

"Errorless" Toilet Training: "The Potty Party"

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Abstract

The current study describes the use of a procedure called the "potty party", an all-day toilet training method using basic learning principles of "errorless" discrimination with 3 children with incontinence diagnosed with autism. At the start of treatment days, each participant was greeted and prompted to request the bathroom. After the child requested the bathroom, they were taken to the restroom, pants and underpants were removed, the child was seated on the toilet. While on-seat, participants were given liquids, less-preferred reinforcers and engaged in typical daily activities such as discrete trial training. When the child voided in the toilet, specific verbal praise and highly preferred edible reinforcers were delivered. The child was also given time off the toilet with their most preferred toys or items/activities. Time off-toilet subsequently increased with each in-toilet urination until the participants were spending the same amount of time off-toilet, out-of-bathroom, and in the classroom as their peers. Results for all three participants using 3 non-concurrent A-B phase designs indicated that the potty party procedure was effective in decreasing accidents to zero levels for all three participants and increased in-toilet urination for two. Future directions for research in toileting are discussed.

Keywords: Toilet Training, Autism, Errorless Learning, Applied Behavior Analysis

Introduction

Learning to use the toilet is a critical life skill (Francis, Mannion, & Leader, 2017; Kroger & Soren-Burnworth, 2009). However, many children with autism and other developmental disabilities have difficulty acquiring this skill and can enter their teen years or go their entire lives without mastering toileting. Therefore, it is desirable to have effective protocols to teach toileting. Almost all modern toileting protocols are based on the Rapid Toilet Training (RTT) method developed by Azrin and Foxx (1971). In the RTT method, Azrin and Foxx describe toilet training as "a complex and lengthy chain of responses that includes social, physical and physiological stimuli and requires strong positive and negative operant consequences for its maintenance in that chain, rather and considering it as a simple associative muscular reflex to internal stimuli" (p. 98). These protocols generally include graduated guidance, reinforcement, scheduled sittings, hydration, and stimulus control procedures involving changing controlling antecedents from "other" (e.g., diapers) to toilet (Kroeger & Sorensen-Bunworth, 2009).

Errorless Learning and Toileting

Because errorless learning "can create situations in which limiting the incorrect response in a learning task is ideal" errorless learning may be a preferred procedure to use with children with developmental disabilities such as autism that often display "response overselectivity and overgeneralization combined with problematic behaviors in response to failure or novel tasks" (Mueller, Palkovic, & Maynard, 2007, p. 695). Errorless learning or "errorless discrimination" was developed by Herbert Terrace (1963) initially to teach color discrimination to pigeons. Terrace presented the target color (discriminative stimulus, S^d) brightly to the pigeon for extended periods of time (3 minutes) and presented the incorrect color (S^a) dimly for only a brief period of time (5 seconds).

This method made it very likely pigeons would respond to the S^d and made it very unlikely that they would incorrectly respond to the S^a . As correct responding increased and errors remained virtually nonexistent, the duration of the S^d and its brightness gradually increased until they were equal to the duration and brightness of the S^a . This procedure resulted in a reduction of errors from several thousand, with conventional discrimination training, to 25 or less with "errorless" learning. Few errors occur because the appropriate situation or setting for a correct response is in effect for extended periods of time while the conditions under which errors may occur are presented only briefly.

The present study investigated an approach to errorless toilet training described in teaching circles in Northeast and Central Ohio as the "potty party". This approach, however, is different than other interventions called potty parties in several self-help books for parents on toilet training their child (e.g., Crane, 2006; Williamson, 2012). The potty party method described here aims to make sitting on the toilet a reinforcing activity (a party), keeps the child on the toilet from the beginning of the day until successful voiding in the toilet occurs, and increase time off toilet gradually throughout the day contingent on success of the learner. Powerful reinforcers including social and tangible consequences, are delivered contingent on successful voiding. The probability of success is maximized because the potty party method utilizes procedures of errorless discrimination training in that the child is sitting on the toilet for long durations of time and is thus substantially more likely to void in the toilet. The potty party method is conceptually in agreement with both RTT and Terrace's (1963) conception of toileting as an operant response that is susceptible to training by operant procedures such as reinforcement and errorless learning that can produce stimulus control by exteroceptive stimuli as well as internal stimuli such as a full bladder. In addition to creating an ideal situation for toilet training where the probability

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of an accident is virtually zero, the procedure also employs established behavioral techniques such as contingent positive social/tangible reinforcement, consistent scheduling, and teaching functional requesting. To our knowledge, no study has investigated the effectiveness of the potty party to teach toileting to children with autism. Therefore, the current study investigated the potty party for its effectiveness with teaching toileting to three children with autism in an initial attempt to establish its empirical validity.

Method

Participants

Three males ages 4 (Joey), 6 (Billy), and 8 (David) enrolled full-time at a center for autism in Northeast Ohio were selected for inclusion in the current study (names reported are pseudonyms). Each had a previous diagnosis of autism and exhibited (by observation and teacher report) at least some of the physical and behavioral readiness to begin toilet training such as imitative behavior, ability to sit without assistance, expressing a need to urinate, dressing and undressing, and other self-management skills (Kaerts, Van Hal, Vermandel, & Wynsdaele, 2012). Consent for participation was gained from the parents of the participants and approval was obtained from the university Institutional Review Board (IRB).

Setting

Training took place in the bathroom and classroom of the autism center that participants attended. Both settings were familiar to the participants. The first 1-2 days of training took place in the bathroom. The bathroom was equipped with three stalls, one of which contained a child-sized toilet, approximately 0.30 meters (1 foot) from the floor to the top of seat (used by Joey and Billy) and two which contained adult-sized toilets, approximately 0.46 meters (6 inches) higher than the child-sized toilet (used by David). The bathroom provided enough space outside of the stall to allow, during "off-toilet intervals," for the participant and experimenter to engage in other activities including one-on-one discrete trial work times, snack time, and leisure/play. The remainder of the intervention was spent in the participant's regular classroom once he was able to remain off the toilet for extended periods of time.

Procedure

Baseline

Prior to beginning the study, reinforcers for each participant were determined through preference assessments conducted by the experimenter and/or indirect reporting from parents and teachers. Data was collected by the participant's primary teacher or the experimenter (who was also a full-time teacher at the center) on the number of accidents the participant had during the school day and the number of times he urinated in the toilet throughout the day. The number of accidents the participant had was determined by checking his diaper or pull-up for wetness every thirty minutes throughout the school day. If the participant was wet, the teacher or experimenter would count this as an accident, change the participant, and check him again after another thirty-minute interval. Baseline data was collected for four days prior to intervention for all 3 participants.

Intervention

Upon entering the building at the start of the school day, participants were greeted by the experimenter and were prompted to request the bathroom through the use of the picture exchange communication system (PECS) or through the use of the child's speech generating device (SGD). Joey was prompted to request the bathroom using the picture exchange com-

munication system (PECS) with a picture icon with the written word "bathroom" and a picture. Participants B and C were gesturally or physically prompted to use their SGD to request the bathroom by selecting the icon that corresponded to bathroom. After prompted requests, the child was then taken to the restroom, was prompted to remove his pants and underwear, and was seated on the toilet facing forward with feet placed on the floor.

While the child sat on the toilet liquids were offered and consumption of snacks was encouraged. Salty snacks were offered to encourage the participant to request and increase their fluid intake. The most preferred snacks identified in the participant's preference assessment were withheld to be used as reinforcement specifically when the child successfully voided on the toilet. While seated on the toilet, the participants engaged in other various activities including playing with moderately preferred toys, reading or singing with the instructor, and engagement in discrete trial work times with the experimenter. As required by the physical therapist on the university's IRB, each participant was also prompted, during the on-toilet intervals, to stand up, shake his legs, stretch, or jump every 10 to 15 minutes in order to prevent any discomfort from extended sitting. Otherwise, the child remained seated on the toilet.

Contingent on the participant successfully voiding in the toilet, descriptive verbal praise was delivered from the experimenter ("Yeah! Great job! You put pee in the potty") and the most highly preferred edible reinforcers identified in the preference assessment were delivered. After successful elimination had been reinforced with praise and edibles, the participant was given underwear to put on and was given his most preferred toys or reinforcing items/activities to engage with as further reinforcement for successful toileting. The participant was then allowed to remain off the toilet for three to five minutes. The specific initial length of the participant's break was determined prior to implementation of the potty party and was based on the child's age and teacher's and experimenter's judgment as to how long the child would be able to remain off the toilet without an accident.

During the off-toilet interval, the experimenter provided praise for the child's previous urination in the toilet and for remaining dry during the period that he was not seated on the toilet. If during time off toilet the participant had an accident the experimenter provided a brief verbal correction ("No, we pee in the potty") in an attempt to stop the flow of urination. The participant was immediately taken to the toilet so that they could finish urinating in the toilet. If they did not finish on the toilet, the client was prompted in a neutral tone to change clothes. The participant was provided new underwear and was again prompted to ask for the bathroom and was sat on the toilet in order to repeat the process. If the participant, however, finished in the toilet after the beginning of an accident, this behavior was reinforced, and the participant was again provided time off of the toilet as described above.

For each successful in toilet urination, the time spent off of the toilet increased by 5 to 10 minutes each time until the child was able to spend a long enough period of time off of the toilet to rejoin classroom activities. Following an accident, the next successful in toilet urination resulted in time off toilet that reverted to last successful interval time without an accident.

Interobserver Agreement

Inter-observer agreement (IOA) was obtained from experimenter's data and the participant's primary teacher who collected data during 40% of days during the study on accidents and successes in the toilet. IOA was calculated using total count IOA in which the smaller number of observed frequencies was divided by the larger number of observed frequen-

cies (Reed & Azulay, 2011). IOA for number of accidents and the number of in-toilet urinations was 100%.

Research Design

The effectiveness of the potty party in increasing successful urination and decreasing accidents was evaluated using a non-concurrent AB phase design replicated across three participants. The AB design, which is sometimes referred to as the interrupted time series design, displays responding across baseline and intervention phases. The AB design "is one of the most basic and practically feasible experimental designs for evaluating treatments in single-case research" (Michiels & Onghena, 2019, p. 2456). The AB design does not control for all threats to internal validity, but often is used in instances in which baseline durations and treatment initiations cannot be systematically altered due to ethical or logistical constraints. Internal validity of the AB phase design, however, can be increased with replications of the effect (Michiels & Onghena, 2019). Six to nine days after instruction a maintenance probe on frequency of accidents and independent in-toilet urination was taken to assess for maintenance of behavior change.

Results

Results indicate the potty party method was successful in both increasing participants' in-toilet urinations and in decreasing the number of accidents (see Figure 1). Joey successfully urinated in the toilet on 0 days in baseline and had 2-3 accidents per day in baseline. Billy successfully urinated in the toilet on 0 days in baseline and had 1-3 accidents per day in baseline. David successfully urinated in the toilet on 0 days in baseline and had 2-3 accidents per day in baseline. After the introduction of the potty party, Joey immediately increased his successful in-toilet urinations from 0 to 7, with a gradual reduction from 2-3 accidents a day for the last 2 days of baseline to 0 accidents for the last 2 days of intervention. Frequency of in-toilet urination remained steady throughout the intervention and ranged from 7 to 9 a day. Billy immediately increased his successful in-toilet urinations from 0 to 2 with a gradual reduction from 2-3 accidents a day in the last 2 days of baseline to 0 accidents for the last 2 days of intervention. Billy exhibited low levels of both accidents and in-toilet urination during the intervention condition. Frequency of successful in-toilet urination for Billy ranged from 0 to 2 throughout the intervention. Lastly, David immediately increased his successful in-toilet urinations from 0 to 10, with a gradual reduction from 2 accidents over the last 2 days of baseline to 0 accidents in the last 2 days of intervention. Frequency of in-toilet urination for David remained steady throughout the intervention and ranged from 7 to 9 a day. Due to the frequent success in urinating in the toilet, all 3 participants were able to begin transitioning back into their classrooms for various durations by the end of day 6. Follow-up maintenance probes conducted showed a maintenance of elevated frequencies of urination for Joey and David and maintenance of zero levels of accidents for all 3 participants.

Two non-parametric non-overlap indices of effect size between baseline and intervention phases were also computed: Percentage of non-overlapping data (PND) and percentage of percentage of data points exceeding the median (PEM; Wolery, Busick, Reichow, & Barton, 2010). To calculate PND for behaviors to increase (in-toilet urination), the highest data points in the baseline was compared with successive data points in the intervention phase. The percentage of intervention points exceeding the highest point in the baseline phase was calculated. Conversely, for behaviors to be decreased (accidents), the lowest data point in the baseline was compared with the data points in the intervention condition. The percentage of intervention points below the

lowest point in the baseline phase was calculated. Qualitative descriptions based on those described by Scruggs and Mastropieri (1998) are also provided for all 3 participants across both behaviors. Using these criteria, the intervention can be described as "effective" or "very effective" for Joey and David. The intervention's effectiveness was questionable for Billy using these criteria.

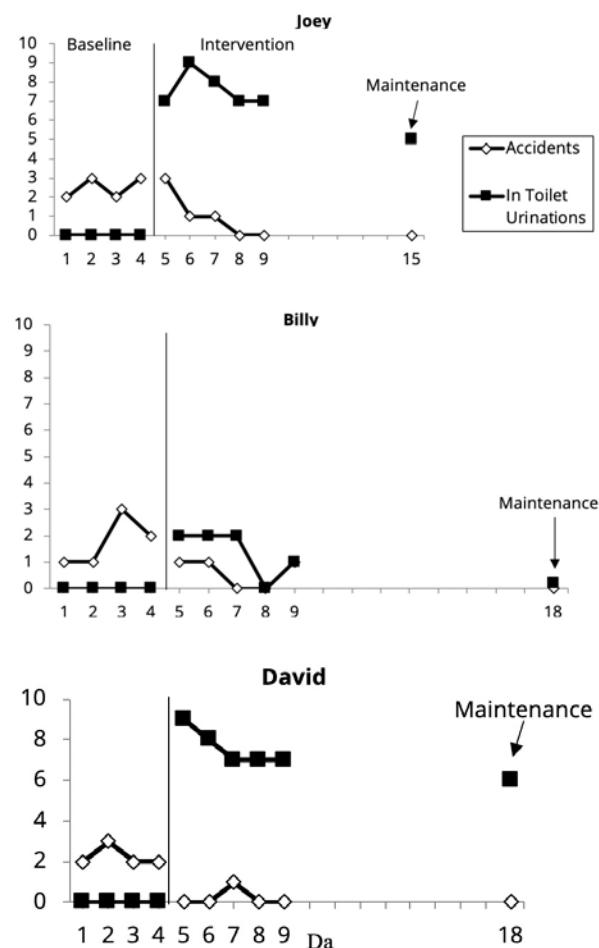


Figure 1. Frequency of accidents and in toilet urinations during baseline, treatment and maintenance for the three participants

Table 1. Percentage of non-overlapping data (PND) for accidents and successful urination for all 3 participants

Participant	Accidents	Description*	In-Toilet Urination	Description*
Joey	83% (5/6)	Effective	100% (6/6)	Very Effective
Billy	50% (3/6)	Questionable	67% (4/6)	Questionable
David	100% (6/6)	Very Effective	100% (6/6)	Very Effective

*Qualitative descriptions based on those offered by Scruggs and Mastropieri (1998)

PEM was calculated in addition to PND because it has been reported to offer advantages over PND, notably the influence of ceiling and floor effects (Ma, 2006). To calculate PEM for behaviors to increase (in-toilet urination), the median of all the data points in the baseline was compared with successive data points in the intervention phase. The percentage of intervention points exceeding the median in the baseline phase was calculated. Conversely, for behaviors to be decreased (accidents), the percentage of data points below the median of the baseline phase was compared with the data points in the intervention condition. Qualitative descriptions based on those described by Heyvaert, Saenen, Campbell, Maes, and Onghena (2014) are also provided for

all 3 participants across both behaviors. Using these criteria, the intervention can be described as "effective" or "highly effective" for Joey and David. For Billy, the intervention was "highly effective" for reducing accidents but had a "questionable" effect on increasing in-toilet urinations.

Table 2. Percentage of data points exceeding the median of baseline phase (PEM) for accidents and successful urination for all 3 participants

Participant	Accidents	Description*	In-Toilet Urination	Description*
A	83% (5/6)	Effective Treatment	100% (6/6)	Highly Effective
B	100% (6/6)	Highly Effective	67% (4/6)	Questionable
C	100% (6/6)	Highly Effective	100% (6/6)	Highly Effective

*Qualitative descriptions based on those offered by Heyvaert, Saenen, Campbell, Maes, & Ongena, P. (2014)

Discussion

The current study was the first to evaluate a method of toilet training based on principles of operant behavior including errorless learning and reinforcement called the potty party. Results indicated that the procedure was quick and effective for increasing in-toilet urinations for 2 of 3 participants and accidents showed a gradual reduction to 0 levels for all 3 participants. The potty party was comparable in its effectiveness and expediency when compared to other methods (e.g., Cicero and Pfadt, 2002; Keen, Brannigan, & Cuskelly, 2007; Kroger & Soren-Burnworth, 2009). By decreasing the total amount of time necessary to toilet train, the potty party can alleviate much of the stress of toilet training. Further, the potty party has the potential to reduce errors, limits the need for additional material (e.g., videos, models), uses no punishment procedures, and is a concise procedure that is consistent with established principles of behavior analysis.

The potty party is likely successful and unique in its approach to toilet training because it is an application of errorless learning. The problem of toilet training may be conceptualized as a problem in discrimination training: The toilet should function as the discriminative stimulus (Sd) for urination, while clothing covering the body should function as an Sd for the response of urination. The existing behavior of urination is brought under stimulus control. Given this conceptualization, it should not be surprising that an effective method for training discriminated responding from basic research (Terrace, 1963), would be effective for teaching discriminated responding in applied situations such as toilet training children with autism. Especially in early training, errorless discrimination minimizes the probability of error and maximizes the probability of correct discrimination (urinating in the toilet not in one's pants). Thus, the opportunity for discriminated responding is increased and the subsequent contingent positive reinforcement is more likely to occur. The procedure gradually fades the amount of time off the toilet based on the client's success in urination.

Other researchers (e.g., Hanney, Jostad, LeBlanc, Carr, & Castile, 2012) have with some success used intensive sitting schedules and then thinned the schedule as in the current study. However even during the most intensive stages in these studies, participants sat for only 10 minutes and then were off for 5 minutes, and continence took "approximately 2 weeks" to attain (p. 26). In the current study, participants sat longer and subsequently showed increases in frequency of in-toilet urination relative to baseline, with all participants showing gradual reductions in accidents that were maintained in maintenance follow-up probes.

Limitations and Directions for Future Research

The current study did not incorporate a traditional experimental design as the baselines were 4 days for all participants. This may threaten the internal validity of the study. However, the replication of the effects of the intervention with 3 participants across the 2 behaviors being tracked in this study increases the confidence with which effects can be attributed to the potty party intervention. Changes in level were noted for all 3 participants with regard to toileting with decreasing trends of accidents to 0 levels for all 3 participants occurring as well. The results meet the scientific criteria for determining the validity of results delineated by Martin and Pear (2015, p. 221). Specifically, the results were repeated in all three participants, there were few overlapping data points between baseline and treatment, the effect was large and observed soon after treatment began, procedures were specified, responses (accidents and in-toilet urinations) were reliably recoded, and the finding extend accepted behavioral theory (errorless learning). Two non-parametric non-overlap indices also indicated that the intervention was highly effective. Future research should, however, utilize stronger designs such as the multiple baseline design to further establish the validity of the potty party.

The potty party method described here does require a teacher, school aide, or parent to be available and give their full attention to toileting for at least one full day and requires that person to spend the better part of that day in the bathroom. This individual should have some knowledge of basic principles of applied behavior analysis (ABA). The experimenter in this study was a graduate student who was familiar with the children and had experience with the application of ABA with children with autism. Participants in the potty party were prompted to request that bathroom each day. While both parents and teachers reported instances of spontaneous requesting (Joey and David) it was not consistent for all participants and was not recorded in the study. Future research should investigate the effect of the potty party on independent requesting for use of the restroom. Lastly, the current study did not examine the potty party for its effectiveness in facilitating increases in bowel continence. This too should be investigated in future research.

Conclusion

This is the first study to our knowledge to document success in decreasing the number of accidents and increasing in-toilet, daytime urinations using a toileting procedure based on errorless learning. The procedure was effective for increase in toilet urinations for 2 of 3 participants and reducing accidents for all three participants. The potty party uses many effective behavioral techniques including contingent positive reinforcement, a consistent toileting schedule, and facilitating functional requesting. The use of errorless learning procedures has the potential to allow for the application of these established principles in a condition in which errors are much less likely to occur than in other toilet training protocols. This reduction in errors has the potential to limit frustration on the part of the caregiver and learner and above all increase the rapidity with which children with disabilities such as autism develop this important functional life skill.

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