# Pica

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## Introduction

Pica refers to the persistent eating of nonedible items. The term pica comes from the Latin term for magpie, a bird famous for having a voracious indiscriminate appetite (Danford & Huber, 1982). Both nonhuman organisms (e.g., cats, dogs, buffalo) and humans engage in pica. Persons who display pica may eat a wide variety of items including nonedible plants, rock salt, small pieces of plastic toys, jewelry, soiled diapers, cigarette butts, cloth, screws, nuts, bolts, coins, and rubber gloves used in hospitals and care facilities (McAdam, Breidbord, Levine, & Williams, 2012; McAlpine & Singh, 1986; Singh, 1997; Williams, Kirkpatrick-Sanchez, Enzinna, Dunn, & Borden-Karasack, 2009). Some persons with pica only target specific items (e.g., cigarettes), whereas others display indiscriminative pica and routinely ingest a wide variety of objects depending on what is available in their current environment (Foxx & Martin, 1975). In some cases, pica may be associated with a nutritional deficit or associated with cultural practices or folk medicine (Ali, 2001).

The topography of pica also may vary significantly across individuals with intellectual and developmental disabilities (Donnelly & Olczak, 1990; Favell, McGimsey, & Schell, 1982). Some people appear to mouth objects but only occasionally swallow them. Other people place objects in their mouth and swallow them quickly. The ingestion of nonedible items can result in various medical complications requiring surgery, or other medical problems, such as intestinal parasites, poisoning, choking, repeated respiratory problems, whipworms, and death (Foxx & Martin, 1975; McAlpine & Singh, 1986; Williams & McAdam, 2012). For example, McLoughlin (1988) reported the case of a 22-year-old man with intellectual and developmental disabilities who died from a chest infection reportedly related to a long history of pica. Williams and McAdam (2012) and McAlpine and Singh (1986) suggested that pica may be under identified, underreported by professions (e.g., physicians, special education teachers), and undertreated by clinicians.

## Diagnosis and Prevalence

The recently published *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5), and the International Classification of Diseases, Tenth Edition, are the two most

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commonly used diagnostic criteria for pica. The definition of pica in DSM-5 was revised in order to eliminate the requirement for the onset of the disorder in childhood. The definition of pica was moved to the feeding and eating disorders section from the feeding and eating disorders of infancy or early childhood section. This revised definition now better accounts for the display of pica by people with no history of pica in childhood (e.g., pica onset associated with dementia) or an unknown developmental history. There are three common features across these diagnostic systems including (a) the persistent eating of one or more nonnutritive substances for a month or longer, (b) the display of pica to be intellectually inappropriate, and (c) if pica occurs as part of the clinical course of another mental disorder (e.g., schizophrenia). It must be severe enough to warrant additional independent attention from a clinician.

The prevalence of pica in persons with intellectual and developmental disabilities reported in the literature has varied considerably, and there are no recent prevalence data. Several researchers have also reported that pica is more prevalent among individuals with severe intellectual disabilities (Ali, 2001). Danford and Huber (1982) conducted a chart review of 991 persons with intellectual and developmental disabilities living in an institution and found that 16 % of the persons for whom a chart review was conducted engaged in pica. Danford and Huber's operational definition of pica was expanded to include the ingestion of nonfood items and the ingestion of underprepared foods (e.g., raw eggs), excessive amounts of food (e.g., a cube of butter), and possibly contaminated food (e.g., food in a garbage can or on the floor). With this expanded definition, the figure of 16 % rose to more than 25 %. A statewide prevalence survey of all 13 public residential facilities in Texas by Griffin, Williams, Stark, Altmeyer, and Mason (1986) found that 17 % of males and 8 % of females identified in the survey as self-injurious were reported to engage in pica.

Both researchers and clinicians could benefit from additional documentation of more recent clinical incidence of pica and the systematic study of its prevalence. The results of pica prevalence surveys—most are more than 30 years old—should be viewed with caution for several reasons. First, much of the information we have on pica is based on systematic chart reviews, and the occurrence of pica may be underreported in medical and clinical records. Second, studies have used varying operational definition of pica. Third, the majority of studies have been conducted with individuals who live in large care facilities (e.g., institutions, eight-person community-based group homes). Finally, there are no current prevalence studies on pica. Thus, we have no recent incidence and prevalence data on pica for individuals with intellectual and disabilities in less restrictive settings or with specific populations of persons with developmental disabilities. For example, there is no recently published study of the incidence and prevalence of pica of young children with autism who live in the community with their parents despite frequent reports of concerns to clinicians and educational teams.

## Assessment of Pica

Contemporary functional assessment standards suggest that an assessment of the operant variables maintaining pica should be conducted to aid in the development of a function-based behavior treatment plan, whenever possible. Functional assessment methods can be divided into two categories: (a) indirect and (b) direct. Indirect methods include questionnaires and interviews. Direct methods include both correlational and experimental approaches. Indirect methods alone are often not adequate for determining the operant function of problem behavior. Therefore, given the potential severity of pica and the potential for serious consequences, we recommend that a functional analysis should always be conducted (Hanley, Iwata, & McCord, 2003). However, it might be feasible if automatic reinforcement is the presumed function to just run an extended alone condition sessions (Iwata & Dozier, 2008). To date, the pica behaviors of the vast majority of persons with intellectual and

developmental disabilities who have participated in a functional analysis are maintained by nonsocial factors (i.e., automatic reinforcement).

The professional in charge of the development, implementation, and evaluation of intervention programs for dangerous pica should, at a minimum, have BCBA certification with several years of related clinical experience with pica. We have learned that licensed professionals in other disciplines rarely have the professional training, experience, and supervision that certified BCBAs have. Therefore, if a licensed psychologist or social worker, for example, claims to be qualified to assess and treat pica, they should find the coursework and supervised experience of the BCBA credential helpful.

Pica is the only topography of self-injurious behavior (SIB) that requires unique health, safety, and medical considerations. Numerous studies have used physician-approved items authorized for a certain level of consumption of nonedible items in both baseline and intervention phases of studies. This use of items that are inedible, but not considered dangerous (i.e., baiting), has helped in the practice of behavior analysis by making it safe to perform an experimental functional analysis (Piazza et al., 1998). Despite a fairly extensive literature in support of baiting, some clinicians and researchers may be reluctant to authorize baiting.

Researchers have used different diagnoses of pica, and this contributes to different prevalence figures for pica. We have suggested using the DSM-IV-R (now the DSM-5) definition for research (Williams & McAdam, 2012). However, the use of this definition (DSM-5), while good for research, is a limiting definition for practitioners and recipients of services. The DSM-5 definition of pica requires observation of outcomes or direct observations of at least two pica incidents in a month. Who observes and collects data to substantiate the diagnoses of pica? Many psychologists and behavior analysts rely on indirect measures (e.g., questionnaires or incident reports). The traditional diagnosis of pica either seems too time-consuming for direct observation by a behavior analyst or occurs at such low rates that the time involved for behavior analysts to reliably identify those with pica may be too labor intensive. However, reliable data must be recorded to verify the diagnosis and to rule out mouthing objects only. A clinical method for doing this satisfactorily has yet to be demonstrated.

The requirement that two pica events must occur in a 30-day period is an unnecessary limitation of the definition of pica. This is a rigid requirement that could preclude a pica diagnosis if an individual displays serious pica incidents only six to eight times per year, for example. Interestingly, we know of no other self-injurious behavior with such a limit on the diagnosis, although repeated incidents are usually documented. Because one incident of ingestion of a nonedible item could be lethal, we think the imposition limiting the diagnosis places people with intellectual and developmental disabilities at a higher risk of harm. In addition, it may delay a diagnosis and possibly preclude early intervention for the pica behavior. The severity or intensity of pica also should be a concern. For example, if a person was found eating rocks, her physician would likely order an X-ray. It is possible to distinguish between severe or highly dangerous pica from less serious pica by reviewing an individual's medical history.

## Evidence-Based Treatments

One of the most recent, comprehensive meta-analysis of the pica literature included 35 studies and 59 participants (McAdam et al., 2012). Studies included had a baseline and intervention, and two effect size measures were calculated (i.e., percentage of nonoverlapping data and percentage of zero data). Excluded were studies with unreadable data graphs, treatment-only analyses of intervention packages, alternating treatment designs, and comparisons of two or more treatments that did not include a baseline comparison. Criteria based on research evaluation and independent replication as presented by (Chambless and Hollon 1998) were employed. The following were the key findings of the meta-analysis: (1) There is well-established evidence for the

effectiveness of these behavioral procedures for the short-term treatment of pica: noncontingent reinforcement, environmental enrichment, and overcorrection.(2) There is limited evidence for the effectiveness of these behavioral procedures for the short-term treatment of pica: physical restraint and response blocking.(3) There is insufficient evidence for the effectiveness of these behavioral procedures for the short-term treatment of pica: physical restraint and aversive stimulation. Sturmey (2014) remarked upon the similarities in outcomes of the aforementioned meta-analysis by McAdam et al. (2012) and the one by Hagopian, Rooker, and Rolider (2011). The agreements between the two systematic review papers on the treatment of pica were achieved despite the independence of the two studies. We present the behavioral treatments in detail, including most recent studies, what was done, and the outcomes of each study.

## Well-Established Treatments for Short-Term Effectiveness

*Noncontingent reinforcement (NCR).* Noncontingent reinforcement is the delivery of the reinforcer independent of the response or on a time-based delivery of reinforcer (Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993). A number of studies have demonstrated that the noncontingent delivery of food or toys may successfully reduce pica to manageable levels. Favell et al. (1982) reduced the pica of three adolescents with profound intellectual disabilities through the noncontingent presentation of toys (e.g., small balls, rubber rings) and popcorn. Noncontingent popcorn was provided to give participants an alternative source of sensory stimulation. Piazza, Hanley, and Fisher (1996) and Piazza et al. (1998) conducted two studies that built on the work of Favell et al. (1982). Initially, Piazza et al. (1996) showed that the cigarette pica of a 17-year-old male with severe intellectual disability and autism was maintained by a physiological variable (i.e., nicotine). Then, the pica was reduced by implementation of a treatment package that included noncontingent delivery of preferred foods and a vocal reprimand contingent on pica (e.g., "no butts"). Piazza et al. (1998) conducted an analogue functional analysis of the pica of three participants with intellectual and developmental disabilities and demonstrated that pica was maintained by automatic reinforcement or a combination of automatic reinforcement and social attention. The pica was treated with a combination of attention and access to preferred activities provided noncontingently.

*Environmental enrichment.* Environmental enrichment can be defined as maximizing reinforcement rates in an environment, including preferred toys, objects, and activities, and making them available to individuals. To this definition, we may add (1) provision of positive reinforcement to teach children how to use preferred stimuli (see Horner, 1980) and (2) adequate floor space (see Boe, 1977). Environmental enrichment was used by Favell et al. (1982) to deliver popcorn as alternate oral stimulation in place of pica. The premise of environmental enrichment is that reinforcers are maximized through increased availability of preferred activities, materials, or toys. There may be multisensory furniture to appeal to a variety of client or student preferences. Increased floor space might be provided (see Boe, 1977), who reduced aggression in a group of 24 children by evaluating the effects of toys present, noncontingent reinforcement, and floor space. Prevention of deprivation states is also a goal of environmental enrichment. A limitation of this approach is that the participant will likely satiate at some point. Environmental enrichment is typically used as part of a treatment package. For example, Falcomata, Roane, and Pablico (2007) found it necessary to add time-out (TO) to environmental enrichment in an interesting study to gain stimulus control of pica.

*Overcorrection.* Overcorrection refers to two specific procedures: (a) restitution and (b) positive practice. Restitution consists of requiring a person to correct their actions to a state that is vastly improved from what existed prior to the occurrence of a challenging behavior. Positive practice consists of having a person engage in an

adaptive alternative behavior that is incompatible with the targeted challenging behavior. A number of studies have used overcorrection to reduce pica. In an early study, Foxx and Martin (1975) used overcorrection to reduce pica and coprophagy. Contingent on the display of pica, the participants were required to spit out the targeted object, brush their teeth with toothbrush soaked in mouthwash, clean their hands and nails, and clean their immediate environment (e.g., mop the floor). Overcorrection produced a clinically significant reduction in the pica of all participants.

In a more recent study, Ricciardi, Luiselli, Terrill, and Reardon (2003) combined alternative practice training and the positive practice component of overcorrection to reduce the pica of a 7 year-old boy with autism who routinely ingested wood chips, stone, paper, and small plastic objects. During alternative practice training, the participant was stopped from picking up an item to ingest and was prompted to throw it in the trash can with the vocal prompt, "Where does it belong? In the trash." After successfully discarding the item, the participant was required practice throwing small items in the trash ten times. The results of an ABAB design demonstrated that the intervention produced a clinically significant reduction in pica that was maintained at a 4-month follow-up. The use of overcorrection is not recommended unless the individual can easily be managed without intense physical opposition. Except for the study by Ricciardi et al. (2003), overcorrection has not been used to treat pica for over a decade. Of course, if it seems appropriate, the date last used is not a factor in considering its use.

## Limited Evidence of Clinical Efficacy for Short-Term Treatment

*Physical restraint*. Physical restraint has been used in a number of studies with pica. We present the following studies that used less restrictive types of restraint involving holding arms or wrists for a minute or less. Winton and Singh (1983) treated pica exhibited by a 19-year-old with profound intellectual disabilities by comparing briefly holding arms to the side for 10 s versus 30 versus 1 min release criteria. Pica was reduced from 22.7 % of intervals per 15 min session to 3 %. Within the framework of an alternating treatment design embedded within a multiple-baseline design, the durations of brief physical restraint were compared. Physical restraint consisted of holding the participants' hands to their side for the full duration of the restraint. All three durations of physical restraint were clinically effective; however, no maintenance data were collected, so confident conclusions could not be reached about long-term effectiveness.

Singh and Bakker (1984) used brief duration holding arms to side for 10 s. The two participants, a 21-year-old female with profound intellectual disabilities and a 20-year-old female with profound intellectual disabilities, were significantly improved. The first participant engaged in pica for 32.2 % of intervals and only 1.3 % after treatment. The second participant was at 10.8 % of interval pretreatment and 0.9 % after treatment. Again, an alternating treatment design was used. Paniagua, Braverman, and Capriotti (1986) used physical restraint (arms held in rigid vertical position for 30 s) as part of a multicomponent intervention package to reduce the pica of a 4-year-old girl with a profound intellectual disability. Pica was reduced from 52 % of intervals to less than 10 % during a 10-min session. A multiple-baseline design was used, and the results obtained replicated earlier studies.

LeBlanc, Piazza, and Krug (1997) used an alternating treatment comparison of physical restraint (i.e., canvas arm sleeves, a helmet, and face mask) versus response blocking for a 4-year-old girl with profound intellectual disability. During the response blocking condition, the participant did not wear any protective equipment. Response blocking consisted of pushing the participant's hand holding the pica item down before she could place it in her mouth. The results of the alternating treatment analysis demonstrated that both procedures successfully eliminated pica. LeBlanc et al. suggested that response blocking was the more appropriate treatment because it

resulted in the display of fewer negative vocalizations and increased the participant's opportunities for social interactions (i.e., response blocking was a less restrictive treatment option than mechanical restraint).

The overall results of studies using physical restraint demonstrate that the approach is a potentially effective intervention. The use of physical restraint may be warranted for individuals who display potentially life-threatening pica and when other less restrictive interventions have failed or cannot be implemented due to risk of harm issues (e.g., history of ingesting potentially fatal items like glass or vinyl gloves). These studies demonstrate clearly that restraint is effective in the treatment of pica.

*Response blocking*. Response blocking requires the caregiver to be as close to the participant as necessary to physically block access to an item. Blocking usually involves the use of hands and forearms to block pica attempts. Blocking in some cases may include grasping a client's wrist; attempts to retrieve potentially dangerous items in the hands or mouth of the client may involve intrusive activities which are restraint. Response blocking has been identified as a procedure that can be used effectively as a component of a treatment package (Hagopian, Rooker & Rolider, 2011). However, Rapp, Dozier, and Carr (2001) found that response blocking alone did not reduce pica sufficiently and a side effect emerged—aggression. McCord, Grosser, Iwata, and Powers (2005) investigated two variations of response blocking and discovered that response blocking may only reduce pica if used early in the chain and if the implementation is so consistent that virtually no responses are missed by therapists, thus preventing the placement of pica on an intermittent schedule. These authors also suggested that response blocking alone may not be adequate and another intervention may need to be incorporated into the intervention package.

Other factors often overlooked in the response blocking literature are age, size, and quickness of participants. Obviously, response blocking may work well with 4-year-old children. Large, strong, and quick children or adults with pica are extremely difficult to control and may require restraint to prevent access to or ingestion, even when assigned one-on-one staff members when nonedible items are freely available in what can be termed a non-pica-safe environment. Another factor to consider is that physical proximity necessary to implement response blocking may be aversive for some individuals. Nevertheless, response blocking may be a necessary part of treatment for some individuals with pica and intellectual and developmental disabilities.

## Interventions with Insufficient Experimental Evidence for Clinical Efficacy

*Differential reinforcement*. Differential reinforcement has been used in several published studies to reduce pica. Two specific schedules of differential reinforcement have been used: differential reinforcement of other behavior (DRO) and differential reinforcement of alternative behavior (DRA). DRO consists of the delivery of a reinforcer contingent on the absence of a problem behavior for a prespecified period (e.g., 30 s, 5 min). DRA consists of the reinforcement of an alternative behavior to the targeted challenging behavior according to specific schedule of reinforcement (FR1; FR3). Smith (1987) used an intervention package including differential reinforcement of alternative behavior to reduce the pica of a 23-year-old man with a profound intellectual disability in a sheltered workshop. Contingent upon touching an item, the participant was verbally prompted not to touch the item and to continue with the scheduled vocational activity. Verbal praise and token reinforcement also were provided contingent on engagement in the vocational activity and for engagement in any other functionally incompatible behaviors. Baseline rates were 21.6 per day and differential reinforcement rates were 3.7 per day.

Donnelly and Olczak (1990) used a differential reinforcement procedure to reduce the cigarette pica of two men with profound intellectual disabilities. In this study, small sips of coffee were provided according to a fixed-time schedule contingent on the chewing of sugarless gum

(a behavior hypothesized to be functionally incompatible with pica). The results of an ABAB reversal design demonstrated that the intervention package produced a significant reduction in pica in brief experimental sessions conducted in a small treatment room. Baseline mean latency of pica was less than 10 s and session data were greater than 800 s.

Several recent research studies have used differential reinforcement of alternative behavior to teach individuals with intellectual and developmental disabilities to throw potential pica items in the trash or hand them to another person instead of ingesting them. Goh, Iwata, and Kahng (1999), for example, used response blocking and DRA to reduce the cigarette pica exhibited by individuals with profound intellectual disability. Contingent on attempted pica, response blocking (e.g., the therapist placing a hand between the participant's hand and mouth) was used to prevent the participant from placing the item in his or her mouth, and the participant was differentially reinforced for handing the pica item to the therapist. The results of a multiple-baseline design across participants showed that differential reinforcement and response blocking successfully reduced the cigarette pica of three of the four participants. Hagopian, Gonzales, Rivet, Triggs, and Clark (2011) expanded on Goh et al. (1999) by demonstrating that response blocking and differential reinforcement significantly reduced the pica behavior of two participants with autism and a severe intellectual disability. All attempts by the participants to place an object in their mouth were blocked, and the participants were differentially reinforced with verbal praise and food for putting the potential pica items in the trash or for using them appropriately. Response blocking and differential reinforcement was demonstrated to successfully reduce both participants' pica, and results obtained were shown to generalize across settings and people.

*Contingent visual screening*. Contingent visual screening is the placement of a blindfold over the eyes immediately following the target behavior. The duration of the screening is typically 10–60 s. Singh and Winton (1984) used this procedure in perhaps the first application with pica behavior. A blindfold was applied for 1 min, resulting in significant reductions of pica in various settings. A decade later, Fisher, Piazza, Bowman, Kurtz, and Lachman (1994) compared ten reinforcers and punishers in an antecedent analysis. Visual screening was found to be the most effective procedure for reducing pica for all three of the participants who experienced pica at high rates prior to treatment. The ages of the participants ranged from 3–5 years. Diagnoses included profound intellectual disability and pervasive developmental disorder (5-year-old), severe intellectual disability and seizure disorder (3-year-old), and severe intellectual disability and pervasive developmental disorder (the other 3-year-old). Baseline rates of pica were 4.5, 3.8, and 4.9 per hour. Rates decreased by at least 90 % before baiting sessions were conducted in the family homes and other places.

*Contingent aversive stimulation*. Contingent aversive stimulation involves the presentation of an aversive stimulus contingent on the occurrence of pica. Both aversive tastes and auditory stimuli have been used to reduce pica. For example, Ferreri, Tamm, and Wier (2006) reduced the pica (e.g., biting off or swallowing pieces of plastic toys) of a 4-year-old boy with autism through the use of a contingent aversive stimulation. The boy had a variety of aversions to food, and he was observed to engage in gagging and spitting when given tapioca pudding to eat. Toys the participant attempted to bite off pieces to swallow were coated in tapioca pudding. When the boy placed the toys coated in tapioca pudding in his mouth, he had a reaction consistent with taste aversion (e.g., gagging, crying, and spitting). After placing the toys coated with pudding in his mouth several times, the boy stopped engaging in pica, and the outcome obtained generalized throughout the boy's preschool. Rapp et al. (2001) used a contingent auditory stimulus to reduce the pica of a 6-year-old girl with autism. Initially, several less restrictive interventions were tried but failed to produce a clinically significant reduction in pica. After the failure of noncontingently presented food, vocal reprimands, and response blocking, the effectiveness of 83 dB tone presented for 2–3 s was evaluated. In the second tone

condition, the volume of the tone was increased to 90 dB, and after the tone was provided contingent on the approach to items that the participant had a history of ingesting, a significant reduction in pica was observed. The reduction in pica obtained was maintained during generalization probes to novel settings.

*Discrimination training*. Several research studies have included a discrimination training component in their intervention package. Discrimination training is based on the hypothesis that some persons with intellectual and developmental disabilities lack the ability to discriminate food from nonfood items; thus, they are at an increased risk for eating nonedible items. Discrimination training for pica consists of teaching participant to only eat items placed on a specific object (e.g., a specific place mat, a red plate) using differential reinforcement. To date, all published studies that have used discrimination training also have included at least one punishment-based component. For example, Johnson, Hunt, and Siebert (1994) taught two adolescents with profound intellectual disabilities to only eat items placed on a specific placemat using differential reinforcement. In addition, they were taught to use a simple sign to demand more food. Contingent on pica, the targeted nonfood item was removed from their mouth, and their face was washed for 15 s. In a second example, Bogart, Piersel, and Gross (1995) used discrimination training and differential reinforcement to teach a 21-year-old woman to discriminate food from nonfood items. Contingent on the occurrence of pica, the participant's face was covered with the bib (facial screening) she was wearing, and her hands were held to her side for 15 s. The use of discrimination training may be particularly clinically useful for individuals with intellectual and developmental disabilities who engage in indiscriminate pica (i.e., eat a wide variety of nonedible items). However, to date, no published studies have examined the clinical effectiveness of discrimination training without the inclusion of punishment-based strategies.

While some reviews of the pica literature do not address generalization and maintenance, effective treatment of potentially highly dangerous behavior must include what has been referred to as the generality issue (see Baer, Wolf, & Risley, 1968). There are studies that address generalization and maintenance. For example, Kern, Starosta, and Adelman (2006) demonstrated excellent strategies for generalization and maintenance of pica treatment. Participants were Orlando—an 8-year-old boy with severe intellectual disabilities and pica—and Matthew, aged 18 and diagnosed with autism and severe intellectual disabilities. Matthew's pica had resulted in two hospitalizations. Initial baseline and treatment were carried out in a small room. Intervention involves blocking pica attempts; however, it was noted that aggression often occurred when blocking was used. Kern et al. stated: "Blocking resulted in reduction of pica, but not attempts" (p. 140). Both clients had data collected in two settings initially, and these settings were expanded to include observations in two additional settings. Observations were expanded to 30 min and then through the day. During training, Orlando was taught to turn pieces of paper (baited items) to staff, and, when he did, he was praised and given an edible item. A reversal was carried out in which baseline was repeated. The reinforcement schedule was moved from FR1 to FR2. A 10-s latency was also used. Matthew's training was expanded to the classroom and the local discount store. It is important to note that training in turning in inedibles for edibles continued in other settings. Baseline data were not collected in other settings for Orlando. For Matthew, any pica or attempts were blocked, or staff tried to block them. The results showed rates of pica attempts approaching zero.

## Summary of Interventions

Virtually all published studies of behavioral treatment show reductions in pica (McAdam, Sherman, Sheldon, & Napolitano, 2004; McAdam et al., 2012). However, when one looks at evidence-based treatments, interesting results can be seen. The meta-analysis by McAdam et al. (2012) found that only three behavioral interventions

were *well-established treatments* for short-term treatment of pica: environmental enrichment, noncontingent reinforcement, and overcorrection. Furthermore, only *limited evidence* was found for physical restraint and response blocking. One of the findings was that there were no behavioral treatments with long-term maintenance and generalization efficacy that met the criteria for evidence based. *Insufficient evidence* was found for visual screening, contingent aversive stimulation, and discrimination training. These findings do not mean, for example, that overcorrection should be used in the treatment of pica and visual screening should not. It may mean that not enough research has been done to make such a determination. In general, clinicians are expected to use the least restrictive treatment that is likely to be effective. In addition, clinicians commonly use two or more treatments as a treatment package.

Some recent literature reviews on pica have declared that positive approaches are the preferred interventions and researchers are therefore no longer researching the effectiveness of aversive procedures. These views are not necessarily an accurate description of the status of the current, most recent research in behavioral treatment of pica. For example, of the six most recent intervention studies, three (Falcomata et al., 2007; Ferreri et al., 2006; Ricciardi et al., 2003) used punishment alone or together with another procedure, and another three used response blocking alone or with other procedures (Hagopian, Rooker & Rolider, 2011; Kern et al., 2006; McCord et al., 2005). While some consider response blocking a form of restraint, others may not. Response blocking, which typically requires staff to be within a foot or so of the target client, or close enough to block, may not appear to be restrictive in brief sessions, but in much longer sessions, it is likely an aversive stimulus for many clients. Several studies reported aggression as a side effect of response blocking, suggesting a possible escape response from an aversive stimulus (blocking or proximity necessary to carry out blocking).

As described above, the current published literature has documented that behavioral treatment procedures can be used to reduce, and in some cases suppress, pica to near-zero levels. A 90 % reduction in pica and pica attempts is a wonderful reduction for low-rate pica, but for high-rate pica, how does a clinician move toward further reductions or generalization if the rate is still 40/day or 3/h? There are a number of limitations that affect the strength of the conclusions that can be reached. In addition, there is a slight gap between what the literature on pica is and what some professionals say it is.

The choice of treatment options by families and caregivers can only be made if there is accurate representation of what the data show and how those data are represented to families. For example, authors of literature reviews or case studies may declare in their discussion that a study or procedure reduced pica. A reduction is better than an increase; however, is this term—without data—the best we can do in a scientific study of behavior? Other reviewers may simply declare a procedure to be effective and present no evidence of efficacy other than using the term "reduced." As an alternative, in their review of pica interventions, McAdam et al. (2004) reported data from each study for both baseline and intervention. Such precise reporting of data in literature reviews is invaluable and highly recommended. In their review, Lundervold and Bourland (1988) used another method for presenting results of aggregate single-subject data. They classified each article reviewed on a 3-point scale: 0 = reduction by 50 % or less (ineffective), 1 = reduction by 51–70 % (effective), and 2 = reduction by 71–100 % (highly effective).

## Practice Recommendations

Because there have been no major prevalence surveys of pica in the last 30 years, there may be a need for recent prevalence estimates, both in institutionalized and community settings. The Behavior Problem Inventory (Rojahn, Matson, Lott, Esbensen, & Smalls, 2001) is one tool that can be used for this purpose. This rating scale can be used, because individual self-identify by engaging in a serious episode of pica (McAlpine & Singh, 1986). Because only the most severe

pica incidents seem to occur without previous notice or assessment, a survey of staff or families to determine a history of pica should be considered in schools, clinics, and institutions.

Behavior analysts who are certified by the Behavior Analyst Certification Board should be available in all public and private schools, clinics, and institutions. The behavior analyst seeks consent for service prior to any involvement in someone's care. Some programs track pica incidents by use of a pica incident report to ensure thorough reviews. This is essential for the prevention of pica incidents.

The first step in the clinical intervention process is to obtain a medical evaluation. Consent for behavioral assessment is next and typically includes specific protocols. The behavior analyst plans and conducts a risk assessment of pica and behavioral procedures (see Bailey & Burch, 2011). If pica is deemed dangerous, evidence-based treatment components most likely to be successful should be considered. A risk assessment is conducted not only for pica but also for any proposed behavioral procedures. This assessment is typically presented to the supervisor and team members for review and approval.

The behavior analyst is responsible for overseeing the methods used for protecting and preventing pica by limiting access to nonedible items in a pica-safe environment. A pica-safe environment includes adequate numbers of well-trained residential staff, ongoing staff training in pica, and pica prevention through on-site monitoring and feedback. Consent is also required for this strategy.

A functional behavioral assessment should be conducted using safe, nonedible baited items that a physician has authorized. Generally, a comprehensive treatment plan is developed after the assessment. Consent for behavioral treatment plans for pica may start with noncontingent reinforcement, environmental enrichment, and/or differential reinforcement—sometimes called level one interventions. This plan may require feedback from a peer review committee before it is submitted to the Human Rights Committee for review and approval.

Level two interventions also require consent and include restrictive procedures (e.g., response cost, response blocking, brief restraint [e.g., 10 s, 30 s], non-exclusionary time-out [e.g., time-out ribbon], and visual screening). These procedures are typically used only for highly dangerous pica behavior after level one interventions have proven ineffective.

Practitioners should begin treatment using brief sessions to evaluate the effects of each intervention, and once the results of the evaluation are complete, the effective components can be used as a package of treatments needed to rapidly gain control of the dangerous pica.

Once treatment is successful, generalization should be programmed across settings and staff that are typically encountered by the individual. Family and/or guardians should be on-site as much as possible for involvement in the assessment and treatment decision making. If the individual is capable of self-determination, consent should be obtained from the individual as well. The essence of behavioral treatment for pica should focus on the quality of life of the individual and not on mere reduction of a problem behavior.

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