THE RELATIONSHIP BETWEEN SOCIAL BEHAVIOR AND MEALTIME BEHAVIOR PROBLEMS IN INDIVIDUALS WITH SEVERE AND PROFOUND MENTAL RETARDATION

A Dissertation

Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy

in

The Department of Psychology

by

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May 2004
ACKNOWLEDGEMENTS

There are several people I would like to thank for their contributions towards the completion of my dissertation and towards my clinical training in general. First I would like to thank my major professor Dr. Johnny Matson for his help and guidance throughout my graduate school training. I would also like to thank my departmental committee members each of whom has contributed significantly to my educational experience at LSU, including Drs. Dorothea Lerman, Amy Copeland, and W. Drew Gouvier. Several fellow students were also instrumental in the completion of this project including Stephen Mayville, Rinita Laud, and Melissa Luke. I am grateful to all of you. I would also like to thank my parents, both of whom have been extremely supportive of me during my academic and life pursuits. And finally I would like to thank my wife Stephanie and daughter Anna for their unending love and support as I strive to reach my goals.
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ABSTRACT

One of the defining features of mental retardation is a problem in adaptive functioning. An area of adaptive skills commonly deficient in this population is social functioning, often characterized as behaviors that provide individuals with the means to interact effectively and appropriately with others. Researchers in this area have generally focused on improving appropriate social behavior and/or decreasing behavioral excesses that interfere with social interactions. Few studies have examined the effects of improving social behavior on collateral behaviors. The current study examined the relationship between social behavior and feeding and mealtime problem behavior in individuals with mental retardation. Individuals across three clinical feeding groups (selectivity, food refusal related behavior problems, and nutrition related behavior problems) were compared across social behaviors as measured by the Matson Evaluation of Social Skills in Individuals with sEvere Retardation (MESSIER) and the Vineland Adaptive Behavior Scales (VABS). Statistically significant differences were only observed among comparisons between the Selectivity group and their matched controls, where greater levels of appropriate social skills and functioning among were associated with the control group. Conversely, individuals who exhibit behaviors associated with selectivity reportedly displayed fewer positive social behaviors. Results of a regression analysis indicate that elevated measures of a mood disturbance can be predictive of the presence of food refusal behavior. Implications of these data are discussed.
INTRODUCTION

History / Definition of Mental Retardation

Mental retardation is a term used to describe individuals who demonstrate significant concurrent deficits in the areas of intellectual functioning and adaptive functioning, which are evident before the age of 18 years. According to the definition of mental retardation described by the American Association on Mental Retardation (AAMR; 1992), significant deficits are characterized by scores two standard deviations below the mean on standardized measures of both intellectual and adaptive functioning. Persons described as mentally retarded are typically categorized according to their “level” of functioning. According to the Wechsler scales and the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV; American Psychiatric Association, 1994), current levels of mental retardation with respect to IQ and adaptive functioning scores include mild (69-55), moderate (54-40), severe (39-25), and profound (≤ 24). The category labels and grouping scores have changed over the years in part to more accurately delineate the groups and also in an attempt to minimize the offensiveness and stigma associated with each label.

Prevalence and Etiology of Mental Retardation

The prevalence of mental retardation among the general population is dependent, in part, on the definition of mental retardation used. Prevalence estimates range from about 3% when only IQ scores are considered (Hodapp & Dykens, 1996) to less than 1% when other factors such as adaptive functioning are included (APA, 1994). More accurate information is available regarding the breakdown of individuals across functioning levels. Most individuals diagnosed with mental retardation, approximately 85%, function in the mild range. Ten percent of those persons function in the moderate range, 3-4% in the severe range, and 1-2%
in the profound range (APA, 1994). Due in part to several X-linked disorders (e.g., Fragile X Syndrome), estimates indicate that more males than females are diagnosed with mental retardation (APA, 1994).

The etiology of mental retardation is often unidentified. Some researchers estimate that the etiology is not known for 20-30% of individuals with severe mental retardation, and upwards of 50-60% of individuals with mild mental retardation (Hodapp & Dykens, 1996). For the remainder of those diagnosed with mental retardation the etiology can be one of numerous factors. These factors include, but are not limited to, (1) genetic abnormalities (e.g., Down’s Syndrome, Fragile X Syndrome), (2) prenatal / perinatal complications (e.g., prenatal exposure to disease, anoxia at birth), (3) postnatal factors (e.g., seizures, malnutrition), and psychosocial influences (e.g., socioeconomic status) (Hodapp & Dykens, 1996).

**Behavior Problems and Deficits Associated with Mental Retardation**

Individuals with mental retardation are often described with respect to their ability to function independently. Communication is one skill identified as essential for independent functioning. Communication skills deficits are common among individuals with mental retardation (McCoy & Buckhalt, 1990), and may contribute to other behavior deficits (e.g., social skills) and/or contribute to the emergence of problem behaviors (e.g., self-injury and physical aggression) (Matson, Smiroldo, & Bamburg, 1998). Subsequently, researchers have found that individuals with mental retardation have pronounced social skills deficits (Lovett & Harris, 1987) and engage in problem behavior, such as physical aggression and self-injurious behavior, more frequently than the general population (Gardner & Cole, 1990; Johnson & Day, 1992). Ineffective communication may also restrict the individual's ability to
access necessary resources and therefore limit his/her capacity for nonrestrictive independent living.

Independent living is a relevant issue concerning persons with mental retardation. Many groups advocate for full inclusion into the community. However, individuals with mental retardation frequently lack the self-help and self-care skills required (AAMR, 1992; APA, 1994). A large body of research in the field of mental retardation has been devoted to training and increasing social, self-care, and self-help skills, and the assessment and treatment of problem behaviors (e.g., self-injury, aggression, and noncompliance) (Carr & Durand, 1985; Matson et al., 1998; Schoen & Sivil, 1989; Wheeler, Bates, Marshall, & Miller, 1988)

Assessment Methodology in Mental Retardation

Assessment of individuals diagnosed with mental retardation is more difficult than with the general population due in part to the inability of the individual to provide an accurate, or any, self-report. Assessment procedures must therefore be adjusted to compensate for this lack of available information. Examiners are forced to rely on observable behaviors exhibited by the individual and/or reports of observable behaviors. Three assessment methods are commonly used to gather important information. The first method, indirect assessment, involves the use of behavior rating scales. A behavior rating scale requires a third-party informant familiar with the individual being assessed to respond to questions about that individual’s behavior. Assessment questions typically address observable behavior that does not require any subjective interpretation. Behavior rating scales are used to assess various constructs, skills, deficits, and other observable behaviors. For example, several indirect assessments have been designed to screen for dual diagnosis including, the Diagnostic Assessment of the Severely Handicapped–II (DASH-II; Matson,
1995a), The Reiss Screen for Maladaptive Behavior (Reiss, 1988), the Behavior Problems Inventory (BPI; Rojahn, Polster, Mulick, & Wisniewski, 1989), the Aberrant Behavior Checklist (ABC; Aman, Singh, Stewart, & Field, 1985), and the Assessment of Dual Diagnosis (ADD; Matson & Bamburg, 1998). Many adaptive functioning measures utilize this method as well, including the Vineland Adaptive Behavior Scales (VABS; Sparrow, Balla, & Cicchetti, 1984a, 1984b, 1985) and the Adaptive Behavior Scale (ABS; Nihira, Leland, & Lambert, 1993). The identification of variables that maintain problem behavior (i.e., functional assessment) can also be accomplished using an indirect assessment. Some examples include the Motivation Assessment Scale (MAS; Durand & Crimmins, 1988), and Questions About Behavioral Function (QABF; Matson & Vollmer, 1995). Social skills excesses and deficits can be identified using measures such as the Matson Evaluation of Social Skills in Individuals with Severe Retardation (MESSIER; Matson, 1995b).

Another assessment methodology frequently utilized is the descriptive assessment. This requires observing the individual in their natural environment and recording his/her behavior, and the surrounding environmental and social variables. This technique has been used in functional assessment, such as the collection of antecedent, behavior, consequence data (ABC; Bijou, Peterson, & Ault, 1968) or scatterplot data (Touchette, MacDonald, & Langer, 1985), which provides information about the variables that proceed and follow a target behavior and/or when the behavior is occurring in time. Descriptive assessment data may also be used to assist in differential diagnoses by providing objective data with respect to topography and frequency of the behavior.

Experimental and analog assessments are commonly used for obtaining information relevant to individuals with mental retardation. This assessment type provides information
about how an individual behaves under various controlled conditions when the antecedents and/or consequences are directly manipulated. Iwata et al. (1982) described a functional assessment methodology using an experimental analysis, which has proven to be one of the most significant advances in the assessment and treatment of severe behavior problems. When utilized appropriately, experimental assessments can provide an empirical demonstration of a relationship between the variables manipulated and the individuals’ behavior (Mace, 1994).

All of these methodologies have been applied to the assessment of behavior problems as well as the evaluation of interventions designed to address those presenting problems. One activity of daily living that has been receiving more attention from researchers is related to problems associated with the ingestion of food and mealtimes in general. Given the frequency that individuals are exposed to this situation and the potential consequences that can result from behaviors that interfere with appropriate eating hygiene, attention from clinicians, researchers, and caregivers is warranted.
FEEDING AND MEALTIME BEHAVIOR

Background and Prevalence

Individuals diagnosed with mental retardation have a higher prevalence of comorbid disorders and behavior problems than the general population (Borthwick-Duffy, 1994; Matson & Barrett, 1993). One area of concern among this population includes feeding and mealtime behavior problems. In 1983 Linscheid described 10 mealtime problems including, tantrums, bizarre food habits, multiple food dislikes, food-texture selectivity, delay or difficulty in chewing, sucking, or swallowing, delay in self feeding, pica, excessive overeating, too little food eaten, and rumination. Sisson and Van Hasselt (1989) suggested that feeding problems could be divided into four categories, (1) lack of independent skills, (2) disruptive behavior, (3) eating too much or too little, and (4) selectivity (by type and texture). While some of these problems such as food refusal and rumination, are often associated with infants and children (Johnston, 1993; Parry, 1994; Riordan et al, 1984), these problems are also prevalent among older individuals with mental retardation.

Feeding difficulties and problematic mealtime behaviors displayed by persons with intellectual disabilities can result in serious health problems. Perske, Clifton, McClean, and Stein (1977) estimated that as many as 80% of individuals diagnosed with severe and profound mental retardation have a serious problem related to feeding. For example, an individual who engages in behaviors that repeatedly bring food past his/her airway (e.g., rumination, vomiting) may be at risk for aspiration (an extremely dangerous behavior characterized by the drawing in of food or drink into the upper respiratory tract), suffocation, and/or pneumonia (Rogers, Stratton, Msall, & Andres, 1994). Rumination, defined as, chronic regurgitation, chewing, and re-swallowing of previously ingested food (Rast,
Johnson, Drum, & Conrin, 1981) has been estimated to be displayed by 6-10% of persons with developmental disabilities living in institutional settings (Fredericks, Carr, & Williams, 1998), and has been estimated to be the cause of death in 5-10% (Konarski, Favell, & Favell, 1992) of those who ruminate.

Some feeding difficulties can foster malnutrition. Researchers have also been addressing the problem of selectivity during meals. Several dimensions exist on which an individual’s selectivity may vary. Individuals can be food selective by the types of food they will ingest (e.g., eat only cheeseburgers), by the texture of the food (e.g., eat only pureed foods), by the temperature of the food (e.g., eat only foods at room temperature), by the person who feeds them or is present during the meal (e.g., will only eat if fed by their mother), by the location of the meal (e.g., will only eat when alone), or a combination of these. Individuals who only eat specific foods, only eat small amounts of food, or refuse to eat altogether, may suffer from malnutrition due to insufficient consumption of necessary nutrients. Insufficient food intake may require the use of invasive feeding tubes, such as naso-gastic or gastronomy tubes (Riordan et al., 1984; Shore & Piazza, 1997). This type of intervention does increase an individual’s food intake. However, it can be associated with additional health risks, while failing to aid in the development of appropriate and effective eating behavior.

The ability to feed one-self independently is another area of concern that is prevalent within this population (Cooper et al., 1995; O’Brien, Repp, Williams, & Christophersen, 1991). Deficits in the skills necessary to effectively feed one-self or ingest the food can be characterized in several ways including: (1) an inability (or unwillingness) to bring the food to the mouth; (2) an inability to chew the food once it enters the mouth; and (3) an inability to
swallow food/liquid. An inability to complete any of these tasks can result in numerous health problems including, malnutrition and starvation. Conversely, some individuals with mental retardation can effectively feed themselves, yet are unable to regulate the pace at which food should be ingested. This deficit can place the individual at risk for choking.

In addition, persons who ingest non-nutritive substances (i.e., pica) are at risk of choking, being poisoned if the item is toxic (e.g., lead paint chips), and depending on the item intestinal blockages may result (Pueschel, Cullen, Howard, & Cullinane, 1977-1978). Pica has been estimated to occur in between 9 and 25% of individuals with intellectual disabilities residing in institutional settings (Matson & Bamburg, 1999). Lofts, Schroeder, and Maier (1979) and Pace and Toyer, (2000) suggested that nutritional imbalances may be common among individuals with mental retardation, thus some individuals may engage is behaviors such as food stealing or overeating to compensate for the relative imbalances. Independent of the reason, these behaviors can place the individual at risk for obesity, illness (e.g., if the individual steals food out of the trash), and/or environmental consequences (e.g., aggression from those from whom the food is stolen).

**Identification of Feeding Problems**

Feeding problems are often confounded by other deficits common in this population, such as communication (Poulton & Algozzine, 1980), motor skills/abilities (Newell, 1997), physical abnormalities (Pulsifer, 1996), and nutritional imbalances (Lofts, Schroeder, & Maier, 1979; Pace & Toyer, 2000). For example, individuals may refuse food because they do not like that particular type of food, but are unable to appropriately communicate this dislike. Or, individuals may ruminate because they are physically unable to recruit other sources of stimulation due to physical limitations (e.g., confined to a wheelchair). A
nutritional or chemical imbalance/deficit may precipitate the occurrence of pica (e.g., dirt to compensate for an iron deficiency). Finally, an individual may eat only small amounts of food or only eat foods of a specific texture due to an esophageal stricture.

An increased risk of feeding problems can be associated with certain conditions where mental retardation is typically present. For example, Spender et al. (1996) found that oral motor functions of individuals with Down's Syndrome, specifically jaw and tongue function, were often impaired resulting in feeding difficulties. Similarly, Frazier and Friedman (1996) found a high prevalence of aspiration among individuals with Down's Syndrome. Riordan et al. (1984) suggested that developmentally disabled individuals are more likely to have oral motor dysfunction.

Some medical problems may be mistaken for behavior problems, such as rumination resulting from gastro-esophageal reflux disease (GERD). Medication side-effects may also present similar to a behavior problem, such as a misdiagnosis of rumination due to neuroleptic use, which has been shown to interfere with swallowing (Bohmer et al., 1999; Rogers, Stratton, Victor, Kennedy, & Andres, 1992). In order to identify the problem, its etiology and/or function, and to determine an appropriate course of treatment, it is necessary to effectively and comprehensively identify and assess the problem.

Similar to other behavior problems, identification of the problem is of primary importance. The behavior may not be perceived as problematic by the individual or caregivers, and thus not addressed. For example, a client who eats only a few specific foods may be labeled as a “picky eater”. Therefore, no measures would be taken to rectify the problem. This problem may be more accurately categorized by health professionals as food selectivity, which has been shown to be associated with malnutrition, and severe growth and
developmental delays (Kern & Marder, 1996). Systematic and effective identification of food selectivity and other behaviors (excesses and/or deficits) categorized as feeding difficulties and problematic mealtime behaviors is essential in order to inform the relevant professionals (i.e., psychologists, nutritionists, physicians, and occupational therapists) who can then proceed with assessment and treatment.

The identification of feeding problems among adults with mental retardation has not historically been formalized or systematic. In state institutions, the responsibility of identifying and treating these problems has fallen on a nutritional management committee including, among other disciplines, an occupational therapist, nutritionist, and a physician. Identification of the problem has also resulted from staff or caregivers informally alerting health personnel when the problem has resulted in severe health problems or has been difficult to manage. Several problems may be appropriately identified and addressed by these disciplines (e.g., rumination due to GERD, or food refusal due to esophagitis). However, many problems may be more appropriately evaluated by mental health professionals (i.e., psychologists).

Assessment Instruments

Some measures have proven useful for identifying the presence of feeding and mealtime difficulties in individuals with mental retardation. The Reiss Screen (Reiss, 1987) is a 38-item questionnaire used to screen for symptoms of psychopathology and other maladaptive behaviors displayed by individuals with mental retardation. The psychometric properties for this instrument range from modest to good, .75 including test-retest reliability, .67 interrater reliability, and an internal reliability (Chronbach’s alpha) at .85 (Sturmey, Burcham, & Perkins, 1995). While this questionnaire does target a wide range of disorders
and problem behaviors, very little attention is given to problems related to feeding and mealtime behavior (item 12). This item addresses problems related to weight gain or loss resulting from either overeating or insufficient eating.

The Diagnostic Assessment for the Severely Handicapped -II (DASH-II; Matson, 1995a) is a more comprehensive 84-item instrument that screens for symptoms of psychopathology among individuals diagnosed with severe and profound mental retardation. The symptoms are subdivided into 13 diagnostic categories. The psychometric properties on this instrument are good, with reliability coefficients for interrater and test-retest at .86 and .84 respectively (Matson, 1995a). The DASH-II includes 6 items that address feeding problems common among individuals with severe and profound mental retardation including, food stealing, vomiting, choking, pica, eating too fast, and eating an insufficient amount. While feeding problems may also be symptoms of forms of psychopathology (e.g., depression) many of the problems identified by the DASH-II are problematic in and of themselves.

The Assessment of Dual Diagnosis (ADD; Matson & Bamburg, 1998) is another screening instrument used to identify symptoms of psychopathology among individuals diagnosed with mild and moderate mental retardation. The ADD is a 79-item scale that groups items into 13 subscales that correspond to disorders in the DSM-IV. Six items related to eating comprise one of the subscales, targeting food refusal, eating too quickly, pica, rumination, vomiting, and a fear of weight gain. Three of the items (food refusal, vomiting, and a fear of weight gain) target symptoms associated with Anorexia Nervosa and/or Bulimia Nervosa. The psychometric properties on this instrument are very good, with reliability
coefficients for internal consistency, interrater, and test-retest at .93, .98 and .93 respectively (Matson & Bamburg, 1998).

None of aforementioned scales provide a detailed, comprehensive evaluation of common feeding problems displayed by persons with mental retardation. The prevalence of feeding and mealtime behavior problems displayed by this population demanded the need for a system to identify the variety of problems that can interfere with appropriate eating hygiene. The Screening Tool of Eating Problems (STEP; Matson & Kuhn, 2001) was designed for the express purpose of identifying feeding and mealtime behavior problems displayed by individuals with mental retardation. This tool includes the areas discussed by Sisson and Van Hasselt (1989) as well as the other problem behaviors. The STEP allows for quick and efficient identification of specific feeding and mealtime behavior problems exhibited by persons with mental retardation using a third-party informant procedure.

The STEP consists of 23 items, each targeting a specific problem or deficit. These 23 items were subsequently divided into five categories of feeding problems. These categories include aspiration risk, selectivity, feeding skills, food refusal related behavior problems, and nutrition related feeding problems. Items included in the aspiration category include items where food is repeatedly brought past the airway placing the individual at risk for aspirating. The selectivity category includes items addressing five different dimensions of selectivity, including selectivity by food type, food texture, food temperature, meal location, and selectivity by feeder. Items included in the feeding skills category address deficits in ability to chew or swallow, feed independently, regulate the rate of food ingestion, as well as identifying the need for adaptive equipment such as adaptive spoons or G-tubes. Items included in the food refusal related behavior problems targets behaviors often associated with
meal refusal or termination, such as physical aggression, self-injury, pushing the food away, or spitting the food out. Lastly, the nutrition related behavior problems category includes items that may be associated with the individual consuming an insufficient amount of food and or nutrients within their usual diet. Behaviors included in this category include, food stealing, pica, and eating too much or too little.

Test-retest reliability and interrater reliability were calculated for the STEP (Matson & Kuhn, 2001). Test re-test reliability was calculated using a Pearson product-moment correlation. Reliability was moderate overall ($r = .72$, $p<.01$) and slightly lower for each category/subscale, averaging .59 (range = .26 - .79, $p<.01$). Interrater reliability data was also calculated using a Pearson product-moment correlation and was also moderate overall ($r = .71$, $p<.01$) and slightly lower for each category/subscale, averaging .68 (range = .55 - .81, $p<.01$). Criterion validity was demonstrated for two of the items. Kuhn and Matson (2002) demonstrated that endorsement of items 9 and 18 reliably identified individuals who meet DSM-IV criteria for Pica Disorder and Rumination Disorder, respectively.

Interdisciplinary Evaluation

Once the problem(s) has been identified, an interdisciplinary evaluation and behavioral assessment is essential. An interdisciplinary evaluation may involve thorough assessments from physicians, dieticians, and occupational therapists. The identification of a medical or motor problem can assist in the treatment, or approach to treatment, of the problem. For example, determining that an individual refuses to eat certain foods (e.g., tomatoes) because it exacerbates their GERD would suggest a medical intervention (e.g., acid-suppressing medication) to suppress the reflux.
A medical assessment may include the following assessment components: (1) To assess the integrity of the hypopharynx and other upper gastrointestinal anatomy, and to ensure that the individual can protect their airway during swallowing, a Barium Swallow Study would be indicated (Babbitt et al., 1994; Hyman, 1994). This procedure also provides information regarding the movement of the food/bolus through the upper gastrointestinal tract, which may demonstrate that the individual is bringing food up from the stomach or esophagus back into the mouth (i.e., rumination); (2) An upper GI endoscopy provides information about whether medical conditions exist (e.g., esophagitis), and about the mucosal lining of the esophagus, stomach and duodenum (Babbitt et al., 1994; Bohmer et al., 1999). The presence of esophageal reflux can also be ascertained using this technique (Kuruvilla & Trewby, 1989); (3) A gastric emptying scan is useful in evaluating motility in the upper gastro-intestinal tract (Babbitt et al., 1994). Aberrant results may be associated with a poor appetite; (4) Esophageal manometry is a relatively new technique that measures intraesophageal pressure which provides information about peristalsis and thus the esophageal motility (Patti et al., 2001).

Dieticians can also provide valuable information pertaining to feeding problems (O'Brien, Repp, Williams, & Christophersen, 1991). An evaluation of the individual’s weight indicates whether he/she is over or underweight. An evaluation of an individual's diet ensures that all necessary nutrients are consumed. A dietician can assess food allergies that contribute to the presenting problem, or identify syndromes that are the basis for problems, such as the inability to digest or metabolize certain proteins.

Instrumental in the evaluation of behavioral feeding problems is an evaluation by an occupational therapist (O’Brien et al., 1991). This evaluation is comprehensive in examining
the individual’s coordination and physical ability to perform various tasks. The skills evaluated that are necessary for self-feeding include gross reflexive movements, hand-eye-coordination, and motor development. The skills evaluated for oral feeding include oral pharyngeal reflexes, and oral-motor skills including, sucking, swallowing, chewing, and tongue control.

**Behavioral Assessment**

For those behaviors that have been identified and are not better accounted for or treated by medical interventions, dietary adjustments, or occupational therapy, behavioral assessments are necessary to identify environmental variables that contribute to or exacerbate the problem. Munk and Repp (1994) designed an assessment to evaluate the effects of the antecedent condition, or in this case the type and texture of the food being presented, on the occurrence of problem behavior. They evaluated the stimulus variables that may occasion food refusal behavior by systematically manipulating the types of foods (e.g., fruits, vegetables, meats, starches) and the food textures within each food type (e.g., junior, ground, chopped), and recorded the subjects’ acceptance and expulsion of food. This methodology provided information about whether the subjects refused food due to selectivity by type of food, selectivity by the texture of the food, or selectivity by both type and texture.

Other behavioral assessments of behavior problems have predominantly involved manipulating the consequence following the problem behavior. For example, following the behavior of physical aggression the effects of various consequences are evaluated; delivering or withholding attention, permitting a break from the situation, or access to preferred items. Functional assessment techniques have been applied to numerous behavior problems (e.g., self-injurious behavior, physical aggression), however its application with feeding problems
has not been as well researched. Sprague, Flannery, and Szidon (1998) conducted analyses to identify the behavioral function(s) of mealtime spitting and whining. Following interviews with family and staff, and meal observations, the authors generated hypotheses regarding the function of the mealtime behavior and tested the hypotheses across two experimental conditions. Providing differential consequences following problem behavior, Sprague and colleagues demonstrated that the mealtime problem behavior was maintained by positive reinforcement in the form of access to the next bite of food. Inter-observer agreement averaged 97% for 30% of sessions conducted. No data was reported regarding the initial mealtime observation or caregiver interviews and how the hypotheses were generated, thus questions remain whether other reinforcement contingencies should have been evaluated.

Girolami and Scotti (2001) conducted analog functional analyses of food refusal and related mealtime behavior displayed by 3 participants. Using experimental conditions similar to those described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982) the authors tested 5 hypotheses regarding the function of the problem behavior: (1) positive reinforcement in the form of access to attention, (2) negative reinforcement in the form of escape from bite / meal, (3) positive reinforcement in the form of access to tangibles, (4) positive reinforcement in the form of access to preferred edibles, and (5) automatic reinforcement. Inter-observer agreement averages were maintained at or above 90% across all participants and dependent measures for at least 30% of intervals observed. Moderate to high levels of consistency \{W=.64, .92, .96 (using Kendall’s Coefficient of Concordance)\} were obtained between the results of the analog analyses and those obtained from other functional assessment data, using the Motivation Assessment Scale (MAS; Durand & Crimmins, 1988), the Functional Analysis Interview Form (FAIF; O’Neill et al., 1990), and observational descriptive data (Bijou,
Peterson, & Ault, 1968). The authors found that food refusal behavior was maintained by escape from the meal for all three participants.

Informal observations and/or descriptive assessments (Bijou et al. 1968; Iwata, Vollmer, & Zarcone, 1990) provide information about events surrounding the target behavior which can aid in assessment and the identification of functional relations. Descriptive assessments can assist in the evaluation mealtime behavior, identifying a variety of relevant variables. Examination of a scatterplot can identify the time of day when the behavior is likely to occur. For example, this method may reveal that an individual only engages in mealtime behavior problems in the morning (i.e., breakfast). Informal observations may find that an individual is more likely to engage in food refusal behaviors following a night associated with highly disturbed sleep. These methods can also be used to assess the characteristics of the feeder (when applicable) including, the type/quality of interactions between the feeder and client, and the behavior of the feeder (e.g., the rate at which they present food, or the type of attention they deliver during the meal; Babbitt et al., 1994).

Following identification and assessment of the problem behavior(s), an intervention tailored to the specific presenting problem and the hypothesized function of the behavior is often developed. Though various medical interventions have been applied to the treatment of behavior problems related to the ingestion of food, only behavioral interventions will be discussed for the purposes of this review.

**Treatment of Feeding and Mealtime Behavior Problems**

One of the most potentially harmful behaviors is the repeated passage of food passed the windpipe. This behavior is associated with both rumination and vomiting. Fredericks and colleagues (1998) described several effective behavioral treatments for rumination including a
satiation diet, differential reinforcement of incompatible behaviors (DRI) such as object
manipulation, and extinction. Some applications of satiation diets (Clauser & Scibak, 1990)
involve providing unlimited access to food during meals, thereby decreasing the client’s
motivation to receive the stimulation associated with eating.

Thibadeau, Blew, Reedy, and Luiselli (1999) implemented a variation of a satiation
diet to decrease instances of rumination in an individual diagnosed with mental retardation
(Bill). Based on observation and staff report, Thibadeau determined that Bill’s rumination
was reinforced by the re-consumption of previously ingested foods. For a one-hour period of
time following meals, Bill was provided with a slice of white bread (identified as preferred)
following each appropriate request. The experimenters hypothesized that Bill would
discontinue requests for bread once he was satiated. Access to white bread following meals
was effective in significantly decreasing instances of rumination. These reductions were
maintained at follow-up even after the quantity of white bread had been faded.

Conrin, Pennypacker, Johnston, and Rast (1982) evaluated the effectiveness of a
differential reinforcement procedure to treat rumination in two developmentally disabled
individuals. After identifying the average amount of time between instances of rumination,
following meals, the experimenters utilized a differential reinforcement of other behaviors
(DRO) procedure in which reinforcement in the form of preferred edibles was delivered
following specified intervals in which rumination did not occur. The lengths of the intervals
were subsequently increased while near zero levels of rumination were maintained.

Lockwood, Maenpaa, and Williams (1997) evaluated three procedures for reducing
instances of self-induced vomiting and associated weight loss in a woman with severe mental
retardation (Helen). Lockwood and group used descriptive assessments to identify the
function of the vomiting, which appeared to be sensitive to negative reinforcement in the form of escape from staff requests. The treatments consisted of: (1) overcorrection, reinforcement for compliance, and DRO for the absence of vomiting; (2) same as 1 plus escape extinction and functional communication training (FCT) to escape from requests; and (3) same as 2 plus the opportunity to choose preferred food for her meals. Only treatment 3 was effective in both decreasing instances of self-induced vomiting and promoting weight gain.

In addition to placing a person at risk for aspiration, vomiting sometimes can be characterized as a method of refusing food because the individual expels the food before it can be fully digested. Individuals who engage in self-induced vomiting accept the food into their mouth prior to expelling it, however, other individuals engage in behaviors that prevent or delay the acceptance of food into their mouth. These behaviors are more commonly characterized as food refusal behaviors.

Previous treatments for total food refusal typically involved forced feedings and other physical prompting procedures. Numerous non-invasive treatments have been evaluated to decrease the problem behaviors and increase food consumption. Hoch, Babbitt, Coe, Krell, and Hackbert (1994) compared two interventions in an effort to increase the amount of food consumed, and decrease negative vocalizations. The intervention consisting of positive reinforcement for bite accepts increased intake slightly, but the contingency contacting treatment was effective at increasing food intake and decreasing negative vocalizations. The contingency contacting procedure involves sustained presentation of the target food until it is consumed.

Ahearn, Kerwin, Eicher, and Lukens (2001) compared two treatments commonly employed for the treatment of food refusal, physical guidance and non-removal of the spoon.
In addition, Ahearn et al., also monitored corollary behaviors that may emerge during treatment, as well as offering the caregivers a choice of treatments to be trained to implement. Across two participants, both interventions were effective in increasing bite acceptances. Corollary behaviors (disruption and negative vocalization) both remained the same or increased from baseline during the initial sessions of treatment. Ahearn did note that these behaviors did decrease once acceptance became more stable.

Patel, Piazza, Martinez, Volkert, and Santana (2002) utilized treatment components described in both the Hoch et al. (1994) and Ahearn et al. (2001) study, escape extinction and differential reinforcement. Patel and colleagues evaluated the differential effects of reinforcing the hypothesized initial and terminal links (acceptance and mouth cleans, respectively) of a food consumption behavior chain. Both differential reinforcement procedures were compared with and without escape extinction. The authors found that food acceptance and mouth cleans did not increase with differential reinforcement alone, however, both behaviors increased following the addition of an escape extinction procedure. The observed effects were consistent across 3 participants, and suggest that escape extinction may be the component responsible for the behavior change; however, extinction alone was not evaluated.

Some individuals refuse to consume only certain foods. This type of behavior is commonly referred to as food selectivity. Individuals can be selective across various dimensions within a food or meal context. Various behavioral interventions have been shown to be effective for the treatment of food selectivity. For example, in a study by Kern and Marder (1996) they evaluated the effectiveness of two methods designed to increase the variety of foods consumed. One method, delayed reinforcement, involved presenting a
preferred food contingent upon acceptance of a non-preferred food. In the second intervention the preferred food was presented simultaneously with the non-preferred food. For example, with the participant in the study, the non-preferred banana was placed on top of the preferred corn chip, and the two were presented simultaneously. These two treatments for increasing food selectivity were compared using a multi-element design. A more rapid and sustained increase in the acceptance of non-preferred foods was observed using the simultaneous presentation method.

Similarly, Shore, Babbitt, Williams, Coe, and Snyder (1998) used a procedure called stimulus fading to treat texture specific food selectivity. Stimulus fading involves slowly and systematically changing the properties of a stimulus (e.g., pureed beef) by altering the stimulus across some dimension (e.g., adding some ground beef) until the stimulus approximates a ‘goal’ stimulus (e.g., hamburger). Initially, appropriate beginning textures (the texture at which the participant currently eats) and goal textures (a food texture that would be more appropriate for the participant) were identified by an occupational therapist based on a modified barium swallow study. The fading procedure included providing verbal praise for accepting the bite of food into their mouth, and access to tangible items contingent on swallowing the bite. By systematically fading the consistency of the foods toward more course textures, and probing bites at higher textures, consumption of higher food textures was achieved for all four participants included in the study.

Ahearn, Castine, Nault, and Green (2001) extended the work of Munk and Repp (1994) (described earlier) by examining selectivity across type and texture for 30 individuals diagnosed with an autism spectrum disorder who had self-feeding skills. Results of this study
support those found by Munk and Repp in effectively identifying antecedent conditions that affect food consumption among individuals with developmental disabilities.

Treatments targeting food refusal and selectivity attempt to increase the amount and variety of food ingested. These treatments can be helpful in mitigating symptoms of malnutrition. Other treatments are necessary to mitigate behaviors associated with overeating or eating potentially harmful substances (i.e., pica). Several studies have examined the effects of behavioral treatments on these types of behaviors. Piazza et al. (1998) developed behavioral treatments for three developmentally disabled persons who engaged in pica. Multiple sources of reinforcement were identified as maintaining variables for the pica, including automatic and social positive. In order to treat the automatically maintained pica, the specific properties of the oral stimulation were identified, including taste and texture. Alternative, more appropriate stimuli that matched the properties of the pica items were then delivered to the participants according to a schedule. This treatment was effective at reducing the pica maintained by automatic reinforcement.

Duker and Nielen (1993) implemented a punishment procedure to decrease pica in a woman diagnosed with severe mental retardation and Prader-Willi syndrome (K). A punishment procedure was evaluated following previous failed treatments (e.g., DRO) and an indirect functional assessment using the Motivation Assessment Scale (MAS; Durand & Crimmins, 1988) that suggested the behavior was maintained by sensory consequences. The punishment procedure involved approaching K when she engaged in pica and pressing the pica item to her lips for two minutes without letting her take a bite. This procedure was effective in decreasing instances of pica and following a seven month follow-up.
Researchers Maglieri, DeLeon, Rodriguez-Catter, and Sevin (2000) used a stimulus control procedure in conjunction with verbal reprimands to reduce covert food stealing in an adolescent (Libby) diagnosed with moderate mental retardation and Prader-Willi syndrome. After establishing a verbal reprimand as a punisher for food stealing, Maglieri and colleagues paired the reprimand with orange stickers that were then placed on food containers. If the experimenters determined (via pre- and post-weights) that Libby had stolen food marked with a sticker, a verbal reprimand was delivered. The experimenters were able to effectively eliminate Libby’s food stealing of items with stickers, and these results were maintained during generalization.

The treatments described above target behaviors that disrupt or interfere with the process of appropriate eating. Other treatments are designed for those individuals who have difficulty eating because they lack the skills necessary engage in appropriate eating behavior. Some of these skill deficits include chewing, swallowing, and/or eating too quickly. Hoch, Babbitt, Coe, Ducan, and Trusty (1995) conducted a study in which they taught a swallowing response to severely mentally retarded girl who was receiving her meals via a nasogastric tube. Several procedures were used to accomplish this task. Initially the participant was taught to accept the bite into her mouth using both positive reinforcement in the form of praise and access to tangibles, and negative reinforcement in the form of meal termination following accepted food. To assist in swallowing, a rubber oral stimulator was placed on the posterior portion of the tongue, and a swallow was elicited by depressing the stimulator as it was brought forward on the girl’s tongue. This procedure was effective in increasing the amount of food consumed by mouth to an eventual 100%, and decreasing food expulsion and negative vocalizations.
Shore, LeBlanc, and Simmons (1999) treated an individual (George) with moderate-to-severe mental retardation who engaged in “rapid eating” which was deemed life-threatening due to an esophageal stricture (narrowing of the esophagus). By systematically manipulating the amount of food George could consume per bite and the rate at which he consumed the bite, the experimenters were able to effectively decrease the bite size and the rate of eating. In addition, using a differential reinforcement procedure, the experimenters increased the number of times George chewed his food per bite.

Advancements in the assessment and treatment of eating and meal-time problems are ongoing. Other areas of adaptive functioning may impact meal-time behavior; specifically, the ability of an individual to interact effectively with his/her caregiver. Individuals diagnosed with mental retardation often lack sufficient social skills required for daily interactions. The next section will describe social behavior among individuals with mental retardation and research addressing assessment and treatment.
SOCIAL BEHAVIOR

Background

In accordance with the definition of mental retardation, as described by the American Psychological Association (1994) and the American Association on Mental Retardation (AAMR), an individual must have impairment in adaptive functioning in addition to sub-average intellectual functioning to meet diagnostic criteria. Social functioning is considered to be a major component of adaptive behavior (Grossman, 1983), and is consequently a common deficit among individuals with mental retardation (Lovett & Harris, 1987). Social behavior/functioning can be conceptualized in several ways; that is, those behaviors that provide individuals with the means to interact effectively with others, to recognize and respond to social cues, to apply appropriate responses to a specific situation, to avoid interpersonal conflicts, and/or to adjust to both simple and complex social situations (Matson & Swiezy, 1994). Individuals who engage in appropriate social behavior can effectively demonstrate and utilize these skills and are able to maintain positive social relationships (Guralnick, 1986).

While the etiology of social functioning deficits can be idiosyncratic, Elliott and Gresham (1993) identified several possible causes, including the lack of opportunities to practice appropriate social behavior, inadequate feedback and/or reinforcement following social behavior, as well as the adverse effects of other behavior problems on social functioning. Furthermore, without sufficient practice or reinforcement for appropriate social behavior, the individual may be less likely to initiate any social interactions (Njardvik, Matson, & Cherry, 1999). Singh and Winton (1983) found that individuals with learning
difficulties were more likely than the general population to engage in excessive inappropriate social behaviors and fewer appropriate social behaviors.

Several researchers have examined differences in social behavior across groups of individuals with dual diagnoses and individuals with mental retardation and severe behavior problems. Duncan, Matson, Bamburg, Cherry, and Buckley (1999) compared the social skills of three groups of individuals with mental retardation who engaged in either aggression, self injury, or both, with experimental controls. They found significant differences between control and experimental groups. Similarly, Njardvik, Matson, and Cherry (1999) examined social skills differences among individuals diagnosed with Autistic Disorder, Pervasive Developmental Disorder (PDD), NOS, and mental retardation. The PDD group consistently demonstrated more positive nonverbal social skills than the autism group; however relative to the mental retardation group they had significantly fewer skills. Kuhn, Matson, and Mayville (2001) compared the social behavior of individuals diagnosed with profound mental retardation who engaged in rumination with peers who did not engage in rumination. Results were similar to those found by Njardvik et al. (1999); individuals who did not engage in rumination consistently demonstrated more positive social behavior than those who did ruminate. Finally, Matson, Smiroldo, and Bamburg (1998) examined the social behaviors of individuals with mental retardation who display symptoms of psychopathology, and compared them to individuals diagnosed with mental retardation who were not experiencing symptoms of psychopathology. Individuals with a greater number of symptoms of psychopathology displayed more negative behaviors and more social problems than the mental retardation only group. Furthermore, those individuals who engaged in stereotypies were significantly less likely to display behaviors characterized as positive.
There is sufficient evidence to suggest that social functioning is impaired among individuals with mental retardation and developmental disabilities. Identification and assessment of this impairment is essential for guiding treatment. The following section will describe various methods and assessments used for that purpose.

**Assessment of Social Functioning**

The assessment of social functioning among individuals with mental retardation has been limited predominantly to those who function within the mild-to-moderate range of mental retardation (Singh & Winton, 1983). However, individuals who function within the severe-to-profound range do engage in behaviors that can be characterized as “social skills” and are amenable to assessment. These behaviors can include, verbal skills (e.g., saying “hello” or “goodbye”), motor skills (e.g., making eye-contact, reaching for familiar people), and interaction skills (e.g., shows interest in others activities). The assessment of social functioning among individuals with mental retardation generally involves the recording or reporting of observable behavior; this population is typically unable to provide reliable, or any, self-report.

Several assessment methodologies have been employed to evaluate social functioning among individuals with mental retardation. Indirect assessments (e.g., behavior rating scales) are the most commonly used measures of social functioning among individuals functioning in severe to profound ranges of mental retardation. A measure of social functioning can often be obtained from adaptive behavior scales (Meyers, Nihira, & Zetlin, 1979). The Vineland Adaptive Behavior Scales (VABS; Sparrow, Balla, & Cicchetti, 1984a, 1984b, 1985) is a standardized measure of adaptive functioning. This instrument has three versions, The Interview Edition, Survey Form, The Interview Edition, Expanded Form, and the Classroom
Edition; however, only the first two versions have norms for low-functioning adults. Both the Survey and Expanded forms are administered in an interview format, while the Classroom Edition is a questionnaire. Each version is divided into four adaptive domains, one of which is Socialization. The Socialization domain has 66 items in the Survey form, 134 items in the Expanded Form, and 53 items in the Classroom Edition. This domain is further divided into the following three subdomains: Interpersonal Relationships (i.e., how the individual interacts with others), Play and Leisure Time (i.e., how the individual plays and uses leisure time), and Coping Skills (i.e., how the individual demonstrates responsibility and sensitivity to others). Reliability and validity has been well established for these instruments. The Survey and Expanded Forms were normed on a sample of 3000 individuals ranging in age from birth the 18 years, 11 months, in addition to supplementary groups of adults with mental retardation. Test-retest reliability coefficients ranged from .95 to .99 for all domains, subdomains, and the adaptive behavior composite. Similarly, interrater reliability coefficients ranged from .93 to .99 for all domains and subdomains. In addition, content validity, discriminant validity, factorial validity, and construct validity were also established for the VABS (Sparrow, Balla, & Cicchetti, 1984a, 1984b, 1985).

The AAMR (American Association on Mental Retardation) Adaptive Behavior Scale-Residential and Community, Second Edition (ABS-RC:2; Nihira, Leland, & Lambert, 1993) is another measure of adaptive behavior created for the express purpose of assessing adaptive behavior among individuals with mental retardation. The ABS was normed on a sample of over 4000 individuals with developmental disabilities residing in community settings. This measure is divided into two parts that are interpreted separately. These parts are further divided into domains. Part one consists of 73 items divided into 10 domains which function
to “evaluate coping skills considered important to personal independence and responsibility in daily living” (Nihira et al., 1993). Respondents are prompted to respond either “yes” or “no” to each item; the items are summed to yield an item score. Part two is designed to measure problem behaviors, and contains 283 items which are also scored as either “yes” or “no”. Scores on this measure can be converted to age-equivalent scores, percentiles and standard scores. Psychometric data for part one of the ABS were available and consisted of internal consistency across part one domains (Cronbach’s alphas .82-.99), test-retest reliability (.88-.99), inter-scorer agreement (.83-.99), and content, criterion-related, and construct validity which the authors reported to be sufficient to support the use of the measure (Nihira et al., 1993).

Another measure of adaptive behavior for individuals with mental retardation can be attained using three scales developed by Kraijer and Kema (1994). These scales include: (1) the Social Functioning Scale for the Mentally Retarded (SRZ), (2) the Maladaptive Behavior Scale for the Mentally Retarded (SGZ), and (3) the Gross Motor Skills Scale for the Mentally Retarded. These scales were normed on samples of over 4000 Dutch individuals with mental retardation. The SRZ is divided into four subscales based on factor analysis, and were labeled: Self-Help, Communication, Persistence, and Social Skills. Both reliability and validity measures were described as “good” (Kraijer, 2000). Each scale yields a total score. Kraijer (2000) described good correspondence between domains on the VABS and subscales of the SRZ. Specifically, the Social Skills subscale of the SRZ corresponds to the Socialization domain of the VABS, the Communication subscale of the SRZ corresponds to the Communication domain of the VABS, and the Self-Help subscale of the SRZ corresponds to the Daily Living Skills domain of the VABS.
A few measures have been created for the express purpose of identifying relative strengths and weaknesses in social behavior displayed by persons with mental retardation. The Matson Evaluation of Social Skills for Individuals with sEvere Retardation (MESSIER; Matson, 1995b) is an indirect assessment developed for and normed on a sample of individuals diagnosed with severe and profound mental retardation. This measure provides information regarding relative strengths and weaknesses in the area of social behavior. The MESSIER contains 85 items addressing specific social behaviors that are grouped into six categories: Positive Verbal, Positive Nonverbal, General Positive, Negative Verbal, Negative Nonverbal, and General Negative. Each item is rated on a four-point Likert scale, ranging from “Never” (0) to “Often” (3). A total item score is not calculated, only category/subscale total scores. Psychometric data for this measure has been well established. Internal consistency for the subscales ranged from .75 to .96. Test-retest reliability was .86. Interrater reliability ranged from .71 to .79. Spearman correlation to demonstrate convergent validity with sociometric ratings was found to be .79 (LeBlanc, Matson, Cherry, & Bamburg, 1999; Matson, LeBlanc, Weinheimer, 1999).

The Social Performance Survey Schedule (SPSS; Matson, Helsel, Bellack, & Senatore, 1983) is an indirect assessment that assesses social skills of individuals functioning in the mild and moderate ranges of mental retardation. This instrument contains 57 items which have been grouped into four categories based on a principal component analysis; Appropriate Social Skills, Communication Skills, Inappropriate Assertion, and Sociopathic Behavior (Matson et al., 1983). The first two categories have been described as “positive” social behavior, and the latter to as “negative” social behavior. The SPSS is scored on a 5 point Likert-type scale ranging from “not at all” (0) to “very much” (4). Limited
psychometric data is available on this measure aside from having good internal consistency and interrater reliability (Matson & Hammer, 1996).

Frea and Hughes (1997) used an experimental analysis to evaluate the function of targeted social behaviors in two individuals with mental retardation. Using methods similar to the procedures described by Iwata et al. (1982), Frea and Hughes examined the effects of escape from social demands, escape from tasks, and social attention on social deficits and inappropriate social behaviors (e.g., preservative utterances, eye contact, incongruent affect). Results of the analyses indicated that for one participant perseverative utterances were maintained by social attention, and the poor eye-contact of the second participant was maintained by escape from social demands. The experimenters developed interventions for each participant that consisted of teaching functionally equivalent responses. Results showed a marked decrease in inappropriate behavior and an increase in the alternative response.

Once the problem areas have been identified and assessed (when necessary), interventions are developed to either increase behavior deficits or decrease behavior excesses. This area of research is often referred to as “social skills training”, and will be discussed at length in the following section.

**Treatment of Social Behavior**

During the 1980’s a significant body of literature began to develop addressing the improvement of social behaviors displayed by persons with mental retardation. Due to the large amount of research in this area, the current review of social skills training will focus only on those studies designed to improve interpersonal behavior, such as communication skills and nonverbal interaction skills. Other topics which can fall under the heading of social
skills include procedures to increase self-help and/or self-care skills and interventions designed to decrease antisocial behaviors (Singh & Winton, 1983).

Stokes, Baer, and Jackson (1974) evaluated the effects of operant procedures to teach and generalize appropriate hand waving in four individuals with mental retardation. Stokes and group used a prompting and shaping procedure to teach four individuals residing in an institution (ages 10-13 years) to wave appropriately. Using a multiple baseline procedure across participants, the authors demonstrated the effectiveness of the intervention and generalization.

In a study by Koegel, Koegel, Hurley, and Frea (1992), four autistic children were taught to successfully increase appropriate interactions with others across multiple settings using a self-management procedure. The children were taught to recognize correct and incorrect responses and record them accordingly. Appropriate responses resulted in the delivery of reinforcement. The authors also managed to effectively thin the schedule of reinforcement. This intervention resulted in an increase in social interactions and a decrease in disruptive behavior.

Bornstein, Bach, McFall, Friman, and Lyons (1980) conducted a study with 6 individuals diagnosed with mild-to-moderate mental retardation. The purpose was to improve various interpersonal deficits including: eye-contact, enunciation, rate of speech, loudness of speech, stereotypic behaviors, intonation, and the number of words used when speaking. The intervention consisted of verbal instructions, modeling, rehearsal, feedback, and social reinforcement in the context of various social settings. The authors successfully improved the interpersonal target behaviors across all six participants. The improvements were maintained at a one-month follow-up.
Senatore, Matson, and Kazdin (1982) compared the effectiveness of two social skills training procedures on increasing deficits related to conversational interactions. Following a pretest of social skills during an interview, 35 individuals diagnosed with mental retardation were matched according to their skills and randomly assigned to one of three groups. Group one received no skills training. Group two received a standard skills training procedure consisting of prompting, feedback, modeling, and praise. Group three received the same training as group two in addition to active rehearsal of the learned skill in an analog setting. The researchers found that the added rehearsal component was instrumental in effectively increasing the participants appropriate social responses in both an interview situation and during role-play.

In a study by Matson, Manikam, Coe, Raymond, Taras, and Long (1988) social behaviors were increased among individuals with multiple handicaps (e.g., autism and hearing impairment). Three adolescents diagnosed with mental retardation between the ages of 12 and 14 years participated. Using visual cues in addition to verbal praise and edible reinforcement, the authors successfully increased each participants amount of eye-contact, in-seat behavior, and on-task behavior. Treatment effects maintained following generalization of the treatment to the classroom teacher and the actual classroom. Taras, Matson, and Leary (1988) attempted to replicate and expand these findings with two autistic children (9 and 10 years old). In addition to the cues, praise, and reinforcement, the experimenters employed a modeling and role-playing procedure in which a therapist would act out the preferred behavior followed by a role-play where the child had the chance to participate. A multiple-baseline design yielded results indicating the utility of the intervention at increasing social behaviors
(e.g., appropriate affect, eye contact, appropriate sitting, and appropriate content of speech) for both participants.

Van Hasselt, Hersen, Egan, McKelvey, and Sisson (1989) implemented a social skills intervention for two deaf males with mental retardation and limited eyesight. Targeted behaviors included on-task behavior and social interaction, characterized by the participant touching a peer to get their attention, offering an object to a peer, making eye contact, and/or playing cooperatively. Using a graduated prompting procedure and the delivery of a token for appropriate responses, Van Hasselt et al. successfully increased both on-task behavior and social interactions for both participants, and the schedule of token delivery was systematically thinned. Experimental control was demonstrated using both a treatment withdrawal design and a multiple-baseline design across target behaviors. In addition, Van Hasselt and group collected data on non-targeted behaviors to monitor the effects of improved social skills. For both participants the occurrence of self-stimulatory behavior decreased significantly following treatment: 40% reduction for Ron and 25% reduction for Samuel.

Collectively, these studies demonstrate the potential effectiveness of interventions designed to increase positive social behavior. There is some evidence to suggest that interventions designed to increase appropriate social behavior may have concomitant positive effects on other behavior (Koegel et al., 1992; Keogel & Frea, 1993). This approach to treatment certainly demands attention, however, prior to a treatment evaluation relations between domains of functioning must be established. As described earlier, a body of research has been developing surrounding the association of deficits in social functioning with other areas of functioning (Van Hasselt et al., 1989). One area of functioning where a relation has not yet been demonstrated is between social functioning and feeding and mealtime behavior.
PURPOSE

There exists a growing body of research examining the presence of relations between social functioning and other co-morbid behavioral and mental health problems (Duncan, Matson, Bamburg, Cherry, & Buckley, 1999; Kuhn, Matson, & Mayville, 2001; Matson, Smiroldo, & Bamburg, 1998; Njardvik, Matson, & Cherry, 1999). Duncan and colleagues (1999) found that individuals who display aggressive and/or self-injurious behavior also have more significant impairment with respect to social skills. Similarly, Njardvik and group (1999) found that individuals with PDD and Autism displayed fewer appropriate nonverbal social skills than their peers, though individuals with PDD displayed more than those diagnosed with autism. The purpose of the current study was to extend that line of research to examine relations between social behavior and feeding and mealtime behavior problems among individuals with mental retardation.

This study also builds upon existing research specific to feeding and mealtime behavior problems among individuals diagnosed with mental retardation by examining behaviors that may contribute to the presenting problem or in some cases may be functionally related. Functional analysis and antecedent analysis can prove to be helpful in identifying the source of reinforcement or the situation where the behavior is likely to occur; however, the results can be limiting. For example, an analysis may suggest that the individual engages in a behavior to access adult attention, but it does not indicate whether the individual has the skills to appropriately and effectively recruit that form of reinforcement or if the individual has access to other sources of reinforcement across their day. Individuals who engage in mealtime problem behavior may have behavior deficits in other areas of functioning that may
contribute to or exacerbate the presenting problem. An analysis of skills may be required to supplement these analyses.

In 2001, Kuhn et al. extended both of the aforementioned lines of research in a study that demonstrated that individuals diagnosed with mental retardation who engaged in rumination were more likely than their peers to have poorer social skills, such as inability to communicate effectively either with words or gestures, not participating with others in activities or games, and failing to show a preference for some people over others. The authors offered several explanations and implications for their results including the possibility that the participants ruminated, or began ruminating, due to an inability or unwillingness to access other forms of stimulation such as interpersonal contact. The study by Van Hasselt et al. (1989) demonstrated that training appropriate social behavior could also result in a decrease in problem behavior not targeted in treatment. Therefore, it may be possible to reduce instances of rumination by increasing the individuals’ skills at recruiting other forms of stimulation.

The current study expanded on the study by Kuhn et al. (2001) by comparing individuals with other clinically significant feeding and mealtime behavior problems with their peers across multiple measures of social skills and social functioning. In addition, the current study was designed to delineate which social behaviors and/or maladaptive behaviors were most commonly associated with particular types of mealtime behavior problems. These findings were important for several reasons. First, these data suggested that impairment in mealtime behavior may not be an isolated construct. That is, problems in one area of functioning may be pervasive across multiple areas. Second, identification of associations between domains of functioning allows clinicians to have a broader understanding of the variables impacting a client’s daily life. Finally, the findings of this study set the occasion for
future studies to examine the effects of social skills interventions on mealtime behavior, and vise versa.
METHOD

Participants

One hundred and sixteen individuals residing at Pinecrest Developmental Center in central Louisiana participated. The various assessments administered were clinically relevant for each client and were included as part of their annual psychological evaluations. Varying numbers of individuals were identified for each clinical group; groups were defined as individuals who have elevated scores on one of the following categories of mealtime behavior problems as identified by the STEP: (1) selectivity (n=23), (2) food-refusal related behavior problems (n=11), and (3) nutrition related behavior problems (n=24). In order to establish control groups each clinical group was matched case by case according to age (within 5 years), gender, and level of mental retardation. Members of each control group did not have an elevation on the corresponding or other clinical subscales of the STEP, and members of each clinical group had elevations on only that particular subscale. Across the clinical groups, all participants were diagnosed with either severe or profound mental retardation. All participants in the control groups were also diagnosed with severe or profound mental retardation (see Table 1 for demographic information). Diagnoses of mental retardation were made previously by licensed psychologists using DSM-IV criteria (i.e., scores on measures of both intellectual and adaptive functioning fall more than two standard deviations below the mean).

Table 1: Demographic Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Selectivity Clinical</th>
<th>Selectivity Control</th>
<th>Nutrition Clinical</th>
<th>Nutrition Control</th>
<th>Refusal Clinical</th>
<th>Refusal Control</th>
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<tr>
<td>N=</td>
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<td>23</td>
<td>24</td>
<td>24</td>
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Table 1 continued.

<table>
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<tr>
<th>Age Mean Range</th>
<th>52.1yrs. 29-82yrs.</th>
<th>52.2yrs. 29-75yrs.</th>
<th>48.2yrs. 21-83yrs.</th>
<th>47.4yrs. 25-78yrs.</th>
<th>49.2yrs. 13-79yrs.</th>
<th>49.6yrs. 18-82yrs.</th>
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<tr>
<td>Gender % Male</td>
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<td>65.2</td>
<td>50</td>
<td>50</td>
<td>54.5</td>
<td>54.5</td>
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<tr>
<td>% Female</td>
<td>34.8</td>
<td>34.8</td>
<td>50</td>
<td>50</td>
<td>45.5</td>
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<tr>
<td>Race % White</td>
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<td>87.0</td>
<td>62.5</td>
<td>62.5</td>
<td>63.6</td>
<td>63.6</td>
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<tr>
<td>% Black</td>
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<td>13.0</td>
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<td>37.5</td>
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<td>% Moderate</td>
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<td>% Severe</td>
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<td>87</td>
<td>79.2</td>
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</table>

**Measures**

**Screening Tool of Feeding Problems**

The Screening Tool of Feeding Problems (STEP; Matson & Kuhn, 2001), is an indirect assessment used to identify various mealtime behavior problems displayed by persons with mental retardation. The STEP contains 23 items; each item targets a specific mealtime behavior problem. Using a Likert-type scale, informants are prompted to respond to questions about the frequency of the target behavior (i.e., how often the behavior is occurring) and the severity of the target behavior (i.e., to what degree does this behavior cause problems for the individual and others). The items are group into five categories: Aspiration Risk, Selectivity, Feeding Skills, Refusal Related Behavior Problems, and Nutrition Related Behavior Problems. A principal component analysis was conducted (Matson & Kuhn, 2001) which yielded an eight factor solution. A moderate amount of overlap was found between the categories and factors. Most of the factors could be accounted for by parts of, or entire, categories (see appendix A). The authors argued that the STEP functions to identify types of
mealtime behavior problems, not necessarily the identification of a behavioral construct. Therefore, the rationally derived categories were regarded as a more appropriate grouping of behaviors for the purposes of assessment. Previous studies have demonstrated both the reliability (interrater, test-retest), and validity (criterion) of this measure (Kuhn & Matson, in press; Matson & Kuhn, 2001).

Matson Evaluation of Social Skills for Individuals with sEvere Retardation

The Matson Evaluation of Social Skills for Individuals with sEvere Retardation (MESSIER; (Matson, 1995)} will be used to assess positive and negative social skills displayed by all participants. The MESSIER is an indirect assessment developed for and normed on a sample of individuals diagnosed with severe and profound mental retardation, and provides information of strengths and weaknesses in the area of social behavior. The MESSIER contains 85 items addressing specific social behaviors that are grouped into six categories: Positive Verbal, Positive Nonverbal, General Positive, Negative Verbal, Negative Nonverbal, and General Negative. Each item is rated on a four-point Likert scale, ranging from “Never” (0) to “Often” (3). Test-retest reliability, interrater reliability, and convergent validity have previously been established for this measure (LeBlanc, Matson, Cherry, & Bamburg, 1999; Matson, LeBlanc, Cherry, Weinheimer, 1999).

Vineland Adaptive Behavior Scales: Survey Form

The Vineland Adaptive Behavior Scales: Survey Form (VABS; (Sparrow, Balla, & Cichetti, 1984a)} is a well-established instrument used to measure adaptive functioning among “typically functioning” individuals and persons with mental retardation using a third-party informant. The VABS is comprised of four domains including: Communication, Daily
Living Skills, Socialization, and Motor Skills. The VABS Survey Form contains 261 items; 67 items in the Communication Domain, 92 items in the Daily Living Skills Domain, 66 items in the Socialization Domain, and 36 items in the Motor Skills Domain. A large amount of normative and psychometric data has been established on this measure, including test-retest and interrater reliability, and content, discriminant, factorial, and construct validity (Sparrow & Cicchetti, 1984a).

**Diagnostic Assessment of the Severely Handicapped – II (DASH-II)**

The Diagnostic Assessment for the Severely Handicapped - II (DASH-II; Matson, 1995) is a more comprehensive 84-item instrument that screens for symptoms of psychopathology among individuals diagnosed with severe and profound mental retardation. Each item is rated across 3 dimensions; frequency (0 = not at all, 1 = 1-10 times in last two weeks, and 2 = more than 10 times in last two weeks), duration (0 = has been occurring for less than one month, 1 = 1-12 months, and 2 = over 12 months), and severity (0 = no disruptions/damages, 1 = interrupted activities of others, and 2 = caused injury/damage). The items are subdivided into 13 diagnostic categories. The psychometric properties on this instrument are good, with reliability coefficients for interrater and test-retest at .86 and .84 respectively (Matson, 1995). Furthermore, the validity of the DASH-II and several of the subscales has been demonstrated, including the Anxiety, PDD/Autism, Stereotypies, Schizophrenia, and Mood (Bamburg, Cherry, Matson, & Penn, 2001; Matson et al., 1996; Matson, et al., 1999; Matson & Smiroldo, 1997; Matson, Smiroldo, Hamilton, & Baglio, 1997).
**Procedure**

Staff who worked with the participants for at least one year were questioned by masters’ level psychologists regarding mealt ime behaviors, social skills, adaptive functioning, and dual diagnoses. Responses to items for each assessment instrument were obtained from information provided by a third party (e.g., direct-care staff). Clinical group participants were identified in two phases. In phase 1, individuals were identified as a member of a particular clinical group if any elevation above a frequency score of “1” was recorded on only the identified subscale of the STEP. In phase 2, data were collected two times per day (AM and PM), for those individuals identified in phase 1, on the occurrence/nonoccurrence of behaviors from the corresponding subscale of the STEP. These data were collected for 4 weeks. Individuals were removed from a clinical group if the occurrence of the target behavior(s) was less than 1 time per week. Endorsements on the MESSIER were categorized as either positive verbal (e.g., attempts to communicate using words or sounds), positive nonverbal (e.g., looks at face of caregiver when spoken to), general positive (e.g., participates in a game or activity with others), negative verbal (e.g., makes loud inappropriate noises), negative nonverbal (e.g., avoids eye contact), or general negative (e.g., disturbs others). Each subscale on the MESSIER yielded a total score reflecting the frequency participants engage in various social behaviors. The ‘Socialization’ domain of the VABS was used to provide additional information about social behavior/social functioning. Total raw scores for the domain and each of the three subscales from the ‘Socialization’ domain (interpersonal relationships, play and leisure time, and coping skills) were calculated. The Frequency scores for four subscales from the DASH-II were also used to provide information about the
presence and frequency of problem behaviors other than mealtime problem behavior (e.g., physical aggression, property destruction, and self-injurious behavior).

Analyses

Three multivariate analyses of variance (MANOVA) were conducted comparing scores on the six MESSIER subscales, the three subscales from the ‘Socialization’ domain of the VABS, and the total score from the ‘Socialization’ domain of the VABS across the clinical and control groups for each of the three categories being evaluated on the STEP. Group membership served as the independent variable, while total scores on each subscale on the MESSIER (positive verbal, positive nonverbal, general positive, negative verbal, negative nonverbal, and general negative), total scores on each subscale of the VABS Socialization domain (interpersonal relationships, play and leisure time, and coping skills) and the total score from the ‘Socialization’ domain were the dependent variables. No follow-up post-hoc tests were required, given that only two groups were compared.

Furthermore, stepwise regressions were conducted for each clinical group, with groups serving as the dependent variable. These analyses were conducted to provide information regarding which independent variables best create a model that can predict behavioral profiles of each of the clinical groups (i.e., which IV-DV relationships account for the most variance). The independent variables incorporated in each regression included: the age of the participant, the total scores on each of the subscales on the MESSIER (positive verbal, positive nonverbal, general positive, negative verbal, negative nonverbal, and general negative), the raw scores from the ‘Socialization’ domain of the VABS, and the sums of frequency scores for the ‘Impulse Control’, ‘Mood’, ‘Pervasive Developmental Disorder’ and ‘Self-injurious Behaviors’ subscales from the DASH-II.
RESULTS

Preliminary power analyses based on expected sample sizes (15 participants per group) yielded a power estimate of 0.61 using the means and standard deviations found in the study by Kuhn et al. (2001). The samples were judged to be too small, therefore, the estimated sample sizes were changed to include all the individuals meeting the established criteria available. The following numbers of participants were identified for each clinical group: 23 (Selectivity), 11 (Refusal), and 24 (Nutrition). The recomputed power estimates given the new sample sizes were 0.81, 0.46, and 0.82, respectively. According to Cohen (1977), estimates for the Selectivity and Nutrition groups were in the high range, while estimated power for the Refusal group was in the low-to-moderate range.

Table 2: Means and Standard Deviations for the Selectivity Group

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Selectivity</th>
<th>Control</th>
<th>F</th>
<th>P-Value</th>
</tr>
</thead>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive Verbal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
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<td>13.2</td>
<td>2.92</td>
<td>0.095</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>11.9</td>
<td>14.2</td>
<td></td>
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</tr>
<tr>
<td>Positive Nonverbal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>17.3</td>
<td>27.6</td>
<td>6.32</td>
<td>0.016*</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>14.2</td>
<td>13.7</td>
<td></td>
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</tr>
<tr>
<td>General Positive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>25.2</td>
<td>41.3</td>
<td>5.36</td>
<td>0.025*</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>22.7</td>
<td>24.5</td>
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</tr>
<tr>
<td>Negative Verbal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>2.0</td>
<td>2.8</td>
<td>0.61</td>
<td>0.441</td>
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<tr>
<td>Standard Deviation</td>
<td>3.5</td>
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<tr>
<td>Negative Nonverbal</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>6.3</td>
<td>4.8</td>
<td>0.54</td>
<td>0.465</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>7.1</td>
<td>6.4</td>
<td></td>
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</tr>
<tr>
<td>General Negative</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>5.2</td>
<td>5.2</td>
<td>0.00</td>
<td>0.980</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>6.6</td>
<td>4.9</td>
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</tr>
<tr>
<td>VABS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socialization (total)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>21.2</td>
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</tr>
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<td>Standard Deviation</td>
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</tr>
<tr>
<td>Interpersonal Skills</td>
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<td></td>
</tr>
<tr>
<td>Mean</td>
<td>12.4</td>
<td>20.4</td>
<td>4.03</td>
<td>0.051*</td>
</tr>
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<td>Standard Deviation</td>
<td>13.3</td>
<td>13.6</td>
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</table>
Results of the multivariate analyses yielded few areas of statistical and, in turn, clinical significance. All statistically significant findings were associated with the comparison between the Selectivity group and matched controls (Table 2), while no significant findings emerged with the Nutrition (Table 3) and Refusal (Table 4) groups. Statistically significant results for the Selectivity group were found for two subscales of the MESSIER, Positive Nonverbal and General Positive, and two subscales of the VABS, Interpersonal Relationships and Play and Leisure Time. Examination of the mean scores reveals that the control group consistently received better scores on the identified subscales than the Selectivity group. Mean score differences on subscales approaching statistical significance (<0.05) for the Selectivity group include Positive Verbal (MESSIER) and Socialization (VABS). Though no statistically significant mean score differences existed between the Refusal group and matched controls (see Table 4), score differences on Negative Nonverbal subscale of the MESSIER also approached statistical significance.
<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Nutrition</th>
<th>Control</th>
<th>F</th>
<th>P-Value</th>
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<td>MESSIER</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive Verbal</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Mean</td>
<td>4.9</td>
<td>5.6</td>
<td>0.06</td>
<td>0.808</td>
</tr>
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<tr>
<td>Positive Nonverbal</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
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<td>19.3</td>
<td>0.00</td>
<td>0.973</td>
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<tr>
<td>Standard Deviation</td>
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</tr>
<tr>
<td>General Positive</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>28.9</td>
<td>26.9</td>
<td>0.10</td>
<td>0.750</td>
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<tr>
<td>Standard Deviation</td>
<td>20.4</td>
<td>21.5</td>
<td></td>
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</tr>
<tr>
<td>Negative Verbal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>1.8</td>
<td>2.1</td>
<td>0.17</td>
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<td>Standard Deviation</td>
<td>2.8</td>
<td>2.8</td>
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<tr>
<td>Negative Nonverbal</td>
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<td></td>
</tr>
<tr>
<td>Mean</td>
<td>6.6</td>
<td>4.7</td>
<td>1.230</td>
<td>0.273</td>
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<td>5.8</td>
<td></td>
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</tr>
<tr>
<td>General Negative</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>5.0</td>
<td>4.8</td>
<td>0.116</td>
<td>0.735</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>5.3</td>
<td>5.2</td>
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<tr>
<td>VABS</td>
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<tr>
<td>Socialization (total)</td>
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</tr>
<tr>
<td>Mean</td>
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<td>35.4</td>
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<td>Standard Deviation</td>
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<td>Interpersonal Skills</td>
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<td></td>
</tr>
<tr>
<td>Mean</td>
<td>14.6</td>
<td>15.9</td>
<td>0.128</td>
<td>0.722</td>
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<tr>
<td>Standard Deviation</td>
<td>12.9</td>
<td>12.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Play and Leisure Skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>7.4</td>
<td>6.7</td>
<td>0.098</td>
<td>0.756</td>
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<td>Standard Deviation</td>
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</tr>
<tr>
<td>Coping Skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>3.5</td>
<td>4.4</td>
<td>0.135</td>
<td>0.715</td>
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<td>Standard Deviation</td>
<td>7.7</td>
<td>8.9</td>
<td></td>
<td></td>
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</tbody>
</table>

* Significant at 0.05 level

Separate stepwise multiple regression analyses were conducted for each of the three criterion variables of interest (Selectivity, Refusal, and Nutrition). For each of the three analyses, the following predictor variables were entered into the equation: the 6 subscales on the MESSIER, the total score from the ‘Socialization’ domain of the VABS and the three associated subscales, and the sum of frequency scores for four subscales from the DASH-II.

None of the predictor variables contributed to the variance at a .05 or less significance level for the criterion variables Nutrition or Selectivity. A regression equation was generated for the Refusal variable. The ‘Mood’ subscale remained in the regression equation with a beta
weight of 0.45, $F(1,20) = 4.9$, $p<0.039$ with approximately 20% of the variance of food refusal behavior explained by mood related behaviors ($R^2=0.206$). Post-hoc examination of the means indicated that scores on the Mood subscale of the DASH-II were higher among participants in the Refusal group when compared to participants in the matched control group, suggesting a greater mood disturbance among the clinical group; however, it should be noted that the average score for each group did not reach clinical significance according to the scoring system used for the DASH-II.

Table 4: Means and Standard Deviations for the Refusal Group

<table>
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<tr>
<th>Dependent Variable</th>
<th>Refusal</th>
<th>Control</th>
<th>F</th>
<th>P-Value</th>
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<td></td>
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</tr>
<tr>
<td>Positive Verbal</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Mean</td>
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<td>0.361</td>
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<tr>
<td>Positive Nonverbal</td>
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</tr>
<tr>
<td>Mean</td>
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<td>0.901</td>
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<td>Standard Deviation</td>
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<td>General Positive</td>
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<td>28.6</td>
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<td>Negative Verbal</td>
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<td>General Negative</td>
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<td>5.0</td>
<td>0.87</td>
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<tr>
<td><strong>VABS</strong></td>
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<tr>
<td>Socialization (total)</td>
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<td></td>
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<tr>
<td>Play and Leisure Skills</td>
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<td></td>
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<tr>
<td>Mean</td>
<td>5.2</td>
<td>5.8</td>
<td>0.11</td>
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<td>Standard Deviation</td>
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<tr>
<td>Coping Skills</td>
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</tr>
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<td>Mean</td>
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* Significant at 0.05 level
DISCUSSION

The prevalence of inappropriate behavior during and/or surrounding the ingestion of food is disproportionately higher among individuals with mental retardation when compared to the general population (Perske et al., 1977). This finding is also evident with many other behavioral phenotypes {e.g., physical aggression (Hodapp & Dykens, 1996), self-injury (Hodapp & Dykens, 1996), sleep disturbance (Espie & Tweedie, 1991), and social skill deficits (Grossman, 1983)}. The current study was designed to identify possible relations that may exist between food related behavior problems and other collateral behavioral excesses and deficits common among individuals with mental retardation. The presence of this type of association has been demonstrated in the literature with other topographies of behavior including psychopathology, aggression, and self-injury (Duncan, Matson, Bamburg, Cherry, & Buckley, 1999; Matson, Smiroldo, & Bamburg, 1998; Njardvik, Matson, & Cherry, 1999).

To examine the presence of relations between food related behavior problems and social functioning, three separate MANOVAs were conducted. Statistically significant differences were only observed among comparisons between the Selectivity group and their matched controls. Differences were found in subscales on both the MESSIER and VABS. Examination of those differences revealed greater levels of appropriate social skills and functioning among controls. Conversely, those individuals who exhibit behaviors associated with selectivity reportedly displayed fewer positive social behaviors. Given that these findings do not imply directionality or causality, the results can be interpreted in several ways. First, upon examination of the individual items within the statistically significant subscales, one of the common themes among those items associated with the largest mean differences was the individual’s responsiveness to the environment. Some examples of these items

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include, distinguishes caregivers from others, responds to the voice of caregivers, shows interest in others activities, shows a preference for some people over others, responds appropriately to activities in the environment, and shows an interest in interacting with others. Individuals in the control group consistently exhibited these behaviors more frequently than the selectivity group.

One possible explanation for this statistical relation is that individuals who do attend to and are responsive to their environment are more likely to interact with multiple exemplars within their environment. This hypothesis is consistent with other research where novel skills/behaviors are displayed following interventions designed to increase other socially appropriate behavior. For example, following peer-implemented pivotal response training (PRT) to increase appropriate social behavior in children diagnosed with autism, Pierce and Schreibman (1995) observed response generalization. Specifically, increases in joint attention was observed for both participants, characterized by the child attending to people and activities rather than objects even though PRT targeted only activity engagement, communication, and attending to multiple cues.

Similar results were obtained by Koegel and Frea (1993) in so far as generalization to non-targeted appropriate social behaviors increased following an intervention targeting other appropriate social behaviors. The authors hypothesized that social behaviors may all be part of the same response class. Therefore, treating one social behavior may alter the occurrence of other behavior(s) within that response class. One of the underlying mechanisms throughout these examples is reinforcement, where behavior that was followed by beneficial consequences in the past is more likely to occur again in the future, and possibly in novel contexts. With respect to the current study, an individual who has learned that engaging with
a variety of stimuli produces reinforcement, may be more likely to engage with new stimuli (i.e., food) in order to increase the likelihood of beneficial or pleasurable consequences. Conversely, an individual who does not have the ability to, or has not attempted to, recruit reinforcement from a variety of situations and stimuli may be less likely to sample novel stimuli.

Another theme common among the items associated with the largest mean differences was related to communication skills (primarily nonverbal) such as, communicates needs through gestures, reaches for familiar people, and uses arm or hand to communicate. Across these (and other) items, the Selectivity group consistently displayed fewer of these behaviors, indicating communication deficits with respect to accessing social interactions. This can also be characterized as an inability to control the delivery of social reinforcement. Often times, individuals with mental retardation who do not have the skills to appropriately recruit sources of reinforcement in their environment will engage in inappropriate behaviors that have in the past been associated with the delivery of some form of socially mediated reinforcement (Carr & Durand, 1985). For example, Kahng, Iwata, DeLeon and Worsdell (1997) demonstrated that an individual with limited appropriate communication (e.g., speech, gestures) engaged in self-injurious behavior as a means to access social interaction. Individuals may engage in selectivity during meals because in the past, this behavior has been associated with high levels of staff attention/interaction in an attempt to get the individual to eat more or different foods.

No differences were found within the analyses of the Refusal and Nutrition groups. The fact that no statistically significant differences were found is of clinical importance. Girolami and Scotti (2001) demonstrated that for all of their subjects, food refusal was maintained by negative reinforcement in the form of escape from the meal. One might predict
that individuals who engage in behaviors associated with the Refusal subscale (e.g., aggression, spitting food, pushing food) might also display these or functionally similar behaviors in other settings and situations. That is, individuals who have learned to effectively escape from aversive situations (e.g., a meal) by engaging in problem behavior may also apply that strategy to escape other aversive events in their life (e.g., completing domestic tasks). This approach was not apparent with the sample used in this study. No statistically significant differences were found across any of the subscales examined, including those subscales (Negative Nonverbal and General Negative subscales of the MESSIER) that address maladaptive behaviors (e.g., physical aggression, temper outbursts, and disruptive behaviors). Given that comparable low levels of maladaptive behavior are common across both the clinical and control groups, these results imply that there is something distinct about the meal situation that establishes escape as reinforcing, since escape maintained problem behavior is not occurring in other contexts. One possible explanation is that food represents a unique or different sensory stimulus.

In order to explain the findings related to the Nutrition subscale, it might be necessary to make some assumptions about the function of these behaviors. Given the topography of the behaviors (pica, food stealing, overeating, and eating small amounts), it is likely that these behaviors are maintained by either automatic negative and/or automatic positive reinforcement. In other words, these behaviors produce their own reinforcement. For example, an individual may engage in pica to correct for nutritional deficiencies (Pace & Toyer, 2000). Or, an individual may engage in food stealing because successful completion of the behavior produces either access to a preferred edible or the termination of an aversive hunger pain (Maglieri et al., 2000). Another possibility is that these behaviors are maintained
by social consequences (e.g., adult attention or escape from the meal). For example, an individual may engage in food stealing because it produces a verbal reprimand from caregivers, or an individual may place an inedible object in their mouth to access adult attention (Piazza et al., 1998). The automatic reinforcement hypothesis could be indirectly supported by the findings in this study in so far as there are no significant differences between the groups (clinical and control) with respect to participant’s ability to communicate his/her wants and needs. One might expect that individuals who engage in problem behavior maintained by social consequences have more global deficits with respect to communication skills (Gardner & Cole, 1990), while individuals who engage in behavior independent of social consequences may or may not have adequate communication skills.

Regression analyses were conducted to identify what domains of daily functioning may be predictive of selectivity, food refusal, and nutrition related feeding and mealtime behavior problems displayed by persons diagnosed with mental retardation. According to the analyses, no models could be created for either the selectivity or nutrition variables. These data may suggest that despite mean score differences (Selectivity MANOVA) the behavioral profile for individuals who engage in these food-related behavior problems is idiosyncratic. While individuals who display behavior related to selectivity may display less appropriate social behavior, not all individuals who lack appropriate social behavior also display selectivity. A one-variable model was created for predicting refusal behaviors. Total scores from the Mood subscale of the DASH-II were found to be predictive of food refusal behaviors. This finding is consistent with research related to mood disorders (Avant, 1987; Munden & Perry, 2002; Myers & Pueschel, 1995). One of the criteria for both Major Depressive Disorder and Dysthymic Disorder (APA, 1994) is a significant change in appetite.
A decreased interest in food and eating would likely be accompanied by attempts to avoid or get out of eating situations. Understanding that 20% of the variance associated with the presence of food refusal behaviors can be accounted for by an overall elevated mood disturbance provides clinicians with information about possible treatment evaluations. For example, if an individual has been identified as engaging in food refusal related behaviors, clinicians should consider assessing the presence of other symptoms of a mood disorder. Conversely, individuals identified as experiencing depression should have their food intake closely monitored. Though treatments targeting food refusal in isolation (e.g., differential reinforcement of food acceptance with escape extinction) may be effective, the treatment may be enhanced by also treating the mood disorder (e.g., anti-depressant medications).

Overall, the methods and results obtained from this study are meaningful in several ways. First, these results enhance the growing body of literature on the assessment and treatment of behavior problems related to eating by assessing for the presence or absence of behavioral repertoires that may directly influence the mealtime behaviors of concern, specifically social functioning. Consistent with the study by Kuhn et al. (2001), some individuals who exhibit problems related to eating also fail to demonstrate appropriate social behavior. These data suggests that either individuals failed to acquire appropriate social behavior because their food-related behaviors interfered, or the absence of appropriate social behavior facilitated the emergence of food-related behavior problems.

Second, the results obtained in this study lay the foundation for future treatment studies. Though the relations identified are correlational, they may actually be causal in nature. Learning about a direction of causality can be instrumental in treatment planning. A significant amount of research is devoted to either the treatment of social behavior (Koegel et
al., 1992; Matson et al., 1988; Pierce & Schreibman, 1995; Senatore et al., 1982; Stokes et al., 1974) or the treatment of feeding problems (Ahearn et al., 2001; Fredericks et al., 1998; Hoch et al., 1994; Kern & Marder, 1996; Piazza et al., 1998; Shore et al., 1998). However, no studies address the effect(s) of treating social behavior on feeding behavior and vice versa.

To evaluate a possible causal relation, future studies may be conducted to evaluate the effects of social skills training on food-related behavior problems. For example, teaching an individual to interact more with others and their environment may result in a decrease in food selectivity since a new history of experiencing novel stimuli and situations has been established. Or, teaching an individual to communicate more appropriately in leisure settings may generalize to mealtime situations and result in a decrease in selectivity behavior maintained by access to attention.

Conversely, researchers may examine the effects on social behavior following treatment of the inappropriate mealtime behavior problem. For example, after teaching an individual with food selectivity to accept a wider variety of foods, an increase in novel/appropriate social interactions may be observed. Or, treating socially maintained food refusal using extinction may result in an increase in functionally equivalent more appropriate behavior. Ruffin, Arnold, Hagopian, and Rush (2001) targeted inappropriate social behaviors (e.g., interrupting others while they are talking, touching others anywhere on their body without permission) for treatment using a differential reinforcement of low rate behavior (DRL) procedure, and subsequently observed an increase in appropriate social behavior (e.g., saying please, thank and you’re welcome, stating he would like to switch topics prior to interrupting the current topic).
There are several limitations to this study that are worth noting since they may restrict some of the findings. First, as mentioned earlier, the power obtained relative to analyses with the Refusal group was in the low range due in large part to a relatively small sample size. Consequently, it is necessary to cautiously interpret the corresponding data analyses. While it is interesting that the regression analysis did yield a model for predicting refusal behavior, the small sample may not be representative of this population. The model generated is consistent with research related to the assessment and diagnosis of mood disorders (Avant, 1987; Munden & Perry, 2002; Myers & Pueschel, 1995). However, interpretations must be made with caution. Had a larger sample size been generated with the Refusal group, significant differences in social functioning may have emerged within the corresponding MANOVA. One might hypothesize that statistically significant results would have emerged within both the Positive and Negative subscales of the MESSIER as well as the Interpersonal Skills subscale of the VABS. These results would validate the hypothesis of Girolami and Scotti (2001) that food refusal behaviors are typically an inability to effectively communicate a desire to terminate a meal. Therefore, it is likely that the presence of problem behaviors related to food refusal is associated with concomitant lack of communication skills, especially those described in the subscales of the MESSIER and VABS.

One variable not controlled for during the matching process that may be important when interpreting some of the findings is the presence of a pervasive developmental disorder. Core features of pervasive developmental disorders include severe impairment in some or all of the following areas: social interaction, communication (verbal and nonverbal), and stereotyped behaviors or interests (APA, 1994). Differences found among the Selectivity group may be accounted for by the presence of a pervasive developmental disorder. For
example, individuals who display a restricted repertoire of behavior, (i.e., stereotypy) such as only eating certain foods, may also have limited social skills as a function of a disorder (e.g., Autistic Disorder) and not necessarily other environmental factors. Therefore, it is possible that the Selectivity group may have a disproportionate number of participants diagnosed with a pervasive developmental disorder. However, the regression analysis for the Selectivity group did not retain scores from the PDD subscale on the DASH-II as one of the predictor variables. Thus, according to the current findings, the presence of symptoms of PDD as measured by the DASH-II are not predictive of the presence of food selectivity.

Furthermore, samples selected from the population for this study all resided in the same state-run developmental center. Therefore, making generalizations beyond this sample/facility should also be made with caution. The possibility exists that variables specific to this environment contribute to the emergence and maintenance of these problem behaviors. For example, it is possible (though very unlikely) that problem behaviors have replaced appropriate communication among residents in this facility because care providers have made no effort to teach appropriate communication skills.

The results of this study identify differences in social functioning among clinically significant samples and non-clinically significant samples. The information learned from this study can also be viewed as the groundwork for a new avenue of treatment research. That is, if clinicians/researchers are able to identify consistent relations between problem behavior and other areas of functioning, it is possible that either the treatment of problem behaviors can be enhanced by also targeting deficits in other areas of functioning, or that reductions in problem behaviors may be observed just by targeting for treatment those deficits in functioning.
In conclusion, these results represent an exciting extension of current research on the assessment and treatment of feeding and mealtime behavior problems. This study has demonstrated that while treatment efforts are typically directed exclusively towards the specific behavior (e.g., pushing food away) and the immediate variables that maintain that behavior, it may be important to address the problem more globally by treating the multiple variables that may be contributing to the problem.
REFERENCES


Bornstein, P. H., Bach, P. J., McFall, M. E., Friman, P. C., & Lyons, P. D. (1980). Application of a social skills training program in the modification of interpersonal deficits


## APPENDIX: CATEGORIES AND FACTOR STRUCTURE

<table>
<thead>
<tr>
<th>Category (item numbers)</th>
<th>Factor (item numbers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skills (1, 3, 4, 5, 8, 15, 16, 17)</td>
<td>1 (1, 8, 16)</td>
</tr>
<tr>
<td></td>
<td>2 (12, 15, 17)</td>
</tr>
<tr>
<td></td>
<td>3 (3, 4)</td>
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<tr>
<td>Aspiration Risk (18, 21)</td>
<td>4 (2, 18, 21)</td>
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<tr>
<td>Nutrition Related Behavior Problems (7, 9, 11, 12, 14)</td>
<td>5 (7, 9, 14)</td>
</tr>
<tr>
<td>Refusal Related Behavior Problems (2, 13, 19)</td>
<td>6 (6, 11, 13, 19, 22)</td>
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<tr>
<td>Selectivity (6, 10, 20, 22, 23)</td>
<td>7 (5, 10)</td>
</tr>
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<td></td>
<td>8 (20)</td>
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</tbody>
</table>
VITA

David Kuhn earned his Bachelor of Arts in behavioral biology at the Johns Hopkins University in 1993. In 1995 David was hired at the Kennedy Krieger Institute (KKI) in Baltimore, Maryland, where he worked for over 3 years on an inpatient unit providing behavioral services to children and adolescents with developmental disabilities and severe behavior problems. After gaining clinical and research experience at KKI he attended Louisiana State University as a doctoral student in clinical psychology. He earned his Master of Arts degree in 2000, and will receive his Doctor of Philosophy degree in clinical psychology in May of 2004. David completed his pre-doctoral internship at the Kennedy Krieger Institute and Johns Hopkins University School of Medicine in Baltimore. Following internship he was hired on as a Case Manager on the Neurobehavioral Unit at KKI. David is currently awaiting appointment as Assistant Professor at the Johns Hopkins University School of Medicine.