What is the evidence for environmental causes of challenging behaviors in persons with intellectual disabilities and autism spectrum disorders?

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1. Introduction

Challenging behaviors (CB) occur in a range of developmental disabilities. A number of disorders are covered, but the two most prevalent are intellectual disabilities (ID) and autism spectrum disorders (ASD) (Farmer & Aman, 2009; Matson & Boisjoli, 2007, 2009a, 2009b; Matson & Nebel-Schwalm, 2007; Rojahn et al., 2009). Both of these problems are characterized by deficits in social skills, adaptive functioning, and communication, which when present may further exacerbate CB (Cheng, Chen, Tsai, Chen, & Cherg, 2009; Matson, Boisjoli, Gonzalez, Smith, & Wilkins, 2007; Matson, Dempsey, & Rivet, 2009; Matson, Rivet, Fodstad, Dempsey, & Boisjoli, 2009; Miniscalco & Gillberg, 2009; Wilkins & Matson, 2009). The overlap between ID and ASD is also considerable, further compounding the problem (LoVullo & Matson, 2009; Matson, Dempsey, & Fodstad, 2009; Matson & Mahan, 2009; Matson & Shoemaker, 2009; Niklasson, Rasmussen, Öskarsdottir, & Gillberg, 2009). These problems are present at very early ages (Matson, Mahan, Hess, Fodstad, & Neal, 2010) and persist throughout the lifetime (Embret, Didden, Schreuder, Huitink, & Van Nieuwenhuizen, 2009). These CB for persons with ID and/or ASD are a primary impediment to independence, to community integration, and to how they are viewed by others (Emerson, 2005; Gardner & Moffatt, 1990; Luiselli & Slocumb, 1983).

Intervention efforts have been largely conceptualized based on internal neurodevelopmental states associated with the disorder or more overt environmental factors (Tenneij, Didden, Stolker, & Koot, 2009). In either case, obtaining accurate
information can be a challenge in and of itself and may require input from several care providers using standardized measures (Lambrecht & Maes, 2009).

CB are among the most serious and studied problems in the field of developmental disabilities. Psychotropic medication and applied behavior analysis are among the most frequently used treatments. The emergence of a functional assessment literature has been helpful in identifying cases of CB that have environmental causes. These data are very important in establishing whether an environmental or medical treatment would be the most appropriate. An analysis of current data on type of CB, and patterns of causative factors are reviewed and discussed (de Leon, Greenlee, Barber, Sabawi, & Singh, 2009; Singh, Matson, Mouttapa, Pella, Hill, & Thorson, 2009; Soenen, Berkalaer-Onnes, & Scholte, 2009; Weeden, Ehrhardt, & Poling, 2009).

2. Challenging behaviors: definition and prevalence

Several CB have been assessed with functional assessment. These include aggression, tantrums, handmouthing, property destruction, stereotypies, and self-injurious behavior (Strachan, Shaw, Burrow, Horsler, Allen, & Oliver, 2009; Swender, Matson, Mayville, González, & McDowell, 2006; Tiger, Fisher, Toussaint, & Kodak, 2009). These behaviors are socially unacceptable and can be harmful to the persons, others, and/or the environment.

CB occur at very high rates in persons with developmental disabilities. Furthermore, these problems have proven to be among the most frequent and hard to manage problems evinced by persons with developmental disabilities. For example, 94.3% of children on the autism spectrum have been reported to display some form of CB (Matson, Wilkins, & Macken, 2009). CB are a frequent problem for persons with ID as well. Holden and Gitlesen (2006) reported rates of 10–15% in the United States and Britain. Similarly, Jones et al. (2008) reported rates of 19–22% depending on the method of assessment used. Conversely, other researchers have reported much higher rates. Murphy, Healy, and Leader (2009) found much higher rates in their study focusing on individuals with ID in Ireland. They reported that 64% of their population evinced CB. Furthermore, they note that many persons displayed multiple CB. Farmer and Aman (2010), in a United States study of CB in children with ASD, found these problems in over half of their sample. In another study from the United States, Benson and Brooks (2008) reported CB in over 50% of their ID sample. The variation in rates can be accounted for in large part by how CB are defined so unevenly across studies. Thus, while debate exists on just how common these CB are in the ID and ASD populations, they most certainly occur at high rates and are an issue deserving great attention.

3. Functions of challenging behaviors

By far the most commonly studied environmental factors have been via functional assessment methods. In a review of SCOPUS, and a hand search of the Journal of Applied Behavior Analysis and Research in Developmental Disabilities, we identified 173 papers that used this methodology. In almost all cases, specifically 97% of those reviewed, one or more functions for the CB were identified. The reader is undoubtedly aware that there is a marked bias in published research toward positive findings. Thus, it is also likely that many papers did not find their way into print due to the inability to identify specific functions. What that percentage is, relative to all studies conducted, however, is unknown and unknowable. What the studies do reflect, however, are what the types of functions that are environmental look like, and the frequency with which they appear when compared to other identified environment functions.

Functions of CB can be categorized into a few distinct categories. The traditionally reported maintaining variables as described in the literature include attention, alone (i.e., self-stimulatory, non-social, or automatic reinforcement), escape, and tangible. Pain or discomfort is also often discussed as a possible cause of CB, but this function has been rarely reported in the experimental literature. In fact, within the current review, less than 5% of assessments resulted in a physical function being identified. Furthermore, in cases in which a physical function was found to maintain the CB, it was commonly only one of multiple functions identified where another function was determined to be the primary maintaining variable (e.g., Applegate, Matson, & Cherry, 1999). The most commonly reported functions are attention and escape. Attention and escape functions were each found to maintain CB in nearly half of the papers reviewed. Tangibles were found to maintain CB in nearly a quarter of papers reviewed, and alone conditions, also related to self-stimulatory behaviors, non-social functions, and automatic reinforcement, were identified in just over a tenth of papers reviewed. Although the samples’ sizes and characteristics, CB assessed, and methods of functional assessment were variable between papers, this information provides a snapshot as to the relative frequency with which functions maintain CB overall.

Although single functions are often found to maintain CB, it is also relatively common for a CB to be maintained by multiple functions. The most common co-occurring maintaining variables are attention coupled with either an escape or tangible function (e.g., Kahng, Iwata, DeLeon, & Wordsell, 1997; O’Reilly et al., 2006; Tarbox, Wallace, & Williams, 2003), although tangible and escape functions may also co-occur at relatively high rates as well (e.g., Mace, Shapiro, & Mace, 1998; Wilder, Chen, Atwell, Pritchard, & Weinstein, 2006). In some circumstances, several functions are identified as maintaining variables or the function is ambiguous (e.g., Carter, 2009; Smith, Iwata, Vollmer, & Pace, 1992). Such findings may indicate an overall communication function for the CB (Carr & Durand, 1985), or perhaps that the CB appears to occur in nearly all situations because it is automatically reinforced.

Within the literature, similar functions are consistently reported for specific CB following a functional assessment. From the current review of 173 papers, the most commonly assessed CB were aggression and self-injurious behavior. For both of
these behaviors, the most commonly identified maintaining variables were those providing social consequences, to include attention, escape, and tangible functions. See Table 1 for a breakdown of number of studies that identified attention, escape, alone, and tangible functions as well as how many studies found multiple functions.

4. Function descriptions

Variability of definition occurred occasionally for each function from study to study. Differences among definitions may affect the generalizability of findings. Additionally, assessing the same function in different manners may also demonstrate subtypes of functions. Examples of some of the components of these definitions should give researchers and clinicians a favor of what is being reported, aid clinicians as they look for maintaining variables, and aid in developing treatment plans.

4.1. Attention

Attention refers to reciprocal social interactions between the person evincing the CB and another. Invariably the other is a caretaker, parent, or teacher in the published literature. Rarely does the challenging individual seek out peers for attention via CB.

Perhaps the most common type of attention used during functional assessment involves reprimands. For example, Fisher, DeLeon, Rodriguez-Catter, and Keeney (2004) instructed the therapist to read a magazine while the client was to play with moderately preferred toys. Contingent on her CB, the therapist provided a brief verbal reprimand on a fixed-ratio schedule. Kuhn and Triggs (2009) also delivered attention in the form of verbal reprimands. Dixon, Benedict, and Larson (2001) describe attention in the form of 10 s of verbal attention such as “You know you should not say things like that.” Similarly, Piazza et al. (1999) delivered attention in the form of a brief verbal reprimand contingent upon targeted CB. Likewise, DeLeon, Arnold, Rodriguez-Catter, and Uy (2003) reinforced bizarre speech by providing verbal attention such as “Jeremy, it doesn’t make sense to say [bizarre statement].” These authors use the same model as the previous authors, an effort by therapists to provide an approximation of how care providers might react as the CB is actually occurring.

Other authors have taken a tact that is a bit different. Roane and Kelley (2008) defined physical attention as consisting of holding onto a therapist following engagement in CB with no other form of attention being given. Anderson and Long (2002) describe attention as noninstructional. Their verbal attention included reprimands, but also verbal statements toward the child such as “You look nice today,” along with physical interactions in the form of hugs, pats on the shoulders, and the like. Similarly, for Watson and Sterling (1998) parents made brief comments within 2–5 s after the target behavior. Attention delivered in these fashions brings into play the possibility of specific forms of attention driving the CB. For example, in these situations the idea of attention itself being delivered contingent on CB without the CB being acknowledged is assessed, as opposed to contingent attention related to the CB (e.g., commenting on the CB).

4.2. Alone

The alone condition consists of no external prompts. Thus, the point is to determine if external environmental factors versus other person-specific (referring to the client here) factors are driving the CB. Kennedy and Souza (1995) describe their alone condition as no attention, which is the most common definition. In this phase, the client was seated at a table and received no social interaction or activities. For Ellingson et al. (2000), the alone condition consisted of a child sitting in the living room watching television without her mother present. Northup et al. (1999) describe their alone condition as a no interaction condition where children were to stay in their classroom seated and work quietly. On the other hand, Piazza, Adelinis, Hanley, Goh, and Delia (2000) describe their alone condition as the absence of social sequences where the client was in the therapy room by him/herself. In most instances the person being assessed in the alone condition by him/herself, is not given access to social interaction or tangibles. Having said that, the environments in which these conditions are presented does vary widely.

The exception to the no attention paradigm is where clinicians are trying to pinpoint specific stimuli that may be the primary self-stimulating reinforcer. This approach is in a gray area. Patel, Carr, Kim, Robles, and Eastridge (2000), for example, provide different conditions to determine sensory stimuli that are driving the CB. They played a sound recording that had been occurring simultaneously with the CB in the natural environment. When the client evinced the CB during the experimental functional analysis, the therapist played the tape recording. They also employed two vibratory conditions; a vibrating toothbrush and vibrating candy holder. For a second client, noncontingent forehead stimulation via a manual head massager was provided.

Given the contingent access to sensory items which may be self-stimulating in the nature which they are used, this method might also be viewed as a tangible function or a method of establishing replacement behaviors. No matter how this
method is characterized, however, it is an important and useful approach. Rather than simply looking at automatic reinforcement the individual might receive completely void of external components, this model assesses the possibility of specific sensations reinforcing the CB.

4.3. Escape

Escape is defined as a negative reinforcement paradigm. The client displays CB and is able to get out of a task or environment. A subtype of this condition is referred to as a demand condition. Butler and Luiselli (2007) describe a demand condition for a child in a classroom. Instructions were delivered to the child, and the child was given 5 s to respond to the demand. If the child did not begin to do schoolwork within the 5 s timeframe, the teacher demonstrated the correct response, waited an additional 5 s, and if needed then guided the student using hand-over-hand prompts. Contingent on CB, tasks were removed and the teacher turned away, thus fulfilling the escape function. Lalli et al. (1999) describe their condition as escape, but it is very similar to Butler and Luiselli (2007). The therapist provided an instruction every 30 s using a graduated prompt sequence with verbal directions, gestures, and physical prompts and an interprompt interval of 10 s. Each occurrence of CB resulted in a 30 s break from the task. Horner, Day, and Day (1997) also use a similar methodology. Escape from an academic task was awarded by removing the activity for 30 s contingent on CB.

O’Reilly, Lacey, and Lancioni (2000) also describe a demand condition. Preschool instructional tasks were presented by the mother in what the authors describe as semirandom. Contingent on CB, tasks were removed for 5 s and then the task was reintroduced. Similarly, Ervin, DuPaul, Kern, and Friman (1998) note that CB occurred for their client when he was presented with a pencil-and-paper writing task; he would engage in off-task behavior. Thus, the bulk of the published research on escape involved academic activities.

4.4. Tangible

This condition consists of presenting the client with an edible, toy, or other item contingent on CB. Ringdahl et al. (2009) defined their tangible condition as therapist delivery of highly preferred items contingent on CB. Lindberg, Iwata, Roscoe, Worsdell, and Hanley (2003) refer to a highly preferred leisure item as the factor maintaining CB for a client at the sheltered workshop. Tangible items also maintained the CB of two children with developmental disabilities (Kang et al., 2010). Mueller, Wiczynski, Moore, Fusilier, and Trahant (2001) gave access to a preferred book for 30 s each time the boy in their study evinced CB. While Piazza et al. (2003) gave the child in their study preferred food or toys following inappropriate behavior. Thus, the tangible condition is relatively consistent across studies compared to the other traditional functions.

5. Findings and conclusions

Biological, cognitive, and operant/environmental models have been proposed to explain CB and to drive treatments (Holden & Gitesen, 2009; Matson & Boisjoli, 2009b; Ringdahl et al., 2009). Having said this, surprisingly little research has been focused on these factors in comparison to the vast amounts of assessment, treatment, and genetic research. Additionally, for the research that has been published, the bulk of the efforts have centered on operant/environmental explanations. And, the topography of the behavior in part determines the type of environmental precursor. So, for example, with aggression, attention is the most commonly identified cause of problem behavior. Conversely, with self-injury, escape is the most likely explanation.

Table 1 provides data from the studies we reviewed. We found attention and escape to be the most common functions across the board, and for many studies researchers reported multiple functions.

Commonly identified causes for motivating and maintaining CB include attention, escape (often from demands), self-stimulation, and seeking tangible items such as food or toys. Often more than one function has been identified for a specific CB. While these explanations for CB do not result in the identification of causes for all problem behaviors in the area of developmental disabilities, they do explain the preponderance of these CB. Furthermore, validation studies have shown that when treatments are tailored to identify environmental causes, the treatments proved to be more effective.

A second line of research has been more descriptive/correlational in nature. A number of studies have identified factors that are predictive of CB. These variables include level of intellectual disability, presence and severity of autism, age, and comorbid psychopathology, particularly impulse related disorders such as attention-deficit/hyperactivity disorder. However, whether these disorders are the sole cause or more likely a contributing factor has yet to be studied extensively. Issues such as intellectual disability result in poor attention seeking skills and other factors that could contribute to CB. In these cases, intellectual disability may contribute in a more indirect fashion to the CB.

A third and much more rare cause of CB is biological determinants. Researchers know that very rare conditions such as Lesch–Nyhan syndrome result in very serious self-injury that is largely caused by the syndrome (Anderson, Dancis, & Alpert, 1978). In such circumstances, the CB may present as if it were automatically reinforcing the individual due to the internal mechanism driving the behavior. In such cases, the results of a functional assessment may help identify co-occurring functions to further assist in identifying treatments.

Overall, the functional assessment literature continues to grow with more evidence accumulating to support its effectiveness in producing valuable treatments. Although a number of functions may exist, the majority of maintaining
variables relate to social consequences which can, relative to non-social variables, and can be easily treated if functions are accurately identified. The current review demonstrates this heavy influence on social consequences with respect to CB, especially with respect to specific challenging behaviors.

References


