation would exist between the VABS adaptive behavior composite score and the BPI total problem behavior score. Therefore, as adaptive behavior scores declined, problem behavior scores would increase. Evidence of whether a relationship exists and if so, the nature of this relationship, is necessary to developing our understanding of the role of adaptive skills in the potential development and maintenance of problem behaviors.

Hypothesis 2

The next component of Experiment 1 was to assess the contribution of specific skill deficits to the overall frequency of problem behaviors. The purpose of this analysis was to determine whether communication, social, and daily living skills predict a significant amount of the variance in the frequency of problem behaviors. In addition, the relative importance of each

of these three adaptive skill areas in the prediction of problem behaviors was assessed. The majority of research conducted on the relationship between problem behaviors and adaptive skills has focused on communicative ability. This is because nonverbal behaviors have long been thought to have communicative properties (e.g., Bates, Camaioni, & Volterra, 1975; Ferster, 1965; Talkington, Hall, & Altman, 1971). Therefore, it was hypothesized that communication skills would predict the greatest amount of variance in problem behaviors. Exploration of the role of specific adaptive skill domains in the expression of problem behaviors in individuals with ID may highlight specific areas where skill development should focus, which will contribute to the ability to plan effective treatments.

Method

Participants. Participants were individuals who resided at Pinecrest Developmental Center (PDC), a state-run residential facility in the state of Louisiana where 550 individuals reside. The individuals living at PDC represent a variety of ages, gender, race, and levels of ID. Licensed psychologists assess each individual at PDC annually with standardized instruments designed to measure adaptive skills, social skills, psychopathology, and feeding problems. In addition, standardized tests of intellectual functioning are administered every five years.

The sample used for Experiment 1 consisted of randomly chosen individuals from PDC. Random selection of participants was used for Experiment 1 to ensure that individuals with varying levels of adaptive skills and problem behaviors were included in the sample. Two a priori power analyses were conducted to determine the sample size required for each of the hypotheses in Experiment 1. A medium effect size was chosen for this and all successive analyses in the study. Because a great deal of the research available on the relationship between problem behaviors and adaptive skills has been conducted using single-subject design,

interpreting an effect size based on previous literature is difficult. The single subject design research, however, has shown that a relationship exists between problem behaviors and adaptive skills on an individual basis. This information provides a basis for reasoning that a moderate to large effect size should exist if a difference can be seen at the individual level. In order to provide a conservative estimate of effect size for the purpose of conducting power analyses for both Experiment 1 and Experiment 2, Cohen's (1988) standard definition of a medium effect size was used.

For Hypothesis 1, the power analysis computer program GPOWER (Erdfelder, Faul, & Buchner, 1996) was used in order to determine the sample size necessary to detect a medium effect size (Cohen, 1988) for a one-tailed correlation. Chase and Tucker (1976) recommended that in behavioral sciences with an a priori level of significance (α) of .05, power should be set at .80. Results of the GPOWER power analysis indicated that a sample size of 64 was necessary to achieve power of .80 under these conditions.

For Hypothesis 2, an a priori power analysis for multiple regressions relied on a rule of thumb for determining sample size. Several researchers have suggested that when testing individual predictors with a medium anticipated effect size (Cohen, 1988), power of .80 and alpha of .05, sample size should be calculated based on the following formula: $N \geq 50 + 8m$, where m is the number of independent variables (Green, 1991; Tabachnick & Fidell, 2001). For the three independent variables in this hypothesis, a sample size of 74 was necessary.

Since the sample size estimates for the two hypotheses in this study were not equal, the larger sample size of 74 was used. Therefore, a random sample of 74 individuals was selected in order to test both hypotheses in Experiment 1. Individuals were selected based on random computer-generated selection from the entire population of PDC. However, individuals with a

diagnosis of Dementia, blindness, or deafness were excluded from the study because these diagnoses are associated with decreased adaptive skills (e.g., Meacham, Kline, Stovall, & Sands, 1987; Moss & Patel, 1997) and could therefore serve as a confound. Approval for this project was obtained from the Institutional Review Board (IRB).

The total sample of 74 participants in Experiment 1 included 51 males (68.9%) and 23 females (31.1%). Of these participants, 61 were Caucasian (82.4%) and 13 were African American (17.6%). The ages of the participants ranged from 18.30 to 81.10 years, with the mean age of 50.51 years and the standard deviation 13.18 years. Length of admission at PDC for the entire sample ranged from 0.70 to 69.42 years, with a mean of 35.23 years and a standard deviation of 15.47 years. Of the participants in Experiment 1, 65 (87.8%) were not currently prescribed any psychotropic medications, 3 (4.1%) were prescribed antipsychotic medications, 3 (4.1%) were prescribed antidepressants, 2 (2.7%) were prescribed anxiolytics medications, and 1 (1.4%) was prescribed a mood stabilizer. Furthermore, 50 individuals (70.3%) did not have any diagnosed psychopathology and 24 (29.7%) had at least one Axis 1 diagnosis (APA, 2000).

Measures

Behavior Problems Inventory (BPI; Rojahn et al., 2001). The BPI is an informant-based behavior rating scale that assesses problem behaviors in individuals with ID. The BPI was designed for use in identifying individuals who engage in problem behaviors and as a method for analyzing the epidemiology of these behaviors (Rojahn et al., 2001). The BPI was selected for use in this study because it was designed specifically for use as an informant-based questionnaire to obtain information about problem behaviors in individuals with ID. In addition, the BPI has well-established psychometric properties and operationally defined topographies of problem behaviors (Rojahn et al., 2001).

The BPI is composed of three subscales (self-injury, aggressive/destructive behavior, and stereotypy) and a total behavior problems score, which is a composite of all three subscales. Each subscale is prefaced by a generic definition that applies to all of the items and is followed by a list of individual behaviors. The self-injury subscale has 14 items, each of which is labeled and operationally defined. Items on the self-injury subscale include self-biting, vomiting and rumination, pulling finger or toenails, and self-scratching. The aggressive/destructive behavior subscale consists of 11 items, including hitting others, being verbally abusive to others, destroying things, and pinching others. Finally, the stereotyped behavior subscale consists of 24 items, including rocking back and forth, rolling head, waving or shaking arms, and pacing. Each item has to have been present within the two months prior to administration.

On the BPI, each item is scored on a five-point frequency scale ('0' = never, '1' = monthly, '2' = weekly, '3' = daily, '4' = hourly) and a four-point severity scale ('0' = no problem, '1' = a slight problem, '2' = a moderate problem, '3' = a severe problem). Rojahn et al. (2001) reported that the frequency and severity subscales on the BPI are highly correlated. The correlation between the frequency and severity scores for the entire BPI was .90, with correlations of .93, .92, and .87 for the self-injury, stereotyped behavior, and aggression/destruction subscales respectively. As a result, Rojahn et al. (2001) suggested that the severity score be eliminated when the BPI is used for research purposes. Therefore, only the frequency scores were used in this study.

Vineland Adaptive Behavior Scale (VABS; Sparrow et al., 1984). The VABS is an informant-based measure of adaptive skills that has been widely used both within and outside of the United States (Beail, 2003). The psychometric properties of the VABS have been studied and

satisfactory to high levels of test-retest reliability, interrater reliability and internal consistency have been reported (Sparrow et al., 1984).

The VABS consists of three domains, each with three subdomains. The Communication domain is composed of the subdomains of receptive communication, expressive communication, and written communication. The Socialization domain consists of the subdomains of interpersonal relationships, play and leisure time, and coping skills. Finally, the Daily Living Skills domain has subdomains of personal daily living skills, domestic daily living skills, and community daily living skills. In addition, adding individual item scores from all three domains produces an Adaptive Behavior Composite score. Each item on the VABS is scored on a three-point likert scale: '0' = no, never; '1' = sometimes or partially; '2' = yes, usually. In addition, a code of 'N' is provided for items on which the individual has 'no opportunity' to engage in and a code of 'DK' is provided for items on which the informant 'does not know' whether the individual is capable of performing the action or activity.

Procedure

BPI and VABS data was collected for all participants in the sample. Informants for all assessment instruments were direct-care staff members at PDC who had known the individual participant for at least six months prior to the assessment. Graduate students administered the BPI and VABS in accordance with their respective procedures. The BPI was administered in a structured-interview format. Each of the BPI's 52 items were read to the informant and the informant was prompted to rate the behavior's frequency based on the BPI's likert scale. Similarly, the VABS was administered in a structured-interview format where the interviewer read each item aloud to the informant and the informant provided a rating based on the Likert scale provided. Both instruments were administered to the same direct-care staff member for

each participant. This was necessary in order to decrease the chance of interrater error between measures. Interviews were conducted in a quiet location in the residents' homes at PDC and took approximately 30 minutes to complete. All data collection and storage were conducted in a manner that ensured participant confidentiality.

Results

Characteristics of the Sample. The rate of problem behaviors and adaptive skills of the random sample used in Experiment 1 were assessed. Scores on the BPI ranged from zero to 37 with a mean of 5.58 and a standard deviation of 7.57. Twenty-five participants (33.8%) received a score of zero on the BPI and the remaining 49 participants (66.2%) received a score of one or greater. The total score of the VABS ranged from 17 to 306, with a mean of 127.23 and a standard deviation of 87.74. Table 1 displays the range, mean, and standard deviation for total scores on the BPI and VABS, as well as their respective subscales.

Table 1

VABS and BPI Scores for the Entire Sample

Measure	Score range	Mean	Standard deviation
BPI Total Score	0.00 – 37.00	5.58	7.57
Self-Injury Subscale	0.00 – 13.00	1.77	2.89
Stereotypy Subscale	0.00 – 24.00	3.04	5.29
Aggression Subscale	0.00 – 6.00	0.74	1.54

Table 1 cont.

VABS Total Score	17.00 – 306.00	127.20	87.70
Communication Domain	4.00 – 93.00	33.40	23.80
Daily Living Skills Domain	0.00 – 147.00	55.10	43.30
Socialization Domain	2.00 – 110.00	38.70	27.80

Hypothesis 1. The relationship between problem behaviors and adaptive skills was first assessed through the visual inspection of a scatterplot graph. The x-axis was the BPI total score and the y-axis was the VABS total score. The visual inspection of the relationship between BPI and VABS scores provided the opportunity to determine if the relationship between the two variables was linear (i.e., points are generally located along a straight line) or curvilinear (i.e., points are located along a curved line). Inspection of the scatterplot indicated that BPI and VABS scores may have a curvilinear relationship. Many participants had a BPI total score of zero, which created a positive skew. In addition, the subjects with higher BPI total scores had corresponding low VABS scores.

Based on the information gathered via visual inspection of the scatterplot, an eta (η) correlation was selected to assess for a relationship between the variables. Hinkle, Wiersma, and Jurs (1998) recommended the use of eta whenever a scatterplot suggests a nonlinear relationship between two variables. However, an eta correlation requires that one variable is categorical and one is continuous. Hinkle et al. (1998) stated that if the variables do not naturally meet this requirement, one variable should be categorized into equal intervals. While this is a rather arbitrary decision, Hinkle et al. (1998) provide a rule of thumb that six to 12 categories should be

created. Therefore, in order to conduct an eta correlation on the current data set, the VABS total score variable was categorized into 10 equal intervals based on the total possible score of 450. Each participant's VABS total score was then assigned a number from one to 10 based on this categorization. An eta correlation coefficient was then calculated for the correlation between VABS total score category and BPI total frequency score. The resulting correlation was $\eta = 0.522$. The square of the eta coefficient ($\eta^2 = 0.272$) can then be interpreted as the proportion of the variance in the dependent variable that can be attributed to the variance in the independent variable (Hinkle et al., 1998). Therefore, variability in the adaptive behavior scores (VABS total score category) for the participants in this sample accounts for 27.20% of the variance in problem behavior frequency (BPI total frequency score). Furthermore, while the eta correlation does not provide indication of a positive or negative relationship, visual inspection of the scatterplot indicated the presence of a negative relationship between adaptive skills and problem behavior. Therefore, as BPI scores increased VABS scores decreased in a curvilinear fashion.

Hypothesis 2. In order to test this hypothesis, the Communication, Socialization, and Daily Living Skills subscales of the VABS served as the three independent measures of these adaptive skill areas and the total score of the BPI was used as the dependent measure of problem behaviors. The amount of variance in BPI total scores predicted by the three subscales of the VABS was assessed using a multiple regression. Multiple regression was selected for this analysis because it allows researchers to assess the relationship between one continuous dependent variable (i.e., BPI total frequency score) and several continuous independent variables (i.e., Communication, Socialization, and Daily Living Skills subscales of the VABS). In standard multiple regression, all three independent variables are entered into the regression equation at the

same time (Tabachnick & Fidell, 2007). Therefore, each independent variable is evaluated in terms of its unique contribution to the prediction of the dependent variable.

Before conducting this analysis, it was first necessary to assess whether the data met the strict assumptions of multiple regression. The primary assumptions of multiple regression are linearity, normality, and homogeneity of variance (Tabachnick & Fidell, 2007). The assumption of linearity states that the relationships between the independent variables and the dependent variable should be linear. The assumption of normality in multivariate statistics states that each variable and linear combination of variables should be normally distributed. In addition, the relationship between pairs of variables should be homoscedastic. Homoscedasticity refers to the variance of one variable being equal to the variance of the other variables (Keith, 2006).

These three assumptions were tested by visual examination of the residuals scatterplots of the predicted dependent variable versus the obtained dependent variable scores (Tabachnick & Fidell, 2007). The residuals scatterplots should be normally distributed, have a straight-line (i.e., linear) relationship, and the variance of the residuals for each predicted dependent variable score should be approximately equal. A residuals scatterplot was created using statistical software for BPI frequency score (i.e., dependent variable) residuals. Visual inspection of the residual scatterplot indicated violations of the assumptions of normality (i.e., residuals were not symmetrically gathered at the middle of the plot) and homoscedasticity (i.e., residuals increased in size at larger predicted values). The assumption of linearity, however, appeared to be met in that residual values decreased as predicted values increased.

Based on the violations of normality and homoscedasticity uncovered in the initial exploration of the data, further inspection of the variables in the study was conducted. Each of the three independent variables and the dependent variable were assessed for normality.

Significant results for the Kolmogorov-Smirnov test of normality were obtained for each variable, which indicated significant deviance from normality (Keith, 2006). Upon further inspection, all variables were found to be negatively skewed, indicating a greater frequency of lower scores on all variables. Specifically, the distribution of BPI scores was highly skewed, with 25 participants (33.80%) having a total BPI score of zero. This finding is not unexpected based on the population from which the study's sample was obtained. The rate of individuals with some degree of problem behaviors in this study is similar to studies by Kiernan and Kiernan (1994) who reported a rate of aggression at 50% and Rojahn (1986) who reported a rate of stereotypies at 62%. Furthermore, the scores obtained on the VABS for these participants were also truncated towards the lower end of the possible score range. This indicates that the participants in this sample generally displayed low levels of adaptive skills.

The heteroscedasticity seen in the residual plots may be contributing to the lack of normality of the independent variables (Tabachnick & Fidell, 2007). In an attempt to remedy the lack of normality in the independent variables, transformations were conducted on each variable. The purpose of transformations is to improve normality. However, the transformations conducted (i.e., log, square root, and inverse transformations) either marginally decreased skew or created a negative skew and hence failed to improve normality. Therefore, the multiple regression was conducted despite these problems. The violations in assumptions of multiple regression shown in the current data set result in an underestimation of the strength of the results found (Keith, 2006; Tabachnick & Fidell, 2007).

A multiple regression was conducted using the enter method with BPI total frequency score as the dependent variable and the three subscales of the VABS (Socialization, Daily Living Skills, and Communication) as the independent variables. Results of the multiple regression

indicated a significant model ($F_{3,70} = 2.82, p < .045$). The adjusted R square (R^2) value was 0.070, which indicates that 7.00% of the variance in behavior problems was accounted for by the model. After finding a significant model, the next step of the multiple regression was to assess the standardized beta coefficients for each independent variable in order to determine if one variable made a greater contribution to the prediction of the dependent variable (Keith, 2006). The VABS Communication domain was found to have the largest standardized Beta coefficient ($B = -0.314, p = 0.090$), while the VABS Socialization ($B = -0.061, p = 0.771$) and Communication ($B = -0.045, p = 0.823$) domains had relatively smaller standardized Beta coefficients. These results are interpreted as a one-unit change in the VABS Communication score results in the largest effect on the dependent variable (BPI total score). However, the beta coefficients for all three variables were not significant.

Exploratory Analysis. As was previously discussed, several limitations were found to exist in the data, including lack of normality and heteroscedasticity. Furthermore, a restricted range of scores was noted in the dependent variable (BPI total score), with the mean being equal to 5.67 and the standard deviation being 8.06. A similar restriction of range was found in the independent variable (VABS total score). This positive skew and restricted range in both variables may have contributed to the limited findings in Hypothesis 2. In examining this data, a further question arose: would it be more appropriate to categorize individual participants as either engaging in or not engaging in problem behaviors as opposed to looking at the data continuously? An exploratory analysis was therefore undertaken to assess whether categorizing the dependent variable would result in a more meaningful regression model. The dependent variable in the study was therefore dichotomized so that 0 = no problem behaviors (i.e., BPI score of zero) and 1 = presence of behavior problems (i.e., BPI score greater than zero). A logistic

regression was chosen for this analysis because logistic regression allows for the prediction of a discrete outcome from a set of continuous variables (Huck, 2000; Tabachnick & Fidell, 2007). Furthermore, logistic regression was deemed appropriate because it does not have assumptions of normality, linearity, and equal error variance (Keith, 2006).

Therefore, a direct logistic regression was performed on behavior problem status (i.e., presence or absence of behavior problems) as the dependent variable and the Socialization, Communication, and Daily Living Skills domains of the VABS as the independent variables. The test of the full model with all three independent variables compared to the null model which only contained the constant was found to not be statistically significant, $\chi^2 (8) = 5.22, p = 0.73$. This result was interpreted as meaning that the set of predictors could not reliably distinguish between individuals with and without problem behaviors.

Experiment 2

While the results of Experiment 1 indicated a limited relationship between adaptive skills and problem behaviors among a random sample of individuals with ID, there remains further areas of research that require attention. By limiting the sample being studied to only individuals with problem behaviors, it was possible to evaluate whether differences in adaptive behavior exist amongst individuals with problem behaviors. The theoretical framework for Experiment 2 was based on the current focus on treating problem behaviors based on the environmental variables that maintain the problem behaviors in individuals with intellectual disabilities. The five factors or functions that are hypothesized to maintain problem behaviors are: nonsocial or automatic reinforcement (e.g., Favell, McGimsey, & Schell, 1982; Patel, Carr, & Kim, 2000); escape from demands (e.g., Carr, Newsom, & Binkoff, 1976, 1980; Sailor et al., 1986; Weeks & Gaylord-Ross, 1981); attention from other people (e.g., Harding, Wacker, Berg, Barretto, Winborn, et al., 2001; Lovaas & Simmons, 1969); access to tangible items (e.g., Carter, Devlin, & Doggett, 2004; Durand & Crimmins, 1988); and, attenuation or expression of physical pain or discomfort (e.g., deLissovoy, 1962; Gardner et al., 1986; Lekkas & Lentino, 1978). Based on the results of a behavioral assessment, an individual is “diagnosed” as having one or multiple of these functions that maintain his or her problem behaviors. A treatment is then developed whereby an adaptive behavior that will serve a similar purpose is taught and other behavior modification techniques are utilized to ensure that the problem behavior no longer elicits similar environmental consequences.

Experiment 2 was designed to assess whether the theoretical relationship between the functions that maintain problem behaviors and adaptive skills deficits actually exist. The relationship between adaptive skills and maintaining variables (i.e., function) was examined in

order to assess whether specific adaptive skills deficits are differentially associated with behavioral functions. The functions under investigation are: 1) nonsocial; 2) escape; 3) attention; 4) tangible; and, 5) physical. The results of this analysis will further our knowledge of the relationship between adaptive skills and problem behaviors in individuals with ID and provide support for continuing our focus on adaptive skills training as a form of intervention for problem behaviors.

Hypotheses

The nature of the relationship between problem behaviors and adaptive skills was further explored through investigating whether specific adaptive skills deficits, as measured by the subscales of the VABS, differed based on behavioral functions, as measured by the QABF. Currently, clinicians and researchers focus treatment on the specific environmental variables that maintain a problem behavior (e.g., Richman, Lindauer, & Crosland, 2001; Tarbox, Wallace, Tarbox, Landaburu, & Williams, 2004). Adaptive skill training is then combined with techniques aimed at disrupting the function of the problem behavior in order to reduce its frequency or severity (Bailey, McComas, & Benavides, 2002; Hagopian, Fisher, Sullivan, Thibault, & LeBlanc, 1998). By investigating whether specific adaptive skills deficits differ based upon the functions maintaining problem behaviors, evidence will be gained to further support the current treatment practices. Additionally, further knowledge of this relationship may improve the tailoring of treatment plans to the variables that maintain problem behaviors and their associated adaptive skill deficits.

In order answer this research question, individuals with problem behaviors were divided into five groups based on the results of the QABF. The five dependent groups are: 1) Escape function; 2) Tangible function; 3) Attention function; 4) Physical function; and, 5) Nonsocial

function. These five groups were then compared across the three domains of the VABS: 1) Socialization; 2) Communication; and, 3) Daily Living Skills.

It was hypothesized that several differences between groups would be found. In the area of Socialization, it was hypothesized that individuals in the Nonsocial group would display significantly fewer socialization skills than individuals in any of the other four groups. This hypothesis was based on the research stating that individuals with a nonsocial function engage in problem behaviors because of the internal stimulation that is invoked and not due to environmental variables (e.g., Favell, McGimsey, & Schell, 1982; Patel, Carr, & Kim, 2000). One potential reason for reliance on internal stimulation is that individuals with a nonsocial function may not have the appropriate social skills to recruit social reinforcement from other people. Therefore, these individuals may be more likely to engage in problem behaviors that are internally rather than externally mediated.

In the area of Communication, it was hypothesized that the Escape, Tangible, Attention, and Physical groups would all display significantly less communication skills than the Nonsocial group. This hypothesis was based on research stating that individuals who engage in problem behaviors for an escape, tangible, attention, or physical function are attempting to obtain reinforcement (either positive or negative) from their environment through engaging in problem behaviors (e.g., Hagopian, Wilson, & Wilder, 2001; Sailor et al., 1986; Weeks & Gaylord-Ross, 1981). It is possible that these individuals engage in problem behaviors because they do not have sufficient communication skills to express themselves appropriately. Without the appropriate communication skills, these individuals may be more inclined than the Nonsocial group to recruit attention in inappropriate methods, such as by engaging in problem behaviors.

The area of Daily Living, however, is an area that has yet to be explored in relation to problem behaviors. However, based on the knowledge that the three domains of the VABS are moderately positively correlated (Sparrow et al., 1984), and that the Daily Living Skills domain was slightly higher correlated with the Socialization domain ($r = 0.49$) than with the Communication domain ($r = 0.55$), it was extrapolated that group differences in the area of Daily Living Skills would be similar to those seen in the Socialization domain. Therefore, it was hypothesized that individuals in the Nonsocial group would have significant lower daily living skills than the other four groups. Table 2 provides a visual representation of the aforementioned hypotheses. Within a given row, an equal sign (=) is used to designate groups that are not hypothesized to be significantly different and a downward arrow (\downarrow) identifies groups that are hypothesized to have significantly lower mean scores.

Table 2

Direction of Hypothesized Group Means

Adaptive skill domain	Function of problem behavior				
	Escape	Tangible	Attention	Physical	Nonsocial
Socialization	=	=	=	=	\downarrow
Communication	\downarrow	\downarrow	\downarrow	\downarrow	=
Daily Living	=	=	=	=	\downarrow

Method

Participants. As in Experiment 1, participants in Experiment 2 were individuals residing at PDC. However, a random sample from the entire population was not used in Experiment 2. Instead, a new sample was used and participants in Experiment 2 were limited to individuals with ID who engaged in aggressive, self-injurious, or stereotypic behaviors. Individuals with problem behaviors at PDC are identified based on observations made by licensed psychologists, standardized assessment instruments, and daily monitoring of incidences of problem behaviors. When an individual residing at PDC engages in aggression, self-injury, or stereotypy, he or she is identified as so through the labeling of the problem behavior as his or her ‘target behavior’ on all charts and database records. Individuals were randomly selected by computer for Experiment 2 based on the presence of aggression, self-injury, or stereotypy as defined by their ‘target behavior’. However, individuals with a diagnosis of Dementia, blindness, or deafness were excluded from the study as these diagnoses are associated with decreased adaptive skills (e.g., Meacham, Kline, Stovall, & Sands, 1987; Moss & Patel, 1997).

The power analysis computer program GPOWER (Erdfelder, Faul, & Buchner, 1996) was used in order to determine the sample size necessary to achieve power of .80 with a medium effect size (Cohen, 1988) for the present study. The “Other F-test” function of GPOWER was utilized in order to calculate the power of a MANOVA design (Erdfelder et al., 1996). Results of the power analysis indicated that a total sample of 75 participants (15 per group) was necessary for this analysis. Therefore, a random sample of 75 individuals with problem behaviors was initially selected for inclusion in this study. However, based on the inclusion criteria and the need to have 15 participants in each of the five groups, additional participants were randomly chosen during the data collection phase until a sufficient number of participants were obtained

for each group. Overall, data was collected on 92 individuals, with 19 individuals meeting criteria for the Nonsocial group, 17 individuals in the Escape group, 15 participants in the Attention group, 16 in the Tangible group, and 15 in the Physical group. However, due to the need for equal sample sizes between groups in a MANOVA (Keith, 2006; Tabachnick & Fidell, 2007), only the first 15 individuals who met criteria for inclusion in each group were included in the analyses. In addition, 10 individuals did not meet criteria for inclusion in the study due to undifferentiated results on the QABF.

The characteristics of the sample in Experiment 2 were analyzed for several demographic variables. The demographic variables examined were participants' age, gender, ethnicity, length of residence at PDC, prescription of psychotropic medication (whether medication was prescribed and type of medication class), and diagnosis of Axis I (APA, 2000) psychopathology. These variables were chosen for consideration based on their potential impact on the results obtained. Age was selected as a demographic variable because adaptive skills can vary based on age (i.e., childhood to adulthood), so it was important to assess whether significant differences in age existed within the sample. Similarly, problem behaviors have been shown to be more prevalent in males over females (Smith et al., 1996), thus ensuring that gender did not significantly differ between groups was also important.

Another demographic variable under investigation was length of residence at PDC. An individual's prior treatment for problem behaviors and training in adaptive skills could have a significant impact on his or her expression of problem behaviors and engagement in adaptive behaviors at the time of the study. However, due to the long-term nature of a placement in a residential facility, it was not possible to obtain comprehensive information on an individual's treatment history. Therefore, length of residence at PDC was included as a measure of length of

active treatment, with the underlying assumption that individuals have been receiving treatment for problem behaviors and training in adaptive skills throughout their placement.

Prescription of psychotropic medication was another variable that could impact an individual's current expression of problem behaviors. In recent years, several classes of psychotropic medication have become more commonly prescribed for the treatment of problem behaviors. These medications include mood stabilizers, antidepressants, and antipsychotics (e.g., Aman, Buitelaar, De Smedt, Wapenaar, & Binder, 2005; Crossland et al., 2003; Devanzo et al., 1998). The prescription of these classes of medication, as well as of the number of individuals in each group not taking any psychotropic medications, were therefore analyzed for group differences that could influence the results of the present study. Finally, problem behaviors have been shown to be more common in some forms of psychopathology (Sovner & Des-Noyers-Hurley, 1986), such as Autistic Disorder (Bodfish, Symons, Parker, & Lewis, 2000) and mood disorders (Marston, Perry, & Roy, 1997; Sovner, DesNoyers-Hurley, & LaBrie, 1982). Thus, the groups in this study were assessed for significant differences in the type of psychopathology diagnosed.

The total sample of 75 participants in Experiment 2 included 43 males (57.30%) and 32 females (42.70%). Of these participants, 60 were Caucasian (80.00%) and 15 were African American (15.00%). The ages of the participants ranged from 20.04 to 80.08 years, with the mean age of the sample being 51.20 years and the standard deviation 12.08 years. Length of admission at PDC for the entire sample ranged from 0.66 to 70.44 years, with a mean of 36.10 years and a standard deviation of 17.82 years. Of the participants in Experiment 2, 48 (64%) were not currently prescribed any psychotropic medications, 12 (16%) were prescribed antipsychotic medications, 9 (12%) were prescribed mood stabilizers, and 6 (8%) were

prescribed antidepressants. Furthermore, 26 individuals (34.7%) did not have any diagnosed psychopathology and 49 (65.3%) had at least one Axis 1 (APA, 2000) diagnosis.

The presence of significant differences between groups in regards to these demographic characteristics has the potential to confound the results obtained from further analyses. Therefore, the presence of significant differences between groups on all of the aforementioned variables was assessed. Chi-square analyses were utilized to assess for the presence of significant differences in gender, ethnicity, and psychotropic medication use between groups. Results indicated no significant difference between groups in gender ($\chi^2(4) = 1.67, p = 0.80$), ethnicity ($\chi^2(4) = 4.14, p = 0.39$), psychotropic medication class ($\chi^2(4) = 14.17, p = 0.29$), and Axis I psychopathology ($\chi^2(80) = 87.43, p = 0.27$). The presence of significant group differences in the age of participants and length of residence at PDC were analyzed with two separate one-way ANOVAs. Results of both omnibus tests indicated that the five groups did not differ significantly in age ($F(5, 70) = 1.13, p = 0.35$) or length of admission ($F(5, 70) = 0.12, p = 0.98$). Table 3 displays the demographic characteristics of each group.

Table 3

Demographic Characteristics by Group

Demographic Variable	Nonsocial	Escape	Attention	Tangible	Physical
Age (years)	51.67	52.72	53.88	52.28	45.46
Length of Admission (years)	35.92	38.86	36.02	34.80	34.90

Table 3 cont.

Gender	8	8	8	12	7
Male	7	7	7	3	8
Female					
Ethnicity					
Caucasian	11	13	11	13	12
African American	4	2	4	2	3
Psychotropic Medication					
Antipsychotic	0	2	5	3	2
Mood Stabilizer	2	0	3	2	2
Antidepressant	0	2	2	1	1
None	13	11	5	9	10
Psychopathology					
None	7	7	3	8	1
Pica	3	0	1	0	0
Pervasive Developmental Disorder (PDD)	3	0	0	1	2
Autistic Disorder	2	3	0	1	5
Bipolar I Disorder	1	0	1	1	0
SMD	1	2	3	2	4

Table 3 cont.

Bipolar Disorder NOS	1	0	1	1	2
Posttraumatic Stress Disorder	0	1	1	0	0
Major Depressive Disorder	0	1	0	0	0
Generalized Anxiety Disorder	0	1	1	0	0
Conduct Disorder	0	1	0	0	0
Schizophrenia	0	0	1	0	0
Impulse Control Disorder	0	0	1	0	0
Delusional Disorder	0	0	1	0	0
Anxiety Disorder NOS	0	0	1	0	0
Mood Disorder NOS	0	0	0	0	1
Obsessive-Compulsive Disorder	0	0	0	0	0
Depressive Disorder NOS	0	0	0	0	1
Psychotic Disorder NOS	0	0	0	1	1
Attention Deficit Hyperactivity Disorder	0	0	0	1	0
Rumination Disorder NOS	0	0	0	1	0
Total*	18	16	15	17	17

*Note: Some participants had more than one Axis I diagnosis

Measures

Questions About Behavior Function (QABF; Matson & Vollmer, 1995). The QABF is an informant-based questionnaire developed in 1995 by Matson and Vollmer. The QABF consists of five subscales: 1) attention; 2) escape from demand; 3) access to tangible reinforcers; 4) physical discomfort; 5) nonsocial reinforcement (Matson & Vollmer, 1995). Each of the 25 items on the QABF are scored on a four-point Likert scale where “0” = the individual “never” engages in the problem behavior for the given reason/situation, “1” = “rarely”, “2” = “some”, and “3” = “often”. An additional score of “X” can be used when the item “does not apply” to the individual. Subscale scores are computed by adding the scores for each item in the subscale. A function is clearly identified when one subscale of the QABF are elevated greater than any other subscale. In situations where more than one subscale is equally elevated, the problem behavior is said to serve multiple functions for the individual (Matson & Vollmer, 1995).

Paclawskyj et al. (2000) reported that among individuals with ID in residential facilities, the QABF has good interrater and test-retest reliability using direct-care staff members as informants. In addition, the QABF’s five-factor structure accounts for 76% of variance found in behavioral function (Paclawskyj et al., 2000). Furthermore, the QABF has been validated against EFA-derived functions (Paclawskyj et al., 2001).

Behavior Problems Inventory (BPI; Rojahn et al., 2001). Please see description of BPI from Experiment 1.

Vineland Adaptive Behavior Scale (VABS; Sparrow et al., 1984). Please see description of the VABS from Experiment 1.

Procedure

For each participant in the sample, graduate students administered a BPI to determine the individual's specific problem behaviors. If more than one problem behavior was endorsed on the BPI, the problem behavior with the highest frequency was considered the individual's primary problem behavior. A QABF was then completed for this problem behavior using the same informant. If multiple problem behaviors on the BPI were reported to occur at the same frequency, a QABF was completed for each individual problem behavior. Only individuals with one clear function were included for further analysis in the study. A clear function was defined in the QABF manual as one subscale having a higher total score than all other subscales (Matson & Vollmer, 1995) and has been used in previous studies (Paclawskyj et al., 2001). In other words, if a single problem behavior served more than one function for an individual (as evidenced by different scales of the QABF elevated to equal levels), then that individual was removed from further analysis. Similarly, if more than one problem behavior was reported at equal frequencies and the QABF functions for those problem behaviors did not agree, the participant was excluded. Thus, participants were placed into one of five groups based on the QABF function of their problem behavior(s): 1) Escape function; 2) Tangible function; 3) Attention function; 4) Physical function; and, 5) Nonsocial function.

In addition to the BPI and QABF data collected, VABS data was collected for each individual who met criteria for assignment to a group. The VABS is administered annually for all individuals who reside at PDC. The PDC archival database was searched for each participant and if the participant had a VABS administered within the prior three months, then archival VABS data was utilized. If a period of greater than three months had passed since a participant's last VABS administration, graduate students administered a VABS for the participant using the same

informant as for the BPI and QABF. The use of archival VABS data in this experiment was deemed to be acceptable because the QABF was used only as a variable for determining groups and no direct comparison was made between the QABF and the VABS. As in Experiment 1, informants for all assessment measures in Experiment 2 were direct-care staff members at PDC who had known the participant for at least six months. Interviews were conducted in a quiet location in the residents' homes at PDC and took approximately 30 minutes to conduct.

Results

In order to assess for differences in adaptive skills between individuals with different problem behavior functions, a one-way Multivariate Analysis of Variance (MANOVA) was utilized with five levels of the dependent variable (i.e., QABF function) and three independent variables (i.e., VABS adaptive skills domains). A MANOVA was the most appropriate statistical analysis for this hypothesis because it allows for the measurement of several independent variables simultaneously while providing protection against inflated Type I error (Tabachnick & Fidell, 2007).

Before conducting the MANOVA, it was necessary to assess for any violations in its statistical assumptions. The three assumptions of MANOVA are: 1) multivariate normality; 2) homogeneity of the covariance matrices; and, 3) independent observations (Weinfurt, 1995). The assumption of multivariate normality states that each dependent variable is normally distributed and that the linear combinations of the dependent variables are also normally distributed. The normality assumption of MANOVA is assessed through evaluating the degree of skew and kurtosis of each dependent variable. While the skew and kurtosis of the dependent variables in this study were between the critical values of -1 and $+1$, the Kolmogorov-Smirnov test for normality was significant for all three variables, indicating that the assumption of normality was

violated (Keith, 2006). While the present sample does appear to depart from normality, several researchers have shown that MANOVA is robust to lack of normality, especially when the overall N of the study is greater than 40, as it was in this study (Seo, Kanda, & Fujikoski, 1995; Tabachnick & Fidell, 2007).

The second assumption of MANOVA, the homogeneity of covariance matrices, states that the variance of the independent variables be equal across each level of the dependent variable and that the variance between each possible pair of independent variables (covariances) are also equal. This assumption is assessed with Box's M test (Tabachnick & Fidell, 2007). The results of the Box's M test for the data in the current study indicated that the covariance matrices were unequal ($p < .000$). However, when the number of participants in each group of the MANOVA is equal, as was in the case in the current study, the MANOVA is considered to be robust to this violation (Tabachnick & Fidell, 2007; Weinfurt, 1995). Finally, MANOVA requires that all observations are independent of each other. This assumption was satisfied in the present study because a participant's scores on the dependent measures were not influenced by the scores of the other participants.

The first step of the MANOVA was to compare the mean scores of the three VABS subscales across the five function-based groups. This was necessary to demonstrate the existence of any differences in adaptive skills between groups that were significantly greater than what would be expected based on chance (Tabachnick & Fidell, 2001). Results of this first level of analysis indicated the presence of a significant difference within the groups ($\Lambda(3) = 2.50, p < .005$). Therefore, the null hypothesis that there were no significant differences between groups was rejected.

Because a significant main effect between groups was found in the first level of analysis, a one-way Analysis of Variance (ANOVA) was conducted across the five levels of QABF function for each of the three adaptive skills domains. Conducting these ANOVAs allowed for the evaluation of specific adaptive skill subscale means that were significantly different between groups (Tabachnick & Fidell, 2001). A Bonferroni correction procedure was used to protect against inflation of the error rate that occurs when conducting multiple ANOVAs (Tabachnick & Fidell, 2001). A significant between-subjects effect was found for the VABS Communication domain ($F(5, 70) = 7.00, p < .000$), the VABS Daily Living Skills domain ($F(5, 70) = 5.09, p < .001$), and the VABS Socialization domain ($F(5, 70) = 7.26, p < .000$).

Table 4

Mean Scores for VABS Domains Across Groups

Domain	Nonsocial	Escape	Attention	Tangible	Physical	F	p
Communication	16.93	34.13	48.00	40.73	16.93	7.00	.000
Daily Living Skills	30.40	57.73	75.53	61.40	21.00	5.09	.001
Socialization	21.00	39.40	50.80	41.93	16.00	7.26	.000

Finally, Tukey post-hoc analyses were then conducted for each of the three adaptive skills domains. The Tukey test was selected because it allows for all possible pair-wise comparisons between groups while controlling for inflation in error rates (Hinkle et al., 1998). In the Communication domain, the Nonsocial group was found to have significantly lower scores than the Attention ($p < .001$) and Tangible ($p < .019$) groups, and the Physical group was found

to have significantly lower scores than the Attention ($p < .001$) and Tangible ($p < .019$) groups.

Table 5 presents the mean differences between groups for the Communication domain.

Table 5

Mean Difference between Groups on Communication domain

	Nonsocial	Escape	Attention	Tangible	Physical
Nonsocial	—	-17.20	-31.07 ^a	-23.80 ^b	0.00
Escape		—	-13.87	-6.60	17.20
Attention			—	7.27	31.07 ^a
Tangible				—	23.80 ^b
Physical					—

^a = $p < .001$

^b = $p < .019$

In the Daily Living Skills domain, the Nonsocial group had significantly lower scores than the Attention group ($p < .005$), and the Physical group had significantly lower scores than the Attention ($p < .001$) and Tangible ($p < .02$) groups. Table 6 presents the mean differences between groups for the Daily Living Skills domain.

Lastly, in the Socialization domain, the Nonsocial group had significantly lower scores than the Attention group ($p < .002$), and the Physical group had significantly lower scores than the Escape ($p < .027$), Attention ($p < .000$), and Tangible ($p < .011$) groups. Table 7 presents the mean differences between groups for the Socialization domain.

Table 6

Mean Difference between Groups on Daily Living Skills domain

	Nonsocial	Escape	Attention	Tangible	Physical
Nonsocial	—	-27.33	-45.13 ^a	-31.00	-0.60
Escape		—	-17.80	-3.67	26.73
Attention			—	14.13	44.53 ^b
Tangible				—	23.80 ^c
Physical					—

^a = p < .005^b = p < .001^c = p < .019

Table 7

Mean Difference between Groups on Socialization domain

	Nonsocial	Escape	Attention	Tangible	Physical
Nonsocial	—	-8.40	-29.80 ^a	-20.93	5.00
Escape		—	-11.40	-2.53	23.40 ^b
Attention			—	8.87	34.80 ^c
Tangible				—	25.93 ^d

Table 7 cont.

Physical

^a = $p < .002$

^b = $p < .027$

^c = $p < .000$

^d = $p < .011$

Exploratory Analysis. A factor that could potentially be influencing the results seen in the current study is cognitive functioning. Cognitive functioning (i.e., intelligence) has been shown in multiple studies to have a moderate relationship to adaptive functioning (e.g., Carpentieri & Morgan, 1996; Dacey et al., 1999). In designing a study that assessed the relationship between adaptive behavior and another variable (i.e., problem behaviors) it was important to consider the effect that cognitive functioning could have on the results obtained. Cognitive functioning is typically assessed through the use of standardized intelligence testing. However, most of the intelligence tests available have basal scores that are not low enough to capture the true intelligence of individuals with lower functioning. As a result, standardized intelligence tests could not be used as a measure of cognitive functioning in participants in this sample. A different method of estimating cognitive functioning was therefore necessary.

Recognizing the difficulty in estimating cognitive functioning in individuals with severe and profound intellectual disabilities, Matson, Dixon, Matson, and Logan (2005) developed a method of classifying individuals as having severe and profound deficits based on scores on the Matson Evaluation of Social Skills in Individuals with sEvere Retardation (MESSIER; Matson, 1995). The MESSIER is a measure of social skills designed for individuals with ID. The

MESSIER is an 85-item, informant-based questionnaire that assesses a wide range of positive and negative social behaviors. Items on the MESSIER are scored on a four point likert scale of 0 (never), 1 (rarely), 2 (sometimes), and 3 (often). The MESSIER consists of six clinically derived subscales: general positive; positive verbal; positive nonverbal; general negative; negative verbal; and, negative nonverbal (Matson, 1995). The psychometric properties of the MESSIER have been reported and the internal consistency ($r = 0.94$), test-retest reliability ($r = 0.86$), and interrater reliability ($r = 0.71$) are all acceptable (Matson, 1995; Matson, Leblanc, & Weinheimer, 1999).

Matson et al. (2005) administered the MESSIER to 618 individuals with known intellectual deficits. Scores on the MESSIER were compared to adaptive behavior scores on the VABS with a discriminant function analysis. Based on this analysis, Matson et al. (2005) found that 20 MESSIER items had pooled within-group correlations above 0.50. These items were included in a new scoring algorithm with all positive behavior items being added together and two negative behavior items being subtracted to produce a total score. A cut-off score of nine was then established as it was the midpoint between the two distributions. Therefore, individuals with a score of less than nine on the algorithm were classified as having a profound deficit and individuals with a score of nine or higher were classified as having a severe deficit.

Classification of the participants on the MESSIER was then compared to ID (i.e., mental retardation) diagnoses previously provided by licensed psychologists based on DSM-IV-TR criteria (APA, 2000). Eighty-six percent of individuals classified as having a severe ID on the MESSIER algorithm were correctly classified based on the psychologists' diagnoses and 73% of individuals classified as having a profound ID on the MESSIER were also correctly classified.

For the purpose of this exploratory analysis, MESSIER scores were used as a method of

classifying cognitive functioning in participants in order to assess the contribution of cognitive functioning in the variability between behavioral functions on adaptive skills.

Because standardized intelligence tests were inappropriate for use in this exploratory analysis, the MESSIER was utilized as a method of estimating cognitive functioning in individuals in the sample. MESSIER scores for all participants were obtained from annual assessments conducted by licensed psychologists at PDC over the past two years. Using the algorithm described by Matson et al. (2005), individuals were classified as having profound or severe intellectual disability based on a cutoff score of nine. The MESSIER classification was then entered into the previously conducted MANOVA as a covariate. The Multivariate Analysis of Covariance (MANCOVA) was conducted in order to assess the presence of significant differences in adaptive skills based on behavioral function when the variance due to cognitive classification is removed. Results of the MANCOVA indicated a significant effect of cognitive classification ($\Lambda(3) = 10.34, p < .000$). However, there was no longer a significant effect for function once the variance attributed to cognitive classification was removed ($\Lambda(3) = 1.15, p = .332$).

Discussion

The problem behaviors of aggression, self-injury, and stereotypy are among the most significant variables affecting the quality of life of individuals with ID and their caregivers (Gardner et al., 2001). Problem behaviors can present substantial risks to an individual's health, as well as restrict the range of living options available to him or her (Borthwick-Duffy et al., 1987; Intagliata & Willer, 1981). Adaptive behavior is often linked to problem behaviors both in theory and in treatment. Deficits in adaptive behavior are hypothesized to underlie the etiology of problem behaviors in individuals with ID and are therefore a primary training target in the treatment of problem behaviors (e.g., Cipani & Spooner, 1997; Durand, 1990). The purpose of the present study was to use several methods to evaluate the relationship between problem behaviors and adaptive skills in individuals with ID.

In Experiment 1, the relationship between problem behaviors and adaptive skills was assessed in a random sample of individuals with ID residing in a residential facility. This portion of the study was aimed at assessing whether individuals with greater problem behaviors exhibited lower adaptive skills. It was hypothesized that there would be an inverse relationship between problem behaviors (as measured by BPI total score) and adaptive skills (as measured by VABS total score). This hypothesis was based on the theory that some individuals with ID engage in problem behaviors as a means of interacting with their environment due to a lack of more appropriate skills (e.g., Guess & Carr, 1991; Sovner, 1986). This hypothesis was supported by the finding of a significant correlation between these two factors. Results of the significant eta correlation indicated that 27.10% of the variance in problem behaviors could be accounted for by adaptive skills. Furthermore, visual inspection of the curvilinear relationship indicated the

presence of an inverse relationship between problem behaviors and adaptive skills. In other words, as problem behaviors increased, adaptive skills decreased within the sample.

In the second part of Experiment 1 the researcher assessed whether the domains of the VABS, Communication, Socialization, and Daily Living Skills, were predictive of problem behaviors when combined and whether the Communication domain accounted for a greater portion of the variance. It was hypothesized that communication skills would be the strongest predictor of problem behaviors, because nonverbal behaviors, such as problem behaviors, have long been thought to have communicative properties (e.g., Bates, Camaioni, & Volterra, 1975; Ferster, 1965; Talkington, Hall, & Altman, 1971). This hypothesis was only partially supported by the data because a significant multiple regression model was found. However, only 7.00% of the variance in problem behaviors was found to be predicted by the model created that included communication, socialization, and daily living skills. The beta weights of the independent variables were not significant. The strongest predictor, however, was found to be the Communication domain relative to the other two domains. This can be viewed as supporting the hypothesis that communication skills would provide the greatest contribution to problem behaviors. It is possible that the underestimation of the multiple regression that was created by the violations of assumptions may be the reason why this data did not reach significance.

Due to the violations of assumptions found in the data, an exploratory analysis was conducted to assess whether a logistic regression with its more flexible assumptions could provide a better estimation of the relationship between problem behaviors and adaptive skills. In order to conduct the logistic regression, participants were divided based on whether any endorsements were made on the BPI. Results of the logistic regression were not found to be significant. It is plausible that categorizing the behavior problems into two groups, those who

engaged in problem behaviors versus those who did not, resulted in a loss of some of the meaning associated with the continuous variable. Therefore, it seems as though the multiple regression was the most appropriate method of analyzing this data, despite the violations of assumptions and resulting reduction in power.

Interpretations of the results of Experiment 1 were complicated by the limitations within the data set. The finding of a significant multiple regression model between problem behaviors and adaptive skills is supported by the work of other researchers who have reported a relationship between level of intellectual functioning and severity of problem behaviors (McClintock et al., 2003; Rojahn & Esbensen, 2002). However, the results of the present study may have been limited because of the restricted range of adaptive skills observed in the present sample. The full range of possible scores on the VABS is zero to 450. However, the range of scores in this sample was 17.0 to 306.0 and the mean full-scale score was 127.60. Thus, the range of scores seen in this sample was restricted when compared to the possible range of scores on the VABS. This information can be interpreted as a limitation of the VABS. While the VABS is one of the most widely used instruments for the assessment of adaptive skills (Beail, 2003), it may not adequately assess the adaptive skills of lower functioning individuals.

Based on this observation about the data set, it seems possible that the choice of a random selection of participants from the entire residential facility population was inappropriate. Individuals are often placed in residential facilities due to their limited ability to care for themselves (Borthwick-Duffy, Eyman & White, 1987; Intagliata & Willer, 1981). Therefore, the participants in this study already represent a population that engages in limited adaptive behavior. Perhaps the use of a sample of individuals that includes both those who reside in residential facilities and community-based settings would provide a wider range of adaptive

skills and might therefore increase the likelihood of finding a stronger relationship between adaptive skills and problem behaviors. The present study, however, can be viewed as providing valuable information for individuals with lower functioning and more severe deficits in adaptive skills.

While the results of Experiment 1 were limited, the importance of problem behaviors in the field ID is far too profound to only be investigated in one manner. Therefore, Experiment 2 examined differences in adaptive skills among individuals who engage in problem behaviors. Experiment 2 focused on a more clinically significant question: do individuals with different functions of problem behaviors exhibit differences in communication, social skills, or daily living skills? This question is clinically significant because the current standard for the treatment of problem behaviors is to conduct an idiographic assessment to identify the function that a problem behavior serves for an individual. Based on the research conducted on these functional assessments, individuals with ID have been reported to engage in problem behaviors in order to obtain social attention (i.e., an attention function), to gain access preferred tangible items (i.e., a tangible function), to escape from demand situations (i.e., an escape function), to attenuate or communicate the presence of physical pain or discomfort (i.e., a physical function), or for the internal stimulation provided by the problem behavior itself (i.e., a nonsocial function).

Once the function or functions of an individual's problem behaviors have been identified, the clinician's next step is to design a treatment that targets the function through training an adaptive behavior that will result in the individual obtaining the same type of reinforcement previously achieved through engaging in the problem behavior (Carr & Durand, 1985; Durand & Crimmins, 1988; Mace & Roberts, 1993). Thus, a clear relationship is theorized to exist between a lack of adaptive skills and engaging in problem behaviors. In Experiment 2 the researcher

assessed this relationship by grouping participants based on the function of their problem behavior. Individuals were placed into the Attention, Tangible, Escape, Nonsocial, or Physical groups based on the identified function of their problem behaviors. The communication, socialization, and daily living skills of these individuals in these five groups were then compared.

In the area of socialization skills, it was hypothesized that individuals in the Nonsocial group would exhibit significantly lower social skills than individuals in the other four groups. This hypothesis was based on researchers who have reported that individuals with a nonsocial function are responding to internal as opposed to external stimuli (e.g., Favell, McGimsey, & Schell, 1982; Patel, Carr, & Kim, 2000). This reliance on internal stimuli may be occurring because the individual does not have the appropriate social skills to recruit reinforcement from his or her environment. It was found that the Nonsocial group engaged in significantly fewer social skills than the Attention group only. In addition, it was also found that the Physical group had significantly lower socialization scores than the Escape, Attention, and Tangible groups.

In the area of communication, it was hypothesized that individuals in the Attention, Escape, Tangible, and Physical groups would exhibit significantly fewer skills than individuals in the Nonsocial group. This hypothesis was based on previous researchers' statements that individuals who engage in problem behaviors for an escape, tangible, attention, or physical function are attempting to obtain reinforcement (either positive or negative) from their environment through engaging in problem behaviors (e.g., Hagopian, Wilson, & Wilder, 2001; Sailor et al., 1986; Weeks & Gaylord-Ross, 1981). Without the appropriate communication skills, these individuals may be more inclined than the Nonsocial group to recruit attention in inappropriate methods, such as by engaging in problem behaviors. This hypothesis was not supported because the Nonsocial group was found to have significantly lower communication

skills on the VABS than the Attention and Tangible groups. The Physical group was also found to have significantly lower communication skills than both the Attention and Tangible groups as well. While it was hypothesized that the Nonsocial group may have better communication skills, this did not prove to be the case. As was seen in the area of socialization, individuals in the Nonsocial and Physical groups may not have the motivation to engage in social interaction and therefore are not communicating for social attention.

Finally, in the area of daily living skills, the pattern of differences between groups was difficult to predict based on a lack of research into this area. However, based on the relatively stronger correlation between the Daily Living Skills and Socialization domains on the VABS (as compared to the correlation between Daily Living Skills and Communication domains), it was hypothesized that individuals in the Nonsocial group would exhibit significantly lower daily living skills than the other four groups. This hypothesis was partially supported, in that the Nonsocial group had significantly lower scores than the Attention group. It was also found that the Physical group had significantly lower daily living skills than the Attention and Tangible groups. These results are similar to those seen in the Socialization domain, which was predicted based on intercorrelation between subscales. The decreased daily living skills seen in the Nonsocial and Physical groups indicate that individuals with these two functions are less able to care for their day to day needs, such as toileting and bathing themselves.

The results of Experiment 2 indicated a varying pattern of differences in adaptive skills based on the domain under investigation. Overall, no significant differences were found between the Attention, Tangible, and Escape groups across all three of the VABS domains. This indicates that there are no significant differences in communication, socialization, or daily living skills between individuals with these three behavioral functions. This finding is in line with previously

conducted treatment researchers who have shown that teaching basic communicative responses to individuals with these behavioral functions results in significant decreases in problem behaviors (Carr & Durand, 1985; 1987; Durand & Kishi, 1987; Wacker, Berg, Harding, Barretto, Rankin, et al., 2005).

While no differences were found between the Attention, Tangible, and Escape groups, a pattern of significant differences was observed with the Nonsocial and Physical groups. The Nonsocial and Physical groups were found to have significantly lower skills than other groups in all three of the adaptive behavior domains. However, no significant differences were found between these two groups on any of the adaptive behavior domains. It may be appropriate to conceptualize individuals with a nonsocial or physical-based function for behavior problems as responding more to internal stimuli (e.g., pain, stimulation brought about by engaging in the problem behavior), and less to external stimuli, (such as social attention or physical items in their environment.) This conclusion is supported by other researchers who have focused on reducing problem behaviors by teaching an alternative means of gaining stimulation (Higbee, Chang, & Endicott, 2005) or attenuating physical pain through combinations of behavioral and medical interventions (Bosch, Van Dyke, Smith, & Poulton, 1997; Carr et al., 2003).

It is important to note that the data in this study were correlational and therefore causation cannot be inferred. Therefore, two explanations for these findings exist. First, these individuals' focus on internal stimulation could arise from a preexisting deficit in their ability to interact with their environment, as evidenced by the significantly lower socialization and communication skills found in these two groups. Individuals in the Nonsocial and Physical groups may lack the motivation to interact with other people and therefore never learn the social and communication skills necessary to do so. These individuals also displayed fewer daily living

skills, which further indicated that they cannot or have not learned the behaviors required to function independently. Overall, these individuals are lower functioning across all three adaptive behavior domains than the individuals in the other groups.

The second explanation for this finding is that the physical discomfort or internal stimulation these individuals are experiencing may be reducing their ability to learn new adaptive skills. This explanation is supported by the finding that these individuals also engaged in fewer daily living skills than individuals in the other groups. As opposed to being predisposed to being lower functioning, the problem behaviors themselves may be interfering with learning adaptive skills. This explanation underscores the necessity of reducing problem behaviors through a combination of behavior modification procedures and adaptive skills training in order to improve an individual's overall functioning.

Interpretation of the results of the present study should be made cautiously based on the potential contribution of two factors: the effects of differing treatments participants may have received and the role of cognitive functioning. The first factor that may be affecting the results found in this study is treatment. Due to the potential severity of problem behaviors, they typically do not go untreated. Therefore, individuals in the study may have been exposed to a number of different treatments to address their behavior problems. These treatments may have included, for example, behavior modification, functional communication training, or psychotropic medications. In addition, it is likely that a number of treatments or combinations there of have been attempted in the past. In addition, it is also likely that adaptive skills training has been conducted with most of the participants in the study. Because it was not possible to control for the treatments received by each participant, the validity with which the treatments

were implemented, or their effectiveness, it was not possible to assess the true effect of treatment on the results of this study.

In order to address this issue, an attempt was made to control for treatment effects through the inclusion of each participant's length of residence at PDC. Since all individuals residing at PDC have behavioral treatment plans written by licensed psychologists and implemented by the direct-care staff under their supervision, it can be assumed that the type of treatment received at PDC is approximately equal for all individuals. Therefore, by evaluating the length of residence at PDC in Experiment 2, we were ensuring that there were not significant differences between groups in the length of active treatment at the facility. Because no significant differences were found between groups, it may be roughly assumed that treatment did not differ significantly between the groups in Experiment 2.

The second factor that could be affecting the results obtained in the present study is the role of cognitive functioning in the expression of problem behaviors and the acquisition of adaptive skills. Researchers have demonstrated that problem behaviors are more common in individuals with lower intellectual functioning (McClintock et al., 2003; Rojahn & Esbensen, 2002). We also have data to support a moderate relationship between cognitive or intellectual functioning and adaptive behavior (e.g., Dacey et al., 1999). However, the relative contributions of cognitive functioning and adaptive behavior to problem behaviors in individuals with ID have not yet been explored. The reason for limited research in this area is most likely due to the lack of appropriate cognitive measures for individuals with lower levels of cognitive functioning. Through the exploratory analysis in Experiment 2, this study attempted to investigate this issue using an estimation of cognitive functioning obtained by the MESSIER (Matson, 1995).

The results of the exploratory analysis were interesting in that all of the variance in adaptive behavior based upon the function of problem behaviors was explained by variation in the participants' cognitive functioning estimation provided by the MESSIER algorithm. This data could be interpreted as meaning that cognitive functioning, and not adaptive skills, is what is varying between individuals with different behavioral functions. This interpretation may be inappropriate due to the great deal of overlap in the items contained by the MESSIER and the VABS. In individuals with lower functioning, it is extremely difficult to directly measure cognitive functioning due to limitations in the basal scores on intelligence. The present study attempted to address this issue by obtaining a cognitive functioning estimation based on an informant-based measure designed for lower functioning populations. The MESSIER, however, is not a direct measure of intelligence and therefore these results must be viewed as exploratory in nature.

Interestingly, the exploratory analysis conducted could be viewed as a confirmation of the findings in Experiment 2 because when functioning level was controlled for by the MESSIER scores, no differences between groups could be found. This information reinforces the results found in Experiment 2 because if significant differences had been found despite the presence of the covariate, one could hypothesize that other unknown variables were at least partially responsible for the differences seen in adaptive skills when individuals were grouped by the function of their behavior problem. Because of the great deal of overlap in items in the VABS and MESSIER, the results of this exploratory analysis are probably best viewed as confirmation of the study's results. This exploratory analysis also serves to remind clinicians and researchers of the need for more appropriate measures of intelligence for individuals with lower cognitive functioning.

Several areas exist for improvement upon the current study in future research. First, the sample in the present study was selected from a population of individuals residing in a developmental center. As a result, individuals in the sample represented the lower functioning end of the continuum of individuals with ID. This resulted in a restricted range of adaptive behavior in the sample and a lack of normally distributed scores. While the VABS is one of the most widely used adaptive behavior scales, the distribution of scores in the present sample may highlight a limitation of the use of the VABS in individuals with fewer adaptive skills. The power of the statistical analyses conducted were therefore decreased and the likelihood of finding a significant relationship was reduced. While significant results were obtained in Experiment 2, the impact of these problems in Experiment 1 is unknown. For these reasons, generalization of results to the entire population of individuals with ID cannot be made at this time. Future research can capitalize on these issues by broadening the sampling to include individuals who reside in community placements, such as group homes. By including individuals who are better able to care for themselves, the range of adaptive skills seen in the sample should increase. In addition, a wider sample would aid in the generalization of results to the entire population of individuals with ID. The present study, however, did provide useful information for a population that is sometimes overlooked: individuals on the lower end of the ID continuum.

The second limitation of the present study that could be improved upon is the reliance on informant-based measures of behavior problems and adaptive skills. Informant-based measures were selected for use in the present study because they are the instruments most commonly used in clinical settings and therefore lend to a greater chance of generalization of results to practitioners who work with individuals with intellectual and developmental disabilities. While informant-based measures have the distinct and often essential benefits of being cost-effective

and efficient, reliance on the opinions of informants introduces a greater potential for problems with reliability and validity. Future studies may be able to improve upon this issue especially within the area of functional analysis. Experimental functional analysis could be used to assess the functions maintaining problem behaviors, and therefore direct measures of reliability and control could be obtained. The benefits of using experimental functional analysis would have to be deemed greater than the costs associated (Paclawskyj, Kurtz, & O'Conner, 2004).

The third potential limitation to the present study is the inclusion of only adults in both experiments. The mean ages of participants in Experiment 1 and Experiment 2 were 50.5 and 51.2 respectively. The skew towards older individuals makes the generalization of results to children and adolescents difficult. Specifically, future studies should examine whether the pattern of adaptive behavior deficits seen among children with different behavioral functions are similar to those reported with adults in the present study. Currently, the trend in clinical intervention is to begin identifying intellectual and developmental disabilities in younger and younger children (Rogers, 2001). Problem behaviors in children with ID have a significant impact on both the children and their careproviders (Blacher & McIntyre, 2006), thus designing both prevention and treatment programs that can be effective in reducing behavior problems in children is of the utmost importance. If a similar pattern of adaptive skills deficits is found in children with ID, the value of training specific adaptive skills as a method of preventing and treating behavior problems may be assessed.

The results of the present study have both theoretical and practical value within the field of ID. The conclusions drawn from Experiment 1 indicate a limited relationship between problem behaviors and adaptive skills in individuals with ID. This portion of the study highlights the need to expand our research in the area of problem behaviors and adaptive skills to include a

wider range of individuals with varying levels of functioning. The data obtained in Experiment 2 hold clinical significance in that the author was able to demonstrate the dearth of adaptive behavior that individuals with problem behaviors maintained by nonsocial and physical functions. This information underscores the necessity of training adaptive skills to individuals with nonsocial and physical functions. Problem behaviors in individuals with intellectual and developmental disabilities are an area of great concern to both researchers and clinicians. The practical importance of continuing to research this area cannot be underestimated and the present study attempted to further our understanding of this important issue.

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