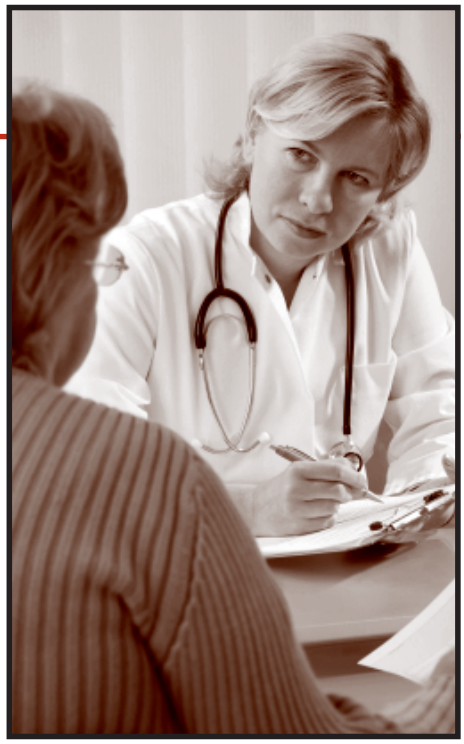
Health and Problem Behavior Among People With Intellectual Disabilities

Michael E. May, Ph.D. BCBA, Southern Illinois University
Craig H. Kennedy, Ph.D. BCBA, Vanderbilt University



ABSTRACT

Good health significantly improves a person's quality of life. However, people with intellectual disabilities disproportionately have more health problems than the general population. Further complicating the matter is that people with more severe disabilities often cannot verbalize health complications they are experiencing, which leads to health problems being undiagnosed and untreated. It is plausible these conditions can interact with reinforcement contingencies to maintain problem behavior because of the increased incidence of health problems among people with intellectual disabilities. This paper reviews common health problems influencing problem behavior and reinforcement processes. A clear implication of this review is the need for comprehensive functional assessments of problem behavior involving behavior analysts and health professionals.
Keywords: functional assessment, health problems, intellectual disabilities, problem behavior

Health problems are illnesses, injuries, impairments, or physical conditions negatively affecting a person's quality of life (World Health Organization, 2000). In general, health problems among people with intellectual disabilities (ID) are similar to those in the general population, although certain health conditions are more prevalent among the ID population (Holland & Koot, 1998; Horwitz, Kerker, Owens, & Zigler, 2000; Wilson & Haire, 1990). Some of the more common health conditions among people with ID include motor deficits, epilepsy, allergies, otitis media, gastroesophageal reflux disease (GERD), dysmenorrhea, sleep disturbances, seizure disorders, mental illness, vision and hearing impairments, oral health problems, and constipation (Jansen, Krol, Groothoof, & Post, 2004; Kennedy et al., 2007; Krahn, Hammond, & Turner, 2006; Sigafoos, Arthur, & O'Reilly, 2003). Further complicating the issue is that the more severe the disability, the less likely health problems are to be diagnosed and treated (Barr, Gilgunn, Kane, & Moore, 1999; Symons, Harper, McGrath, Breau, & Bodfish, 2009). Undiagnosed and/or untreated health problems may reduce a person's life expectancy and contribute to the development of secondary health complications (Cooper, Melville, & Morrison, 2004; Piazza et al., 2003).

There is emerging evidence from the behavior-analytic literature that health problems may also contribute to increases in problem behavior among people with ID. For example, O'Reilly (1997) showed that the self-injury of a boy with ID occurred to reduce ambient noise when otitis media symptoms (inflammation in the middle ear) were present, but these behaviors did not occur when he was free of otitis media symptoms. Similarly, researchers have shown that food refusal in children with pediatric feeding disorders is often correlated with the presence of oral-motor deficits and/or GERD (Kitfield & Masalsky, 2000; Rommel, De Meyer, Feenstra, & Veereman-Wauters, 2003). Treatment packages often include health and oral-motor interventions aimed at reducing the health problems and behavioral interventions aimed at increasing food intake (or reducing problem behaviors emerging around mealtime).

Symptoms of a health problem are initially treated with health interventions once they are identified. However, ignoring the reinforcement contingencies could result in problem behavior being socially reinforced in the absence of the health problem (Carr & McDowell, 1980; Piazza et al., 2003). For example, Carr and McDowell (1980) reported the case of a child with ID who began scratching himself in response to a skin allergy; the scratching was likely maintained by automatic reinforcement. After remission of the allergic reaction, scratching continued because the behavior acquired a social reinforcement function (i.e., positive reinforcement in the form of access to attention). In other words, although health problems can influence rates of problem behavior, problem behavior may persist in the absence of the original health problem.

It is becoming increasingly clear that, in some cases, comprehensive assessments and treatments are necessary to attenuate the influence of health problems on rates of problem behavior. However, behavior analysts are not trained to diagnose and

Behavior Analysis in Practice, 3(2), 4-12

treat health problems, and health professionals do not have the expertise in applied behavior analysis to identify response-reinforcer relations. Therefore, comprehensive assessments should be a collaborative effort between these professionals. The following sections describe how comprehensive functional assessments can identify interactions between common health problems and reinforcement contingencies influencing problem behavior in persons with ID.

How Can Functional Behavior Assessment Identify Health Problems?

Best practices in the assessment and treatment of problem behavior in a variety of clinical populations have changed with the development of functional behavior assessment (FBA) technologies (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994; Tasse, 2006). An FBA is a problem-solving strategy for identifying the contextual factors associated with problem behavior and consists of record reviews/interviews, descriptive assessments, and experimental analyses (Iwata & Dozier, 2008). In other words, a behavior analyst identifies the stimulus controls, motivating operations, and response-reinforcer relations altering the rate, variability, topography, and/or intensity of problem behavior. Treatments are then derived from the FBA addressing antecedent events influencing and/or consequent events maintaining problem behavior.

Episodic variability in problem behavior may lead to the systematic monitoring of health symptoms such as excessive sneezing, bowel movements, or sleep patterns, which in turn may lead to the identification of a previously undiagnosed health problem. Symptoms related to a variety of health problems, whether acute or chronic, can produce unique patterns of problem behavior. Thus, FBAs are conducted at times when the health problem is present, and when it is absent (Kennedy & Becker, 2006). During some FBAs, the problem behavior occurs only in the presence of the health problem. For example, Kennedy and Thompson (2000) tracked symptoms related to GERD (i.e., heartburn and regurgitation) in a man with ID while conducting an FBA. Results showed that the self-injury followed mealtimes producing GERD symptoms. When treated with antacids, this pattern of problem behavior following mealtimes was eliminated.

During other FBAs, problem behavior is present even when the person is healthy, but intensifies when the person is ill. For example, O'Reilly (1995) analyzed the aggression of a man with frequent night awakenings. O'Reilly tracked the sleep patterns of the individual while conducting functional analyses. On days when the man slept five or more hours, aggression was infrequent when demands were placed on him. When the man slept less than five hours, aggression occurred more frequently to escape demands placed on him.

There are at least three temporal patterns in which the onset of health problems can influence response rates during FBAs. Health problems can occur multiple times per day (e.g., heartburn after food ingestion) with a sudden onset or exacerbation of problem behavior being observed at each onset of the health problem (Kennedy & Thompson, 2000). The temporal onset of the health problem may be cyclical over shorter time periods (e.g., sleep disturbances), which may correspond to the onset or exacerbation of problem behavior in the presence of aversive environmental events (Fisher, Piazza, & Roane, 2002; O'Reilly, 1995). Finally, the effects of health problems can build up over longer time periods (e.g., constipation) with problem behavior becoming more and more likely as health symptoms worsen in the presence of aversive events (Christensen et al., 2009). These three temporal patterns of health problems can also be classified as acute symptomatology, in which sudden onset of the health problem is accompanied by relatively rapid remission of symptoms when treated, or chronic symptomatology, in which health problems are persistent over time and may progressively worsen if untreated.

How Does Health Affect Problem Behavior?

Health problems can alter behavior-consequence relations responsible for the development and maintenance of problem behavior in two distinct ways (Kennedy & O'Reilly, 2006; Langthorne, McGill, & O'Reilly, 2007; Laraway, Snycerski, Michael, & Poling, 2003). First, the health problem may alter the value of a particular reinforcer. For example, the discomfort associated with otitis media may increase the value of escape from loud noises or other environmental events that produce vibrations contacting the individual's eardrum. Similarly, environmental events typically effective as positive reinforcers could be rendered ineffective for evoking appetitive behaviors. Second, because of the value-altering effect the health problem has on a particular reinforcer, a response associated with the reinforcer becomes more or less likely to occur. For example, head hitting may increase because it has temporarily relieved pain associated with otitis media in the past. Similarly, on-task behavior, a response maintained by edibles, may decrease when GERD symptoms are present because the pain interferes with or abolishes the value of the positive reinforcer.

In most cases, health problems establish certain stimuli as noxious and increase rates of negatively reinforced behavior (although noxious stimuli can alter the value of positive reinforcement, as mentioned above). However, health problems alone do not determine whether or not problem behavior is maintained by environmental events. The following sections review health problems empirically demonstrated to interact with reinforcement contingencies to affect rates of problem behavior in people with ID.

Allergies. No prevalence data are currently available for people with ID, but research suggests this population may be highly susceptible to developing reactions to various allergens (Kedesdy & Budd, 1998; Shott, 2006). Allergies are defined as hypersensitivity of a person's immune system to allergens that have been inhaled, ingested, or come in contact with the skin. Allergic reactions can vary from mild to severe and can occur immediately or hours (sometimes days) after the allergen

was introduced to the person. Allergens may include pollen, animal dander, food, medicine, or insect bites that may be harmless to others without these hypersensitivities. The most common symptoms of allergies include an inflammation of the mucous membranes of the nose, nasal discharge, coughing, sneezing, nasal/eye itching, hives, dark discoloration beneath both eyes, extra wrinkles below lower eyelids, a transverse nasal crease due to chronic upward wiping of the nose, and enlarged tonsils and adenoids. Some of the more severe symptoms of an allergic reaction include difficulty breathing or swallowing, chest or abdominal pain, dizziness, vomiting, diarrhea, swelling of the face, wheezing, and anaphylactic shock. These symptoms may also be associated with significant comorbidities such as asthma (restricted breathing caused by inflammation of the airways), sinusitis (improper drainage of mucus from the nasal cavity), nasal polyposis (non-cancerous tissue growth in the nose), and otitis media with effusion (painful inner-ear infection causing fluid buildup; Uphold & Graham, 2003). Thus, secondary medical causes for allergies need to be ruled out by health professionals before diagnosing more severe allergies.

Kennedy and Meyer (1996) conducted an FBA on self-injurious head-banging of a boy with ID during the presence and absence of allergies. The analysis demonstrated that the behavior was maintained by escape from instructional demands when the boy was experiencing nasal congestion, nasal discharge, and red/watering eyes. In this case, allergies may have exerted value-altering effect on instructional requests by making those requests more aversive. Self-injury was negatively reinforced by the termination of instructional demands during these times. In the absence of allergies, the boy tolerated the instructional requests.

Health professionals try to eliminate or reduce allergy symptoms. Allergy management includes vacuuming and dusting frequently, removing rugs, and keeping pets out of the bedroom. Furthermore, health professionals may try prescription or over-the-counter medications (e.g., Benadryl®, Zyrtec®, Nasonex®). If behavior problems persist, steps can be taken by the behavior analyst to minimize demands when allergies are present and/or provide reinforcement-based strategies to increase socially-appropriate responses to the environment (e.g., teach functional communication requesting a break from task demands; see Tiger, Hanley, & Bruzek, 2008). The effects of health and behavioral interventions on problem behavior are then observed during subsequent observations. If the interventions are effective, observations will reveal a remission of the allergy symptoms and a reduction/elimination of problem behavior under the same contextual circumstances that produced the problem behavior in the first place.

Otitis Media. Prevalence of otitis media is estimated to occur in 25% of the ID population, but varies by disability type (Mitchell, Call, & Kelly, 2003; Rosenhall, Nordin, Sandstrom, Ahlsen, & Gillberg, 1999). Interestingly, typically developing children experiencing otitis media may also engage in self-injurious behavior while the infection is present (Bramble, 1995). Otitis media is a middle-ear infection or inflammation, and includes ear pain, ear drainage, fever, and hearing loss (Uphold & Graham, 2003). These symptoms may be accompanied by irritability, problem sleeping or eating, runny or stuffy nose, and/or cough. Risk factors for recurrent otitis media include episodic otitis media during the first six months of life, passive/active smoking, gender (i.e., males), congenital disorders such as cleft palate or Down syndrome, and a history of enlarged adenoids, tonsillitis, asthma, or a family history of otitis media. Thus, behavior analysts should refer individuals suspected of suffering from otitis media to appropriate health professionals for diagnosis.

> During some FBAs, the problem behavior occurs only in the presence of the health problem; in others, problem behavior is present even when the person is healthy, but intensifies when the person is ill.

O'Reilly (1997) observed self-injurious ear poking of a child with ID under various reinforcement contingencies during the presence and absence of otitis media. Self-injury occurred at high frequencies in continuous bouts of two to three days per month. During these bouts, the child was examined by a health professional and diagnosed with otitis media. The results of this FBA showed that the behavior occurred at high rates when loud noise was introduced to the environment. When otitis media was not present, the child tolerated loud noise. In this case, otitis media enhanced the noxious value of noise, which led to negatively reinforced ear poking.

Health interventions for otitis media may include antibiotics, analgesics, and allergy avoidance. To reduce the incidence of otitis media, it is important to modify risk factors such as avoiding passive cigarette smoke, controlling allergies, and treating sinusitis. If problem behaviors do not resolve, it may be necessary to implement behavioral interventions based on the function of the problem behavior. As with any health or behavioral intervention, tracking the rate of problem behavior will allow professionals to determine the relative effectiveness of intervention components.

Dysmenorrhea. Dysmenorrhea is associated with pain in the lower abdomen beginning with the onset of menstruation (Uphold & Graham, 2003). Dysmenorrhea occurs in 25% to 33% of women in the general population, but is estimated to be twice as high among women with ID (Osuga et al., 2005; Walsh & Heller, 2002). In cases of problem behavior being associated with dysmenorrhea, the occurrence of behaviors is cyclical and coincides with the onset of menses and resolves shortly thereafter (Quint, Elkins, Sorg, & Kope, 1999). However, some cases are more severe and require health professionals to rule out secondary conditions causing dysmenorrhea.

Carr, Smith, Giacin, Whelan, and Pancari (2003) examined the problem behavior of women with ID under demand situations prior to and during menses. Individuals were included in the study if serious behavior problems worsened at the time of menses, behavior problems became more frequent when task demands were presented, and nonverbal and/or verbal behaviors indicated the presence of menstrual-related discomfort (e.g., participant observed clutching her abdomen or verbally reporting pain). The data suggested that the discomfort associated with dysmenorrhea established or exacerbated the aversive properties of demands during daily routines, thus increasing rates of socially reinforced problem behavior that functioned to avoid demands.

If a comprehensive FBA identifies dysmenorrhea as altering the value of reinforcement contingencies, reduction of the dysmenorrhea symptoms is attempted by using prescription medication for pain, hot water bottles for backache, periods of rest for fatigue, dietary changes, exercise, and use of pads in place of tampons. If the symptoms cannot be treated using these less intrusive methods, medication that suppresses the production of hormones (i.e., prostaglandins) and oral contraceptives are also highly effective in treating dysmenorrhea. Carr et al. (2003) included health interventions such as prescription pain medication, heating pads, periods of rest for fatigue, and use of pads. Behavioral interventions consisted of: teaching the participants appropriate ways to seek help in completing, and to take breaks from, tasks; redesigning the structure and presentation of tasks when participants seemed to be in pain; and offering choices between tasks.

Sleep Disturbances. Anywhere from 35% to 90% of people with ID experience sleep disturbances (Clements, Wing, & Dunn, 1986; Harvey & Kennedy, 2002; Robinson & Richdale, 2004). Sleep disturbances refer to a variety of conditions in which people with ID experience disruptions in sleep, such as sleep apnea, restless legs syndrome, insomnia, and night awakenings. Some types of sleep problems (e.g., sleep apnea and restless legs syndrome) primarily reduce REM sleep; while difficulty falling asleep and night awakenings have a greater impact on Slow-Wave Sleep (SWS; Pace-Schott & Hobson, 2002). The negative effects of sleep deprivation include reduced attention, impaired memory, increased stress response, and altered immune system functioning (Stickgold, Hobson, Fosse, & Fosse, 2001). Because sleep disturbances may be associated with other health conditions, such as depression or hyperthyroidism, it is important for health professionals to identify the etiology of the sleep disturbance before treatment.

O'Reilly (1995) analyzed the aggression of a boy with ID under various reinforcement contingencies in his home and at his vocational facility. Structured interviews and functional analyses indicated his aggression was maintained by positive reinforcement in the form of social attention, and negative reinforcement by escape from demands. When the boy suffered from disrupted sleep, his aggression was more severe during demanding tasks. A behavior support plan included rest periods, offering choices, pre-task requests, functional communication training, and backward chaining during skills training, which successfully attenuated the effects of disrupted sleep on daily activities and aggression.

Kennedy and Meyer (1996) found the problem behavior of a girl with ID was maintained by social negative reinforcement in the form of escape from demands. When she did not go to bed at her typical time, she arrived at school asleep or appeared drowsy to staff. On days when she experienced limited sleep, she exhibited increased overall levels of problem behavior, particularly when daily task demands were presented at school. Although no treatment was evaluated in this study, the relation between disturbed sleep and school-based problem behavior was shown and should be considered when complaints regarding disturbed sleep and problem behavior are made during a behavioral consult.

O'Reilly and Lancioni (2000) also examined the relation between sleep deprivation and changes in problem behavior for a child with ID. Not only did the child exhibit problem behavior during her daily scheduled routines, but more so when the child missed her afternoon naps. In this study, sleep

disturbances functioned to exacerbate negatively reinforced responding and decreased the discrimination between contexts and reinforcement contingencies.

Intervention for sleep disturbances influencing problem behavior involves the remediation of sleep disturbance through sleep hygiene routines (Durand, 1998), psychopharmacology (Roth, Hajak, & Ustun, 2001), or a combination of the two. This may suffice for instances in which sleep disturbances evoke problem behaviors that do not otherwise occur. However, in many instances, problem behaviors occur even when sleep disturbances are not present. In these instances, behavior intervention plans that actively focus on increasing appropriate behaviors and decreasing inappropriate behaviors should be in place.

Constipation. As many as 75% of people with ID experience constipation on a routine basis (Bohmer, Taminiau, Klinkenberg-Knol, & Meuwissen, 2001; Tse, Leung, Chan, Sien, & Chan, 2000). Constipation refers to diminished frequency of defecation, incomplete evacuation, and/or stools that are too hard or too small (Uphold & Graham, 2003). The most common effect of constipation is abdominal discomfort, which progressively increases in severity since the last bowel movement. Patients with poor eating/drinking habits (e.g., decreased fluid and fiber intake) and those on various psychotropic medications are predisposed to constipation (Tierney, McPhee, & Papadakis, 2005). Constipation can also produce other health conditions, including GERD and sleep problems (Eicher, 1997). Secondary causes of constipation include primary diseases of the colon such as stricture, tumor, fissure, and proctitis. It is important to determine a person's baseline bowel habits in order to assess deviations from the norm for that person because of the wide range of bowel movement frequencies among individuals.

Several studies have associated constipation with increases in problem behavior among people with ID (Christensen et al., 2009; Janowsky, Kraus, Barnhill, Elami, & Davis, 2003; Kozma & Mason, 2003). In Christensen et al. (2009), FBAs revealed that high rates of problem behavior occurred across experimental conditions, suggesting a nonsocial reinforcement contingency was maintaining the behavior. Following several days of not eating and constipation, problem behavior increased in frequency. When the constipation was treated with medication, FBAs revealed a reduction in problem behavior across experimental conditions.

Dietary interventions such as increased fiber intake may be warranted if a health assessment is negative for endocrine (e.g., hypothyroidism), metabolic (e.g., diabetes mellitus), and neurologic (e.g., Parkinson's disease or spinal cord lesions) causes for constipation. If secondary causes are identified, interventions would include elements to remediate constipation, while monitoring other health problems and their effects on behavior. However, as with other health problems, it may be necessary to address reinforcement contingencies with function-based interventions if problem behavior persists.

Gastroesophageal reflux disease. In people with ID, the incidence of GERD may be as high as 48% (Bohmer et al., 1999). GERD is a painful condition involving stomach contents washing back into the esophagus. Heartburn and regurgitation are the main symptoms, but atypical indicators of GERD can include asthma, chronic coughing, hoarseness, sore throat, and chest pain (Roka et al., 2005). An important distinction between GERD and other health problems is that GERD symptoms are likely to reappear anytime a meal or snack is consumed. FBAs reveal that the onset of GERD symptoms could establish events as noxious, thereby increasing the likelihood that behaviors which reduce such events will be negatively reinforced. For example, Swender, Matson, Mayville, Gonzalez, and McDowell (2006) found that GERD symptoms were more common in people with ID who engaged in hand-mouthing compared to matched peers without hand-mouthing. The behavioral function of hand-mouthing was determined to be nonsocial, suggesting the behavior may have produced negative reinforcement when pain was present.

Researchers have also shown that food refusal is consistent with an escape or avoidance function, such as a physical resistance to feeding, expulsion of food, or other incompatible behaviors such as aggression and attempts to leave the table (Piazza et al., 2003). The inappropriate behavior these children display tends to be higher when inappropriate behavior resulted in escape or breaks from bites of food, and for some when inappropriate behavior resulted in adult attention or tangible items. The majority of these children suffered from GERD and/or food allergies. When these health problems are suspected in maintaining problem behavior, appropriate interventions focus on dietary changes, therapy for oral-motor deficits, and/or pharmacological intervention. However, behavioral interventions still need to address the reinforcement history. If GERD symptoms are substantially reduced or eliminated and problem behavior persists, an FBA should be conducted to identify environmental antecedents and consequences associated with behavior problems. Due to the prominence of negatively-reinforced problem behavior during mealtimes, escape extinction is often used to prevent the child from escaping food intake, once the GERD symptoms are addressed (Patel, Piazza, Martinez, Volkert, & Santana, 2002).

Can Other Health Conditions Influence Reinforcement Contingencies?

There is emerging evidence of other health conditions that, under appropriate circumstances, may contribute to problem behavior. For example, mental illness can occur at any time during a person's lifespan and includes disorders of mood, thought, and/or behavior. The symptoms related to mental illness among people with ID in the United States is estimated at four to five times greater than that diagnosed in the general population (Borthwick-Duffy, 1994; Holden & Gitleson, 2003). However, analyzing mental health and problem behavior is a complex task, mainly due to the tautological tensions

inherent in research on the etiological and environmental factors contributing to each. For example, problem behavior is often used as a criterion for psychosis. Thus, when problem behavior occurs, the conclusion is drawn that it must be an atypical symptom of psychosis. But classifying problem behavior as a diagnostic indicator for mental health problems runs the risk of obscuring complex interactions between impaired cognitive, adaptive, and communicative skills associated with the behavior and the controlling features of the environment on the problem behavior. In short, the presence of problem behavior cannot be causally linked to any particular psychiatric diagnosis (Tsiouris, 2003).

Nonetheless, problem behavior may be temporally related to the course of a mental illness (Taylor & Schanda, 2000). For example, McDougal (2000) used a functional analysis to examine aggression among institutionalized adolescents with mental illness. Antecedent events precipitating aggression included frustrating interactions, activity demands, and interventions by others perceived by the adolescent as an attack. These environmental events lead to increases in negatively reinforced aggression, but only when active symptoms of psychosis were present.

Problem behaviors could also occur in temporal cycles that are indicative of depressive versus manic symptomatology for bipolar disorder (Sovner, Fox, Lowry, & Lowry, 1993). In the Sovner et al. (1993) study, adults with profound ID and rapid cycling bipolar disorder engaged in aggressive behavior when the individuals were experiencing manic symptoms, or self-injurious behavior when experiencing depressive symptoms. The use of antidepressant medication to treat chronic depression reduced self-injury and the use of restrictive behavioral programming (i.e., mechanical restraint). This study suggests that FBAs can assist in further understanding of behavioral manifestations of mental illness and in determining the effects of interventions on these behavioral manifestations.

Another possibility is that problem behavior may initially be symptomatic of mental health problems, but then be maintained by social reinforcement contingencies (Sigafoos et al., 2003). For example, someone with schizophrenia suffering from hallucinations may perceive that people are trying to attack them, resulting in physical aggression toward others in the environment. The aggression in this case may function to remove the other person, thereby increasing the probability this same behavior will be used to remove other noxious events in the future, regardless of the presence or absence of hallucinations.

However, it also seems possible that some mental illnesses may change the value of particular reinforcers. For example, a depressive phase of bipolar disorder may be associated with an unwillingness to participate in educational activities, establishing escape from the activities as negative reinforcement. Similarly, a manic episode of bipolar disorder may be associated with increased risk-taking behaviors, establishing certain events as more positively reinforcing than usual (e.g., promiscuity, excessive spending, drug taking). More research is needed to isolate symptoms of mental illness associated with problem behavior in people with ID. However, some studies have reported that treatment of conventional psychiatric symptoms improves associated problem behaviors (e.g., Lowry & Sovner, 1992; Sovner et al., 1993).

Some research suggests the seizures related to epilepsy co-occur with problem behavior (Caplan & Austin, 2000; Roberts, Yoder, & Kennedy, 2005). Available data suggest that problem behavior may also be more common among people with sensory impairments, oral health problems (dental caries, gingivitis, and periodontal disease), asthma, medical side effects of polypharmacy, influenza, and other health issues (e.g., Jansen et al., 2004; Krahn et al., 2006). However, there currently exists no empirical evidence linking these health problems to problem behavior. It is important to recognize that the impact of such health problems on problem behavior can be assessed under conditions where antecedents and consequences are systematically manipulated as in an appropriate FBA.

> In most cases, health problems establish certain stimuli as noxious and increase rates of negatively reinforced behavior.

Implications for Practice

The development of FBA techniques has allowed researchers to identify a range of variables influencing and maintaining problem behavior. Results from such an assessment can be used to build a behavioral intervention plan to teach the person with ID alternative appropriate behaviors, such as those used to escape from aversive situations. However, a clear implication for practice is that health problems may complicate FBA results, primarily leading to variable and difficult to interpret assessment outcomes. Because health-related conditions are often undiagnosed in people with ID, problem behavior is sometimes assigned a behavioral function unrelated to the health-related circumstances. Thus, a behavioral intervention may not be very effective at reducing problem behavior if health problems

are not alleviated first. Conversely, the temporal presence of chronic health problems may allow behavior analysts to predict when problem behavior is more likely to increase, and anticipate this increase by taking steps to minimize antecedents and/or consequences related to problem behavior (e.g., decreasing task demands when an individual is sleep deprived or providing frequent breaks when requested).

It would be ill-conceived to assume health conditions affect rates of problem behavior without assessing all relevant variables occurring around the time problem behavior is most likely to occur (O'Reilly & Lancioni, 2000; Smith & Iwata, 1997). However, coordinated effort between health professionals and behavior analysts should be able to isolate the relative impact of health problems and reinforcement contingencies on problem behavior. Once health causes are identified, they can be treated by health professionals before developing function-based interventions, or developed in conjunction with a function-based intervention that addresses the detrimental reinforcement contingency. Interventions with these individuals will usually be multifaceted: targeting the health conditions, teaching functional communication skills, and redesigning the environment to make demanding activities more tolerable or even pleasurable.

References

Barr, O., Gilgunn, J., Kane, T., & Moore, G. (1999). Health screening for people with learning disabilities by a community learning disability nursing service in Northern Ireland. *Journal of Advanced Nursing, 29,* 1482-1491.

Bohmer, C. J., Niezen-de Boer, M. C., Klinkenberg-Knol, E. C., Deville, W. L., Nadorp, J. H., & Meuwissen, S. G. (1999). The prevalence of gastroesophageal reflux disease in institutionalized intellectually disabled individuals. *American Journal of Gastroenterology, 94,* 804-810.

Bohmer, C. J., Taminiau, J. A., Klinkenberg-Knol, E. C., & Meuwissen, S. G. (2001). The prevalence of constipation in institutionalized people with intellectual disabilities. *Journal of Intellectual Disability Research, 45,* 212-218.

Borthwick-Duffy, S. A. (1994). Epidemiology and prevalence of psychopathology in people with mental retardation. *Journal of Consulting and Clinical Psychology, 62*, 17-27.

Bramble, D. (1995). Two cases of severe head-banging parasomnias in peripubertal males resulting from otitis media in toddlerhood. *Child: Care, Health, and Development, 21,* 247-253.

Caplan, R., & Austin, J. K. (2000). Behavioral aspects of epilepsy in children with mental retardation. *Mental Retardation and Developmental Disabilities, 6,* 293-299.

Carr, E. G., & McDowell, J. J. (1980). Social control of self-injurious behavior of organic etiology. *Behavior Therapy, 11*, 402-409.

Carr, E. G., Smith, C. E., Giacin, T. A., Whelan, B. M., & Pancari, J. (2003). Menstrual discomfort as a biological setting event for severe problem behavior: Assessment and intervention. *American Journal on Mental Retardation, 108,* 117-133.

Christensen, T. J., Ringdahl, J. E., Bosch, J. J., Falcomata, T. S., Luke, J. R., & Andelman, M. S. (2009). Constipation associated with self-injurious and aggressive behavior exhibited by a child diagnosed with autism. *Education and Treatment of Children, 32,* 89-103.

Clements, J., Wing, L., & Dunn, G. (1986). Sleep problems in handicapped children: A preliminary study. *Journal of Child Psychology and Psychiatry, 27,* 399-407.

Cooper, S., Melville, C., & Morrison, J. (2004). People with intellectual disabilities. *British Medical Journal, 329,* 414-415.

Durand, V. M. (1998). *Sleep better! A guide to improving sleep for children with special needs.* Baltimore: Paul H. Brookes.

Eicher, P. S. (1997). Feeding. In M. L. Batshaw (Ed.), *Children with disabilities* (4th ed., pp. 621-641). Baltimore: Paul H. Brookes.

Fisher, W. W., Piazza, C. C., & Roane, H. S. (2002). Sleep and cyclical variables related to self-injurious and other destructive behaviors. In S. R. Schroeder, M. L. Oster-Granite, & T. Thompson (Eds.), *Self-injurious behavior: Gene-brain-behavior relationships* (pp. 205-222). Washington, DC: American Psychological Association.

Harvey, M. T., & Kennedy, C. H. (2002). Polysomnographic phenotypes in developmental disabilities. *International Journal of Developmental Neuroscience, 20,* 443-448.

Holden, B., & Gitleson, J. P. (2003). Prevalence of psychiatric symptoms in adults with mental retardation and challenging behaviour. *Research in Developmental Disabilities, 24,* 323-332.

Holland, A. J., & Koot, H. M. (1998). Mental health and intellectual disability: An international perspective. *Journal of Intellectual Disability Research, 42,* 505-512.

Horwitz, S. M., Kerker, B. D., Owens, P. L., & Zigler, E. (2000). *The health status and needs of individuals with mental retardation.* New Haven, CT: Yale University School of Medicine, Department of Epidemiology and Public Health.

Iwata, B. A., Dorsey, M., Slifer, K., Bauman, K., & Richman, G. (1994). Toward a functional analysis of self-injury. *Journal of Applied Behavior Analysis, 27,* 197-209. (Reprinted from *Analysis and Intervention in Developmental Disabilities, 2,* 2-20, 1982).

Iwata, B. A., & Dozier, C. L. (2008). Clinical application of functional analysis methodology. *Behavior Analysis in Practice, 1*, 3-9.

Janowsky, D. S., Kraus, J. E., Barnhill, J., Elami, R. B., & Davis, J. M. (2003). Effects of topiramate on aggressive, self-injurious, and disruptive/destructive behaviors in the intellectually disabled: An open-label retrospective study. *Journal of Clinical Psychopharmacology, 23,* 500-504.

Jansen, D. E. M. C., Krol, B., Groothoof, J. W., & Post, D. (2004). People with intellectual disability and their health problems: A review of comparative studies. *Journal of Intellectual Disability Research, 48*, 93-102.

Kedesdy, J. H., & Budd, K. S. (1998). *Childhood feeding disorders: Behavioral assessment and intervention.* Baltimore, MD: Paul H. Brookes.

Kennedy, C. H., & Becker, A. (2006). Health conditions in antecedent assessment and intervention of problem behavior. In J. K. Luiselli (Ed.), *Antecedent intervention: Recent developments in community-focused behavioral support* (2nd ed.). Baltimore: Paul H. Brookes.

Kennedy, C. H., Juarez, A. P., Becker, A., Greenslade, K., Harvey, M. T., Sullivan, C., & Tally, B. (2007). Children with severe developmental disabilities and behavioral disorders have increased special healthcare needs. *Developmental Medicine & Child Neurology, 49,* 926-930.

Kennedy, C. H., & Meyer, K. A. (1996). Sleep deprivation, allergy symptoms, and negatively reinforced problem behavior. *Journal of Applied Behavior Analysis, 29,* 133-135.

Kennedy, C. H., & O'Reilly, M. F. (2006). Pain, health conditions, and problem behavior in people with developmental disabilities. In T. F. Oberlander & F. J. Symons (Eds.), *Pain in children & adults with developmental disabilities* (pp. 121-135). Baltimore, MD: Paul Brookes.

Kennedy, C. H., & Thompson, T. (2000). Health conditions contributing to problem behavior among people with mental retardation and developmental disabilities. In M. Wehmeyer & J. Patten (Eds.), *Mental retardation in the 21st century* (pp. 211-231). Austin, TX: ProEd.

Kitfield, E. B., & Masalsky, C. J. (2000). Negative reinforcement-based treatment to increase food intake. *Behavior Modification, 24*, 600-608.

Kozma, C., & Mason, S. (2003). Survey of nursing and medical profile prior to deinstitutionalization of a population with profound mental retardation. *Clinical Nursing Research, 12,* 8-22.

Krahn, G. L., Hammond, L., & Turner, A. (2006). A cascade of disparities: Health and health care access for people with intellectual disabilities. *Mental Retardation and Developmental Disabilities Research Reviews, 12,* 70-82.

Langthorne, P., McGill, P., & O'Reilly, M. (2007). Incorporating "motivation" into the functional analysis of challenging behavior: On the interactive and integrative potential of the motivating operation. *Behavior Modification, 31,* 466-486.

Laraway, S., Snycerski, S., Michael, J., & Poling, A. (2003). Motivating operations and some terms to describe them: Some further refinements. *Journal of Applied Behavior Analysis, 36,* 407-414.

Lowry, M. A., & Sovner, R. (1992). Severe behaviour problems associated with rapid cycling bipolar disorder in two adults with profound mental retardation. *Journal of Intellectual Disability Research, 36,* 269-281.

McDougal, T. (2000). Violent incidents in a forensic adolescent unit: A functional analysis. *Nursing Times Research, 5*, 346-362.

Mitchell, R. B., Call, E., & Kelly, J. (2003). Ear, nose, and throat disorders in children with Down syndrome. *Laryngoscope, 113,* 259-263.

O'Reilly, M. F. (1995). Functional analysis and treatment of escape-maintained aggression correlated with sleep deprivation. *Journal of Applied Behavior Analysis, 28,* 225-226.

O'Reilly, M. F. (1997). Functional analysis of episodic self-injury correlated with recurrent otitis media. *Journal of Applied Behavior Analysis, 30,* 165-167.

O'Reilly, M. F., & Lancioni, G. (2000). Response covariation of escape-maintained aberrant behavior correlated with sleep deprivation. *Research in Developmental Disabilities, 21,* 125-136.

Osuga, Y., Hayashi, K., Kobayashi, Y., Tokyodawa, S., Momoeda, M., Koga, K., et al. (2005). Dysmenorrhea in Japanese women. *International Journal of Gynaecology and Obstetrics, 88,* 82-83.

Pace-Schott, E. F., & Hobson, J. A. (2002). The neurobiology of sleep: Genetics, cellular physiology, and subcortical networks. *Nature Reviews Neuroscience, 3,* 591-605.

Patel, M. R., Piazza, C. C., Martinez, C. J., Volkert, V. M., & Santana, C. M. (2002). An evaluation of two differential reinforcement procedures with escape extinction to treat food refusal. *Journal of Applied Behavior Analysis, 35,* 363-374.

Piazza, C. C., Fisher, W. W., Brown, K. A., Shore, B. A., Patel, M. R., Katz, R. M., et al. (2003). Functional analysis of inappropriate mealtime behaviors. *Journal of Applied Behavior Analysis, 36*, 187-204.

Quint, E. H., Elkins, T. E., Sorg, C. A., & Kope, S. (1999). The treatment of cyclical behavioral changes in women with mental disabilities. *Journal of Pediatric and Adolescent Gynecology, 12,* 139-142.

Roberts, C., Yoder, P. J., & Kennedy, C. H. (2005). Descriptive analysis of seizures and the occurrence of self-injury and aggression. *American Journal on Mental Retardation, 110,* 405-412.

Robinson, A. M., & Richdale, A. L. (2004). Sleep problems in children with intellectual disability: Parental perceptions, sleep problems, and views of treatment effectiveness. *Child Care and Health Development, 30,* 139-150.

Roka, R., Rosztoczy, A., Izbeki, F., Taybani, Z., Kiss, I., Lovonvics, J., & Wittmann, T. (2005). Prevalence of respiratory symptoms and diseases associated with gastroesophageal reflux disease. *Digestion, 71*, 92-96.

Rommel, N., De Meyer, A., Feenstra, L., & Veereman-Wauters, G. (2003). The complexity of feeding problems in 700 infants and young children presenting to a tertiary care institution. *Journal of Pediatric Gastroenterology & Nutrition, 37*, 75-84.

Rosenhall, U., Nordin, V., Sandstrom, M., Ahlsen, G., & Gillberg, C. (1999). Autism and hearing loss. *Journal of Autism and Developmental Disorders, 29,* 349-357.

Roth, T., Hajak, G., & Ustun, T. B. (2001). Consensus for the pharmacological management of insomnia in the new millennium. *International Journal of Clinical Practice, 55,* 42-52.

Shott, S. R. (2006). Down syndrome: Common otolaryngologic manifestations. *American Journal of Medical Genetics, 142C*, 131-140.

Sigafoos, J., Arthur, M., & O'Reilly, M. F. (2003). *Challenging behavior and developmental disability.* London: Whurr Publishers.

Smith, R. G., & Iwata, B. A. (1997). Antecedent influences on

behavior disorders. *Journal of Applied Behavior Analysis, 30*, 343-375.

Sovner, R., Fox, C. J., Lowry, M. J., & Lowry, M. A. (1993). Fluoxetine treatment of depression and associated self-injury in two adults with mental retardation. *Journal of Intellectual Disability Research, 37*, 301-311.

Stickgold, R., Hobson, J. A., Fosse, R., & Fosse, M. (2001). Sleep, learning, and dreams: Off-line memory representation. *Science, 294,* 1052-1057.

Swender, S. L., Matson, J. L., Mayville, S. B., Gonzalez, M. L., & McDowell, D. (2006). A functional assessment of handmouthing among persons with severe and profound intellectual disability. *Journal of Intellectual & Developmental Disability, 31*, 95-100.

Symons, F. J., Harper, V. N., McGrath, P. J., Breau, L. M., & Bodfish, J. W. (2009). Evidence of increased non-verbal behavioral signs of pain in adults with neurodevelopmental disorders and chronic self-injury. *Research in Developmental Disabilities, 30,* 521-528.

Tasse, M. J. (2006). Functional behavioural assessment in people with intellectual disabilities. *Current Opinion in Psychiatry, 19*, 475-480.

Taylor, P. J., & Schanda, H. (2000). Violence against others by psychiatric hospital in patients: Prevention strategies and challenges to their evaluation. In S. Hodgins, & R. Muller Isberner (Eds.), *Violence, crime, and mentally disordered offenders: Concepts and methods for effective treatment and prevention* (pp. 251-275). Bognor Regis, England: Wiley.

Tierney, L. M., McPhee, S. J., & Papadakis, M. A. (2005). *Current medical diagnosis and treatment* (44th ed.). New York: McGraw-Hill.

Tiger, J. H., Hanley, G. P., & Bruzek, J. (2008). Functional communication training: A review and practical guide. *Behavior Analysis in Practice, 1*, 16-23.

Tse, P., Leung, S., Chan, T., Sien, A., & Chan, A. (2000). Dietary fibre intake and constipation in children with severe developmental disabilities. *Journal of Paediatrics Child Health, 36,* 236-239.

Tsiouris, J. A. (2003). Challenging behaviours should not be considered as depressive equivalents in individuals with intellectual disability. *Journal of Intellectual Disability Research, 47,* 14-21.

Uphold, C. R., & Graham, M.V. (2003). *Clinical guidelines in adult health* (3rd ed.). Gainesville, FL: Barmarrae.

Walsh, P. N., & Heller, T. (2002). *Health of women with intellectual disabilities*. Malden, MA: Blackwell Publishing.

Wilson, D. N., & Haire, A. (1990). Health care screening for people with mental handicap living in the community. *British Medical Journal, 15,* 1379-1381.

World Health Organization. (2000). *The world health report 2000.* Geneva: Author.

Author Note

Address correspondence to: Michael May, Southern Illinois University at Carbondale, Mailcode: 4618, Carbondale, IL 62901

Action Editor: Timothy R. Vollmer, Ph.D., BCBA