The Handbook of High-Risk Challenging Behaviors in People with Intellectual and Developmental Disabilities

edited by

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Randolph, Massachusetts

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He is active in clinical treatment, consultation, and research. In 1996 he was ranked by the Association for Advancement of Behavior Therapy (AABT) as one of the top 50 most-published authors in the behavior analysis and therapy literature from 1974 to 1994. The journal *Research in Developmental Disabilities* (2000) listed him as the eighth most-published researcher in the developmental disabilities field from 1979 to 1999. He has authored more than 275 publications, including the books *Behavioral Medicine and Developmental Disabilities* (Springer-Verlag, 1989), *Self-Injurious Behavior: Analysis, Assessment, and Treatment* (Springer-Verlag, 1991), *Antecedent Control: Innovative Approaches to Behavioral Support* (Paul H. Brookes Publishing Co., 1998), *Behavior Psychology in the Schools: Innovations in Evaluation, Support, and Consultation* (The Haworth Press, 2002), *Antecedent Assessment and Intervention: Supporting Children and Adults with Developmental Disabilities in Community Settings* (Paul H. Brookes Publishing Co., 2006), *Effective Practices for Children with Autism: Educational and Behavior Support Interventions that Work* (Oxford University Press, 2011), and *Behavioral Sport Psychology: Evidence-Based Approaches to Performance Enhancement* (Springer, 2011).

Dr. Luiselli has been the senior editor of special-topic journal issues published in *Behavior Modification, Mental Health Aspects of Developmental Disabilities, Child & Family Behavior Therapy, Journal of Developmental and Physical Disabilities,* and *International Journal of Behavioral Consultation & Therapy.* He was a contributing editor to the *Habilitative Mental Healthcare Newsletter* and Associate Editor for *Education and Treatment of Children*. He also is a contributing writer for *The New England Psychologist*, reviews books for *Metapsychology Online Reviews*, and serves on the board of editors of six peer-reviewed journals, including *Journal of Positive Behavior Interventions, Mindulness,* and *Clinical Case Studies.* He has been a national expert consensus panel member for the Treatment of Psychiatric and Behavioral Problems in Mental Retardation for the guideline series published by the *American Journal on Mental Retardation*.

Health-Threatening Eating Disorders

Behavioral Assessment and Treatment of Pica

Louis P. Hagopian, Natalie U. Rolider, and Griffin W. Rooker

Pica is defined diagnostically as 1) consumption of nonnutritive items for more than a month, 2) consumption of nonnutritive items inappropriate to developmental age, 3) eating that is not part of culturally sanctioned activity, and 4) a behavior severe enough to require independent clinical attention when other clinical services are being provided for another mental disorder (American Psychological Association, 2000). Several severe health risks are associated with pica (Decker, 1993), including lead poisoning, intestinal perforation and obstruction (sometimes necessitating surgical removal of the item), and death (Chisholm & Kaplan, 1968; Greenberg, Jacobziner, McLaughlin, Fuerst, & Pellitteri, 1958). The research literature describes three populations of individuals that engage in pica, including typically developing individuals with a nutritional disorder, typically developing individuals who engage in obsessive-compulsive disorder (OCD), and individuals diagnosed with intellectual and developmental disability (IDD).

For individuals with a nutritional disorder, research on pica has been related to the prevention of lead poisoning (Chisolm & Kaplan, 1968) and pica is the manifestation of poor diet, specifically anemia (Gutelius, Millican, Layman, Cohen, & Dublin, 1962; Lanzkowsky, 1959). Pica is directly related to an imbalance in the diet and thus can be treated by correcting the deficiency; however, no connection has been made about the types of items consumed and their relation to specific dietary deficiencies. For individuals with OCD or impulse control disorder (Luiselli, 1996), pica is related to the ritualistic nature of the disorder. Therefore, medications such as a serotonin reuptake inhibitor (SRI) have been an important part of treatment (Stein, Bouwer, & van Heerden, 1996). For individuals with IDD, which is the focus of the current chapter, pica can involve ingestion of inedible items (e.g., dirt; Bucher, Reykdal, & Albin, 1976), edible but insufficiently prepared food (e.g., raw potatoes; Lacey, 1990), and food that is contaminated (see Table 9.1).

The prevalence of pica in people with IDD has been reported to be between 5.7% and 25.8% (Ashworth, Hirdes, & Martin, 2009). In the largest study, Danford & Huber (1982) reviewed the records of 991 institutionalized individuals and found that pica occurred in 25.8% of the sample. The authors also evaluated the frequency of different forms of pica based on the type of items ingested (e.g., inappropriate food vs. nonfood items) and concluded that nonfood pica was the most prevalent (16.7%), followed by food pica (5.4%), and finally combinations of food and

nonfood pica (3.7%). In addition, research suggests that pica is more prevalent among lower functioning individuals (Ali, 2001). Kinnell (1985) conducted a case-review of 140 individuals who attended an in- or outpatient hospital, 70 diagnosed with autism and 70 with Down syndrome, and found that 60% of those with autism and 4% of those with Down syndrome engaged in pica, respectively. However, it is possible that the difference between the groups was so great because of the inclusion criteria. That is, because individuals with autism selected for the Kinnell review were also diagnosed with profound intellectual disability, these participants were already more likely to engage in pica. Table 9.1 shows the participant characteristics of 25 studies that assessed and treated pica through behavior analytic procedures.

BEHAVIORAL ASSESSMENT OF PICA

Functional Behavioral Assessment

To assess the operant contingencies maintaining pica, a functional behavioral assessment (FBA) is recommended (Iwata, Dorsey, Slifer, Bauman, & Richman, 1994). A variety of FBA procedures have been described, and can be categorized as involving indirect or direct methods. Indirect methods include interviews and questionnaires aimed at identifying controlling variables based on the report of others. Direct methods involve observation of the behavior of interest and can be further categorized as correlational or experimental. Correlational methods include observation of environmental antecedents and consequences and require the clinician to make inferences about functional relations between those environmental variables and the behavior of interest. Experimental methods (i.e., functional analysis, FA) are the most rigorous and involve directly manipulating relevant antecedent and consequent variables and then observing their effects on behavior. In light of the level of rigor and control inherent in experimental FA, this approach has become the clinical standard for identifying the variables that maintain problem behavior such as aggression and self-injury (Iwata & Worsdell, 2005).

Although FBA using indirect methods have not proven to be sufficiently valid to endorse their use for assessment of severe aggression and self injury (Camp, Iwata, Hammond, & Bloom, 2009; Lerman & Iwata, 1993), there is some evidence that indirect methods may be valid for assessment of pica. Wasano, Borrero, and Kohn (2009) assessed the pica of three individuals using indirect and direct methods (FA) and found that in all three cases the results of the indirect assessment matched the results of the FA. Wasano et al. also showed that indirect assessments required less time to complete than the FA. These findings suggest that indirect assessments may be more accurate for pica than for other behaviors because pica is usually maintained by nonsocial reinforcers. Nevertheless, we recommend conducting an experimental FA particularly if earlier interventions based on indirect assessments are not effective, and if the individual can be kept safe in the interim.

Use of Safe and Simulated Pica Items

Because an FA requires repeated observation of the target behavior, caution should be taken to ensure the individual's safety during an FA of pica. Many studies

describing FAs of pica have involved "baiting" the environment with safe pica items (i.e., items that are safe to ingest) or with simulated pica items that are similar to items the individual has historically ingested but are safe to consume in controlled amounts. Eight of the studies listed in Table 9.1 have used simulated pica items, and eight have used safe pica items. Safe pica items have included paper, small pieces of string, and pieces of cigarettes. Simulated pica items have included imitation paint chips (flour and water), metal pieces (cake toppings), cleaning fluid (water with food coloring), ceiling tiles (animal crackers), lint (cotton candy), small twigs (beef jerky), rocks (licorice jelly beans), leaves and plants (salad greens), and dirt (ground-up cookies), as well as several items that are generally not considered edible but were not specified to directly mimic another item (e.g., uncooked pasta, uncooked beans, onion skins, rice cakes, seaweed, rice paper, nontoxic molding clay). Use of safe or simulated pica items for assessment permits pica to occur while ensuring a person's safety. Whether using simulated or safe pica items, we advise having medical staff knowledgeable about the individual review the items and define how much can be ingested safely.

Functional Analysis of Pica

The most commonly used FA procedures involve four conditions (alone, attention, play, and demand) that are alternated in a multielement design (Iwata et al., 1994). In the "alone" condition, the individual is in a room alone and there are no programmed consequences for pica. This condition tests whether pica occurs in the absence of social consequences. If so, the conclusion is that pica is maintained by sensory reinforcement. In the "attention condition," the individual and a therapist are in the room and the therapist does not attend to the individual unless pica occurs, at which time a comment is made (e.g., "No, don't put that in your mouth!"). This condition tests whether pica is sensitive to access to positive reinforcement in the form of attention. In the "demand" condition, the individual and the therapist are in the room with various task materials. The therapist instructs the individual to complete tasks and removes them briefly when pica is displayed. This condition tests whether problem behavior is maintained by negative reinforcement in the form of escape from demands. In the "play" condition, the individual and therapist are present in the room with various toys and no demands are presented. If pica occurs, the therapist does not attend to the individual. This condition serves as the control condition against which other conditions are compared.

Early studies often did not conduct an FA of pica and it was often assumed that pica was maintained by sensory consequences. This assumption has generally been borne out in most studies employing FA but is not always the case (see Table 9.1). Piazza et al. (1998) showed that pica was maintained by attention for one of three individuals for whom an FA was conducted. In total, 11 studies have conducted a FBA (indirect or direct methods) to determine the maintaining variables of pica. These studies reported on a total of 20 individuals, 19 of which (95%) had pica that was maintained by sensory reinforcement. Despite these findings, conducting some

type of FBA of pica is recommended to ensure that the relevant controlling variables are identified prior to developing treatment. We reiterate that conducting an experimental FA with baited safe or simulated pica items is recommended for cases with frequent and high-risk pica.

BEHAVIORAL TREATMENT OF PICA

Although the type of population being considered may play an important factor in developing a treatment for pica, two broad classes of intervention have been shown to be successful: medical and behavioral interventions. Within the context of medical interventions, correcting identified nutritional deficits has shown the most promise. When medical interventions are unsuccessful, or there is no reason to believe that a nutritional deficit exists, behavior analytic interventions have been shown to be extremely effective at reducing pica. Treatments often involve multiple components, and can be divided into three classes of behavioral interventions: *antecedent interventions* (including noncontingent reinforcement and effort manipulations), *consequent interventions* (including reinforcement, response blocking, punishment, and reinforcement interventions), and *combined antecedent and consequent interventions* (including noncontingent reinforcement in combination with consequent interventions).

Antecedent Interventions

Noncontingent Reinforcement

Noncontingent reinforcement (NCR) involves delivering a reinforcer on a timed schedule (usually variable or fixed time) independent of the individual's behavior. Two possible mechanisms may account for NCR's effectiveness: extinction (EXT) or satiation (Hagopian, Crockett, van Stone, DeLeon, & Bowman, 2000). First, NCR may be effective because it contains an EXT component. That is, the response–reinforcer relation is broken because the consequences for problem behavior are provided independently of problem behavior. Second, NCR may be effective because free access to reinforcement decreases the motivation to perform the behavior.

These procedures have sufficient evidence supporting their effectiveness for aggression and self-injury to be characterized as "empirically supported treatments" (Carr, Severtson, & Lepper, 2009). NCR is the most commonly reported intervention for pica (see Table 9.1; Falcomata, Roane, & Pabico, 2007; Favell, McGimsey, & Schell, 1982; Fisher et al., 1994; Goh, Iwata, & Kahng, 1999; Gonzalez & Hagopian, 2009; Piazza, Hanley, & Fisher, 1996; Piazza et al., 1998; Rapp, Dozier, & Carr, 2001). As a treatment for pica, NCR involves providing noncontingent access to reinforcing stimuli. For example, Favell et al. (1982) provided noncontingent access to edible and leisure items to three individuals with IDD that engaged in pica. Goh et al. (1999) found that a dense schedule of NCR (edibles delivered every 10 seconds for 5 minutes) successfully reduced pica for one individual with IDD. However, Hagopian and Adelinis (2001) found that NCR

alone was not sufficient to reduce pica—blocking plus redirection (a consequent intervention) had to be implemented as additional procedures.

Noncontingent reinforcement is relatively easy to implement, as it requires simply providing the individual access to edible or leisure items. The challenge is identifying the stimuli that compete with reinforcement maintaining problem behavior. A competing stimulus assessment (CSA) has become the preferred approach for identifying stimuli that are associated with reduced pica (Goh et al., 1999). The assessment involves systematically exposing individuals to stimuli (one at a time) and observing how access to them affects rate of pica relative to a no-stimulus control. The CSA should be conducted in an environment baited with simulated pica materials that are safe to ingest (e.g., Goh et al., 1999; Piazza et al., 1996; Piazza et al., 1998).

Response Effort Manipulations

Response effort manipulations have been used to treat self-injury and pica maintained by sensory reinforcement. The goal is to increase the effort required to engage in the response beyond the level supported by obtained reinforcement. To illustrate, Piazza, Roane, Kenney, Boney, and Abt (2002) reduced pica of three individuals by increasing the relative effort required to perform the inappropriate behavior. The authors found that when items associated with pica and appropriate alternative food items were available, individuals were more likely to consume the alternative item. When the response effort to obtain an item (pica-associated item or appropriate alternative) was increased, the participants consumed whatever item could be obtained with the least effort. In addition, Piazza, Hanley, Blakeley-Smith, and Kinsman (2000) reduced pica and increased appropriate toy play by attaching toys to a string for one individual who was blind and found that when it was less effortful to locate toys, the individual played with toys rather than engaging in pica. Therefore, this intervention combined both NCR (free access to toys) and effort manipulation (reducing effort to obtain toys). Although research findings are sparse, results to date suggest that manipulations of response effort may be a highly effective procedure for behavior that is automatically reinforced. Additional research is needed to examine whether response effort manipulations must be maintained over time to remain effective, or whether exposure over extended periods of time may establish alternative repertoires.

Consequent Interventions

Reinforcement-Based Procedures

Reinforcement is defined as both an operation and a process. Reinforcement is an operation (or procedure) involving the contingent addition (positive) or removal (negative) of a stimulus that increases the future probability of a response (process). Differential reinforcement procedures have been effective with different problem behaviors, including pica, in a number of populations (see Cooper, Heron, & Heward, 2007). Specifically, differential reinforcement of alternative (DRA) or incompatible behavior (DRI) involve providing a reinforcer contingent on a specific

response that is an alternative to pica or topographically incompatible with it respectively. Studies using differential reinforcement to treat pica have targeted eating nonpica items, playing with alternative items, or discarding/exchanging potential pica items. For example, Fisher et al. (1994) provided 30 seconds of reinforcement for appropriate eating, as well as punishment for inappropriate eating, to decrease pica in three individuals. However, appropriate eating did not increase significantly. Donnelly and Olczak (1990) provided participants with chewing gum and delivered praise and an edible item for every 5 seconds in which participants were chewing the gum. This procedure decreased the latency to pica for all three participants. Kern, Starosta, and Adelman (2006) trained two participants to hand pica items to therapists in exchange for preferred edibles. In addition, if the participants did not exchange the item, the therapist prompted them accordingly. This procedure was effective for both participants. Finally, Gonzalez and Hagopian (2009) provided reinforcement for throwing away pica items combined with response blocking.

Differential reinforcement of other behavior (DRO) involves providing a reinforcer for not engaging in pica (rather than specifying a particular alternative or incompatible response). As the sole treatment for pica DRO has been described in only one study (Finney, Russo, & Cataldo, 1982). In that study, DRO alone was effective in two of four cases. DRO was combined with punishment in the form of overcorrection for the other two cases for which DRO alone was not effective.

Response Blocking/Response Interruption

Response blocking or response interruption (RB/RI) involves preventing a behavior from occurring and has been shown to be effective in reducing problem behavior maintained by sensory reinforcement (see Cooper et al., 2007). RB/RI to treat automatically maintained problem behavior may be effective because it prevents the individual from obtaining reinforcement. However, RB/RI is an atypical EXT procedure, in that most EXT procedures allow the response to occur and then withhold reinforcement. In RB/RI both the response itself, as well as the reinforcer, are restricted. Alternatively, there is some evidence that RB/RI may function as punishment (Lerman and Iwata, 1996). Concerning pica, McCord, Grosser, Iwata, and Powers (2005) successfully treated three individuals by blocking them from touching pica items. However, pica was not entirely suppressed in all cases. In another study, Ricciardi, Luiselli, Terrill, and Reardon (2003) interrupted one individual from displaying pica by redirecting him back to tasks in a classroom setting, eventually adding a positive practice procedure to eliminate the behavior.

Punishment-Based Procedures

Similar to reinforcement, punishment is both an operation and process. Punishment is defined as the contingent addition (positive) or removal (negative) of a stimulus that decreases the frequency or probability of that behavior as the result of a stimulus (Cooper et al., 2007). An example of positive punishment would be the pica-contingent oral hygiene routine described by Mulick, Barbour, Schroeder, and Rojahn (1980). An example of negative punishment would be withholding attention following pica (Mace & Knight, 1986).

The use of punishment procedures for pica is proportionally more prominent than for other types of behaviors, perhaps because pica can be life threatening. And yet, only a few studies have evaluated punishment procedures alone (see Table 9.1; Buchar et al., 1976; Ferreri, Tamm, & Wier, 2006; Foxx & Martin, 1975; Mulick et al., 1980; Rojahn, McGonigle, Curcio, & Dixon, 1987; Singh & Winton, 1984). One of the earliest studies that used punishment to treat pica was conducted by Foxx and Martin (1975). In this study, positive punishment (overcorrection) decreased pica over 90% for all four participants. Similarly, Buchar et al. (1976) assessed the effectiveness of positive punishment (brief contingent restraint) on the pica behavior of two individuals. The authors found that pica was reduced to zero when both a reprimand and brief contingent restraint were used in conjunction for touching a pica item.

Multicomponent Consequent Interventions

Punishment and RB procedures are usually used in conjunction with reinforcement procedures. Typically, punishment or RB/RI is added to the treatment when reinforcement procedures alone are insufficient to decrease problem behavior. Of note, Lerman and Vorndran (2002) suggested that punishment may be necessary when the reinforcer for problem behavior cannot be controlled or behavior is so severe that significant injury is possible. Both of these conditions are satisfied in some cases of pica, so it is not surprising that punishment is often used concurrently with reinforcement-based procedures. For example, Goh et al. (1999), mentioned previously, assessed the same reinforcement component with two different additions (DRA and RB as well as DRA and punishment) and found that DRA plus RB increased the latency to pica for three participants but that little difference was seen between DRA plus RB and DRA plus punishment.

Antecedent and Consequent Interventions

Noncontingent reinforcement has been used in conjunction with reinforcement-based, punishment-based, and reinforcement and punishment-based treatments (see Table 9.1; Donnelly & Olczak, 1990; Falcomata et al., 2007; Favell et al., 1982; Fisher et al., 1994; Goh et al., 1999; Gonzalez & Hagopian, 2009; Piazza et al., 1998; Piazza et al., 1996; Piazza et al., 2002; Rapp et al., 2001). As mentioned previously, NCR may be a necessary component for the differential reinforcement treatments because of the nature of the response. For example, Donnelly and Olczak (1990) provided three participants with chewing gum and then delivered coffee and praise for every 5 seconds the participants were chewing gum and not engaging in pica. The authors found that the latency to pica increased over the course of 15-minute sessions. Similarly, Kern et al. (2006) trained two individuals to trade pica items for preferred edibles. Here, the turning over of pica items is incompatible with eating pica items, and the exchange behavior is maintained by access to highly preferred items. This procedure was effective for reducing pica for both individuals. Favell et al. (1982) found that adding DRA to NCR had idiosyncratic effects for each of three participants. Pica was further reduced for one participant; no difference in pica was observed for another participant, and pica disrupted the effects of NCR for the

third participant. These results suggest that the use of DRA plus NCR may be effective in some cases; however, counter therapeutic effects are possible. For an example of how NCR can interact with DRA, see also Goh et al. (2000).

The use of NCR and punishment has also been investigated. Piazza et al. (1996) first examined noncontingent access to edible items as a treatment for pica, found it ineffective, and added a verbal reprimand effectively for one individual. Conversely, Rapp et al. (2001) evaluated several antecedent and consequent procedures for decreasing pica, and found that NCR plus punishment was not effective.

A unique set of studies have examined NCR plus DRA and punishment or RB. For example, Fisher et al. (1994) evaluated noncontingent access to edible items, differential reinforcement for eating food items, and a facial screen for pica among three individuals. The procedures decreased pica and slightly increased appropriate eating for all of the participants. Similarly, Gonzalez and Hagopian (2009) studied the effects of noncontingent access to leisure items, RB, and DRA for edible items. During the DRA, the participants identified and discarded inedible items to earn edible ones. The combination of these procedures was effective at decreasing pica for two individuals.

CONCLUSIONS AND RECOMMENDATIONS

As noted by Mace (1994), the widespread use of functional analysis ushered in a shift toward the development of interventions based on an understanding of the determinants of behavior in lieu of using default procedures to override existing (and often unknown) contingencies. Technological and conceptual advances in the assessment and treatment of problem behavior (aggression, self-injury) described in recent decades have been extended to the assessment and treatment of pica. The increased proportion of reinforcement-based procedures relative to punishment procedures for problem behavior and self-injury associated with these advancements (Kahng, Iwata, & Lewin, 2002; Luiselli, 2004; Pelios, Morren, Tesch, & Axelrod, 1999) is also evident in the literature on the treatment of pica (Table 9.1).

Although some behavior analytic treatments such as punishment have been used consistently to treat pica, two general trends in pica research have been observed in the last 40 years: 1) the proportion of studies that have incorporated reinforcement-based procedures has increased, and 2) more treatment components have been employed concurrently as part of treatment packages for pica. With the introduction of analog FA as described by Iwata and colleagues (beginning in 1984), the number of studies that incorporated reinforcement procedures increased. For example, between 1970 and 1995, six studies used punishment alone as a treatment procedure, whereas only three studies used differential reinforcement alone as treatment. However, between 1995 and 2010, an equal number of studies examined punishment and differential reinforcement procedures—and punishment was generally not the sole treatment component.

Research on the treatment of self-injury maintained by sensory reinforcement in particular has informed and has been informed by developments in the treatment of pica. The application of NCR as a treatment component for pica also has

increased with the more common use of FBA of pica. This increase in the number of studies that use NCR and competing stimuli is not surprising given that pica is typically found to be maintained by sensory reinforcement. The parallel development of treatments for self-injury maintained by sensory reinforcement and for pica is perhaps most evident if one examines the procedures used to identify stimuli intended to produce competing sources of reinforcement. Although early studies selected stimuli to compete with problem behavior and pica (Favell et al., 1982) using informal methods, current studies use competing stimulus assessments to systematically select stimuli based on the extent to which they decrease the response, presumably via reinforcer competition (e.g., Piazza et al., 1996).

The inherent risks associated with pica pose a significant barrier to safe and thorough behavioral assessment and treatment evaluation. Baiting the environments with simulated pica items or safe pica items during assessment and treatment is a significant development that allows pica to occur without threat to the individual. Simulated pica items are needed in cases where none of the items the individual has consumed are safe to ingest, even in small quantities. However, to increase the generality of treatment, some training should be conducted where the actual pica materials are present, noting that precautions must always be taken to ensure safety. In cases where the threat of harm is particularly severe (e.g., eating feces) some form of response blocking could be used to ensure safety. Using a progression of simulated pica items to actual pica items will validate that the treatment effects are not related to the particular items used in treatment and will remain effective outside of the current treatment conditions.

Interventions developed in clinic settings have value only if their effects generalize to the natural environments of the individual. Successful generalization is more likely to be achieved by explicitly programming for generalization. Thus, treatment of a child's pica at school would have to be extended to the home if it occurs in that setting. Similarly, effective intervention for one form of pica, say, cigarettes, does not guarantee a similar outcome for other pica objects. Accordingly, programmed generalization for pica treatment should entail cross-setting implementation by all care-providers and for a broad class of pica behaviors.

The goal of treatment of pica should be to establish edible and inedible items as separate and distinct stimulus classes that occasion different responses. To reiterate, items may be inedible because of their location (on the ground, in the garbage) or type (nails, bleach). Therefore, individuals who engage in pica should be trained to respond differentially to stimuli that are of the edible and inedible class. This type of stimulus control training has been demonstrated in several studies (e.g., Bogart, Piersel, & Gross, 1995; Finney et al., 1982; Gonzalez & Hagopian, 2009; Piazza et al., 1996). Establishing these stimulus classes can be accomplished through the use of differential consequences for consumption of the different items paired with schedule-correlated stimuli. Supplemental stimuli can be used in the early stages of treatment, but the ideal intervention would be designed to establish naturally occurring stimuli as discriminative for what items can and cannot be ingested.

Like generalization, intervention effects for pica are more likely to be maintained over time if addressed through formal programming. For example, if a

four-component treatment package successfully eliminated pica, it would be prudent to systematically remove single components of the package while maintaining previous treatment gains. Ultimately, it is advantageous to withdraw the full strength of intervention so that low- to no-frequency pica can be supported with natural contingencies. Of course, it may not be possible to remove treatment completely but instead, make it more practical.

Intervention integrity (Hagermoser-Sanetti & Kratochwill, 2008) is critical given the seriousness of pica and the requirement, at least initially, for intensive treatment. Treating professionals must carefully monitor care providers to verify that they apply procedures accurately. Intervention integrity assessment is conducted through direct observation that documents adherence to the procedures that comprise a treatment plan. Feedback in the form of positive reinforcement and correction is given to care providers based on their intervening at or below criterion, respectively. A nontreatment effect with good intervention integrity would indicate that the treatment plan should be revised. As important, a nontreatment effect with poor intervention integrity would signal further training and supervision of care providers. Because behavior analytic treatment plans for pica typically have more than one procedure and must be implemented by multiple care providers, intervention integrity assessment is integral to success.

Finally, practitioners should work with care providers to create a safe environment where opportunities for pica are decreased. This includes providing a sufficient level of supervision, and keeping the environment clean to minimize access to potential pica items. As noted previously, more recent interventions have sought to involve the individual in this process, by teaching him or her to clean the environment and appropriately discard potential pica materials (e.g., Gonzalez & Hagopian, 2009; Kern et al., 2006). Any safety precautions, however, should be as least restrictive as needed to ensure that the individual continues to have opportunities to engage in a normalized routine, access preferred activities, and live in a stimulating environment.

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