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A parent training model for toilet training children with autism

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Abstract

Background Azrin & Foxx pioneered an intensive toilet training protocol for individuals with intellectual disability living in a residential setting. Since the development of the Rapid Toilet Training (RTT) protocol, many have replicated the efficacy, most notably in educational and outpatient treatment settings, but often training over longer periods of time. This study presents data from a parent training model that replicates Azrin and Foxx's results and training time.

Method This multiple baseline across subjects design study employs an ABA design where two boys diagnosed with autism were toilet trained using a modified Azrin & Foxx intensive teaching protocol. The first subject, a 4-year-old boy, did not have a history of attempted toilet training. The second subject, a 6-year-old boy, demonstrated a history of failed toilet training attempts in both the home and school settings. The trainings were conducted in the home setting where a novel parent-training approach was implemented.

Results Participant 1 was continent at the end of the second day of training, and completely toilet trained (including initiation and communication) by day 10 of the intervention. Participant 2 was continent after day 1 and completely toilet trained by day 5 of the intervention.

Conclusions Long-term follow-up demonstrates maintenance of skills 3 years post training. Social validity via parent satisfaction was assessed. Limitations to the current study and recommendations for future research were discussed.

Keywords autism, continence, parent training, self-initiation, toilet training, voiding

Azrin & Foxx (1971) made prominent gains in the remediation of incontinence in individuals with intellectual and developmental disabilities in developing the most widely cited treatment protocol for continence training. Many researchers have adapted minor components while maintaining the whole of the programme (i.e. positive reinforcement, hydration where the subject is provided increased access to fluids, scheduled sitting) and demonstrated successful continence training across a variety of developmental disability populations (e.g. Taylor *et al.* 1994; Luiselli 1997; Leblanc *et al.* 2005), with the removal of urine alarms (e.g. Cicero & Pfadt 2002; Post & Kirkpatrick 2004) and overcorrection and positive practice procedures where the subjects are typically required to clean the resultant soiled items and repeatedly practice walking to the bathroom from the site of the accident (e.g. Cicero & Pfadt

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2002). In addition, further models of toilet training maintaining core components such as reinforcement and intensity have also been developed (e.g. Didden *et al*. 2001; Averink *et al*. 2005) [see Kroeger and Sorensen-Burnworth (2009) for comprehensive review]. Most studies maintain shorter training times; however, many children referenced as continence trained demonstrate residual issues and the more components to the original study manipulated or removed from treatment protocols, the longer the training time appears to take (Kroeger & Sorensen-Burnworth 2009).

It would seem that parent training is a critical component to successful continence training and its maintenance over time as most individuals with autism live at home with their parents as primary caregivers. In addition, children with autism characteristically demonstrate difficulty in generalisation of skills across environments and persons making parent training even more critical (Lovaas 1987). Nonetheless, most frequently toilet training is still conducted in clinical and school settings (e.g. Cicero & Pfadt 2002; Averink *et al.* 2005; Leblanc *et al.* 2005), and the inclusion of parents in the training component is cited as a unique element (Leblanc *et al.* 2005). This could be problematic in the literature as the current trend for children with autism is to spend majority of their time in the home setting (as opposed to institutional) and demonstrate a documented history of poor generalisation of skill acquisition.

The current study sought to implement a parent-delivered, intensive training protocol implemented within the home setting without the use of punishment procedures, such as positive practice (repeated walking from accident site to bathroom), environmental restitution (cleaning self, soiled linens and soiled areas) or verbal reprimands (verbally telling child any version of 'No, don't pee in your pants.'). By training parents and subsequently their children within the home, issues of generalisation are circumvented in that the training is provided in the child's most common environment with the child's most frequent caregiver (parents). Moreover, when young children leave their homes they are often accompanied by parents (such as going to a relative's house, shopping centre or therapy sessions), thus bringing their 'toilet trainers' and skills with them to new settings increasing the likelihood of generalisation. In addition, it has been suggested that punishment procedures are not critical elements of the rapid training procedure (e.g. Cicero & Pfadt 2002) and clinical anecdotal observation noted that parents are routinely not consistent in their delivery of punishment and its proper procedure. Moreover, with the cited exponential increase in autism spectrum diagnoses, lay persons, direct care staff and professionals outside the field of autism often consider autism to be categorically different from other developmental disabilities creating an increased need to document efficacy of established intensive toilet training interventions on this population as well. Because of this noted trend and in combination with the difficulties in communication and generalisation inherent to a spectrum diagnosis, particular attention also has been noted in generalisation and communication training within the procedural description.

Method

Participants

Marvin, a Caucasian boy, was 4 years, 11 months at the time of implementing the toilet training programme. Marvin was diagnosed with autistic disorder at age 3 by a multidisciplinary team at an autism clinic in a university-affiliated children's hospital. Marvin received a score of 15 (cut-off score of 12 for autism diagnosis) on Module 1 of the Autism Diagnostic Observation Schedule – General (ADOS-G; Lord *et al.* 2000). In addition, he had a Vineland Adaptive Behavior Scales (VABS; Sparrow *et al.* 1984) Composite score of 65 (X = 100, SD = 15) and Bayley Scales of Infant Development – Second Edition (BSID-II; Bayley 1993) Mental Development Index of 58 (X = 100, SD = 15). Marvin was functionally nonverbal and primarily communicated through the use of the Picture Exchange Communication System (PECS; Bondy & Frost 1994) where he was communicating in phase IV (sentence construction).

Attempts to train Marvin previously had not occurred and he would only tolerate sitting on the toilet for a few seconds with the lid closed. Marvin wore diapers on a routine basis. Marvin demon-

strated one-half of one of the toileting prerequisites generally recommended by paediatricians (Brazelton *et al*. 1999). Of the seven prerequisites (stay dry for at least 2 h at a time, regular bowel movement schedule, follow simple instructions, demonstrate discomfort with dirty diapers, ask to use the toilet, request to wear underwear, pull pants up and down), Marvin was able to pull his pants up.

Chris, a Caucasian boy, was 6 years, 4 months at the time of the training intervention. Chris was diagnosed with autistic disorder at age 3 by a multidisciplinary team at an autism clinic in a university-affiliated children's hospital. Chris received a score of 15 (cut-off score of 12 for autism diagnosis) on Module 1 of the ADOS-G. He was also nonverbal and communicating in phase IV of the PECS protocol.

Previous attempts in the home and school setting failed to train Chris. His parents stated that a minimum of two separate attempts were made to train Chris at home and school. By verbal description, all of those attempts were primarily systematically scheduled pots with the planned consequence of verbal praise for successful voids. By the time of intake, Chris occasionally voided in the toilet during a scheduled sit when seated by an adult; he wore pull-up diapers on a routine basis. Of the recommended toileting prerequisites, Chris demonstrated three readiness behaviours on a routine basis including staying dry for at least 2 h at a time, a regular bowel movement schedule, demonstrating discomfort with dirty diapers via removal of the soiled linen, and pulling pants up and down.

The participants were selected as a sample of convenience. They were selected for study post-training given their completeness of datasets (including follow-up data) and anecdotal reported similarity to children with autism most frequently presenting to developmental disabilities clinics requesting toileting services. The selected participants provide a sample of (1) children with autism not attempted to train (Marvin); and (2) children with autism who fail to train without professional intervention (Chris).

Permission to publish archival clinical data from which these cases were derived was obtained through the governing children's hospital institutional review board.

Setting

All training occurred in the first-floor bathroom of the children's home. Both training bathrooms contained a toilet and sink. For Marvin, the bathroom was adjoined to the family's laundry facility; however, the child was not permitted in that section of the bathroom during the training. A small stool for the trainer (and subsequent parent) was included in front of the toilet. A bin of preferred but not highly motivating toys was also accessible to the trainer and parent, as well as a clipboard with datasheets and edible reinforcers. An audible timer was used to signal scheduled pots and cessation of breaks. Once the children were demonstrating routine continence, the toileting skill was then generalised first to other bathrooms within the home and then systematically to other familiar and routine settings for each child.

Data collection and interobserver agreement

Data were collected continuously throughout the baseline, training and return to baseline periods. For Marvin, baseline lasted 8 days, training for 4 days and return to baseline was 7 days recorded. Chris had a recorded baseline of 4 days, training period of 5 days and return to baseline data recorded for 3 days. Across all study phases, data were collected on frequency of in-toilet voids, self-initiations to use the toilet and accidents. For the purposes of this study, an in-toilet void was recorded when urine or faeces were directly deposited into the toilet, a self-initiation was indicated when the participant child independently went to the bathroom and subsequently voided without the use of verbal or physical prompts at any point in the behavioural sequence, and an accident was noted to occur any time a void occurred away from/off of the toilet. Data were recorded on both number of accidents and self-initiations as a child may not have accidents, however, also may not be independently toilet trained in that all or most voids are prompted by another person or event (such as a schedule).

Reliability was assessed during the first day of treatment only for the time when the trainer and parent were both physically involved in the training. Data were recorded for voids, initiations and acci-

dents. Interobserver agreement (IOA) during the training time was 100% (calculated using the exact agreement method) for both subjects and continued reliability was not obtained in accordance with reasons cited in Cicero & Pfadt (2002) including the obviousness of the operationally defined behaviour, historically high IOA associated with toilet training and high current IOA for the 6-h training periods. Long-term follow-up data with IOA were not collected as parent report was considered a reliable source.

Procedure

Medical consent and clearance were ascertained from the children's attending developmental paediatricians before beginning the intensive training procedure. The procedure used was adapted by the second author from Leaf & McEachin (1999) based on the Azrin & Foxx (1971) intensive training approach. Training occurred upon waking in the morning and continued until the child went to bed in the evening (all waking hours).

Stimulus preference assessment

The participant children's mothers were interviewed prior to baseline data collection using a reinforcer interview modified from the Reinforcer Assessment for Individuals with Severe Disabilities (RAISD; Fisher *et al.* 1996). Based upon interview findings, Marvin's target potent reinforcers were identified as popsicles, candy-coated chocolate candies and access to a computer (preferred website/game), while playing on the outside swing-set and fish-shaped cheese crackers were identified as principal reinforcers for Chris. The families were asked to restrict the children's access to these reinforcers for a minimum of 3 days prior to implementing the intensive training treatment protocol.

Experimental design and baseline

This study collected data across two subjects in an ABA design in that baseline data were collected, the training programme implemented and then training components were removed and the children left to initiate and pot on their own. Baseline data for frequency of voids were manually assessed via wet/dry checks and collected across environments (home, school and other), as well as recorded for all in-toilet voids and self-initiations. Data demonstrated a reliable pattern of primary incontinence, hence treatment was initiated. Treatment (formal training) ended when the children were reliably continent (one or less accidents per day) and self-initiating use of the toilet more than half the time for voids (50% or greater). Leblanc *et al.* (2005) noted the higher occurrence of parental prompting to use the restroom when training younger children (i.e. the younger the child the more likely the parent to prompt or remind to use the restroom). Follow-up data were collected at 2 weeks, 6 months and 3 years post-training in order to assess for long-term maintenance of continence and initiation of toilet use, as well as overall consumer satisfaction and social validity.

Intensive toilet training programme components

The intensive training treatment components consisted of the following: (1) increased fluids; (2) scheduled sitting on toilet; (3) positive and negative reinforcement for target behaviour (in-toilet voids); (4) redirection for accidents; and (5) scheduled sitting on a chair (as opposed to toilet) to increase self-initiations.

Increased fluids

Parents were instructed to increase the children's access to fluids for 3 days prior to implementing the training in order to assure they were well-hydrated and to provide for maximum opportunity for voiding success when beginning to implement the protocol. It was recommended to consult with their paediatricians to determine a safe volume of liquids in order to avoid over-hydration and the minimal potential risk of hyponatremia. Increased fluid intake was continued until 18:00 h on day 1 of training.

Toilet scheduled sitting

The boys were undressed from the waist down and continuously seated on the toilet with planned escape for appropriate voids or brief time-outs from sitting in order to stretch and move their legs during non-void intervals. As they increased their number of appropriate voids, the time for scheduled

Table 1 Toilet scheduled sitting fade schedule

30 min on toilet	5-min break for successful void
25 min on toilet	10-min break for successful void
20 min on toilet	15-min break for successful void

sitting on the toilet was systematically reduced and time off of the toilet increased. Time on the toilet was reduced and time on break increased when the children successfully voided three times during a given time ratio. Table 1 summarises the sitting schedule and time on/off ratios. The children were permitted to play with preferred (but not highly reinforcing) toys while seated on the toilet in order to prevent boredom and potential inappropriate behaviours associated with the prolonged sits. If the child did not void during the allotted scheduled sit time, he was permitted off the toilet for 2 min but restricted to remain in the bathroom until the 2-min break elapsed. If the child successfully voided in the toilet, he immediately was permitted a longer break off of the toilet and outside of the bathroom.

Reinforcement for continent voids

If the children successfully voided while on a scheduled sit, they were provided immediate reinforcement (primary edible reinforcement and planned escape to a preferred activity). If the child self-initiated a void while on break, he was provided immediate reinforcement and a new break time was begun after the self-initiated void (e.g. if he was 3 min into a break and self-initiated use of the toilet, his break was then restarted for the full break time after the void was complete). Both of these situations were accompanied by verbal praise and behaviour-specific labelling of the target behaviour.

Redirection for accidents

If an accident occurred on break, the children were administered a neutral verbal redirection (i.e. 'We go pee-pee on the toilet.') and physically redirected back to the toilet. Once on the toilet a scheduled sit was initiated. If they finished voiding in the toilet after the physical redirection, they were reinforced and the void treated as a successful void.

Chair scheduled sitting

If the children were successful at voiding in the toilet on a 20-min on/15-min break schedule but not yet self-initiating, the initiation training component of the treatment protocol was then implemented; this occurred midday of day 1 for Marvin and in the late morning of day 1 for Chris. A chair was placed next to the toilet and the child seated there instead of on the toilet for the scheduled sits. When beginning a void, if the child did not move from the chair to the toilet, he was provided the least intrusive, minimal, physical prompt. When he independently moved from the chair to the toilet to void three consecutive times, the chair was systematically moved away from the toilet in 2-feet increments. Once the chair was 20 feet from the toilet, time was again systematically decreased for scheduled sits by 5 min and break time increased by 5 min. When the time ratio was at 30-min break/5-min scheduled sits and self-initiations were 50% of the time or greater, protocol was discontinued.

Planned generalisation

Once the children demonstrated reliable continence as outlined above, they were introduced to planned generalisation in order to increase the likelihood of successful toilet training as well as positive skill transfer. They were first shown and required to use another toilet in the home setting and then systematically generalised to other bathrooms in their routine settings outside the home. For Marvin, this occurred on day 3 for different toilet within the home and days 6 (therapy sessions and school) and 10 (public library) for settings outside the home. For Chris generalisation probes occurred on days 5 (different toilet within home), 6 (school setting) and 7 (grandparent's house).

Intensive toilet training caregiver training protocol

The children's parents were the primary caregivers and trained in the toileting protocol as described above on day 1 of the intervention. At the beginning of day 1, protocol details were verbally reviewed with each child's parents, including operational definitions for both successful and accidental voids, component strategies of the training protocol, data collection and prompt fading techniques. The

trainer was present in each child's home for six consecutive hours. The first 3 h the trainer coordinated and modelled the intensive training while the parents observed, and the following 3 h the parents implemented the training while the trainer observed and coached the parents. At the conclusion of the 6-h trainer visit, written protocol was provided for the family reviewing the above and including immediate contact information for the trainer. Verbal directions were then additionally provided for continuing the child in protocol from his current level. The families were instructed to contact the trainer with any additional questions or concerns. Marvin's parents contacted the trainer five times for the following concerns: concern on redressing for outside play (day 2), concern regarding prompt dependency on auditory component of the timer (day 3), review of protocol to fade chair prompt use and discontinue protocol (day 4), review of protocol to discontinue verbal prompts for use of toilet (day 5) and review of protocol to fade all prompts (day 7). Chris's parents also contacted the trainer five times for concerns regarding review of accident protocol during initiation training (day 1), reduction of physical prompts during initiation training (day 2), reduction of unobtrusive prompts (eye contact) during initiation training (day 2), runny bowel movements during training (day 3) and removal of chair from initiation protocol and fading training protocol overall (day 4).

Results

Figure 1 illustrates the accident and self-initiation percentages of daily voids for Chris across baseline, treatment and follow-up phases. At the beginning of the fifth day, all treatment components, including scheduled sits, reinforcement and prompting for independence, were discontinued. Beginning day 6 (return to baseline period), Chris was independently potting and requesting to use the restroom (via PECS).

Figure 2 illustrates the accident and self-initiation percentages of daily voids for Marvin across study phases. By the beginning of the fifth day, all treatment components, including scheduled sits and reinforcement, were discontinued and by the 2-week follow-up physical and verbal prompts were completely faded and removed. The additional prompts were discontinued on day 7 of the training; however, it could not be ascertained that they did not inadvertently occur on occasion until the 2-week follow-up. Therefore, the treatment components that taught and maintained the continent behaviour were discontinued at the conclusion of day 4 of training and all residual parental prompts and reminders were discontinued previous to the 2-week follow-up.

It should be noted that percentages (number of accidents or self-initiations divided by total voids) were reported. Therefore, due to the decrease in overall number of voids after the discontinuation of increased fluids, the number of accidents appears slightly inflated. Beginning with day 4 and continuing for all remaining consecutive data collection days, Marvin only had one accidental void when accidents were indicated. By the 2-week follow-up Marvin did not have any accidents and this zero-accident rate continued at the 6-month and 3-year follow-ups. Table 2 provides the raw data ratio of in-toilet voids to accidents for the participants.

On day 2 of training, the void accident was faecal incontinence (first bowel movement since training implementation) and was behaviourally managed as with urinary incontinence (i.e. verbal and physical redirection). On day 3, the audible timer to signal break and scheduled sitting times was removed in order to dissuade auditory prompt dependency. Beginning day 5, removal of the chair prompt and return to typical home activities were implemented. Day 6 was reintroduction to routine activities outside the home (e.g. school, speech therapy) and generalisation of toileting skills outside the home setting. It should be noted that self-initiations did not occur on this day and follow-up probes indicated that the participant's mother reverted to delivering routine verbal prompts (e.g. asking 'Do you have to go to the bathroom?') to initiate use of the restroom. This is not an uncommon phenomenon when skills are generalised to settings where incontinence carries higher social stigma and more complex restitution routines (e.g. cleaning, changing). Marvin's mother was again instructed to remove all verbal and physical prompts beyond what was deemed appropriate given child's chronological age (it was permissible to provide a toileting reminder before car/bus trips and going to bed).

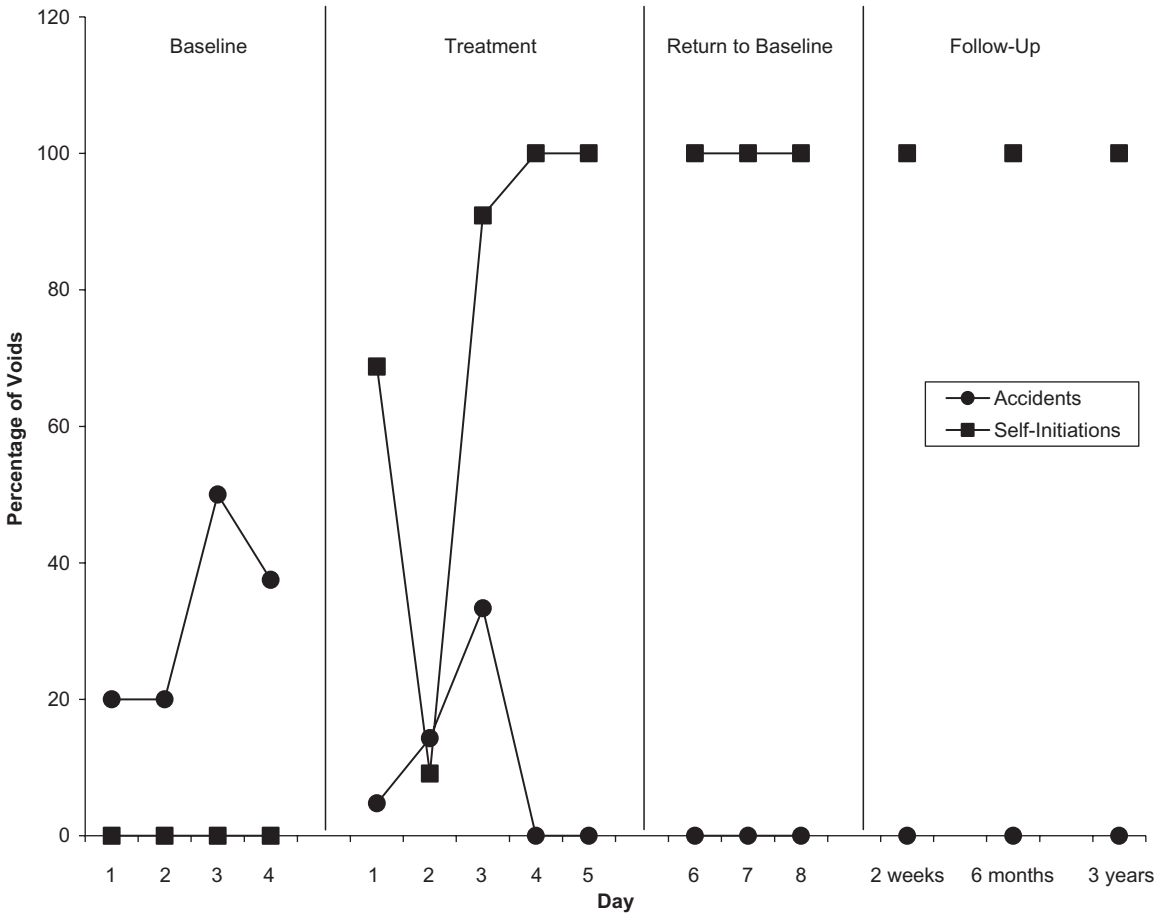

Figure 1 Percentage of daily accidents and self-initiations for voids for Chris.

Day 8 introduced communication training to the participant child via PECS. When going to the bathroom, he was prompted to construct the communication sentence 'I want bathroom' using the corresponding icons. Data collection was discontinued after day 11 as the parents reported that the participant child was independently initiating use of the toilet (with exception of two verbal reminders per day when getting on the bus to and from school) with an absence of accidental voids.

Faecal continence was not trained for separately in this protocol. Both participants had faecal accidents on the first and second days of training, which were consequated the same as urinary accidents, and demonstrated in-toilet voids for bowel movements by midday on the second day of training. Residual issues were not noted or reported to occur otherwise during the remainder of training or at follow-up probes. This reduced need to train for faecal continence was likely circumvented due to the intensity of training in that the children were not long away from the toilet during the initial phases of training.

Social validity measure

After training and follow-ups were complete, a social validity measure was sent to the participants' parents for completion and return in order to assess the procedures acceptability, feasibility and adverse events. The Treatment Evaluation Inventory – Short Form (TEI-SF; Kelley *et al*. 1989) results yielded that the families were highly satisfied with the treatment, procedures, acceptability and effectiveness,

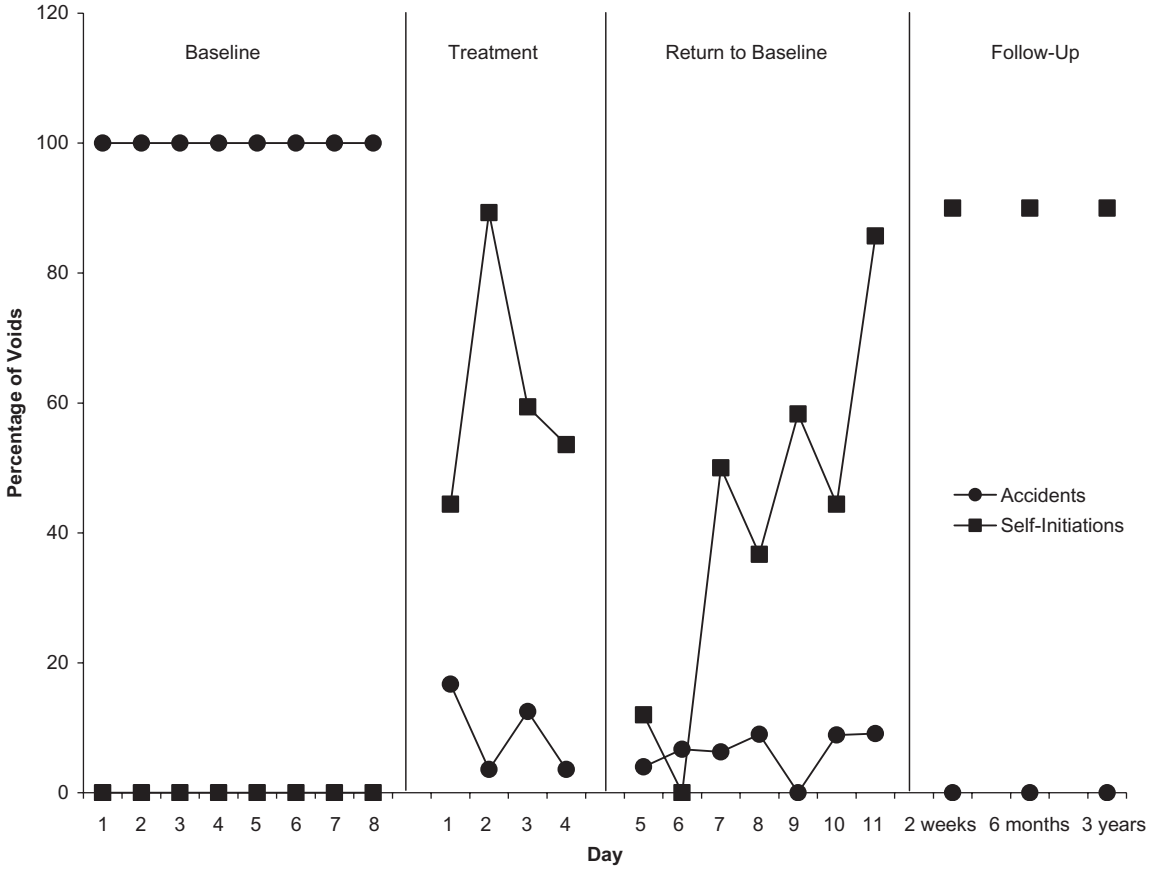

Figure 2 Percentage of daily accidents and self-initiations for voids for Marvin.

Table 2 Ratio of frequency of in-toilet voids to accidents per day for participants

Day	Marvin	Chris
1	30:6	20:6
2	27:1	12:2
3	28:4	10:4
4	27:1	10:0
5	24:1	12:0
6	14:1	7:0
7	15:1	9:0
8	10:1	
9	12:0	
10	8:1	
11	10:1	
12	4:0	
13	5:0	
14	5:0	5:0

and did not associate the protocol with related child discomfort. Per parental reports, the intensive training procedure used was deemed to be high in social validity.

Discussion

The results for this study indicate that the outlined intensive training protocol was highly successful in providing caregiver training to effectively toilet train two children with autism to independently use the toilet in a relatively short amount of time and maintain the skill over time. The model appears to be promising for children who are both newly introduced to toilet training as well as resistant to training attempts. These results are also hopeful in that the described model could reduce the clinical time spent with professionals in training continence

(allowing accessible training to more children), increase parental self-efficacy in working with their children with autism, reduce the need for home generalisation training and achieve independent toileting in a short time while accounting for resolution of residual issues (i.e. initiation, bowel movement training and communication) as well. In addition, children with autism are characteristically impeded by issues restricting generalisation of skills newly learned and communication in general. This study successfully trained the two participants for continence while also accounting for and successfully achieving generalisation and communication in regard to toileting.

This protocol replicates Azrin and Foxx's rapid toilet training (RTT) protocol original training time (matched 4-day training time with median 4-day training). More recent studies focused on training children with autism (e.g. Cicero & Pfadt 2002; Leblanc *et al.* 2005) were slightly longer in training time (7–11 days and 12–27 days, respectively) despite utilising similar training procedures. Cicero & Pfadt (2002) called into question the chronic difficulty in replicating the Azrin/Foxx RTT training time. Perhaps, the discriminating factor lies instead in the trainer, or implementer, of the protocol. Both the current study and original Azrin and Foxx study trained the primary caregivers for the target participants (parents and direct care institution staff, respectively) as opposed to 'part-time' primary caregivers (e.g. trained support staff or teachers). The advantage of primary caregivers is twofold: (1) the motivation for the participants to achieve continence could be greater in persons who are primarily responsible for changing, cleaning and maintaining the living areas of the participants as cited by Azrin & Foxx (1971), as well as (2) the primary caregivers are also going to be the most aware of subtle cues, responses and behaviours of the participants leading to potentially faster reaction time or hypervigilance to potting behaviours and occurrences. In addition, the training was also implemented in the primary setting for the participants (home and institution living ward again, respectively) where the participant is most familiar and adept in manipulating. Perhaps person and place could be more important factors than originally suspected in the speedy training of children with autism.

While it was suggested that the removal or manipulation of the original components to the Azrin & Foxx (1971) protocol could account for longer training times, this study counters that such a statement would appear to be untrue. Again exists the possibility that the setting and primary caregiver as trainer are critical components to successful and brief training reminiscent of RTT protocol. The current study varied from the RTT protocol in the use of urine sensing devices, delivering differential reinforcement of alternative behaviours (DRA) for remaining dry during off-toilet times, and implementing the use of punishment.

The current study eliminated the use of urine-detecting apparati, including in-pants and in-toilet sensors. In-pants sensors were not necessary for urine detection as the children were (initially) naked from waist down (clothing was systematically redressed as the children demonstrated incremental success with maintenance of low accidents). This was possible because the training was conducted in the privacy of the children's homes where it would be acceptable to remain unclothed. The urine alarm was required in the RTT trials due to the shared public space and unethical ability to disrobe the participants. In the home setting, the use of a urine alarm is rather an unnecessary, additional and costly step. Moreover, in-toilet sensors were not required in this study due to the nature of the caregiver. Parents would be more comfortable visually observing their child's genitalia in anticipation of voids (as opposed to paid support staff working with adults in the RTT studies) thus again removing the need for costly, additional materials. Therefore, the same result was achieved in the two different training protocols albeit using different methods due to the change in persons used as primary trainer.

Another variation in protocol was the removal of DRA during dry periods off of scheduled sits in the current training protocol. This change likely maintained the training time in that different from the RTT studies was the extended scheduled sit times in the current study. The participants had less time to void while on break reducing the need to differentially reinforce the absence of the incontinent behaviour. Hence, the longer sit time may have resulted in more frequent reinforcement for target behaviour and ultimately similar reinforcement schedules when the DRA was used with the RTT participants.

Another variation in protocol is the implementation of punishment procedures, notably restitution and positive practice. While more recent publications cite reduced and/or varied use of punishment procedures (e.g. Duker *et al.* 2001; Cicero & Pfadt 2002; Averink *et al.* 2005; Leblanc *et al.* 2005) most also demonstrate increases in training time. The current study is the least restrictive and essentially 'punishment-free' in protocol design. Planned consequences for accidents were providing a simple verbal redirection ('We pee on the toilet.') and walking the participant to the toilet. However, it should be noted that after the occurrence of the (first) bowel movement accident for Marvin, his parents restricted access to the computer post-accident since he was playing on the computer when the accident occurred. While this was not a planned protocol consequence, it was indeed a form of negative punishment and could most certainly have influenced subsequent incontinent behaviour. Cicero & Pfadt (2002) cite that parental involvement in current training protocols is likely higher and more socially acceptable due to reductions in positive punishment procedures. Perhaps the use of negative punishment procedures could be useful as the one-time occurrence of it in the current study was indeed parent initiated. In addition, current parent rearing practices are more characteristic of negative (e.g. grounding, privilege restriction) versus positive punishment (e.g. spanking, overcorrection) use.

Parents of incontinent children with developmental disabilities report higher personal stress and distress likely related to the toileting problems presented by their children than parents of toilet trained children with developmental disabilities (Macias *et al.* 2006). It could be deduced then that continence training not only increases quality of life factors for the child by increasing associated hygiene factors and access to activities and placements, but also increases the quality of life for the parents by reducing stress and subsequently for other family members such as siblings as corollary recipients of the distress. Toilet training could then be one source of long-term stress reduction for families with individuals with pervasive developmental disorders. Therefore, the social acceptability of this intensive protocol is key in that the protocol is parent-delivered in the child's home and were it not socially valid it would be rendered a useless treatment protocol due to lack of implementation.

Dalrymple & Ruble (1992) generated survey results that indicated 30% of individuals with autism who were toilet trained regressed in training at some later point in time. Hyams *et al.* (1992) additionally noted regression in reference to self-initiation in a review of long-term follow-up of toilet training in developmental disabilities. The current participants have maintained continence as well as void self-initiation for over 4 years at the time of publication. Perhaps the currently demonstrated resistance to regression is again with the parents as primary trainers in that they have the tools necessary (as direct executors of the initial training protocol) to prevent regression in toileting. That is, since they provided the original training, they additionally have the training tools on hand to prevent any subsequent regression or backslide in toileting.

The current study could be criticised that it is not a 'true' ABA treatment design in that while most of the treatment procedures were definitively discontinued and returned to baseline conditions (scheduled chair sits, tangible reinforcement and timer removals), verbal and physical prompting were significantly reduced but still faded over time. Still, those named core treatment components that signal the intensive training protocol were removed leaving the child to pot independently. It is hard to conceive that the participant children would spontaneously become continent during this time as they had not spontaneously voided on the toilet previously and toilet training was not successful or attempted (depending on the participant child) across settings. Similar conclusions were made by Cicero & Pfadt (2002) in their study. The current study's findings instead suggest a behavioural trap as described by Baer *et al.* (1976) where the toileting skills developed through the applied intervention (subsequently removed) were maintained by the natural environment in that the children were internally rewarded (i.e. comfort and cleanliness) for the continent behaviour and the behaviour itself became a learned/automatic behaviour.

Areas of future research for this protocol would be to investigate its effectiveness in additional training-resistant children and adults with autism. Only two children's datasets were presented limiting

the ability to generalise the results and procedure. In addition, as the treatment resources for children with autism nationwide are limited, it may be of benefit to test this protocol in a group treatment setting where the parents are provided training in the intensive protocol, video clips of training scenarios shown, and then sent home to implement with their children. Such a group treatment would even further reduce the clinical hours of professional time while servicing more individuals with autism in this critical area of self-sufficiency and independent behaviour.

In conclusion, however, is the promising result offered by the current study in that a parent-training protocol was successfully implemented in the home environment, leading to reduced professional time while maintaining high social validity with the caregivers. This study contributes to the currently growing body of toileting research investigating the effectiveness of established training protocols on young children diagnosed with pervasive developmental disorders. Similar to conclusions made by Leblanc *et al*. (2005), commensurate with early intervention in general, the earlier the children demonstrate acquisition of such behaviours the more opportunity they have to participate in typical community events and mainstream educational placements.

References

Averink M., Melein L. & Duker P. C. (2005) Establishing diurnal bladder control with the response restriction method: extended study on its effectiveness. *Research in Developmental Disabilities* **26,** 143–51.

Azrin N. H. & Foxx R. M. (1971) A rapid method of toilet training the institutionalized retarded. *Journal of Applied Behavior Analysis* **4,** 89–99.

Baer D., Rowbury T. & Goetz E. (1976) Behavioral traps in preschool: a proposal for research. *Minnesota Symposia on Child Psychology* **10,** 3–27.

Bayley N. (1993) *Bayley Scales of Infant Development*, 2nd edn. Psychological Corporation, San Antonio, TX.

Bondy A. & Frost L. (1994) The picture exchange communication system. *Focus on Autistic Behavior* **9,** 1–19.

Brazelton T. B., Christophersen E. R., Frauman A. C., Gorski P. A., Poole J. M., Stadtler A. C. *et al.* (1999) Instruction, timeliness, and medical influences affecting toilet training. *Pediatrics* **103,** 1353–8.

Cicero F. R. & Pfadt A. (2002) Investigation of a reinforcement-based toilet training procedure for children with autism. *Research in Developmental Disabilities* **23,** 319–31.

Dalrymple N. J. & Ruble L. A. (1992) Toilet training and behaviors of people with autism: parent views. *Journal of Autism and Developmental Disorders* **22,** 265–75.

Didden R., Sikkema S. P., Bosman I. T., Duker P. C. & Curfs L. M. (2001) Use of a modified Azrin-Foxx toilet training procedure with individuals with Angelman-Syndrome. *Journal of Applied Research in Intellectual Disabilities* **14,** 64–70.

Duker P. C., Averink M. & Melein L. (2001) Response restriction as a method to establish diurnal bladder control. *American Journal on Mental Retardation* **106,** 209–15.

Fisher W. W., Piazza C. C., Bowman L. G. & Amari A. (1996) Integrating caregiver report with a systematic choice assessment to enhance reinforcer identification. *American Journal of Mental Retardation* **101,** 15–25.

Hyams G., McCoull K., Smith P. S. & Tyrer S. P. (1992) Behavioural continence training in mental handicap: a 10-year follow-up study. *Journal of Intellectual Disability Research* **36,** 551–8.

Kelley M. L., Heffer R. W., Gresham F. M. & Elliott S. N. (1989) Development of a modified treatment evaluation inventory. *Journal of Psychopathology and Behavioral Assessment* **11,** 235–47.

Kroeger K. A. & Sorensen-Burnworth R. (2009) Toilet training individuals with autism and other developmental disabilities: a critical review. *Research in Autism Spectrum Disorders (2009)*, doi:10.1016/j.rasd.2009.01.005.

Leaf R. & McEachin J. (1999) *A Work in Progress: Behavior Management Strategies and A Curriculum for Intensive Behavioral Treatment of Autism*. Autism Partnership, New York, NY.

LeBlanc L. A., Carr J. E., Crossett S. E., Bennett C. M. & Detweiler D. D. (2005) Intensive outpatient behavioral treatment of primary urinary incontinence of children with autism. *Focus on Autism and Other Developmental Disabilities* **20,** 98–105.

Lord C., Risi S., Lambrecht L., Cook E. H., Leventhal B. L., DiLavore P. C. *et al.* (2000) The Autism Diagnostic Observation Schedule-Generic: a standard measure of social and communication deficits associated with the spectrum of autism. *Journal of Autism and Developmental Disorders* **30,** 205–30.

Lovaas O. I. (1987) Behavioral treatment and normal education and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology* **55,** 3–9.

Luiselli J. K. (1997) Teaching toilet skills in a public school setting to a child with pervasive developmental disorder. *Journal of Behavior Therapy and Experimental Psychiatry* **28,** 163–8.

Macias M. M., Roberts K. M., Saylor C. F. & Fussell J. J. (2006) Toileting concerns, parenting stress, and behavior problems in children with special health care needs. *Clinical Pediatrics* **45,** 415–22.

Post A. R. & Kirkpatrick M. A. (2004) Toilet training for a young boy with pervasive developmental disorder. *Behavioral Interventions* **19,** 45–50.

Sparrow S. S., Balla D. A. & Cicchetti D. V. (1984) *The Vineland Adaptive Behavioral Scales*. American Guidance Service, Circle Pines, MN.

Taylor S., Cipani E. & Clardy A. (1994) A stimulus control technique for improving the efficacy of an established toilet training program. *Journal of Behavior Therapy and Experimental Psychiatry* **25,** 155–60.

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