Intensive Outpatient Behavioral Treatment of Primary Urinary Incontinence of Children With Autism

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Three children with autism who were previously nonresponsive to low-intensity toilet training interventions were toilet trained using a modified Azrin and Foxx (1971) intensive toilet training procedure. Effects were demonstrated using a nonconcurrent multiple baseline design across participants. The training was conducted across home and school settings by parents and school staff. Each child achieved continence, and 2 children eventually initiated the majority of toileting events. Implications for future research and clinical practice and dissemination are discussed.

The intensive behavioral treatment package developed by Azrin and Foxx (Azrin & Foxx, 1971; Foxx & Azrin, 1973) for primary urinary incontinence has been effective for numerous populations (Luxem & Christophersen, 1994). The original treatment package, which was first evaluated with adults with mental retardation, consists of the following components: scheduled toileting, reinforcement of in-toilet urination and "dry pants," increased fluid intake, and an overcorrection (restitution, positive practice) package for accidents. The Azrin and Foxx treatment package has been replicated and modified numerous times. Modifications have included attempts to render the original treatment package less intensive (e.g., Luiselli, Reisman, Helfen, & Pemberton, 1979), evaluate its effectiveness without the overcorrection component (e.g., Post & Kirkpatrick, 2004), and improve its effectiveness with transfer-of-stimulus-control procedures (e.g., Taylor, Cipani, & Clardy, 1994).

Several recent investigations (Cicero & Pfadt, 2002; Luiselli, 1997; Post & Kirkpatrick, 2004) have evaluated versions of the Azrin and Foxx (1971) treatment package with children with autism and other pervasive developmental disorders. Although the treatment package has already been applied successfully with individuals with mental retardation (Azrin & Foxx, 1971), Angelman syndrome (Didden, Sikkema, Bosman, Duker, & Curfs, 2001), multiple sensory impairments (Lancioni, 1980), and other disabilities, we believe investigations of the treatment package with individuals who have pervasive developmental disorders are important for at least two reasons. First, recent survey studies have indicated that more than half of parents of children with autism report toileting and urination problems (Whiteley, 2004; Williams, Oliver, Allard, & Sears, 2003). In addition, the recent surge of interest in and availability of intensive behavioral treatments for autism (Maurice, Green, & Luce, 1996) might provide yet another opportunity to disseminate the Azrin and Foxx protocol to parents.

In a recent investigation, Cicero and Pfadt (2002) evaluated behavioral toilet training with three children with autism who had not yet been exposed to toilet training efforts. Their treatment package, which was conducted solely in the children's school, contained positive reinforcement of in-toilet urination, scheduled toileting (which was immediately faded), communication training, and positive practice contingent on accidents. The authors demonstrated reductions in accidents and increases in self-initiations across children. Cicero and Pfadt were among the first in this literature to use stimulus preference assessments to identify programmed consequences and to include communication training to facilitate independent rather than scheduled toileting. However, several limitations of the Cicero and Pfadt study are noteworthy. From a methodological perspective, the authors employed a nonexperimental (A-B) design to evaluate treatment effects and did not report measures of interobserver agreement. Nonetheless, the effects were large and immediate and suggest that intensive behavioral toilet training can be effective with children with autism who have never been toilet trained and who participate in schools that are amenable to the implementation of such methods.

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We believe that an issue raised by Cicero and Pfadt (2002) is worth discussing here. Cicero and Pfadt questioned the use of punishment (i.e., overcorrection) in the treatment of incontinence. However, it should be noted that the form of overcorrection employed by Azrin and Foxx (1971) was *restitutional* in nature. In other words, contingent on an accident, the individual was prompted to engage in an extensive behavioral sequence of dressing, cleaning the immediate environment, and so forth. As an alternative to restitutional overcorrection, Cicero and Pfadt employed a version of overcorrection known as *positive practice* in which the individual repeatedly performs only the appropriate behaviors that should occur after an accident (e.g., going to the bathroom, undressing, sitting). Although positive practice is still a form of overcorrection, we believe that there might be benefit in using this lesser form of overcorrection to interrupt the urine stream, teach the individual the proper toileting sequence in the presence of a full bladder, and ultimately reduce accidents.

The present study was designed to extend previous research in several ways. First, we evaluated the effects of intensive behavioral toilet training with children with autism, but in contrast to prior studies we included children who had already been exposed to less-intensive toilet training (e.g., scheduled toileting) to no avail. Second, we employed a positive practice component and collected data to determine how often it was used. Third, our treatment was initially implemented by parents in an outpatient setting before being used in home and school environments. Fourth, we included a communication training component to promote self-initiated toileting and collected data on self-initiated successes. Finally, we corrected some of the methodological limitations of previous studies by (a) using an experimental design to evaluate treatment effects, (b) assessing interobserver agreement, (c) conducting follow-up assessments, and (d) assessing social validity.

METHOD

Participants and Setting

Three children diagnosed with autism who were served in local preschool special education classrooms participated in the study. A multidisciplinary school-based diagnostic team independent of the current investigation had previously evaluated the participants. Through these evaluations, the participants were identified as meeting the "autistic impairment" educational eligibility classification according to state law. All children had participated unsuccessfully in low-intensity attempts at toilet training in their homes and schools (e.g., scheduled sits at 2-hr intervals, positive reinforcement for successful voids) and wore diapers throughout baseline. Before the study began, each participant's mother completed an interview of the survey version of the *Vineland Adaptive Behavior Scale* (VABS; Sparrow, Balla, & Cicchetti, 1984) and the *Gilliam Autism Rating Scale* (GARS; Gilliam, 1995). These measures were employed in the current investigation to corroborate the previous diagnoses and provide additional information regarding participant characteristics.

Adam was 4 years 1 month old and had a VABS composite score of 73 and a vocabulary of approximately 100 words. His GARS autism quotient was 107. At school, Adam's program consisted of toileting sits every 2 hr and preferred consequences for successful urination. He urinated in the toilet infrequently at school and never urinated successfully at home. Adam's mother, a single parent, and school staff members served as therapists. Adam was taught to vocally request "potty" during treatment.

Alice was 4 years 11 months old and had a VABS composite score of 47 and a GARS autism quotient of 90. She had no spoken language and communicated infrequently via the Picture Exchange Communication System (PECS). Prior to the study, Alice had never urinated in the toilet and no sitting schedule was in place at home or school. Her mother, father, and school staff members served as therapists in the study. Alice was taught to request bathroom trips using PECS.

Gary was 4 years 7 months old and had a VABS composite score of 63 and a GARS autism quotient of 102. He had fewer than 50 recognizable words that he used in phrases and short sentences. Prior to the study, Gary rarely urinated in the toilet successfully, though sits on the toilet were scheduled every 2 hours at school. His single mother, an aunt, and an adult cousin who provided daycare served as therapists, as did members of the school staff. Gary was taught to vocally request "potty" during treatment.

The first day of the toileting program was conducted in a children's suite of an outpatient clinic located on a university campus. A large bathroom served as the primary setting when participants spent time on the toilet, and a small therapy room was used for time spent off the toilet. The regular-sized toilet was equipped with a toilet-seat adaptor for children. Both rooms included TV/VCR units and preferred toys, foods, and beverages.

Data Collection and Interobserver Agreement

Data were collected on all daytime toileting incidents by researchers, school staff, and family members. Toileting incidents were recorded at home, at school, at the outpatient clinic, and in the community. Observers collected data on two primary dependent measures: toileting success and self-initiated toileting. Each urination occurring during daytime (excluding any wet diaper upon initial waking in the morning) was scored as either a success or an accident. Urinations occurring in the toilet were scored as successes while urinations occurring outside of the toilet were scored as accidents. Each success was also scored as either prompted or self-initiated. Self-initiations were defined as a request by the participant to use the bathroom using spoken requests, sign language, or picture icon, or by walking to the toilet and initiating the process without prompting. The *frequency of accidents* was used as the

primary index of toileting success, and the *percentage of self-initiated successes* was used as the primary index of toileting independence.

Interobserver agreement (IOA) data were collected by two independent observers across home, school, and clinic settings. Family members or school staff members collected primary data. A member of the research staff always served as the second independent observer for IOA purposes. IOA was assessed across baseline, intensive training, and follow-up phases (i.e., multiple assessments per week), and these assessments were conducted across home, school, and clinic settings. IOA was calculated using the overall (i.e., point-by-point) agreement method (# of agreements ÷ [# of agreements + disagreements] x 100%). An agreement was defined as both observers recording the same data (i.e., success or accident, prompted or self-initiated) for each toileting incident. IOA was assessed for 12.5% of Alice's toileting incidents and was 91.1%. IOA was assessed for 24.1% of Gary's toileting incidents and was 87.2%. IOA was assessed for 29.6% of Adam's toileting incidents and was 91.1%

Procedure

Stimulus Preference Assessment. Parents completed the *Reinforcer Assessment for Individuals with Severe Disabilities* (RAISD; Fisher et al., 1996) during an initial interview to identify potential foods, beverages, and toys to use as programmed consequences during the intervention. Separate multiple stimulus (without replacement) preference assessments were conducted for foods, beverages, and toys (DeLeon & Iwata, 1996). An array included an average of 8 equally spaced stimuli items (range 4–10), which were placed on a table in front of the participant. The participant was then instructed to "pick one." After selection, the participant was given brief access to the item. Foods and beverages were provided in brief quantities so they could be completely consumed after selection. Toys were provided for approximately 10 s, after which time they were returned to the researcher. The remaining items in the array were then rearranged, and the selection process was repeated until all items were selected or no more selections were made. Each array was presented twice.

Experimental Design and Baseline. A nonconcurrent multiple baseline design across participants (Watson & Workman, 1981) was used to evaluate the effects of the intervention. The nonconcurrent multiple baseline design controls for the potential confounds of maturation and exposure to the therapeutic preparation but does not require that participants be evaluated concurrently. The length of each baseline phase is staggered, and the specific timing of the phase change is based on the stability and trend in the pattern of the data. The baseline condition included any ongoing interventions at home or school. These lower intensity toileting interventions included praise and infrequent sits for one child and scheduled hourly sits for another child.

Intensive Toilet Training Treatment Components. The treatment components comprised (a) a sitting schedule, (b) programmed consequences for successful urinations and self-initiations, (c) increased fluids, (d) communication training, (e) a urine sensor and alarm, and (f) positive practice for accidents (see Note). The *sitting schedule* (see Table 1) was divided into 12 levels, beginning with a 10-min sit followed by 5 min off of the toilet. The schedule progressed by one level each hour (Day 1), one level each half-day (Days 2 and 3), and one level every two days (Day 4 and until the schedule was removed). Alice had not successfully urinated in the toilet at noon on the first day, so her schedule remained at Level 3 (5-min sits at 15-min intervals) for one additional hour, during which she successfully urinated. Moderately preferred videos were shown to participants during lengthy sits. These videos were identified during a prior stimulus preference assessment and were used to reduce potentially aversive properties of scheduled sits.

Programmed consequences for successful urination included access to highly preferred foods, toys, and beverages and escape from the toilet. When the participant urinated, the remainder of the sit interval was added to the intersit interval. *Programmed consequences for self-initiation* were praise and a trip to the toilet. Preferred items were delivered only if the self-initiation was followed by a successful urination.

Increased fluids were made available to the participant during the first day of treatment in the form of preferred noncaffeinated, nondairy drinks. The participants were prompted to drink every 5 min during the first hour, every 10 min during the second hour, every 15 min during the third hour, and every 30 min throughout the rest of Day 1. It is estimated that each participant drank between 2 and 4 ounces of fluids per hour.

Communication training was conducted immediately before each scheduled sit. Response forms were a vocal request of "potty" with Gary and Adam and the exchange of a picture

TABLE 1
Levels of Scheduled Toileting "Sits"

Level	Schedule
1	10-min sit on the toilet, 5 min off the toilet
2	10 min on, 10 min off
3	5 min on, 15 min off
4	5 min on, 25 min off
5	5 min on, 35 min off
6	5 min on, 45 min off
7	5 min on, 60 min
8	5 min on, 90 min off
9	5 min on, 2 hours off
10	5 min on, 2.5 hours off
11	5 min on, 3 hours off
12	5 min on, 4 hours off

icon with Alice. For Gary and Adam, the adult modeled the communicative response, prompted the participant to imitate, and praised the participant's response if it occurred. For Alice, a sequence of verbal, gestural, and physical prompts was used to teach the exchange. Prompts were faded over time.

A Wet Stop™ *urine sensor* was placed in a pouch sewn into the front of the participant's underwear. The sensor activated a small alarm attached to the participant's shirt at the shoulder. Adults responded to the alarm by saying, "No wet pants" in a firm voice tone and quickly escorting the participant to the bathroom to sit for 1 min. If the participant completed urination in the toilet, positive practice was avoided and consequences for successful toileting were implemented.

Positive practice was implemented each time an accident was not followed by completion in the toilet. Positive practice consisted of quickly escorting the participant to the toilet after stating "No wet pants" in a firm voice tone. After removing his or her pants, sitting briefly, standing, and replacing the clothing, the participant was rushed back to the site of the accident for four repetitions of the procedure. The intersit interval was not reset when accidents occurred.

Day 1: Outpatient Clinic. All components were used in the initial intensive training, which occurred on a Friday from approximately 9 a.m. to 4 p.m. in the outpatient clinic. Researchers implemented the first 2 hours of the protocol, and parents observed and were instructed in each procedure. Caregivers gradually began to implement aspects of the treatment with immediate feedback until they were implementing the protocol independently for the last 2 to 3 hr of the day with delayed feedback. All caregivers were proficient in all components of the intervention by the end of the day. In addition, each participant had completed Level 6 of the sitting schedule by 4 p.m., when the family returned home to continue the protocol. The sitting schedule remained at Level 6 throughout the evening of the first day. Researchers were available by phone for consultation during the evening. From this point forward, the participants wore regular underwear during all waking hours except when riding to and from school on the bus. The treatment protocol was discontinued at certain times of the day when there were no logistical means to get the participant to the bathroom quickly if he or she asked to use the bathroom (e.g., riding on the school bus, fire drills at school, long car rides, swimming class).

Days 2 and 3: Home. Caregivers implemented all of the components, except increased fluids, at their home over the weekend. The sitting schedule from the previous day remained in effect in the morning of Day 2 and progressed in the afternoon contingent upon two successes (e.g., Level 7 on Saturday afternoon, Level 8 on Sunday afternoon). Researchers conducted scheduled 2-hr visits each day to answer any questions, provide encouragement and support, ensure accuracy of protocol implementation, and collect IOA data. Researchers also were available via phone for any necessary consultation.

Days 4+: Return to School. On Day 4, the participant returned to school. A researcher trained the staff and remained present throughout the morning to ensure accurate implementation. All components except increased fluids were in effect until criterion was met for the removal of a component. All participants arrived at school on Monday morning at Level 8. The sitting schedule continued to be gradually thinned with a criterion of 80% success (i.e., successes ÷ [success + accidents] x 100) for 2 consecutive days to move to the next level. After the participant had achieved 80% success for 2 consecutive days at Level 12, the schedule was removed and the participant was expected to self-initiate for access to the toilet. The criterion for removal of the urine alarm was (a) 100% success for 2 consecutive days with at least one self-initiation or no scheduled sits or (b) 80% success for 2 consecutive days with at least 40% of successes self-initiated each day. Programmed consequences for successes and self-initiations continued, but preferred items were delivered on an intermittent schedule.

Follow-Up. When the participant had achieved 80% success for 2 consecutive days after removal of the sitting schedule, he or she entered the follow-up phase. Follow-up data were collected 1 full day each week for 4 weeks. The only component of the treatment package in effect during follow-up was praise for urination in the toilet.

RESULTS

Intensive toilet training was evaluated using a nonconcurrent multiple baseline design across participants in which the baseline lengths were staggered as follows: 6, 10, and 13 days. The design, as depicted in Figure 1, demonstrates experimental control of the intensive toilet training protocol because the primary dependent measure (frequency of accidents per day) changed only after each participant received treatment.

Adam

The results from Adam's treatment evaluation are depicted in the top panel of Figure 1. During baseline, Adam had a mean of 4.8 (*SD* = 1.2) accidents per day. Approximately one fifth (*M* = 18.1%, *SD* = 21.4) of Adam's toileting successes were self-initiated. During the intensive toilet training period, which lasted 12 days, Adam's accidents were reduced to a mean of 0.8 (*SD* = 1.5) accidents per day. His self-initiated toileting successes increased to a mean of 38.3% (*SD* = 26.4). During intensive training, Adam was exposed to six instances of positive practice and met criteria for removing the alarm and sitting schedule in 3 and 9 days, respectively. The four assessments that were conducted during the 30 days following intensive training revealed that Adam had zero accidents and a mean of 47.5% (*SD* = 18.9) self-initiated toileting successes, which indicate full continence. Less than 100% of toileting events were self-initiated due to adults' naturally prompting young children to urinate at specific times for convenience (e.g., before getting on the school bus, before getting in the swimming pool).

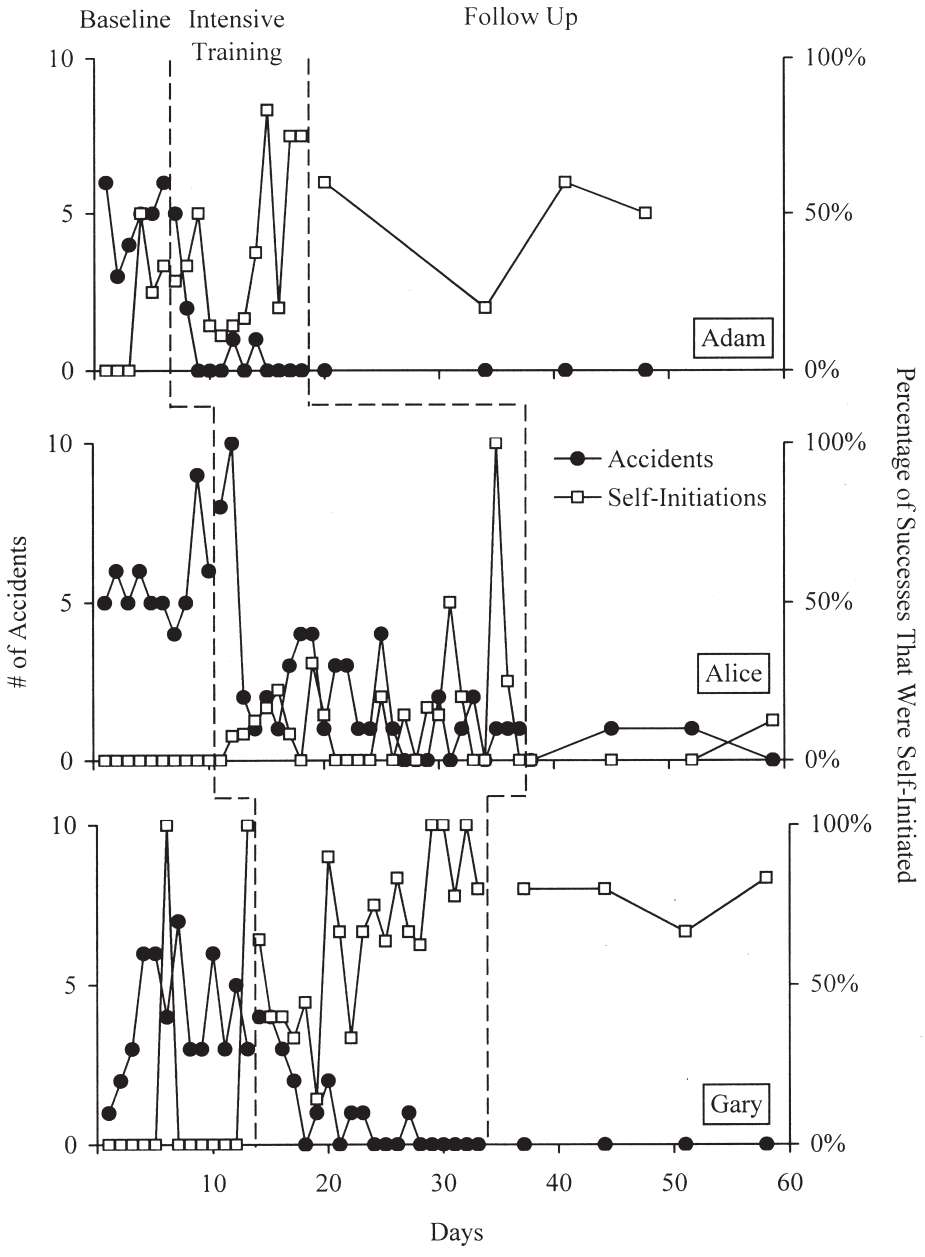

FIGURE 1. Number of accidents (left *y*-axis) and percentage of successful self-initiations (right *y*-axis) across baseline, intensive toilet training, and follow-up phases for each participant.

Alice

The results from Alice's treatment evaluation are depicted in the middle panel of Figure 1. During baseline, Alice had a mean of 5.6 (*SD* = 1.3) accidents per day and had no successes, self-initiated or otherwise. During the intensive toilet training period, which lasted 27 days, Alice's accidents were reduced to a mean of 2.1 (*SD* = 2.4) accidents per day. Her self-initiated toileting successes increased to a mean of 14.1% (*SD* = 21.0). During intensive training, Alice was exposed to 10 instances of positive practice and met criteria for removing the alarm and sitting schedule in 18 and 23 days, respectively. The four assessments that were conducted during the 22 days following intensive training revealed that Alice had two accidents (*M* = 0.5, *SD* = 0.6) and a mean of 3.1% (*SD* = 6.3) self-initiated toileting successes.

Gary

The results from Gary's treatment evaluation are depicted in the bottom panel of Figure 1. During baseline, Gary had a mean of 4.0 (*SD* = 1.8) accidents per day. An average of 15.4%

(*SD* = 37.6) of Gary's toileting successes were self-initiated. During the intensive toilet training period, which lasted 20 days, Gary's accidents were reduced to a mean of 1.0 (*SD* = 1.4) accident per day. His self-initiated toileting successes increased to a mean of 65.1% (*SD* = 24.5). During intensive training, Gary was exposed to 15 instances of positive practice and met criteria for removing the alarm and sitting schedule in 12 and 17 days, respectively. The four assessments that were conducted during the 25 days following intensive training revealed that Gary had zero accidents and a mean of 77.5% (*SD* = 7.4) self-initiated toileting successes, which indicate full continence.

Social Validity Assessment

After follow-up assessments were completed for all participants, each parent was given a copy of the *Treatment Evaluation Inventory–Short Form* (TEI-SF; Kelley, Heffer, Gresham, & Elliott, 1989) to anonymously rate the acceptability of the treatment procedures. The TEI-SF (see Table 2) is a rating scale with nine general statements regarding treatment (e.g., "I like the procedures used in this treatment."). Caregivers responded to each statement by indicating *strongly disagree*, *disagree*, *neutral*, *agree*, or *strongly agree*. Two of the three parents returned the form. One respondent provided the most positive rating for each of the assessment's nine items. The other respondent provided positive ratings (i.e., *agree* or *strongly agree*) on eight of the nine items. The remaining item, "I believe the child will experience discomfort during the treatment," was rated neutrally. Refer to Table 2 for a depiction of all of the responses to TEI-SF items.

DISCUSSION

An intensive behavioral toilet training intervention proved effective for three children with autism who had not responded to prior lower intensity behavioral interventions, such as sitting schedules and reinforcement. All treatment components except intermittent praise for successful toileting were removed by the end of the evaluation. All of the participants remained continent across settings at a 1-month follow-up assessment, and two of the three participants consistently initiated toileting on a daily basis. These effects are particularly striking because parents and school staff members were the intervention agents after the initial training day. These findings further advance the literature on toilet training due to several methodological improvements, including demonstration of experimental control using a multiple baseline design, thorough assessment of IOA across environments and experimental phases, and assessment of social validity.

Although our participants had not benefited from low-intensity scheduled toileting and reinforcement prior to the study, they did benefit from an intensive treatment package that included positive practice with an embedded avoidance contingency. Although our experimental design does not allow conclusions to be made about the specific treatment components that were responsible for the outcomes, it is worth noting that our participants experienced only 6 to 15 instances of positive practice before becoming continent. In addition, social validity data indicate that parents reported the treatment package acceptable, despite its inclusion of positive practice.

The data on self-initiations suggest that children can effectively respond to the sensation of bladder fullness and subsequently request a toileting opportunity. For two participants, the majority of toileting events were self-initiated, with the exception of those that might be prompted for any 4-year-old (e.g., before getting on the bus or going swimming). For a third participant (Alice), parents continued to provide frequent prompts despite our recommendations; thus, initial increases in self-initiated toileting were lost. Frequently prompted toileting events may remove the opportunity for the child to experience a full bladder, which could serve as a motivator (e.g., an establishing operation) for initiating toileting. These data may suggest that frequent toileting prompts must be faded from toilet training to sustain self-initiations. It is also worth noting that Alice was the only participant with whom a pictorial communication response was used. The use of such a communication form might have resulted in increased response effort for communication when the picture card was

TABLE 2
Parental Responses to the *Treatment Evaluation Inventory—Short Form*

Statement	Responses
I find this treatment to be an acceptable way of dealing with the child's problem behavior.	Strongly agree, strongly agree
I would be willing to use this procedure if I had to change the child's problem behavior.	Strongly agree, strongly agree
I believe that it would be acceptable to use this treatment without children's consent.	Agree, strongly agree
I like the procedures used in this treatment.	Strongly agree, strongly agree
I believe this treatment is likely to be effective.	Agree, strongly agree
I believe the child will experience discomfort during the treatment.	Neutral, strongly Disagree
I believe this treatment is likely to result in permanent improvement.	Agree, strongly agree
I believe it would be acceptable to use this treatment with individuals who cannot choose treatments for themselves.	Agree, strongly agree
Overall, I have a positive reaction to this treatment.	Strongly agree, strongly agree

Note. Possible responses included *strongly disagree, disagree, neutral, agree,* and *strongly agree.*

unavailable; however, this should be viewed only as a possibility because other differences also existed between Alice and the other participants (e.g., gender). Alice has since been served in an outpatient clinical setting where increased initiations were successfully targeted with additional communication training and removal of all extraneous prompts.

The following limitations should be noted about the present study. First, the baseline data for Adam indicate a slight increasing trend in self-initiations just prior to treatment implementation, although these self-initiations were not associated with a decrease in accidents. However, the immediate effects of the intervention produced dramatic decreases in accidents quickly with similar levels of self-initiations. Second, self-initiations were not maintained for Alice; however, she remained essentially continent with frequent toileting prompts. Third, due to practical constraints on data collectors, no procedural integrity data are available to ensure that the intervention was implemented exactly as prescribed. It is almost certainly the case that minor deviations in the protocol occurred; however, the successful outcomes indicate that the treatment package can remain effective even when procedural integrity is imperfect.

With respect to the intensive behavioral treatment of the incontinence of children with autism, the past few years have witnessed the publication of two single-participant demonstrations (Luiselli, 1997; Post & Kirkpatrick, 2004), one study with three participants that employed an A-B design (Cicero & Pfadt, 2002), and the present study, with three treatment-resistant participants employing a multiple baseline design. Such mounting evidence indicates that intensive behavioral toileting procedures are effective with children with pervasive developmental disorders and that they can be implemented in home and school settings by parents and school staff members, in addition to behavioral specialists. Furthermore, recent studies have investigated transfer-of-stimulus-control procedures (Luiselli, 1996), priming (Bainbridge & Myles, 1999), and socially maintained incontinence (Ricciardi & Luiselli, 2003), all with children with pervasive developmental disorders. Taken together, the aforementioned studies indicate renewed attention to the treatment of incontinence in this population. Future researchers might evaluate specific dissemination efforts, as well as additional evidence on the treatment of preschool children who might be better able to access community activities and mainstreamed educational environments in kindergarten and higher grades if they are continent. This latter goal is particularly important given the substantial advances being made in the behavioral treatment of autism (Maurice et al., 1996).

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AUTHORS' NOTE

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NOTE

This treatment package is similar to the original version described by Azrin and Foxx (1971) except that we did not include extensive training of toileting self-care skills, frequent delivery of preferred consequences while dry, extensive cleanliness training for accidents, or time-out for accidents.

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