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# Urinary bladder control during the first 3 years of life in healthy children in Vietnam — A comparison study with Swedish children

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**Abstract** *Objectives:* To study outcomes of early potty training in a population of healthy children with a tradition of early potty training and to compare these findings with a group of children to whom potty training was applied later.
*Subjects and methods:* Mothers and their 47 healthy children in Vietnam participated in this longitudinal study. The voiding pattern and emptying ability were followed by the 4-h voiding observation method from 3 months to 3 years of age. A comparison is made with a group of 57 Swedish children investigated in a similar manner.
*Results:* In the group of Vietnamese children, 89% were on daily potty training at the age of 6 months. At the age of 24 months, potty training was complete for 98%. In the Swedish group, just a few (5%) had started daily potty training by the age of 24 months ($p < 0.001$). The Vietnamese group had fewer voidings and lower voided volumes than the Swedish group. In the Vietnamese children, bladder emptying could be regarded as having been completed, with no residual urine at 9 months, compared with the Swedish group, which first showed complete emptying at the age of 36 months.

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*Conclusion:* Potty training performed daily affects the emptying ability positively. In the Vietnamese group, no residual urine was found at the age of 9 months. These results differ significantly from those of the group of Swedish children.


## Introduction

The development of bladder function and the way healthy children achieve bladder control have been addressed in several studies during the last decade. This knowledge is important to understanding first what is abnormal and then being able to imitate a normal pattern in children with congenital bladder anomalies and dysfunction.

Studies have shown that toilet training changes the physiological functions involved in micturition. The bladder capacity increases, the coordination between the bladder and sphincter improves, and the emptying of the bladder becomes complete [1—4]. Before having bladder control, the child often has residual urine and frequent voiding of small urinary volumes [5—7].

This knowledge emanates from studies performed during the last decades and has also been shown in a longitudinal study of healthy children in Sweden who were followed from the age of 3 months—6 years [2,6]. Results from this latter study indicate that the frequency of voiding decreased over time, the voided volumes increased and the post-residual urine decreased marginally until the age at which bladder control was achieved, at around 3.5 years. A large variation in the voided volumes of individual children was identified; indicating that bladder emptying was not an automatic function without influence from the brain. The study also indicated that the children had signs of arousal when it was time to void already in early infancy, supporting the concept that the brain influences the bladder function already from birth [7,8]. Such arousal at voiding already in the neonatal period was previously reported in a study from Hong Kong using electroencephalography [9].

In a study of healthy children in Vietnam, who were followed from newborn up to 12 months of age, 81% of the mothers had started toilet training their children already at the age of 3 months, and, by the age of 12 months, all the children were potty trained on a regular basis. Almost all the children voided without residual urine at the age of 9 months, probably as a result of this early training [10]. Two-way communication was used between the mother and child. The mother looked for signs of when the child had a need to void and responded to it by holding the child in a sitting position. This was done often, every one or 2 h. The voiding was supported by a whistling sound from the mother [11]. In the Swedish study [2,6] however, the child-oriented method was used. In this method the parents waited for the right time to come and for the child to be mature enough to be diaper free. The potty training procedure often took place during the summer and the child was encouraged, in co-operation with the parents, to practice using the potty or toilet [12].

The aim of the present study was to make a direct comparison between a cohort of children subjected to early potty training and a group subjected to late potty training, with special reference to age for the disappearance of the physiological dyscoordination and improvement in emptying ability. The direct research question is whether there are benefits regarding bladder function variables when potty training children earlier than is traditionally done in the Western World.

## Subject and methods

The study has a longitudinal design. Mothers of healthy newborn children in Vietnam were consecutively informed about participating in the study when attending health check-ups for their children at the National Hospital of Pediatrics (NHP). After written informed consent had been obtained from the parents, the children were investigated at the hospital. Permission for the study was obtained from the ethical committee at the NHP. Preliminary results had been published previously from the first year of life of these Vietnamese children [10]. In the present study, the voiding pattern and emptying ability were followed from 3 months to 3 years and compared with a group of Swedish children. The data on the Swedish children have been published previously, and in these studies 57 healthy children were followed from 3 months to 6 years [2,6].

The children in both groups were investigated in a similar manner: every 3 months up to the age of 12 months and then every 6 months [10]. The study included an investigation of the micturition pattern through the 4-h voiding observation method [2,6,13]. Ultrasound (Toshiba Nemio XG) was used to measure residual urine following each voiding. A group of five mothers with children was invited to each session. The children had to void in a potty or pre-weighed diaper. The diaper was checked every 10 min during the 4-h period, though the child was under observation all the time. The Vietnamese children who did not use diapers at all were checked in the same way. The voided volume and residual urine were recorded in a protocol together with notations of sleeping, eating and crying. Occurrences of interrupted voiding were recorded as a sign of dyscoordination. Interrupted voiding means at least two voidings within 10 min and less residual urine at the last voiding. Parents and children were observed for events of importance to the study (notes) and interviewed (notes and tape recordings) at each visit regarding health, the micturition procedure and the use of nappies.

The inclusion criteria were that the child should be healthy in terms of illnesses and disabilities affecting the micturition pattern or his or her development. If the child became ill during the study, he or she would still be included unless the parents wished to withdraw the child. Completed potty training was defined as: the child managing the toilet procedure independently of any reminders or support from others. The voided volumes were measured and named, instead of using the term bladder capacity,