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REVIEW

Can evidence-based medicine change toilet-training practice?

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KEYWORDS

Toilet training;
Urinary incontinence;
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ABBREVIATION

TT, toilet training

Abstract ***Objectives:*** To assess the evidence showing that a specific method of toilet training (TT) is more effective than others, as any method of TT recommended by a physician faces obstacles because parents rarely request advice on TT from physicians, and TT practices vary tremendously across cultures and socioeconomic levels.

Methods: Reports on the natural course of urinary incontinence in children and different methods of TT, published in English between 1946 and 2012, were reviewed. Specifically investigated were historical recommendations on TT, the prevalence of urinary incontinence during childhood, the outcome of TT methods, and the effect of culture and socioeconomic status on the choice of TT method and timing.

Results: TT now occurs at later ages than it did previously. This progression reflects changing ideas about normal childhood physiology and psychology. The prevalence of urinary incontinence in European countries progressively decreased in children aged between 6–7 years and 16–17 years old. TT methods change with increasing socioeconomic levels to 'child-centred' techniques applied at older ages,

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but the prevalence of urinary incontinence after 'parent-centred' techniques of TT at younger ages has not been studied. There is currently no evidence that a specific timing or method of TT is more effective or prevents voiding dysfunction.

Conclusions: Follow-up studies of urinary continence in children toilet trained at 6–12 months of age might provide evidence for whether a given method or timing of TT is beneficial to prevent voiding dysfunction. The recommendations of physicians might be more readily adopted if they fit culturally accepted ideas of good parenting techniques.

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Introduction

The hypothesis that delayed toilet training (TT) in Western countries is responsible for an increased risk of dysfunctional voiding is a provocative idea [1,2]. It suggests that TT needs to be done during an optimal period to avoid long-lasting effects such as urinary incontinence and UTI. However, the increased prevalence of dysfunctional voiding might be due to other factors, such as the increased recognition of urinary incontinence in children in wealthier countries, or it might show that children who are prone to dysfunctional voiding take longer to be trained [3,4]. The ability to study this topic is a 'moving target', as increasing wealth usually leads to the adoption of a 'child-centred' TT approach applied at older ages, as diapers become more affordable. While a prospective trial comparing different methods and timings of TT would be scientifically rigorous, success rates for TT methods depend on how intensively parents are instructed on the method [5]. Parents gather much of their information on TT from non-medical sources, such as friends and family members with older children or websites, which reflect their culture and socioeconomic status [6]. Often, advice from physicians is requested only when TT becomes frustrating for parents. The cheapness of diapers vs. the availability of time for parents or caregivers to train children might be the key factors which influence families on TT methods. It would be difficult to change these social factors with medical advice.

In the absence of a clinical trial, a prospective multicentre case-control study might provide evidence on the benefits of early 'parent-directed' vs. later 'child-directed' methods. To evaluate these data, knowledge of the natural history and prevalence of urinary incontinence in children would be necessary to provide a baseline for comparison. The minimum outcomes of this study would include urinary incontinence (quantified by the daily number of episodes), age, gender, family history, timing and method of TT. Ideally, this cohort would be followed over time to see if the rate of urinary incontinence improved at older ages. Other known factors, such as psychological stress and developmental delay, would be harder to assess in a large survey population, and these factors might not be evenly matched. The data might be explained by several factors, and it might not be possible to clearly show that either the method or the timing of TT was the cause of voiding dysfunction. However, this type of evaluation would provide the most accurate 'real-world' results of TT. The primary outcomes to be evaluated would be:

1. What is the prevalence of urinary incontinence immediately after TT? Using a standardised tool would answer the question of whether an increased risk of dysfunctional voiding was due to increased recognition.
2. Was a consistent method of TT applied? If there was a significant cross-over from a 'parent-centred' to 'child-centred' approach, that might suggest that some children have difficulty mastering the physiological steps of TT.
3. What is the prevalence of urinary incontinence 10 years after TT? If the long-term outcomes are similar, the short-term outcomes might not be as clinically important. One would be more concerned if the data suggested that permanent urinary incontinence could result from using an incorrect method or timing for TT.

Methods

Reports published in English between 1946 and 2012 on the natural course of urinary incontinence in children and different methods of TT were identified, combining the search terms 'urinary incontinence', 'paediatrics', and 'toilet training'. Relevant reports were reviewed for historical recommendations on TT, the prevalence of urinary incontinence, outcome of TT methods, and the effect of culture and socioeconomic status on the choice of TT method and timing. Papers quoted in the Reference sections of these papers were also reviewed, along with papers analysed in previous reviews on paediatric urinary incontinence and methods of TT [7–12]. 'Parent-centred' TT is a method where the parent takes the lead in determining the timing of TT for the child. This is commonly used in African and Asian countries, sometimes starting at 3 months of age, more often at 6 months, and usually with the goal of having the child able at 1 year old, to signal to its parents that he or she needs to empty the bladder [13]. There is no initial

expectation that children will be able to clean and dress themselves, but as they grow it is expected that they will master the additional tasks required to independently toilet themselves. 'Child-centred' TT involves waiting for the child to show signs of readiness for TT before embarking on the training process. This is commonly used in European and North American countries, usually starting at 18–22 months old, and is more popular when disposable diapers are relatively affordable. Because the child is older, cleaning and dressing after use of the toilet is expected [14]. For the purpose of this review a loose definition of urinary continence was used, i.e. being able to signal to a parent the need to urinate, and to stay dry in between, as this will allow a comparison of the two TT methods. Because nocturnal enuresis also affects a significant population of children and is harder to modify, this review will only discuss daytime urinary continence.

Results

Historical perspective

Early TT was typical in the USA in the mid-1800s. A paediatric textbook from 1847 proposed early TT as a goal: '*Children may be so trained to cleanliness, that at a very early period of their lives, they will avoid soiling themselves. A friend informed us, that the little patient of eight months old, for which we were prescribing, had not worn a diaper since it was a month old; nor had it in a single instance soiled itself, either during the day or the night. When it felt a necessity, it would by signs make it known in such good time as to prevent accident. This, we admit, to be a rare instance of discipline, but it is not less worthy of imitation*.' [15]. By the early 1900s, failure to achieve early TT was felt to be a moral failure on the part of the parents. '*Before the end of the first year many intelligent children can be trained to indicate a desire to empty the bladder. Many mothers and nurses succeed so well in training children so well that by the tenth or eleventh month napkins are dispensed with during the day. On the other hand it is very common to see children of two or even two and a half years still wearing napkins due to lack of proper training…The annoyance and discomfort from the neglect of early training in this particular are very great*.' [16]; and '*In most cases the condition is purely a habit, often associated with other habits that indicate an unstable or highly susceptible nervous system*' [17].

Gradually, the expected age of TT changed towards later ages, as reflected in this official US government publication on children's care from 1951: '*When some neighbour tells you her baby was ''trained'' at a very early age, take it with a grain of salt. You can be sure it was really she who 'trained' herself to recognize little signals that her baby was about to have a movement. Or, her baby happened to be one whose bowel movements came at quite regular times earlier than most babies' do. Of course it saves work if your baby doesn't soil his diapers. But don't fool yourself into thinking that a baby under a year old can learn to control either his bowels or his bladder. Anything that looks like 'control' will be because you remembered to put him on the toilet…A mother who refuses to have a battle over toilet training can be pretty sure that once he has caught on, her child will learn without much trouble*.' [18]. The previous emphasis on early TT had been 're-packaged' as the parent becoming trained to recognise the infant's need to void or defecate. The largest change to later TT probably occurred in response to Terry Brazleton's 'child-centred' approach [14], which was popularised in his *Touchpoints* book series. He used a psychological approach in the paper: '*Encopresis and urinary incontinence can be traced to adverse or punitive training practices. Such pathologic symptoms usually reflect a fundamental psychological disturbance in the child's adjustment…There must be a psychologic readiness associated with a desire to control the impulses to defecate and urinate. These impulses are associated with a kind of primitive pleasure and an immediacy*.' He suggested starting with a potty chair at 18 months old. During the period of 1951–61, most children in his suburban practice started TT at 24 months old and completed it by 30 months. Of 1170 patients 150 (13%) did not complete TT until 3.5 years old, while 12 (1%) remained incontinent at age 5 years [14].

Studies using the stricter definition of continence from the 1950s to 1980s showed that it was rare for children in the USA or Europe to be completely independent at toileting until 36–48 months old [19]. A survey of Brazilian children found that 98% of 2-year-old children were dry at 2 years old in 2003, compared to 24% of 2-year-olds in 2006 [20].

Prevalence data and longitudinal follow-up

In European countries, daily urinary incontinence occurs in 1–9% of children at 7 years old, with girls having higher rates than boys (2.3–8.9% vs. 1.3–9.2%; mean 6% vs. 4%) [4,21,22]. The broad range might be due to an increased awareness of urinary incontinence over time, as the more recent studies have a higher prevalence rate [4]. By the time this cohort of children reached 15–17 years old, the prevalence decreased to 0.3–5% (girls 3.6–4.7% vs. boys 0.3–1.0%). Interestingly, none of the older children felt that their urinary incontinence was a significant issue, and they did not request medical treatment [4,23–25]. Both of the longitudinal studies were carried out in the 1990s. No longitudinal data from Asian or African countries are available, although the cross-sectional prevalence of urinary incontinence does not appear to be significantly different from the European studies. English children show a decrease in daytime urinary incontinence between 4 and 9 years old, from 11% to 2% in girls, and 11% to 3% in boys [26]. In Australian elementary-school children at a mean

age of 7.3 years, 10% reported daily urinary incontinence, which was more common in girls than boys [27]. In South Korean elementary-school children aged 6–13 years, daytime incontinence occurred in 11%, with a clear trend towards improvement with age (31% in 5-year-olds to 6% in 13-year-olds). UTI and delayed stool control negatively affected dysfunctional voiding [28]. Brazilian children aged 6–12 years reported a 31% rate of urinary incontinence, although the frequency of wetting and trend over time was not specified [29]. Finnish children have frequent urge incontinence, at a rate of 4% when 4–7 years old, which decreases to 0.6% by 8–12 years. It was not reported at all in those aged 13–26 years, and social problems caused by the incontinence were only reported in 1% of children aged 4–12 years [30].

Parent- vs. child-centred TT methods

TT methods clearly change with increasing socioeconomic levels to child-centred techniques applied at older ages, probably due to the affordability of disposable diapers. The prevalence of urinary incontinence after parent-centred techniques of TT at younger ages has not been studied. One Vietnamese paper showed that infants can be trained by 1 year old, and that the postvoid residual urine volume decreased after infant TT [31]. Although the experience of the Digo people of Kenya is the most referenced paper [13], the same 'parent-centred' technique was successfully applied in the Netherlands with 3–7-month-old infants [32].

No direct comparisons of TT methods have been reported. The Foxx-Azrin method is an intensive parent-centred technique that requires many steps, including both positive and negative reinforcement by the parents [33]. The initial publication suggested that 20-month-old children could be trained at a mean of 4 h, and would remain dry for 4 months. Follow-up studies showed that the success of the Foxx–Azrin method varied considerably, depending on whether parents were provided with experienced trainers, vs. those who were only instructed to read the book. Parents who did not receive supervision were less likely to achieve continence in the child, and the children who did become dry in this group had a rapid relapse [5]. While the child-centred approach suggests looking for several signs as a way of determining when a child is ready to TT, the period during which these signs are apparent varies between 2 and 40 months old [34].

The initial paper from Switzerland comparing early TT (onset between 6 and 9 months, 1954–56) with current delayed TT (onset between 12 and 24 months, 1974–84) over different periods found that about 90% of boys and girls achieved daytime continence at 48 months old in both groups. This paper used a stricter definition of successful TT, including dressing and toileting. This study suggested that early TT only prolonged the process, and did not result in children achieving early continence [35]. This was supported by another study comparing the timing of TT in a predominantly white, suburban population in the USA. This study found that early TT (18–21 months, compared to later) correlated with a longer duration of TT, suggesting that there was no benefit to starting TT before 27 months old [36]. By contrast, a study from the UK found that waiting to TT after 24 months was correlated with a higher risk of daytime urinary incontinence, prolonged TT, and relapse to daytime incontinence [3]. The authors hypothesised that a delay in TT would expose children to additional stresses, which interfered with TT. A retrospective comparison of Belgian elementary-school children found that children with no urinary symptoms were more likely to start TT before 18 months old than were those with urinary incontinence [37]. A comparison of Taiwanese kindergarten children who had TT at <18, 19–24 and >24 months old found no difference in urinary incontinence, uroflow patterns or postvoid residual volumes. In that study, 28% started TT using a parent-directed method before 18 months old, 30% at 19–24 months and 42% used a child-directed method after 25 months old [38].

The use of the bedwetting alarm to help train children in day-care settings was shown to be more effective than a control (52% vs. 8%) over the course of 3 weeks [39]. A survey of Belgian day-care providers showed that 82% spent at least an hour each day on TT, 50% used readiness signs to determine the proper age to start, and 95% used timed toileting to start the process. A third of providers felt that parents did not participate sufficiently in enforcing TT at home, although 60% of day-care workers also felt pressure from parents to accelerate the process [40].

Variations by socioeconomic group

Parents from lower socioeconomic groups had the expectation that their children would toilet train at an earlier age. African-American children who lived in the Milwaukee (WI, USA) area were more likely to train early than were Caucasian children (50% completing TT by 30 vs. 39 months) [41]. A survey of USA parents showed that Caucasian parents believed that children should be trained at a later age than did African-American parents (25 vs. 18 months). Race was a stronger predictor than income for the belief that children should be trained at a later age [42]. Turkish children complete TT by 28 months for girls, and 29 months for boys. Multivariate analysis found that an earlier initiation of TT was associated with lower socioeconomic status, use of a potty chair, and use of punishment. The duration of TT was longer in rural and semi-urban areas than in urban areas [43]. It is unclear whether this is due to a need to minimise expenses for disposable diapers, or whether this is associated with a cultural

expectation that children should grow up earlier. British mothers who were older and had a longer education were more likely to wait until 24 months to TT, whereas young, single mothers with a shorter educational experience were more likely to TT at 15 months or earlier [3].

Readiness signs

Deciding when a child is ready to toilet train depends on the presence of both overall readiness skills and toilet-specific skills. The lesson that can be learned from parent-centred TT is that at a minimum, the child must be able to signal to its parent that he or she needs to urinate. This can be present as early as 3 months [13], but in Western countries, occurs at a median age of 28 months for girls and 33 months for boys [44]. Staying dry during an afternoon nap has been suggested as a good marker for increasing bladder capacity, which occurs at a median age of 26 months for girls and 29 months for boys [44]. Unfortunately, the use of absorbent diapers has made it more difficult for parents to realise when their children are staying dry, compared to when cloth diapers were used, as the wetting is not immediately apparent [45]. Up to 28 separate toilet-readiness signs have been proposed, which occur at 2–40 months old [34,44]. This broad range of ages unfortunately provides no guidance to physicians or parents on when to start TT, although the onset for half of the signs will have occurred at 12–24 months old [34]. If the skills that involve independent toileting are excluded, the child is able to tell its parent that it needs to use the toilet when it is 9–36 months old, bladder capacity increases between 12 and 32 months, and a child is bothered by a wet diaper when it is between 18 and 24 months old [34]. A reasonable approach would be for parents to consider TT when their child is able to communicate the need to urinate and is able to stay dry during a nap, or for 2 h during the day.

Barriers

While scientific evidence might be helpful in convincing some parents to use a specific method of TT, the USA experience would suggest that successfully propagating a new TT method depends on the efforts of a charismatic, trusted expert, probably a paediatrician, whose instructions have a large effect on parents across socioeconomic groups. The reasons for the method must fit popularly accepted concepts of childhood development, and the techniques must work within child-care arrangements, to allow wide adoption. The public-health implications of providing appropriate advice for parents and child-care providers on optimal methods of TT, especially in low socioeconomic areas, could include shorter periods of TT, a decrease in the use of diapers, and a reduction in parental stress in achieving this developmental milestone.

Conclusions

TT practices have varied widely over time, but these changes were driven less by scientific data than by popular ideas of whether permissive or strict parenting was better. Prevalence and incidence data on urinary incontinence after 'child-centred' TT are available to provide a comparison for children who undergo 'parent-centred' TT. Follow-up studies of urinary continence in children TT at 6–12 months old might provide evidence on whether 'parent-centred' TT is beneficial to avoid voiding dysfunction. The normal course for urinary incontinence in children is a spontaneous resolution, but children with significant urinary incontinence often do not seek medical attention. If TT is used predominantly by child-care providers in the future, TT methods based on scientific evidence might be easier to implement.

Conflict of interest

None.

Source of funding

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