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Toilet Training a Child Diagnosed with Autism

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Abstract

The focus of this action research project was to determine if interventions were effective when toilet training a five-year-old boy diagnosed with autism spectrum disorder (ASD). Evidence based interventions were implemented over a six week period. Qualitative data were collected through observations, surveys, interviews, and journal notes. Quantitative data were collected by recording successful urinations in the toilet, accidents in the child's pants, and compliance in using the bathroom. Analysis of the data collected suggests that the interventions were effective in toilet training a child with autism.

Toilet Training a Child Diagnosed with Autism

Parents look forward to the time when their child is finally toilet trained. Every child is unique. Some children are easy to train, and others come with a few challenges. Toilet training, sometimes referred to as potty training, can be stressful. A child is generally considered toilet trained when a child, without reminders, can communicate a need to go to the bathroom, walk independently to the bathroom, pull down pants, urinate in the stool, wipe, and pull up pants. Blum, Taubman, and Nemeth (2004) defined effective daytime toilet training as when a child has less than four wetting accidents per week. For the vast majority of typically developing children in the United States, 98%, meet this criterion by their third birthday (Blum, Taubman, & Nemeth, 2004).

Toilet training is a big step for the child, the parents, and the caregivers. It can be an exciting time for parents with the thought of saving money and the child gaining independence. It may also be challenging, especially for children that have been diagnosed with autism spectrum disorder. Many children with autism may take longer to learn how to use the toilet. There are many reasons for this. Children with autism spectrum disorder (ASD) prefer routine and often find change very difficult. Children sometimes have sensory issues and repetitive behavior, which make transitions extremely challenging. In addition, because of the limited expressive language it is not easy for children with autism to tell someone when they need to go to the bathroom.

The teacher researcher had a special interest in learning more about interventions to use when toilet training children with developmental disabilities because six of eight students, ages three to five, were still wearing pull ups and three students were diagnosed with ASD. In addition, with the rapid rate of diagnoses of ASD, the teacher researcher had a professional interest in

learning more strategies to assist young children with ASD. The researcher wanted to help students to begin developing self-help skills to increase independence before transitioning to kindergarten. The research question guiding this study is, How effective are these interventions when implemented in the school setting with a boy diagnosed with autism?

Literature Review

To gain a better understanding of the challenges of toilet training a child diagnosed with autism spectrum disorder, it is important to become familiar with the different approaches and philosophies of toilet training. For the literature review, the researcher studied several different research based approaches that have been successfully used in the process of toilet training children diagnosed with autism. The researcher reviewed five interventions: removal of pull up and use of underwear, scheduled sits, visual task management, positive reinforcers, and video priming.

Intensive behavioral interventions have been used to teach children and adults with learning disabilities to use the toilet for several decades. Davina Richardson (2015), stated that “a literature search on toilet training for children with autism and developmental disabilities reveals that most of the research has focused on small number of children and has used modified versions of the rapid toilet training program developed by Azrin and Foxx” (p. 19).

Dr. Nathan H. Azrin and Dr. Richard M. Foxx (1974), describe a fast track toileting technique as a very intense, parent oriented, method of toilet training. The authors stated that the method incorporated “language ability, imagination, imitation, verbal rehearsal, and verbal instructions, as well as association and reward to effectively toilet train a child in less than a day – typically in three to four hours” (Azrin & Foxx, 1974, p. 10). The concept came from the re-

search with rapid learning when it was studied in the 1970's with special needs people. The co-authors discuss the study of 200 children, ranging from just under two-years to four-years-of-age, in which the older children actually needed, on average, only two and half hours of intensive training, while younger children, under 26 months, required approximately five hours. The findings revealed a success rate close to 100 percent of the 200 children in the study. Another study conducted by Azrin and Foxx (1971) involved 34 typically developmental children (20 to 36 months of age) who were considered difficult to train and toilet training was accomplished in an average of 3.9 hours using this intensive method. The fast track method focused on the scheduled sits, absence of distractions; increased fluid intake, positive reinforcements and having the child help in the cleanup of the soiled environment (overcorrection) (Azrin & Foxx, 1974). Today, most of the fast track approaches to toilet training are still based on Azrin and Foxx's (1974) training techniques; however, more recent literature follows a modified version of their toilet training program.

There is little research to support an effective school-based program to teach toileting skills implemented by public school staff. Cocchiola, Martino, Dwyer, and Demezzo (2012) conducted a study with five children diagnosed with autism or some type of developmental delay who had no prior success with learning how to use the toilet. The intervention program focuses on removal of diapers during school hours, scheduled time intervals for bathroom visits, three-minute sit time on the toilet, reinforcers delivered immediately upon urinating in the toilet, and gradual increased time intervals between scheduled sits. The program was successful for all five participants.

Greer, Neidert and Dozier (2016) found that the switch from disposable diapers or pull-ups to regular underwear appeared to be a stronger factor in toilet training success than dense

toilet training schedules and differential reinforcement. Based on this research, after obtaining a baseline to establish the participant's wetting behavior, the participant was placed in underwear to aid in the development of the toilet training process.

Reinforcement-based training is another component that several studies utilize during toilet training (Azrin & Foxx, 1971; Cicero & Pfadt, 2002). Chung (2007) used reinforcement-based training as one of the components in the protocol to toilet train a 12-year-old-boy with developmental disabilities, providing the boy with reinforcement contingent upon a successful void in the toilet. Results showed an increase of successful voids in the toilet that generalized across environments.

Priming is providing information to the participant, prior to using it, to familiarize the student with the material to increase student success. Keen and Cuskelly (2007) investigated if video modeling would be an effective tool to toilet train individuals with ASD across various settings. Results showed increased continence for the participants who watched the video as compared to those who did not. Another common procedure used when toilet training is scheduled sits which simply means developing a consistent schedule of when the participant will use the toilet. Boles, Roberts, and Vernberg (2008) conducted an eight-week study, which evaluated the effects of rewarded scheduled toilet sits. The participant was an elementary student who was receiving services for serious emotional disturbance. The author's findings supported the use of scheduled sits when toilet training. The good news from this research study is there is varieties of interventions that help children with autism overcome their toilet training challenges.

Methods

Participant

This action research study took place in an early childhood special education classroom located in Northwest Iowa. The special education classroom consists of seven boys and one girl. The students receive direct instruction in a special education setting as well as being integrated into a Head Start classroom for the majority of the day. The Head Start classroom consists of 18 students all from low-income families. All students range from ages three to five years. The students attend preschool five days a week, six and half hours per day. Six of the eight children with Individualized Education Plans (IEP) are not toilet trained. Possible participants were evaluated using a toilet training readiness checklist (see Appendix A). Five of the students qualified for the study based on the readiness checklist, but only one child's parents had the desire to start the toilet training process. Based on the interview with the child's parents, the child had no history of attempted toilet training. The participant for this study is a five-year-old boy diagnosed with ASD. The student was diagnosed at the age of two years and two months by a clinical psychiatrist.

Data Collection

The focus of the action research project was to determine if interventions were effective when toilet training a five-year-old boy diagnosed with ASD. A mixed method approach was used for data collection. Quantitative data were collected by documenting the frequency of successful voids in the toilet, accidents, and compliance of walking to the bathroom. The associates collected this data during every trip to the bathroom on a recording sheet in table format in a Google document. The data collected included the date and time, accidents, successes, and comments (see Appendix B). Qualitative data were collected through observation notes (see Appendix C), pre and post surveys completed by the paraprofessionals assigned to the child (see Appendix D), informal interviews with the child's parents throughout the study, and a daily jour-

nal kept by the researcher teacher. During data collection, baseline was collected, interventions were implemented, and the behavior was measured. The dependent variable was the urinated accidents. The independent variable was the interventions.

The entire data collection process took place for six weeks. The baseline data were collected the first five days of the study. The baseline phase involved scheduled bathroom visits every hour and checking the child's pull up to determine if it was wet or dry. The data collected during baseline allowed the researcher to look for a pattern in the child's toilet behavior. Interventions focused on putting the child in underwear, scheduled visits to the bathroom, positive reinforcers, use of social stories, and video priming.

Prior to the study, the parents indicated to the teacher researcher an interest in toilet training the child. The parents confirmed that at the last wellness check, the doctor said the child had no medical issues preventing the start of the toilet training process. The parents were informally interviewed to identify potentially reinforcing items through simple observation for one week. Once this list was generated, the parents listed them in order from highest preference to lowest. Determining highly preferred items was an important intervention to increase motivation to successfully void in the toilet. The child's high preference items were edibles (Goldfish crackers and Smarties), PJ mask toys, and the iPad. Parents were asked to restrict access to the reinforcers during the intervention phase to increase effectiveness.

Training for the paraprofessionals assigned to the child was a two-hour in service of training before the start of the toilet training procedure. This training consisted of explaining the toilet training procedure (see Appendix E), a review of how data were to be collected, modeling of the procedure, and a questions and answer time.

Baseline data for successful voids in the toilet were collected for five days prior to the start of the first day of intervention. The participant wore pull-ups during baseline. After collecting five days of baseline data, the interventions were then implemented. During the intervention phase, the goal was to get the child to the bathroom six times during the school day. The parents agreed to continue the sit schedule of every 60 to 90 minutes at home, but did not want to implement the other interventions. The first intervention was the removal of the pull up both at school and at home. For extra motivation, the child was placed in fun cartoon character underwear of his choosing. The next intervention was positive reinforcement for appropriate urination. In the beginning of the intervention phase, the participant was allowed access to the iPad while seated on the toilet to encourage sitting for three minutes and to minimize inappropriate behaviors, such as hitting, scratching and screaming. This was phased out quickly because the child preferred to stand instead of sit.

Throughout the school year, the teacher researcher implements a picture exchange communication system (PECS) in the classroom. PECS gives children with little or no communication skills the ability to communicate by using pictures. This is the way the child communicates wants and needs in the classroom. During the intervention phase, a visual support for each step of the toilet procedure was taught to the child and displayed in the bathroom (see Appendix F). Before each visit to the bathroom, the participant took the toilet picture off the PECS board, handed the picture to the adult and said “potty” (see Appendix G). If the child did not say the word, the associate would say the word. This was done to help increase the child’s independence and to encourage self-initiation. Once in the bathroom, the associates used verbal and visual cues to complete the toilet procedure. The cues included pants down, sit on toilet, go potty, wipe, pants up, flush, and wash hands. The task analysis visual schedule was posted on the bath-

room wall for the child and the adults to reference. Social praise followed all attempts to comply with each step. The staff set the visual timer for three minutes. At the start of the interval, staff held the reinforcer in the participant's field of vision. The paraprofessional would state, "First pee, then candy." This was said several times in the three-minute wait time. Positive social interaction occurred when the child remained at the toilet. Staff gently redirected the participant back to the toilet when needed.

Another intervention implemented was priming. This technique helps prepare the child for an upcoming activity or event, especially for one, which may present difficulty. To familiarize the child with the toilet routine, interventions were used including social stories, reading books about the toilet process, and watching animated videos. A social story is a visual aid which is a short story written in a specific style and format. Social stories are used to help children develop appropriate behavior or cope with new and challenging situation such as toilet training. The teacher researcher created a pre-made social story, specifically designed for the child, using more pictures than words, which focused on the toilet training process. It was read with the child every day. The teacher researcher uses many social stories in her classroom, so the use of a social story was routine for the child. There are many picture books published on the topic of toilet training. The book, *No More Diapers for Boys*, by Esther Smith was read often during the intervention phase. Video priming was also implemented. The child watched a video on YouTube daily called "Everyone Goes Potty Every Single Day". It is very similar to a social story but in animated video format. The child prefers technology to books so this intervention was used the most during the intervention phase. The use of social stories, books, and videos were implemented with the expectation that it would increase better understanding of the toilet process.

Findings

Data Analysis

The study was implemented over a six-week period, but the data were only collected when school was in session, which was 28 school days. There were several days data were not collected due to the school not in session due to severe weather, professional development, and the child being absent. After a five-day baseline phase, the child was introduced to a new intervention weekly. A new intervention was added each week, but no interventions were removed. In evaluating this data, it must be kept in mind that success and accidents can be observed quite easily, so researcher bias is very limited in this study.

Quantitative Analysis

The quantitative data collected for this research were collected on every trip to the bathroom. During the baseline, the student did not urinate in the toilet at all. The child had the first successful void in the toilet three days into the study.

Table 1 illustrates the successful voids in the toilet percentages for the child across the baseline and interventions. The child's rate of successful voids in the toilet was zero percent during the baseline phase. At the end of the study, the average rate of successful voids in the toilet improved 29%. The rate of successful voids is calculated by dividing the number of times the student urinated in the toilet, into the total number of visits to the bathroom, multiplied by 100.

Table 1***Rates of Urination in the Toilet***

Baseline	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Average Gain
0%	12.5%	33%	50%	25%	23%	33%	29%

Table Two shows the child's rate of wetting in his pants was 100% during the baseline phase. At the end of the study, the average rate of having accidents in his pant improved 16%. The rate of wetting oneself is calculated by dividing the number of times the student wets himself, into the total number of visits to the toilet, multiplied by 100.

Table 2***Rates of Accidents in Pants***

Baseline	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Average Improvement
100%	25%	29%	25%	4%	10%	8%	16%

Table Three shows the child's rate of compliance to use the bathroom. The number of times that the child initiated toilet use by walking to the bathroom without physical prompting by an adult was counted. During baseline, the child complied zero percent of the time. The child screamed and flopped to the ground every time he was taken to the bathroom. There was a gradual increase in percentage of compliance each week, and at the end of the study, the child was complying 100% of the time. The number of compliance divided by the total scheduled sits calculated percentages.

Table 3***Growth in Compliance to Use the Bathroom***

Baseline	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Gain
0%	17%	58%	58%	92%	80%	100%	100%

Qualitative Analysis

Qualitative data were collected through observation notes, pre/post surveys completed by the paraprofessionals, informal interviews with the child's parents throughout the study, and a journal kept by the researcher teacher. Qualitative data were constructed to help the researcher gain better understanding of the child's behaviors. The qualitative data also provided the information for the researcher to make informed decisions throughout the toilet training process.

Communication between the researcher and the child's parents was frequent and ongoing throughout the study. In the first interview, the parent's expressed their reservations about toilet training their child because they were also in the process of training their three-year-old son, but they were willing to give it a try. Early on in the study, the parents implemented the sit schedule and the positive rewards. The parents also observed that the positive reinforcers were not working at home. No quantitative data was formally collected in the home, but the child's parents were very involved with the toilet training process. About halfway through the study, the parents decided to put the child in underwear and then a pull up over the top because they were tired of cleaning up the mess. The parents requested that this also happen at school to avoid embarrassment for the child. This request may have skewed the data collected, but the researcher felt it was necessary to comply with the parent's wishes. At the end of the study, the results revealed that even though the child was not successfully toilet-trained, parents were very pleased that the child was complying to use the bathroom and hope to see continued progress.

Two paraprofessionals completed a pre and post survey. After analysis of the surveys, the researcher discovered that one paraprofessional had several years of experience working with

children with ASD. The other associate had experience with children, but not those diagnosed with autism. The post survey revealed that lack of consistency and not adequate training hindered the effectiveness of the interventions.

The researcher analyzed her notes from her journal on an ongoing basis. In the beginning of the study, the child was showing aggressive behavior such as screaming, flopping to the ground, and scratching. The child was using the large bathroom down the hall from the classroom. Through observation, a decision was made to start using a smaller, quieter bathroom and behaviors seemed to lessen. The journal notes also revealed that throughout the study the child's mood and whether he had his medication played a big role in his cooperation of walking to the bathroom. By the end of the study, through observation, it was evident that positive reinforcers were not an effective intervention to motivate this child, but social stories and video priming were effective in lessening the his noncompliant behaviors. Overall, the researcher gained valuable insight from the individuals involved in the study about the effectiveness of the interventions used in the toilet training process.

Discussion

Summary of Major Findings

The child's urinations in the toilet were at zero during baseline data collection, and the introduction of the interventions resulted in some improvement, but the child did not completely get toilet trained in the six-week period. When the data collected during the intervention phase were examined, it was seen that scheduled sits did help the child to have his first void in the toilet. However, scheduled sits alone was not enough to encourage the child to urinate in the toilet on a regular basis. An unanticipated finding was that the positive reinforcers were not motivating for this child. Through observational data the four positive reinforcers (Smarties, goldfish

crackers, iPad, PJ mask toys) did not seem to motivate the child to void in the toilet. The week the intervention of video priming was introduced is when the child had the most successful urinations in the toilet. However, because each intervention built upon the next intervention it is difficult to say which intervention was the most effective. Requests for the bathroom never did occur. There were no instances of self-initiated requests to use the bathroom.

In the beginning of the study, behavior issues such as aggression and noncompliance needed to be addressed. During the beginning of the intervention phase, the child screamed on every trip to the bathroom. The researcher expected this behavior because it was a change in the routine. Use of the communication board, the visual schedule, and a consistent sit schedule seemed to be effective in decreasing the aggressive behaviors. In the middle of the intervention phase, especially after using videos and social stories, there was an increase in the child's compliance, and by the end of the study, the child went to the bathroom willingly. The results of the study indicate that the interventions were effective in decreasing behaviors when using the restroom.

Limitations of the Study

There are a number of limitations with this study. Due to using more than one intervention at a time, it is difficult to know which intervention may have caused the increase in successes or the decrease in accidents so the reliability of the data could be called into question.

Another limitation to this study was the sample size. This study was implemented with only one student over a limited period of time. In order to fully understand the impact of interventions on the toilet training process, it would be best to study more participants over a longer time.

Because the study was conducted in the school setting, another limitation was not having a bathroom in the classroom. The child had to use the bathroom down the hall from the classroom that made transitioning very difficult. The researcher did not have any control over this situation, but felt it did hinder the toilet training process.

Another factor that impeded the study was consistency. The child had several different adults caring for him and each one implemented the training process slightly differently. Other factors that caused inconsistencies were no school days due to bad weather, child illness, and professional development for the teachers, and child not having his medication.

Further Study

Further research is needed with a larger sample of children. It would be interesting to compare how effective the interventions are when implemented with both typical developing peers and children with developmental disabilities. It would also be beneficial to conduct a study for each intervention individually instead of having each one building upon the next. Another area that would warrant further study would be self-initiating toilet skills. In addition, because of the unexpected finding with the preference assessment intervention, further study in this area would be beneficial to educators.

Conclusion

Learning to use the toilet is an important step for children with developmental disabilities. The findings compiled from the collected quantitative data suggest that evidence based interventions such as removal of the pull up, scheduled sits, positive reinforcers, social stories, and video priming, are effective when training a child with autism. The qualitative data suggests that it is important that teachers, associates, and parents receive adequate training on the interventions before the toilet training process begins. The teacher, associates, and parents continued to im-

plement the toilet training process with the child after the study was finished. The overall result of this research shows that a child with ASD can learn to use the toilet if there are interventions in place and implemented consistently.

References

- Azrin, N. H., & Foxx, R. M. (1974). *Toilet training in less than a day*. New York, NY: Pocket Books.
- Blum, N., Taubman, B., & Nemeth, N. (2003). Relationship between age at initiation of toilet training and duration of training, a prospective study. *Pediatrics, 111*(4), 810-814.
- Boles, R. E., Roberts, M. C., & Vernberg, E. M. (2008). Treating non-retentive encoprosis with rewarded scheduled toilet visits. *Behavior Analysis in Practice, 1*(2), 68–72.
<http://doi.org/10.1007/BF03391730>
- Chung, K. (2007). Modified version of Azrin and Foxx’s rapid toilet training. *Journal of Developmental and Physical Disabilities, 19*, 449–455.
- Cicero, F. R. & Pfadt, A. (2002). Investigation of a reinforcement-based toilet training procedure for children with autism. *Research in Developmental Disabilities, 23*, 319–331.
- Cocchiola, M.A., Martino, G.M., Dwyer, L.J., & Demezzo K. (2012). *Behavior Analysis Practice, 5*(60). Retrieved February 1, 2018, from:
<https://doi.org/10.1007/BF03391824>
- Greer, B. D., Neidert, P. L., Dozier, C. L., Payne, S. W., Zonneveld, K. L. M., & Harper, A. M. (2013). Functional analysis and treatment of problem behavior in early education classrooms. *Journal of Applied Behavior Analysis, 46*(1), 289-295.
- Keen, D., Brannigan, K. L., & Cuskelly, M. (2007). Toilet training for children with autism: The effects of video modelling. *Journal of Developmental and Physical Disabilities, 19*(4), 291–303.

Richardson, D. (2015). Toilet training for children with autism. *Nursing Children and Young People*, 28(2), 16-22.

APPENDIX A

TOILET TRAINING READINESS CHECKLIST

Is your child ready to be Potty Trained?

Check those that apply to your child.

- Follows simple directions.
- Remains dry for at least 2 hours at a time during the day.
- Dry after nap time.
- Regular and predictable bowel movements.
- Walks to and from the bathroom, pulls down own pants and pulls them up again
- Seems uncomfortable with soiled or wet diapers
- Seems interested in the toilet.
- Has asked to wear grown-up underwear.

Children with autism spectrum disorder (ASD) generally show the same signs of readiness for toilet training as typically developing children do. But **these signs might appear when your child is older, and the training might take longer.**

Some signs that your child is ready include:

- being able to tell you (or show you with a sign or gesture) that she has wet or soiled her nappy or clothes
- being able to follow a simple instruction like 'Sit on the toilet', and being able to pull her pants up and down
- having regular formed bowel movements
- having enough bladder control to stay dry for at least one hour at a time during the day.

QUESTIONS TO THINK ABOUT

1. What words or gestures does your family use for: (body parts, urine, bowel movement?)
2. What strategies have been tried at home? (Example: reading books, aiming at Cheerios, trying on big kid underwear, sitting on potty,)
3. Does your child have a special needs or circumstance that needs to be taken into consideration?

APPENDIX C

Observation and thoughts on Toilet Training Interventions

Date/Time	Observation (what you saw)	Reflection (your thoughts)

APPENDIX D

POST SURVEY FOR PARAPROFESSIONALS

How did your toilet training program go? What was difficult? What was easy?

Were you able to follow the guidelines and procedures? If not, why?

What would make it easier for you to implement the toilet training procedures?

Describe any progress the child made during the toilet training? How do you feel the child responded to the interventions?

Thinking of the interventions implemented, what changes would you make to the toilet training process?

Have you ever toilet trained a child with or without ASD before? If so, describe your experience. How did it compare to training the child for this action research study?

APPENDIX E

CHILD'S TOILET TRAINING PLAN

GOAL: To have child visit the bathroom every hour while at school and gradually increase the time he sits on the toilet

INSTRUCTIONS:

Each day upon arrival at school, child will enter the bathroom to ensure his "pull-up" is off or wearing underwear with pull up over the top of the underwear.

Every day, the child will be cued to the bathroom on the hour. (e.g., 9:00, 10:00, etc).

Once in the bathroom and seated on the toilet, he will remain seated for 3 min.

MATERIALS NEEDED: visual schedule, 3 minute visual timer, an established bathroom, the monthly data collection sheet, edible reinforcers, change of clothes and wipes

ROUTINE:

1. Tell child "Time to go potty"
2. Step by step: Go to the bathroom, go in the stall and close the door, pants down, sit on toilet, staff shows the child the visual 3 minute time and locates it within his field of vision, the child sits on toilet, when timer is finished or he urinates, say All done. Pants up. Wash hands. Go bath to the classroom.
3. Refer to the visual schedule while in the bathroom.
4. While on the toilet, every 30 seconds tell the child "go potty"
5. If child gets off the toilet before the time, gently put him back on the toilet and tell time "go potty". If he doesn't go, when the 3 minute are up, he can get off, pull up his pants, and wash his hands and return to the classroom.
6. If successful, he is immediately rewarded with a few pieces of candy and verbally praised.

STAFF INSTRUCTIONS:

If child urinates on the toilet, give immediate verbal praise along with "smarties or skittle as the edible reinforcer. Very important: Use the edible reinforcers only for appropriate use of the bathroom

If he has a wet/soiled accident, assist child into the bathroom and help him to put dry clothes on. Have him help put his soiled clothes into a trash bag. Interaction during this procedure should remain neutral and matter of fact.

APPENDIX F



APPENDIX G

