

*THE EFFECTS OF UNDERGARMENT TYPE ON THE
URINARY CONTINENCE OF TODDLERS*

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There is a growing trend toward later toilet training of typically developing children. This trend is a problem for caregivers and professionals who work with young children, because it is associated with a number of costs and health risks in child-care settings. Results of a recent study (Tarbox, Williams, & Friman, 2004) suggest that wearing underwear may facilitate the development of toileting skills. Based on these findings, we examined the effects of wearing disposable diapers, disposable pull-on training pants, and underwear on urinary continence of 5 typically developing toddlers in a child-care setting. Underwear decreased incontinence and increased continent urinations for 2 of the 5 participants, produced no improvement in 2 participants, and when combined with increased fluid intake and longer sitting periods, produced some favorable trends for the 5th participant.

DESCRIPTORS: continence, child care, diapers, toileting, underwear

There is a growing trend toward later toilet training of typically developing children. According to a study released by the American Academy of Pediatrics, only 22% of children were toilet trained by the age of 30 months in 1997, compared to 90% in 1961 (as cited in Neff, 1998). This trend is associated with a number of costs including financial expense, negative effects of nonbiodegradable materials on the environment, and increased risk of the spread of acute infectious diarrhea and hepatitis (Luxem & Christophersen, 1994). Moreover, many child-care centers will not enroll children who are not fully toilet trained or may charge extra fees for those children (Luxem & Christophersen). Thus, care options may be limited, or more expensive, for those children who experience delayed training.

Results of a study by Tarbox, Williams, and Friman (2004) suggest that prolonged use of

disposable undergarments may be one factor that contributes to delayed toilet training. This study showed that the urinary continence of an adult with developmental disabilities increased and incontinence decreased when his undergarment was changed from diapers to underwear. Although this strategy is sometimes recommended as a component of toilet training (e.g., Azrin & Foxx, 1974), the effects of underwear on urinary continence have not been evaluated with typically developing children. Therefore, this study measured child continence and incontinence while wearing underwear and two other common undergarments, disposable diapers and disposable pull-on training pants.

METHOD

Participants and Setting

Five typically developing toddlers who attended a full-day infant and toddler program participated. Prior to the start of this study, Anne (female, 26 months), Beth (female, 25 months), Chad (male, 21 months), and Darcy (female, 30 months) participated in a toilet-training procedure implemented by classroom staff. This procedure consisted of (a) wearing disposable diapers, (b) having a toileting opportunity (i.e., sit on toilet for

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3 min) once every hour, and (c) receiving social praise and a preferred edible item contingent on continent urinations. At home, Anne, Beth, and Darcy wore disposable diapers and occasionally sat on the toilet. Chad wore disposable pull-on training pants and was provided with toileting opportunities about three times each day at home. Ellie (female, 22 months) wore disposable diapers at school and home and had no previous exposure to sitting on a toilet.

This study was conducted in a toddler classroom, which included a separate toileting area that contained child-sized toilets. Experimental procedures were implemented for approximately 5 hr per day and were discontinued during the children's naptime, for occasional field trips, and when the child departed the center.

Response Measurement and Interobserver Agreement

Incontinent urinations (accidents) were recorded if the child's undergarment or clothing was seen or felt to be wet. It was possible to detect incontinent urinations (a) at a 15-min undergarment check, (b) at a 30-min toileting opportunity, (c) when clothing was seen or felt to be wet, or (d) upon the child's request (i.e., vocal or signed) to use the toilet. Continent urinations were recorded upon visual detection of urine in the toilet bowl or on the toilet paper after the teacher wiped the child. This latter form of measurement was added to permit detection and reinforcement of continent urinations resulting in small amounts of urine; this was considered important for Anne and Darcy, who urinated only once during some school days. Our primary dependent measure was percentage continence, which was calculated by dividing the number of continent urinations by the total number of urinations (continent and incontinent).

A second observer simultaneously but independently recorded the condition of the child's undergarments and continent urinations on a minimum of 31% of all undergarment

checks (range, 31% to 34%) and toileting opportunities (range, 31% to 33%) and a minimum of 24% for all requests to toilet (range, 24% to 100%) for all participants. Interobserver agreement was calculated by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying by 100%. An agreement was scored when both observers recorded the same information for each category (e.g., both observers indicated that Anne urinated in the toilet) during a particular observation interval. Agreement ranged from 99% to 100% for all measures across all conditions.

Procedural integrity was scored if the teacher correctly implemented each procedure (e.g., provided a toileting opportunity within 5 min of the scheduled time) during a particular interval. Procedural integrity data were collected for 100% of the intervals each school day for all children. Procedural integrity was above 99% for all components of the experimental procedures. Interobserver agreement for procedural integrity was collected on a minimum of 31% of undergarment checks and toileting opportunities and a minimum of 24% of all requests to toilet. Agreement was 100% for all measures and all participants.

Procedure

Undergarment checks. Every 15 min the child's undergarments were checked to detect incontinent urinations. If the undergarment was dry, the teacher provided descriptive praise. If the undergarment was wet, the teacher said, "[child's name], your [undergarment] is wet" in a neutral tone, and the undergarment was changed immediately. This procedure remained in effect across all experimental conditions for all participants.

Toileting opportunities. A toileting opportunity was provided every 30 min. Consequences for dry and wet undergarments were identical to those provided during undergarment checks. At each toileting opportunity, the child was prompted to sit on the toilet until he or she urinated, or a maximum of 3 min (all partic-

ipants) or 5 min (Ellie only). When urination in the toilet occurred, behavior-specific praise (e.g., "Good job going on the potty.") was delivered, and the teacher presented the child with a choice of three items identified through a multiple-stimulus-without-replacement preference assessment (DeLeon & Iwata, 1996) conducted every 7 school days. The teacher allowed the child to either consume one piece of an edible item or interact with a toy for 1 min. These procedures remained in effect across all experimental conditions for Anne, Darcy, and Ellie. The amount of time between toileting opportunities was gradually increased for Beth and Chad; otherwise, procedures were identical to those described above.

Requests to toilet. A toileting opportunity was provided immediately following a child's independent request to toilet. Behavior-specific praise (e.g., "Thanks for telling me that you have to go potty.") was delivered following requests. Consequences for dry and wet undergarments and continent urinations were identical to those provided during toileting opportunities.

Experimental Conditions

Diaper condition. The child wore a disposable undergarment that was made of a thick, absorbent material and fastened at the hips with hook-and-loop tape or adhesive strips.

Pull-on training pants condition. The child wore a disposable undergarment that was made from an absorbent material but was somewhat thinner than a diaper. In addition, pull-on training pants are designed to simulate more typical undergarments in that they are applied by putting the child's legs through the leg holes and pulling the waistband up to the waist.

Underwear condition. The child wore 100% cotton underwear (i.e., regular children's underwear without polyester padding or plastic covers).

Experimental Design

This study employed nonconcurrent multiple baseline (all participants) and reversal (Anne and Chad) designs to evaluate the effects of

three types of undergarments. The three experimental conditions varied only in the type of undergarment worn. The designated undergarment was worn throughout the observation period and was changed immediately when an incontinent urination was detected.

RESULTS AND DISCUSSION

Figure 1 shows results for all participants. In the diaper and pull-on conditions, Anne displayed no continent urinations, but had between one and five incontinent urinations per day. The introduction of underwear resulted in increased levels of continence and a decrease in accidents; this effect was replicated within a reversal design. Beth displayed moderate levels of continence during the diaper and pull-on conditions. Immediately after the introduction of underwear, her percentage of continent urinations increased and remained at nearly 100%, with very few accidents. Toileting opportunities were then decreased to every 40, 60, 90, and 120 min, with no disruption in performance. Beginning at Session 44, researchers terminated daily data collection, and Beth's classroom teachers implemented the toilet-training procedures. Data collected after 7, 21, and 28 additional school days showed maintenance of this performance.

Darcy's continence was initially variable but decreased to zero during the diaper condition and remained at zero when she was offered 88.7 ml of water after each toileting opportunity. The introduction of underwear was associated with a decrease in accidents but no increase in continent urinations. Darcy appeared to be "holding" her urine until naptime or the end of the school day, at which time she was placed in a diaper. This was considered an undesirable result; therefore, other toilet-training procedures (not reported here) were implemented with Darcy. Ellie's continent urinations were at zero with the use of diapers, and the introduction of underwear resulted in little change. She showed a substantial improve-

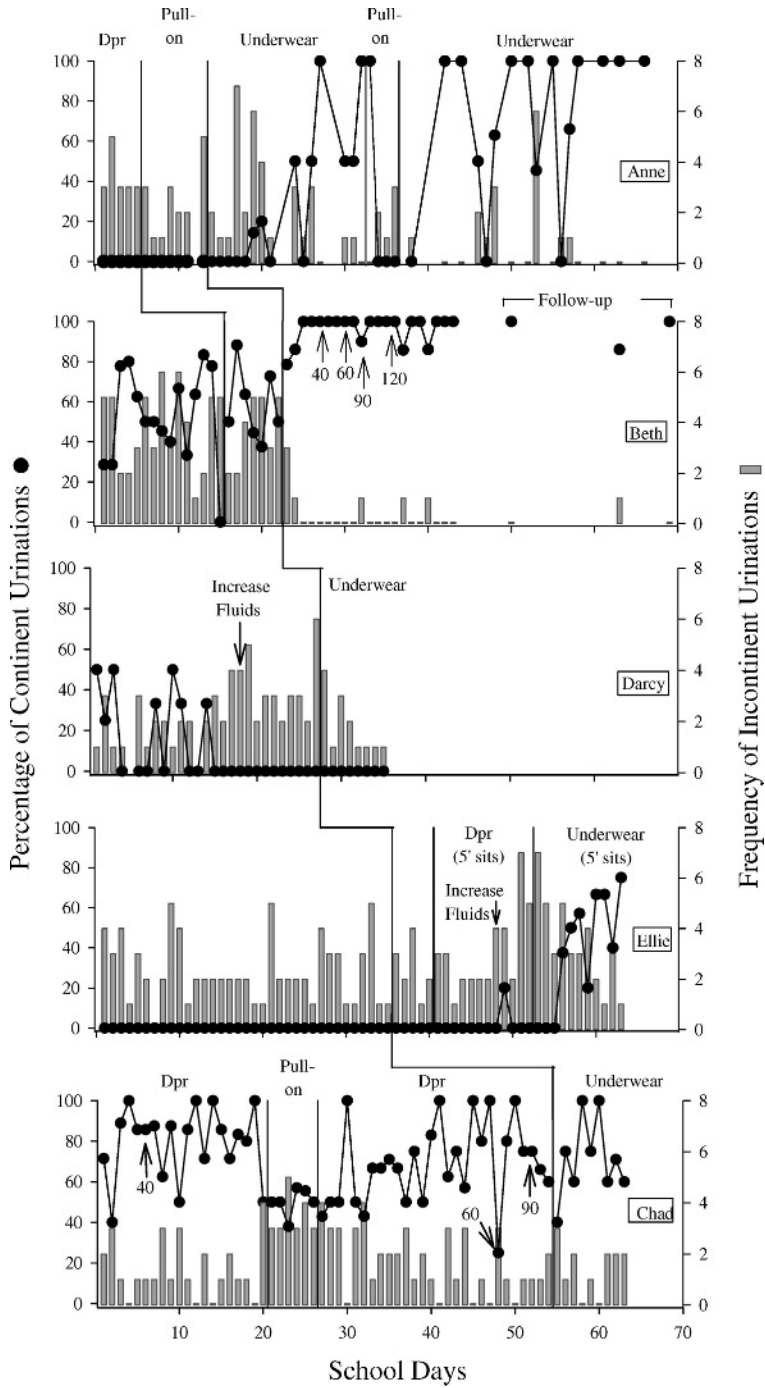


Figure 1. The percentage of continent urinations and frequency of incontinent urinations for all participants during the diaper, pull-on, and underwear conditions. School days without data points reflect days on which the child did not urinate during the experimental conditions. Arrows indicate changes to the toileting schedule or an increase in the amount of fluid offered.

ment in continence only when she wore underwear, had longer (5 min) toileting opportunities, and was offered fluids (88.7 ml of water) after each toileting opportunity. However, this increase in percentage continence was a result of an increase in continent urinations; incontinent urinations remained at baseline levels. Unfortunately, a lengthy school break interfered with Ellie's further participation in this study. Chad displayed moderately high levels of continence while wearing diapers, and a decrease in continence and increase in incontinent urinations was observed with the use of pull-on training pants. In light of the moderate success with diapers, Chad's toileting schedule was faded to 40, 60, and 90 min. The introduction of underwear resulted in no observable change in continence. Chad's teachers continued to implement these procedures after the experiment was terminated.

We evaluated the effects of undergarment type on the continence of 5 toddlers and found that underwear alone increased continence and decreased accidents for 2 of the 5 children (Anne and Beth). These data are consistent with the results of Tarbox et al. (2004) and show that, for some children, a change in undergarment may represent a fairly low-effort component of toilet training that may substantially improve continence and decrease incontinence.

For 2 of the 5 participants (Anne and Beth), the introduction of underwear resulted in clear increases in continent urinations and decreases in incontinent urinations. With Ellie, underwear combined with longer toileting opportunities and increased fluids resulted in an increase in continent urinations, but she continued to display frequent accidents while wearing underwear. Ellie's outcome highlights one limitation associated with having children wear underwear (rather than a more absorbent undergarment) during toilet training. That is, caregivers may spend additional time and effort cleaning up (e.g., cleaning floors, changing and laundering clothes) if accidents do not decrease

quickly after the introduction of underwear. Although a decrease in accidents was not observed with Ellie, the effects of underwear when used in combination with increased fluid intake and longer sitting periods were considered desirable because an increase in continent urinations was observed. However, the design of the analysis does not permit us to determine the extent to which those increases in continent urinations were due to wearing underwear, increased fluid intake, or longer sitting periods.

Chad and Darcy showed no improvement in continence when wearing underwear. In fact, underwear was associated with a negative outcome for Darcy; she began "holding" her urine. Darcy's and Ellie's results illustrate the importance of evaluating the effects of toilet training by examining multiple measures of performance. That is, Ellie showed an improvement in continence but no decrease in accidents, whereas Darcy showed a decrease in accidents but no improvement in continence. The mixed results observed across these 5 participants highlight the importance of an individualized approach to toilet training and provide an example of the practical advantages associated with isolating the effects of individual intervention components.

It seems likely that, for some children, underwear may improve continence and decrease incontinence by exposing individuals to a naturally occurring, unpleasant consequence associated with incontinent urinations (wet undergarments and clothing). However, this study was not designed to rule out other sources of influence (e.g., the duration of clean-up). Additional research is needed to identify the mechanism through which this intervention influences continence and to determine the effectiveness of underwear as a component of toilet training in a larger sample of children.

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