

PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Sequential Acquisition of Toilet-Training Skills: A Descriptive Study of Gender and Age Differences in Normal Children

Timothy R. Schum, Thomas M. Kolb, Timothy L. McAuliffe, Mark D. Simms,
Richard L. Underhill and Marla Lewis

Pediatrics 2002;109:e48

DOI: 10.1542/peds.109.3.e48

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://pediatrics.aappublications.org/content/109/3/e48.full.html>

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2002 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



Sequential Acquisition of Toilet-Training Skills: A Descriptive Study of Gender and Age Differences in Normal Children

Timothy R. Schum, MD*[†]; Thomas M. Kolb, BS§; Timothy L. McAuliffe, PhD‡; Mark D. Simms, MD*[†]; Richard L. Underhill, BS§; and Marla Lewis, MEd||

ABSTRACT. *Objective.* To compare the ages, by gender, at which normally developing children acquire individual toilet-training skills and to describe the typical sequence by which children achieve complete toileting success.

Methods. A longitudinal survey was conducted of a cohort of children who were 15 to 42 months of age and attending 4 pediatric practices in the Milwaukee area (2 inner city and 2 suburban) from 1995 through 1997. Parents completed background surveys, and each child's development was assessed using the Bayley Scales of Infant Development II. Each week for 12 to 16 months, parents completed a training status survey (TSS). The TSS, designed for this project, included information on daily toilet-training status (eg, number of urine successes on a 5-point scale) and 28 weekly toilet-training behaviors rated on a 5-point Likert scale from 1 (never) to 5 (always). Children were considered to have acquired a particular skill when they received a rating of 4 or 5 on the TSS scale. The median age and interquartile range for children for each toilet-training skill are reported for girls and boys separately using survival curve analysis. Ages at which each gender achieved these skills are compared using a log-rank test.

Results. The study included 126 girls and 141 boys; 88% were white. Parents submitted a total of 10 741 weekly surveys (range: 1–73; median: 49 per child). Girls demonstrated toilet-training skills at earlier ages than boys. The median ages for "staying dry during the day" were 32.5 months (95% confidence interval: 30.9–33.7) and 35.0 months (95% confidence interval: 33.3–36.7) for girls and boys, respectively. The median ages for readiness skills for girls and boys, respectively, were as follows: "showing an interest in using the potty," 24 and 26 months; "staying dry for 2 hours," 26 and 29 months; "indicating a need to go to the bathroom," 26 and 29 months. There was a marked concordance in the sequences in which girls and boys achieve individual skills. In addition, the interquartile ranges of the toileting skills varied from 6.9 to 11.4 months in girls and from 7.5 to 14.6 months in boys.

Conclusions. In this study population, girls achieve nearly all toilet-training skills earlier than boys, including successful completion. Most children do not master the readiness skills until after the second birthday. The range of normalcy for the attainment of individual skills

may vary by as much as a year. *Pediatrics* 2002;109(3). URL: <http://www.pediatrics.org/cgi/content/full/109/3/e48>; *toilet training, gender, age, readiness, child development.*

ABBREVIATIONS. FTTS, Fundamentals of Toilet Training Study; TSS, training status survey; BSID-II, Bayley Scales of Infant Development II; SD, standard deviation; BM, bowel movement; CI, confidence interval.

The medical literature on toilet training is woefully deficient. Toilet training is a universally acquired skill for normally developing children, yet there is no information about the requisite skills that children learn sequentially, beginning with the signs of readiness and ending with successful completion of toileting.

Current pediatric literature stresses the importance of the child's readiness before initiating toilet training.^{1–3} Despite this perceived importance, a commonly used developmental screening test in general pediatrics does not reference any specific toilet-training skills.⁴ A critical review of the literature reveals 2 broad categories of readiness skills: global readiness skills, which include achievement of motor milestones (eg, sitting, walking), understanding and use of words for elimination, positive relationships with caregivers and the desire to please, identification with and imitation of parents and significant others, and the desire to be autonomous and master primitive impulses^{2,5}; and specific toileting readiness skills, which include bladder control (eg, staying dry for 2 hours), physical awareness (eg, appearing uncomfortable in soiled diapers), and instructional readiness (eg, indicating a need to urinate).^{3,6} Several authors have stated that these skills are present by 18 to 24 months in normally developing children, yet normative data are lacking.^{2,7}

The broad sequence of achieving toileting "milestones" has also varied across studies. For example, Brazelton studied upper-middle-class children in Cambridge, Massachusetts, and found that approximately 80% of children attained daytime control of bowel and bladder function simultaneously at an average of 28 months, with no difference between the genders.⁸ In 12% of children, daytime bowel training occurred first; in 8%, bladder control was achieved first. Stein and Susser⁹ noted that children who attended day nurseries in Lancashire, United Kingdom, typically acquired nighttime bowel control before daytime control and daytime bladder con-

From the Departments of *Pediatrics and †Biostatistics, Medical College of Wisconsin, Milwaukee, Wisconsin; §Kimberly-Clark Corporation, Neenah, Wisconsin; and ||Children's Service Society of Wisconsin, Waukesha, Wisconsin.

Received for publication May 1, 2001; accepted Dec 3, 2001.

Reprint requests to (T.R.S.) Downtown Health Center Pediatric Clinic, 1020 N 12th St, Milwaukee, WI 53233. E-mail: tschum@mcw.edu

PEDIATRICS (ISSN 0031 4005). Copyright © 2002 by the American Academy of Pediatrics.

tol before nighttime control. Largo and Stutzle¹⁰ studied upper-middle-class Swiss children and also noted that bowel control generally preceded daytime and nighttime bladder control. Even different authors in the same textbook have conflicting information on the sequence of bowel versus bladder control.¹ However, the sequence of steps (specific toilet-training skills including readiness skills) by which children normally acquire these milestones has never been studied in detail.

New information is needed because many frequently cited references on toilet training are decades old and the age at which children attain independence in toileting has increased steadily during the past century in industrialized countries for reasons that remain elusive.^{11–17} Studies of toilet training provide little insight on this trend because of differences in sample composition, methods of training, cultural attitudes and beliefs, and definitions of and criteria for “completion” of the process. However, a review of the available literature during the past 50 years reveals a steady increase in age of attainment of daytime bowel and bladder continence from approximately 24 months in the 1950s to 36 to 39 months in the late 1990s.^{8,11–17}

Health care providers must have an evidence-based understanding of the typical sequence and/or stages of development to guide parents and professionals in the management of children with both normal development and toileting-related difficulties. Unfortunately, the lack of recent studies, data on the typical sequence, and gender-specific differences fail to provide a firm foundation to guide practice. Ultimately at issue is accurate knowledge regarding the process by which toilet training occurs so as to determine which aspects of toilet training are influenced by environmental factors (eg, educational methods, parental expectations, different types of diapers) and which are mostly “biological” and dependent on physical maturation.

We undertook the Fundamentals of Toilet Training Study (FTTS) to address the need for an evidence-based understanding of toilet training. This study addressed the following research question: What is the age-specific chronology of toilet-training skills among normally developing children by gender?

METHODS

Overall Study Design

The overall design of the FTTS involved 5 phases. Initially, the recruitment phase included identification of interested parents of age-appropriate children, followed by determination of eligibility and obtaining informed consent. Then, parents filled out a mailed survey describing child and parent demographics. Next, parents returned to the clinic for an assessment of their child’s cognitive development. The heart of the study was data gathering; parents filled out a training status survey (TSS) detailing their child’s toilet-training behaviors each week for 12 to 16 months. Finally, data analysis was performed.

Participant Recruitment

Families were recruited into the FTTS (a descriptive longitudinal study) between October 1995 and August 1996. For making the results more generalizable, recruitment sites included 4 pediatric clinics in the greater Milwaukee metropolitan area (2 inner city clinics, whose populations are 60% Hispanic and 75% black, and 2

suburban clinics, whose populations are 70%–90% white). The study families represented a convenience sample of parents who responded to posters located in each clinic or were recruited by word of mouth from clinic staff or doctors or fellow study parents. Interested parents filled out an initial application. We made no attempt to ascertain reasons that parents chose to participate. Anecdotal reports, however, indicated that parents were often interested in finding out about their child’s development or wished to be part of a clinical research study. Within 3 weeks, a research associate called each parent and administered a recruit screening survey. In an effort to capture the entire toilet-training process, we sought only those children who were not in toilet training. Therefore, at recruitment, parents classified their child’s toilet-training status as not started, not currently training, in training, or training complete. No additional explanation was provided to the parent about these classifications, and no specific behaviors were assigned. Parents of eligible children gave informed consent.

Inclusion/Exclusion Criteria

Children were eligible for the study if their toilet-training classification was either not started or not currently training, parents planned to start toilet training within 3 months, and parents agreed to send in a TSS each week for 1 year. Inclusion criteria were child’s age between 15 and 40 months at the time of the recruitment and English-speaking parent and child. The age range was selected to include the most common ages for toilet training. The upper age limit was chosen because the Bayley Scales of Infant Development II (BSID-II) has a ceiling age of 42 months.¹⁸ Exclusion criteria were child currently enrolled in a program for developmentally delayed children, hospitalized for 10 or more days in the previous year, or having a congenital problem with bowel or bladder as these factors had the potential to delay the age of successful toilet-training skills. Also excluded from the study were children of parents who worked for an infant care product company or families who had participated in more than 3 market research studies involving diaper products in the last 6 months, as both populations could influence the use of diapers and the toilet-training process.

Sample

To achieve an enrollment goal of 300 participants, we obtained initial applications from 1003 individuals. During the eligibility screening process, 166 applications (17%) were rejected for the following reasons: 95 applicants could not be reached and 71 (7%) did not meet the inclusion criteria (25 were outside the age range, 20 had known developmental delay, 8 had frequent hospitalizations, 7 were involved in marketing research, and 11 others related to inclusion/exclusion criteria). Of the eligible participants, 52 parents (5%) refused to participate (15 gave no reason, 14 for parental scheduling conflicts, 23 for other reasons), 122 children (12%) did not complete the scheduled developmental assessment, 16 children (2%) were excluded because no toilet-training status was noted, and 380 children (38%) were already in toilet training or their toilet training was complete, leaving 267 (27%) children in the data set.

Demographic and Assessment Data

Child and parent demographic information was assessed using a background survey tool. Child demographic information collected included gender and age. Parental information surveyed included age, race, marital status/living arrangement, parental educational levels, hours per week each parent spent away from home, household income, index child’s use of child care, and number of other children the parents had toilet trained.

Child Cognitive Assessment

Each child’s cognitive development was assessed using the BSID-II.¹⁸ After formal training by the same pediatric psychologist (including direct observation), 2 research associates, who were not blinded to the study data, administered and scored the BSID-II and verified information on the demographic surveys. BSID-II scores were reported in the standard method with a mental developmental index (a numerical score having a mean of 100 and a standard deviation [SD] of 15) and a descriptive classification of delayed (<1 SD), average, or accelerated (>1 SD).

Data Gathering, Survey Instrument, and Toilet-Training Behavior

Weekly data collection occurred from October 1995 through December 1997 with parents returning a weekly TSS for 12 to 16 months. Preliminary results revealed that more than half of the children were still not toilet trained after participating for 12 months, so the weekly data collection was extended an additional 4 months for those children who were not daytime toilet trained after 12 months. The FITS TSS was developed, piloted, revised, and used for this project. This survey tool asked parents to rate their child's behaviors on 28 different toilet-training behaviors, eg, "stays dry during the day," on a 5-point Likert scale (1 = never; 2, 3 = sometimes; 4, 5 = always) for that week. Twenty-six of the skills were common to both genders, and 1 skill was specific to each gender ("wipes urine effectively" for girls and "urinates while standing" for boys). We included the skill of "has a potty chair available," although it is more a parental behavior because it reflects a readiness of the parents to initiate toilet training. To anchor selected behaviors, parents rated the child in the following categories: number of accidents per day, number of times the child sat on the potty per day, and number of urine successes per day using a 5-point Likert scale and number of bowel movements (BMs) per day using a 4-point Likert scale.

The Human Rights Review Board at Children's Hospital of Wisconsin and the Human Research Review Committee of the Medical College of Wisconsin approved the entire protocol. Parents were reimbursed for their efforts after the initial developmental assessment, monthly and at the end of the study.

Outcome Measures and Statistical Analysis

The age at attainment of a specific toilet-training skill was calculated as the child's age at the week when the parent first rated the child's behavior as 4 or 5 for performing that skill. Categories 4 and 5 were grouped together because they indicated a reasonable mastery of that skill. For children who did not master a skill before the conclusion of the study, the age at attaining the skill is known only to be beyond their age at the end of the study period. In this case, the child's age at end of the study period was calculated and recorded as a censored measure of the exact age at attainment. Because for several skills, some children did not master the skills before the conclusion of the study period, the Kaplan-Meier method for estimating survival curves with censored data were used to estimate the 25th percentile, median, and 75th percentile of the age distribution for achievement of each skill. The log-rank test was used to compare age distribution at attainment of a skill.

The correlation between the Bayley mental index, use of child care, and the presence of siblings with the behavior "enters bathroom and urinates by self" stratified by gender was analyzed using repeated measures logistic regression.

To provide a behavioral anchor for our weekly toilet-training status items, we did a correlation between the daily behaviors of "number of accidents," "sits on potty," "urinates in potty," and "has a BM in potty" with the weekly behavior of "stays dry for 2 hours." Because each child has a number of weekly status reports, violating the assumption of independent observations, the correlation was done for each child first. The resultant nonparametric Spearman rank correlations were then summarized using the median and central interval excluding the lower 5% and upper 95%. *P* values were not as helpful because the large sample size makes small correlations significant. The statistical software SAS (Version 8.0; SAS Institute, Inc, Cary, NC) was used for analysis, and statistical test significance was set at the .05 level.

RESULTS

The demographics of the study population are presented in Table 1. Participating families returned 10 741 weekly training status surveys (mean: 40.2; median: 49; range: 1–73).

For the girls, the mean age at the start of the study was 23 months. The girls' median ages and the interquartile ages (the ages when 25% vs 75% of the children acquired the skill) rank ordered by the median ages for each of the 27 skills are shown in Fig 1.

TABLE 1. Profile of Study Population

Group	n (%)
Children	
Number of children	267
Boys	141 (53)
Girls	126 (47)
Race	
Black	16 (6)
White	236 (88)
Other	15 (5)
Child care use	101 (38)
Siblings at home	
None	81 (30)
1 or more	186 (70)
BSID-II Mental Developmental Index (mean ± SEM)	103.4 ± 6.3
Parents	
Parental status	
Both living with child	246 (92)
One living with child	20 (8)
Household income	
≥\$50 000	126 (49)
<\$50 000	129 (51)
College degree	
Mother	141 (53)
Father	142 (55)
Employed	
Mother	168 (61)
Father	251 (99)
Mean work time per wk (h)	
Mother	20.9
Father	46.2
Mean age (y)	
Mother	30.8
Father	33.4

On average, the earliest skill to emerge for girls was "stays BM free at night" (22.1 months), whereas the latest skill acquired was "wipes poop effectively" (48.5 months). The median ages, confidence intervals (CIs), and the number of girls who acquired that skill are shown in Table 2. The median age when parents rated their girls as "stays dry during the day" was 32.5 months (95% CI: 30.9–33.7). The median age when girls could independently enter the bathroom and urinate by themselves was 33.0 months (95% CI: 31.2–34.4). The interquartile ranges varied from 6.9 to 11.4 months for girls for the age at acquiring each skill. There were not enough children who attained the skill of "wipes poop effectively" to be able to determine the 75th percentile for girls or boys.

For boys, the mean age at the start of the study was 25 months. The boys' median ages and the interquartile ages for each of the 27 skills are shown in Fig 2. On average, the earliest skill to emerge for boys was "understands potty words" (24.5 months), whereas the latest skill acquired was "wipes poop effectively" (45.1 months). The median ages, CIs, and the number of boys who acquired that skill are shown in Table 2. The median age when parents rated their boys as "stays dry during the day" was 35.0 months (95% CI: 33.3–36.7). The median age when boys could independently enter the bathroom and urinate by themselves was 37.1 months (95% CI: 35.0–38.6). The interquartile ranges varied from 7.5 to 14.6 months for boys for the age at acquiring each skill.

The median ages, CIs, and significance levels comparing girls and boys for each of the 28 skills are

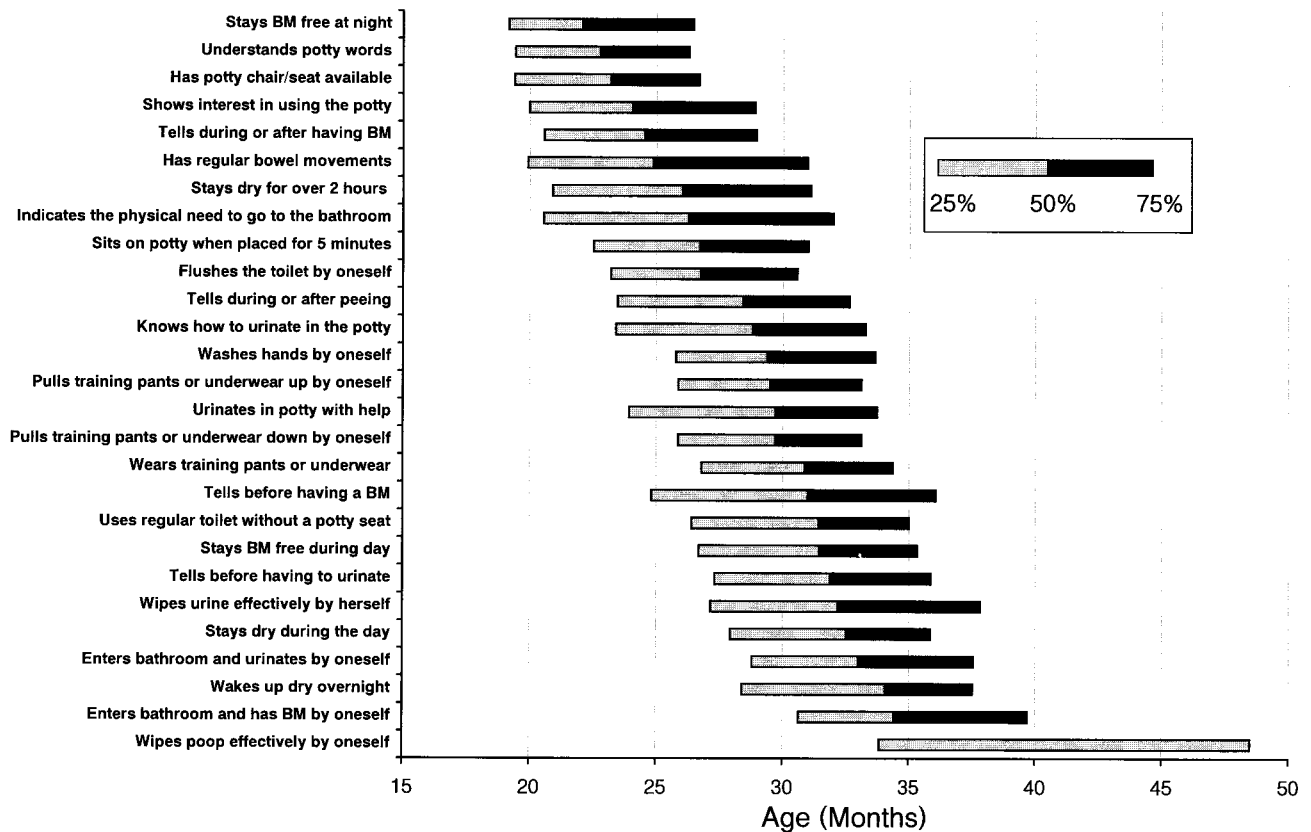


Fig 1. Age of attaining toilet-training skills—girls.

presented in Table 2. Overall, girls attained toilet-training skills at younger ages than boys in all categories except “flushes toilet by self” and “washes hands by self.” The 1 skill in which boys achieved success at an earlier age was “wipes poop effectively by self.” The skills that showed the greatest differences in median ages between girls and boys were “enters bathroom and has a BM by self” and “sits on potty when placed for 5 minutes” at 5.0 and 4.5 months, respectively.

There was a marked concordance between the girls and boys in the order in which the 26 skills common to both genders are attained. Only 2 skills showed a rank order difference of 3 positions between the girls and boys: flushes toilet by self (10th for girls and 6th for boys), although the median ages varied by only 0.2 months, and tells during or after urinating (11th for girls and 14th for boys), for which median ages varied by 4.2 months. There was no correlation between the Bayley mental index, presence of siblings, or the use of child care with the outcome “enters bathroom and urinates by self” for either girls or boys.

The correlation between the daytime behaviors of number of accidents, times sitting on the potty, urinations in the potty, and BMs in the potty with the weekly skill of “stays dry for 2 hours” is shown in Table 3. As the ratings for “stays dry for 2 hours” increased, the median ratings for 3 of the 4 daytime behaviors increased, whereas the number of accidents per day decreased.

DISCUSSION

This is the first study to document the sequential acquisition of the entire range of toilet-training skills in normally developing children. As has been noted in some previous studies of toilet training, we found that girls acquire specific skills at earlier ages than boys in almost every category.^{8,15,16,19} One obvious explanation is that girls’ physical and language skills mature sooner than boys’. Another explanation is that parents may initiate toilet training girls at younger ages than boys, and the practice at an earlier age leads to earlier acquisition of skills.

Contemporary literature has maintained that toileting readiness skills typically develop between 18 and 24 months of age.¹⁻³ Our data challenge this conventional wisdom. In only 2 of the 11 readiness skills were the median ages for girls less than 24 months of age: “stays BM free overnight” (22.1 months) and “understands potty words” (22.8 months). The median ages for boys were over 24 months in all 11 readiness criteria. Although some boys and girls acquire readiness skills before their second birthday, most do not. As practitioners advocating that parents wait until their children are ready to start toilet training, we should now revise our ages upward to 22 to 30 months when children are typically ready for toilet training.

The marked concordance in the sequence of attaining toilet-training skills between girls and boys should help providers to counsel parents about expected norms for children to master toilet-training

TABLE 2. Ages of Attaining Toilet-Training Skills by Gender

Toilet-Training Skill	Girls			Boys			P Value
	Median Ages (Months)	95% CI (Months)	n	Median Ages (Months)	95% CI (Months)	n	
Stays BM free overnight	22.1	20.7–24.3	123	24.7	23.0–25.5	135	.007
Understands potty words	22.8	21.4–24.0	125	24.5	23.3–25.8	133	.002
Has potty chair/seat available	23.2	22.0–24.4	115	25.2	24.2–26.2	126	.002
Shows interest in using the potty	24.1	22.9–24.9	118	26.2	24.8–27.6	125	.012
Tells during or after having a BM	24.6	23.0–26.3	118	27.0	25.2–28.7	123	.0007
Has regular BMs	24.9	23.5–26.5	105	26.2	24.4–30.5	107	.044
Stays dry for over 2 hours	26.0	24.0–27.3	112	28.9	27.8–31.6	119	.0002
Indicates the physical need to go to the bathroom	26.3	24.5–27.2	109	29.3	26.7–30.9	111	.003
Sits on potty when placed for 5 minutes	26.7	25.3–28.3	106	31.2	28.3–33.3	105	.0001
Flushes the toilet by self	26.8	25.8–28.5	104	27.0	25.6–28.7	123	NS
Tells during or after peeing	28.4	26.3–29.3	108	32.6	30.4–33.6	105	.0001
Knows how to urinate in the potty	28.8	26.6–30.4	104	30.9	29.0–32.1	113	.009
Washes hands by self	29.4	28.4–30.8	95	31.7	29.4–33.2	100	NS
Pulls training pants or underwear up by self	29.5	28.4–30.8	96	33.5	32.2–34.1	106	.0001
Urinating in potty with help	29.7	27.7–31.2	102	31.7	29.4–33.5	107	.003
Pulls training pants or underwear down by self	29.7	28.9–30.7	98	32.8	31.4–34.1	107	.0005
Wears training pants or underwear	30.9	30.2–32.4	97	33.8	32.4–35.7	107	.0001
Tells before having a BM	31.0	28.7–33.5	92	33.6	31.8–35.7	98	.01
Uses regular toilet without a potty seat	31.4	29.2–32.8	96	34.0	32.6–35.7	99	.0002
Stays BM free during the day	31.5	30.0–33.3	96	34.7	33.6–36.5	97	.0004
Tells before having to urinate	31.9	30.8–33.3	91	34.7	33.3–36.7	91	.0006
Wipes urine effectively by herself	32.2	29.5–33.3	85	NA	NA	NA	NA
Urinating while standing by himself	NA	NA	NA	38.0	35.6–39.3	77	NA
Stays dry during the day	32.5	30.9–33.7	92	35.0	33.3–36.7	98	.002
Enters bathroom and urinates by self	33.0	31.2–34.4	82	37.1	35.0–38.6	85	.002
Wakes up dry overnight	34.1	31.9–35.8	80	35.8	33.5–37.8	86	.03
Enters bathroom and has BM by self	34.4	33.5–35.8	78	39.5	37.8–40.4	69	.0001
Wipes poop effectively by self	48.5	*	37	45.1	*	31	.01

NS indicates not significant; NA, not applicable.

* Unable to determine.

skills. Early toileting skills tend to be readiness skills: “understands potty words,” “shows an interest,” “tells during or after having a bowel movement,” “stays dry for 2 hours,” and “indicates a physical need to go.” Middle toilet-training skills involve many self-help skills that can be taught to children: “flushes toilet by self,” “washes hands,” and “pulls training pants up and down.” Late toilet-training skills show major strides in toilet-training completion: “uses a regular toilet,” “stays BM free during the day,” “tells before having to urinate,” “stays dry during the day,” “enters bathroom to urinate or have a BM,” and “stays dry overnight.”

Our data add to the current information about the sequence of bowel and bladder control. Nighttime bowel control is an early toilet-training skill, whereas nighttime urine control is one of the last skills to develop for both genders. Although girls achieve daytime bowel and urine control at younger ages than boys, there is no statistically significant difference between the ages at attainment of daytime bowel control versus daytime urine control within each gender. Interquartile ranges vary from 7.9 to 12.3 months for the 4 skills and are especially noticeable in the skill of “waking up dry overnight” for which the interquartile range is 9 months for girls and 12 months for boys. The considerable overlap in the ages at acquiring daytime bowel and urine control helps to explain the wide variation in individual acquisition of skills and accounts for the conflicting reports in the literature.^{1,8,10}

The reasons for the wide interquartile ranges of

ages in acquiring the skill “enters bathroom and urinates by self” remain elusive. Our study shows that developmental ability among normal children is not critical. Even parental experience with a previous sibling was not predictive. Parents can be reassured that child care use does not seem to affect the acquisition of toilet-training skills as also noted by others.^{15,16} At present, we are not able to predict which child will toilet train at a younger age.

Our study has several limitations, including 3 for the outcome measure. First, outcome measures rely on parental report of a global score. As with other rating scales, there can be variability in which rating each parent may assign to particular behaviors. Second, behavioral anchors are not assigned to a particular rating for each skill achievement. However, Table 3 shows that the correlation between 4 behaviors, eg, the number of successful urinations in the potty with “stays dry during the day,” is excellent. Third, some children entered our study at young ages and may not have even reached the ages for the 75% for some of the skills. Another limitation is that the parents of our study children were highly educated, affluent, and mostly of white race. We had difficulty recruiting minority children. One reason was that many black children were already in the process of toilet training by 15 months of age, our lower age limit. Minority children successfully achieve toilet training at earlier ages,^{16,19} so it is reasonable to assume that they would acquire specific toilet-training skills at earlier ages than white children. Addi-

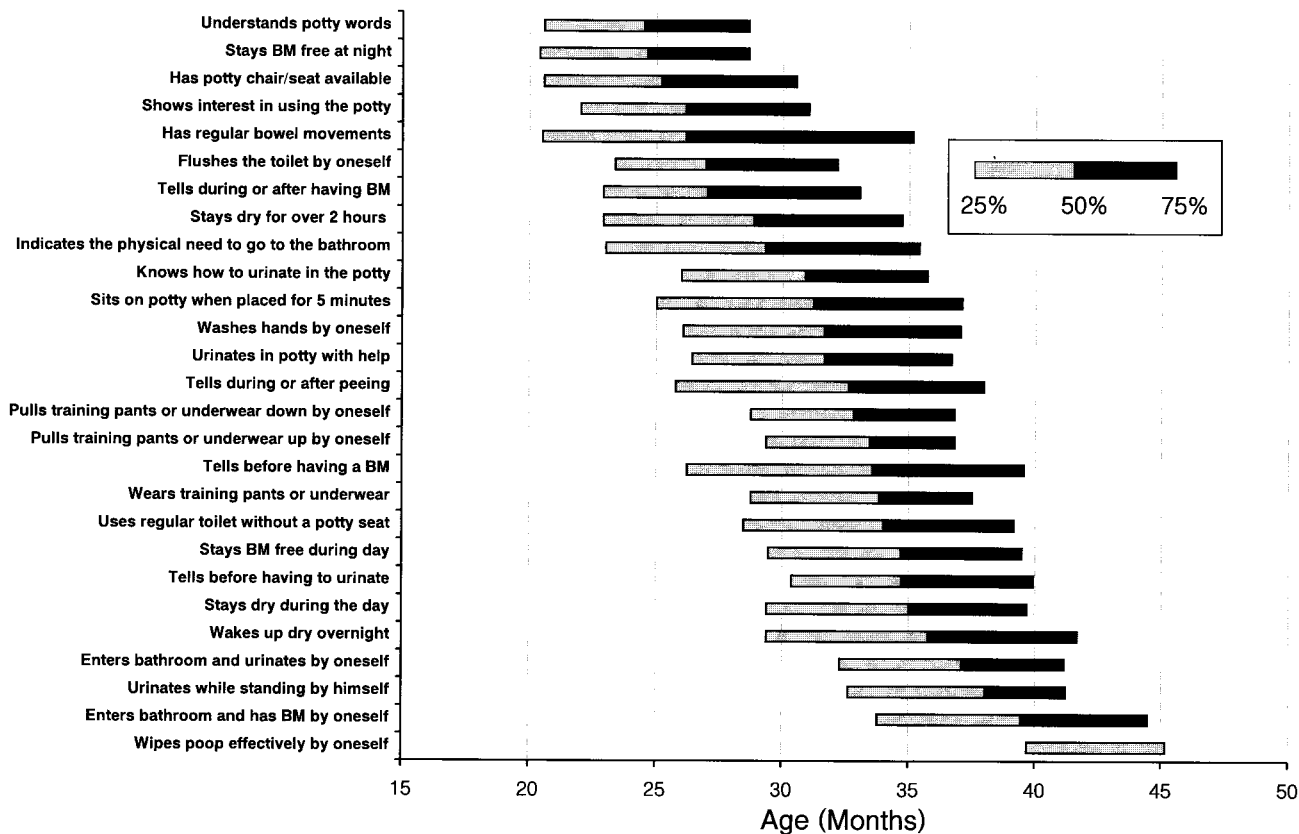


Fig 2. Age of attaining toilet-training skills—boys.

TABLE 3. Mean Daily Occurrence Rate for Various Toilet-Training Behaviors by Weekly Frequency of Staying Dry for at Least 2 Hours at a Time—Spearman Correlation Over Each Child’s Multiple Weekly Status Reports (Median and Outer 5% Ranges)

Toileting Behaviors	Stays Dry for at Least 2 Hours					Spearman Correlation	
	Never (1)	Seldom (2)	Sometimes (3)	Mostly (4)	Always (5)	Median‡ Correlation	5th and 95th Percentiles
Number of accidents*	3.4	3.1	2.7	2.0	1.2	-0.48	-0.94 to -0.22
Sits on potty*	1.9	2.3	2.8	3.6	3.4	0.39	-0.25 to 0.83
Urinate in potty*	1.5	1.9	2.5	3.5	3.5	0.52	-0.18 to 0.87
Has BM in potty†	1.1	1.3	1.5	2.0	2.1	0.42	-0.15 to 0.87

* Scale: 1 = zero, 2 = one to two, 3 = three to five, 4 = six to eight, 5 = nine or more.

† Scale: 1 = zero, 2 = one, 3 = two, 4 = three or more.

‡ Median correlation among participants between toileting behaviors and weekly status for “stays dry for at least 2 hours,” over the course of study for an individual’s repeated weekly status assessments.

tional research is needed to evaluate black children but must focus on children younger than 15 months. The findings represent an American approach, as children are toilet trained at younger ages in other cultures.^{17,21,22} Also, even with 267 children enrolled, compliance in returning weekly reports was not perfect. We had 2 groups of families. Some were exceptional at returning surveys with half sending in more than 50 surveys, whereas 15 families sent in fewer than 10 weekly surveys. Finally and curiously, the category of number of accidents per day created some unanticipated difficulty. Many parents believed that an accident occurs only when children are out of diapers, so the number of accidents did not turn out to be a reliable indicator early in the toilet-training process.

CONCLUSION

Pediatricians should continue to emphasize the importance of readiness for the initiation of toilet training. The ages when children achieve typical readiness skills, now in the range of 22 to 30 months, is older than previously reported. We now have information about the usual sequence that children follow along the toilet-training continuum, so practitioners can provide normative data and counsel parents of children who are having toilet-training difficulty. It is hoped that additional research will lead to a toilet-training progress scale that can be used both to assess where a child is along the toilet-training continuum at any given time and to compare data from different research studies. In addi-

tion, research is needed to examine the natural history of how rapidly children progress once actively in toilet training, which techniques are most effective in helping children acquire toilet-training skills, and what influences racial differences in toilet training.

ACKNOWLEDGMENTS

This study was funded by a grant from the Kimberly-Clark Corporation (Neenah, WI) in conjunction with the Medical College of Wisconsin.

We thank the physicians and staff at Pediatric Consultants, Southwest Pediatrics, 16th Street Community Health Center, and the Downtown Health Center Pediatric Clinic; Drs Michael Chusid, Patricia Lye, Karen Marcadante, David Schiedermayer, Deborah Simpson, and Rebekah Wang-Cheng for manuscript reviews; Ron Pupp for research support; and Gail Kreklow for secretarial assistance.

REFERENCES

1. Behrman RE, Kliegman RM, Jenson HB, eds. *Nelson Textbook of Pediatrics*. 16th ed. Philadelphia, PA: WB Saunders Co; 2000
2. Brazelton TB, Christophersen ER, Frauman AC, et al. Instruction, timeliness, and medical influences affecting toilet training. *Pediatrics*. 1999; 103:1353–1358
3. *Toilet Training*. Elk Grove Village, IL: American Academy of Pediatrics; 1998
4. Frankenburg WK, Dodds J, Archer P, Shapiro H, Bresnick B. The Denver II: a major revision and restandardization of the Denver Developmental Screening Test. *Pediatrics*. 1992;89:91–97
5. Michel RS. Toilet training. *Pediatr Rev*. 1997;7:240–244
6. Azrin NH, Foxx RM. *Toilet Training in Less Than a Day*. New York, NY: Pocket Books; 1974
7. Illingworth RS. *The Development of the Infant and Young Child-Normal and Abnormal*. New York, NY: Churchill Livingstone Inc; 1980
8. Brazelton TB. A child-oriented approach to toilet training. *Pediatrics*. 1962;29:121–128
9. Stein Z, Susser M. Social factors in the development of sphincter control. *Dev Med Child Neurol*. 1967;9:692–706
10. Largo RH, Stutzle W. Longitudinal study of bowel and bladder control by day and at night in the first six years of life. I. *Dev Med Child Neurol*. 1977;19:598–606
11. Roberts KE, Schoellkopf JA. Eating, sleeping, and elimination practices of a group of two-and-one-half-year old children. IV. Elimination practices: bowel. *Am Dis Child*. 1951;82:137–143
12. Roberts KE, Schoellkopf JA. Eating, sleeping, and elimination practices of a group of two-and-one-half-year old children. IV. Elimination practices: bladder. *Am Dis Child*. 1951;82:144–152
13. Spock B. *Baby and Child Care*. New York, NY: Pocket Books; 1957
14. Takahashi E. Investigation of the age of release from the diaper environment. *Pediatrician*. 1987;14(suppl 1):48–52
15. Taubman B. Toilet training and toileting refusal for stool only: a prospective study. *Pediatrics*. 1997;99:54–58
16. Schum TR, McAuliffe TL, Simms MD, Walter JA, Lewis M, Pupp R. Factors associated with toilet training in the 1990's. *Ambulatory Pediatr*. 2001;2:79–86
17. Bakker E, Wyndaele JJ. Changes in the toilet training of children during the last 60 years: the cause of an increase in lower urinary tract dysfunction? *Br Med J*. 2000;86:248–252
18. Bayley N. *Bayley Scales of Infant Development*. 2nd ed. San Antonio, TX: The Psychological Corporation; 1993
19. Oppel WC, Harper MD, Rider RV. The age of attaining bladder control. *Pediatrics*. 1968;42:614–626
20. Luxem M, Christophersen E. Behavioral toilet training in early childhood: research, practice, and implications. *J Dev Behav Pediatr*. 1994;15:370–378
21. deVries MW, deVries R. Cultural relativity of toilet training readiness: a perspective from East Africa. *Pediatrics*. 1977;60:170–177
22. Hindley CB. Growing up in five countries: a comparison of data on weaning, elimination training, age of walking and IP in relation to social class from European longitudinal studies. *Dev Med Child Neurol*. 1968; 10:715–724

Sequential Acquisition of Toilet-Training Skills: A Descriptive Study of Gender and Age Differences in Normal Children

Timothy R. Schum, Thomas M. Kolb, Timothy L. McAuliffe, Mark D. Simms, Richard L. Underhill and Marla Lewis

Pediatrics 2002;109:e48

DOI: 10.1542/peds.109.3.e48

Updated Information & Services	including high resolution figures, can be found at: http://pediatrics.aappublications.org/content/109/3/e48.full.html
References	This article cites 16 articles, 5 of which can be accessed free at: http://pediatrics.aappublications.org/content/109/3/e48.full.html#ref-list-1
Citations	This article has been cited by 1 HighWire-hosted articles: http://pediatrics.aappublications.org/content/109/3/e48.full.html#related-urls
Post-Publication Peer Reviews (P³Rs)	4 P ³ Rs have been posted to this article http://pediatrics.aappublications.org/cgi/eletters/109/3/e48
Subspecialty Collections	This article, along with others on similar topics, appears in the following collection(s): Development/Behavioral Issues http://pediatrics.aappublications.org/cgi/collection/development:behavioral_issues_sub Growth/Development Milestones http://pediatrics.aappublications.org/cgi/collection/growth:development_milestones_sub
Permissions & Licensing	Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at: http://pediatrics.aappublications.org/site/misc/Permissions.xhtml
Reprints	Information about ordering reprints can be found online: http://pediatrics.aappublications.org/site/misc/reprints.xhtml

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2002 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

