# DOES A PROFOUND CHANGE IN TOILET-TRAINING AFFECT DEVELOPMENT OF BOWEL AND BLADDER CONTROL?

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We have reported previously on the development of bowel and bladder control and on the role of potty-training and the child's initiative (Largo and Stützle, 1977*a, b*). Our observations were based on the first Zürich longitudinal study, in which children born between 1954 and 1956 were followed from birth to adulthood. At that time parents started toilet-training in the first year of a child's life, and a few mothers even held their infants on the potty when they were a month old. Potty-training was initiated in 96% of the infants by the age of 12 months. Similar data have been reported for other European countries for the same period (Douglas and Bloomfield 1958, Hindley 1968, Klackenberg 1971). In the two decades after our first study (hereafter called study 1), disposable nappies (disposable diapers) were introduced and parents became more liberal in their attitudes to child-rearing. In the second Zürich longitudinal study, which enrolled children born between 1974 and 1984, a profound change in the onset and intensity of toilet-training was noted: training was postponed by more than a year and was markedly less intense. This change between the fifties and the seventies gave us a unique opportunity to investigate the efficacy of toilet-training and the role of the child's initiative.

The following questions are addressed in this article: (1) How do the child's age at the onset of toilet-training and the intensity of the training affect the development of bowel and bladder control? (2) Is the child's initiative influenced by toilet-training? (3) Does the current practice of toilet-training correspond to children's individual needs?

## Method

### SUBJECTS

The data presented here are based on two cohorts of healthy Swiss children who have been, or are being, followed up from birth to adulthood (Table I). The first Zürich longitudinal study, of 320 term children born between 1954 and 1956, was conducted in co-operation with the Centre International de l'Enfance in Paris (Falkner 1960). In the second Zürich longitudinal study, term and preterm infants born between 1974 and 1984 were enrolled. In this article, data on 309 healthy term children are reported.

### PROCEDURE

The children in both cohorts were seen at ages 1, 3, 6, 9, 12, 18 and 24 months, and at yearly intervals thereafter. The same questionnaires were used in both cohorts (for detailed information, see Falkner 1960, where the complete questionnaires were published). The mothers were asked

ZUSAMMENFASSUNG

*Zwei Stufen Verfahren zur Identifizierung von Kindern mit entwicklungsbedingten Koordinationsstörungen in Singapur*

Die Autoren untersuchten die Häufigkeit von entwicklungsbedingten Coordinationsstörungen (DCD) in einer randomisierten Gruppe von 6- bis 9-jährigen Grundschulkindern (N=427) in Singapur mit einem zwei Stufen Verfahren, das in der Movement Assessment Battery für Kinder Henderson and Sugden enthalten ist. Nach diesem zwei Stufen Verfahren betrug die Häufigkeit 4%, wenn die erste Stufe die unteren 15% der randomisierten Gruppe einschloß. Das zwei Stufen Verfahren versucht, die diagnostischen Kriterien für DCD, herausgegeben von der amerikanischen Psychiatriegesellschaft (DSM-IV) und der Weltgesundheitsorganisation (ICD-10), zu erfüllen, die eine schwere motorische Störung in der Entwicklung der motorischen Koordination und eine signifikante Beeinträchtigung der Aktivitäten des täglichen Lebens der Kinder, die nicht durch geistige Retardierung oder eine bekannte körperliche Behinderung bedingt ist, bezeichnen.

RESUMEN

*Método en dos tiempos para la identificación de niños con alteraciones en el desarrollo de la coordinación de Singapore*

Se estudió la prevalencia de la alteración del desarrollo de la coordinación (ADC) en niños de escuela primaria de 6 a 8 años de edad, en Singapore, a partir de una muestra al azar (N=427) utilizando un procedimiento en dos etapas contenido en la Batería de Evaluación del Movimiento para Niños de Henderson y Sugden. El porcentaje de prevalencia de este procedimiento fue del 4% cuando la primera etapa incluia el fondo del 15% de la muestra al azar. El procedimiento de las dos etapas se mueve hacia el cumplimiento de los criterios diagnósticos para la ADC, de la Asociación Psiquiátrica Americana (DSM-IV) y la OMS (ICD-10), para la alteración motora grave en el desarrollo de la coordinación y la interferencia significativa con las actividades de la vida real, no debida, en niños, a un retraso mental o a una discapacidad física conocida.



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TABLE I
**Study populations**

| *Zürich Longitudinal Study* | *Birth year* | *Females* | *Males* | *Total* |
|---|---|---|---|---|
| First | 1954–1956 | 158 | 162 | 320 |
| Second | 1974–1984 | 153 | 156 | 309 |

about toilet-training, child behaviour and bowel and bladder control. The stage of bowel and bladder control by day and at night observed during the month before each examination was recorded as follows: 0% = no control; 1 to 29% = partial control, during approximately one-third of the time; 30 to 69% = control during one-third to two-thirds of the time; 70 to 99% = total control except for a few relapses; and 100% = total control.

Socio-economic status was defined by means of a 6-point score of both paternal occupation and maternal education. The lowest possible socio-economic status score was 2 (lowest status of both paternal occupation and maternal education), and the highest was 12.

### STATISTICAL METHODS

Logistic regression with binomial dependent variable and binary or continuous regressors was used throughout. This method allows a more refined global assessment of the significance of study and sex differences and of the effect of certain covariates than would be possible by pairwise comparisons at fixed ages and within study or sex group.

In logistic regression, the logit of the probability P of a certain event, such as achieving complete bladder control at night, is modelled as a linear function of binary and/or continuous covariates:

$\log (p/(1-p))=\alpha_0+\alpha_1*X_1+\alpha_2*X_2+\ldots+\varepsilon$,

where $X_1$, $X_2$ ... are the covariates (*e.g.* age at onset of training) and $\varepsilon$ is the error. The longitudinal structure of the data is not fully exploited in logistic regression; rather, the subgroups studied, *e.g.* males and females, are regarded as being independent rather than as consisting of the same individuals in both cases.

With regard to the models, age – the most important covariate, available at five to eight levels – was modelled as a polynomial of degree two or three, sometimes four or five. Interactions with age were modelled only when the corresponding reduction in deviance was highly significant and additional 'biological' or graphical evidence for their necessity was provided. In two-sample questions, *e.g.* comparisons of the sexes, non-parametric Wilcoxon tests and $\chi^2$ tests were used. Associations between pairs of variables, *e.g.* socio-economic status and daily prompting, were obtained by calculating Spearman correlation coefficients.

Detailed statistical analyses could be carried out only in study 2. For study 1, the complete set of individual data was no longer available, but only the proportions reported here (see Table II).

## Results

The observed proportions at any given age are shown in Table II for all parameters, for both studies and for both sexes separately. The developmental course of toilet-training, daily prompting, the child's initiative and bladder and bowel control, as obtained by fitting logistic regression models with sex, study and age as regressors, is represented in Figure 1.

The developmental course in the two studies differed significantly ($p<0.001$) for the onset of toilet-training, intensity of daily prompting, occurrence of the child's initiative, bladder control by day and at night and bowel control. Significant differences according to sex were noted for all these parameters in study 2, but only for bowel control and bladder control by night in study 1. On logistic regression, the sex differences appeared to be additive, *i.e.* equal in both studies, in the logit scale for bladder control at night and asking for potty. The individual parameters are discussed in more detail in sequence.

### TOILET-TRAINING

*Onset of potty-training*

In study 1, potty-training was started at the



*Developmental Medicine and Child Neurology*, 1996, 38, 1106–1116

Table II
**Course of toilet-training and of development of continence**

| | *Age (mths)* | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *1* | | *3* | | *6* | | *9* | | *12* | | *18* | | *24* | | *36* | | *48* | | *60* | | *72* | |
| | *M* | *F* | *M* | *F* | *M* | *F* | *M* | *F* | *M* | *F* | *M* | *F* | *M* | *F* | *M* | *F* | *M* | *F* | *M* | *F* | *M* | *F* |
| *Potty-training* | | | | | | | | | | | | | | | | | | | | | | |
| Study 1 | 2 | 1 | 12 | 14 | 33 | 31 | 79 | 81 | 94 | 98 | 99 | 99 | 100 | 100 | | | | | | | | |
| Study 2 | | | | | 1 | 2 | 7 | 7 | 16 | 20 | 33 | 48 | 61 | 75 | 91 | 99 | 100 | 100 | | | | |
| *Daily prompting (%)* | | | | | | | | | | | | | | | | | | | | | | |
| Study 1 | | | | | | | | | | | | | | | | | | | | | | |
| 0 | | | | | | | | | | | 5 | 2 | 2 | 1 | 8 | 10 | 33 | 34 | | | | |
| <1 | | | | | | | | | | | 11 | 10 | 25 | 23 | 70 | 62 | 37 | 35 | | | | |
| 1–2 | | | | | | | | | | | 19 | 20 | 20 | 14 | 12 | 16 | 24 | 27 | | | | |
| 3–5 | | | | | | | | | | | 20 | 21 | 19 | 27 | 7 | 9 | 5 | 4 | | | | |
| >5 | | | | | | | | | | | 47 | 47 | 34 | 35 | 3 | 3 | 1 | 0 | | | | |
| Study 2 | | | | | | | | | | | | | | | | | | | | | | |
| 0 | | | | | | | | | | | 72 | 61 | 51 | 37 | 32 | 38 | 41 | 54 | | | | |
| <1 | | | | | | | | | | | 1 | 4 | 2 | 4 | 5 | 8 | 7 | 11 | | | | |
| 1–2 | | | | | | | | | | | 17 | 18 | 18 | 21 | 29 | 39 | 36 | 30 | | | | |
| 3–5 | | | | | | | | | | | 10 | 17 | 29 | 35 | 32 | 14 | 15 | 5 | | | | |
| >5 | | | | | | | | | | | | | | 3 | 2 | 1 | 1 | | | | | |
| *Potty-training* | | | | | | | | | | | | | | | | | | | | | | |
| Study 1 | | | | | | | | | 4 | 6 | 26 | 40 | 57 | 85 | 95 | 99 | | | | | | |
| Study 2 | | | | | | | | | 1 | 2 | 17 | 31 | 41 | 60 | 76 | 92 | | | | | | |
| *Bowel control* | | | | | | | | | | | | | | | | | | | | | | |
| Study 1 | | | | | | | | | | | | | | | | | | | | | | |
| 0% | | | | | | | 32 | 26 | 8 | 13 | 3 | | 1 | 1 | 2 | 1 | | | | | | |
| 1–30% | | | | | | | 18 | 16 | 14 | 11 | 5 | 5 | 7 | 1 | | | | | | | | |
| 30–70% | | | | | | | 18 | 21 | 14 | 15 | 6 | 5 | 3 | 3 | | | | | | | | |
| 70–99% | | | | | | | 24 | 24 | 32 | 22 | 29 | 25 | 16 | 12 | 2 | 1 | 2 | 3 | 2 | 1 | 1 | 1 |
| 100% | | | | | | | **8** | **13** | **32** | **39** | **57** | **65** | **73** | **83** | **96** | **98** | **98** | **97** | **98** | **99** | **99** | **99** |
| Relapses from 100% | | | | | | | | | 5 | 8 | 18 | 21 | 8 | 6 | | | | | | | | |
| Study 2 | | | | | | | | | | | | | | | | | | | | | | |
| 0% | | | | | | | 96 | 94 | 92 | 88 | 85 | 74 | 67 | 50 | 25 | 8 | 2 | 1 | 3 | 1 | 3 | 3 |
| 1–30% | | | | | | | 2 | 1 | 3 | 5 | 4 | 12 | 14 | 17 | 5 | 2 | | | | | | |
| 30–70% | | | | | | | 1 | 3 | 1 | 4 | 5 | 7 | 8 | 11 | 8 | 2 | | | | | | |
| 70–99% | | | | | | | | 1 | 3 | 1 | 2 | 5 | 4 | 4 | 5 | 2 | 4 | | 2 | | 1 | |
| 100% | | | | | | | | | **1** | **1** | **1** | **1** | **3** | **10** | **54** | **82** | **92** | **99** | **93** | **99** | **96** | **97** |
| Relapses from 100% | | | | | | | | | | | 1 | 1 | 1 | 1 | | | | | | | | |

Table II (CONTINUED)

| | Age (mths) | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *1* | | *3* | | *6* | | *9* | | *12* | | *18* | | *24* | | *36* | | *48* | | *60* | | *72* | |
| | *M* | *F* | *M* | *F* | *M* | *F* | *M* | *F* | *M* | *F* | *M* | *F* | *M* | *F* | *M* | *F* | *M* | *F* | *M* | *F* | *M* | *F* |
| *Bladder control, day* | | | | | | | | | | | | | | | | | | | | | | |
| Study 1 | | | | | | | | | | | | | | | | | | | | | | |
| 0% | | | | | | | 97 | 92 | 90 | 78 | 56 | 43 | 26 | 14 | 2 | | 1 | 1 | 2 | 2 | 1 | 1 |
| 1–29% | | | | | | | 3 | 4 | 8 | 11 | 15 | 29 | 10 | 10 | 1 | 1 | 1 | | | 1 | 2 | |
| 30–69% | | | | | | | | 2 | 2 | 2 | 7 | 5 | 11 | 15 | 2 | 3 | | 1 | 1 | 1 | 3 | 1 |
| 70–99% | | | | | | | | | | 9 | 12 | 7 | 36 | 39 | 78 | 78 | 9 | 9 | 5 | 4 | 3 | 1 |
| 100% | | | | | | | | | | | **10** | **16** | **17** | **22** | **18** | **18** | **86** | **89** | **89** | **92** | **97** | **97** |
| Relapses from 100% | | | | | | | | | | | | | 7 | 11 | 11 | 14 | 4 | 3 | | | | |
| Study 2 | | | | | | | | | | | | | | | | | | | | | | |
| 0% | | | | | | | 98 | 96 | 95 | 92 | 92 | 83 | 66 | 50 | 17 | 5 | 1 | | | | | |
| 1–29% | | | | | | | 1 | 3 | 3 | 6 | 4 | 11 | 19 | 17 | 8 | 2 | | | | | | |
| 30–69% | | | | | | | 1 | 1 | 2 | 2 | 4 | 5 | 11 | 20 | 8 | 2 | 1 | | 3 | | | |
| 70–99% | | | | | | | | | | | | 1 | 1 | 6 | 14 | 5 | 10 | 2 | 9 | 3 | 4 | 4 |
| 100% | | | | | | | | | | | | | **2** | **7** | **53** | **84** | **88** | **98** | **88** | **97** | **96** | **94** |
| Relapses from 100% | | | | | | | | | | | | | | | 1 | 2 | | | | | | |
| *Bladder control, night* | | | | | | | | | | | | | | | | | | | | | | |
| Study 1 | | | | | | | | | | | | | | | | | | | | | | |
| 0% | | | | | | | 100 | 99 | 99 | 98 | 82 | 80 | 58 | 47 | 7 | 6 | 2 | 1 | 4 | 2 | 1 | 3 |
| 1–29% | | | | | | | | 1 | 1 | 2 | 10 | 6 | 13 | 11 | 11 | 6 | 4 | 2 | 1 | 2 | 3 | |
| 30–69% | | | | | | | | | | | 2 | 2 | 10 | 15 | 10 | 10 | 2 | 3 | 3 | 1 | 3 | 1 |
| 70–99% | | | | | | | | | | | 4 | 6 | 12 | 18 | 56 | 56 | 15 | 8 | 6 | 6 | 3 | 2 |
| 100% | | | | | | | | | | | **2** | **6** | **7** | **9** | **16** | **22** | **77** | **86** | **86** | **89** | **90** | **94** |
| Relapses from 100% | | | | | | | | | | | | | 1 | 2 | 2 | 1 | 1 | | | | | |
| Study 2 | | | | | | | | | | | | | | | | | | | | | | |
| 0% | | | | | | | 100 | 100 | 100 | 100 | 99 | 98 | 97 | 89 | 47 | 33 | 15 | 11 | 7 | 1 | 1 | 2 |
| 1–29% | | | | | | | | | | | | 1 | 1 | 5 | 12 | 13 | 5 | 3 | 3 | 1 | 2 | 1 |
| 30–69% | | | | | | | | | | | 1 | 1 | 1 | 3 | 9 | 8 | 5 | 3 | 3 | 1 | 3 | 1 |
| 70–99% | | | | | | | | | | | | | 1 | 1 | 8 | 3 | 8 | 3 | 11 | 6 | 8 | 3 |
| 100% | | | | | | | | | | | | | | **2** | **23** | **42** | **67** | **80** | **76** | **91** | **86** | **93** |
| Relapses from 100% | | | | | | | | | | | | | | | 1 | 1 | 2 | | | | | |
| *Actual numbers* | | | | | | | | | | | | | | | | | | | | | | |
| Study 1 | 39 | 41 | 38 | 40 | 37 | 39 | 34 | 38 | 46 | 50 | 85 | 79 | 152 | 150 | 162 | 161 | 163 | 161 | 143 | 146 | 152 | 156 |
| Study 2 | 123 | 125 | 152 | 150 | 154 | 144 | 153 | 146 | 152 | 145 | 146 | 145 | 150 | 138 | 138 | 120 | 131 | 119 | 116 | 115 | 104 | 101 |

Values (except 'actual numbers') are percentages of the total number of subjects in the study for whom the condition applies at each age.

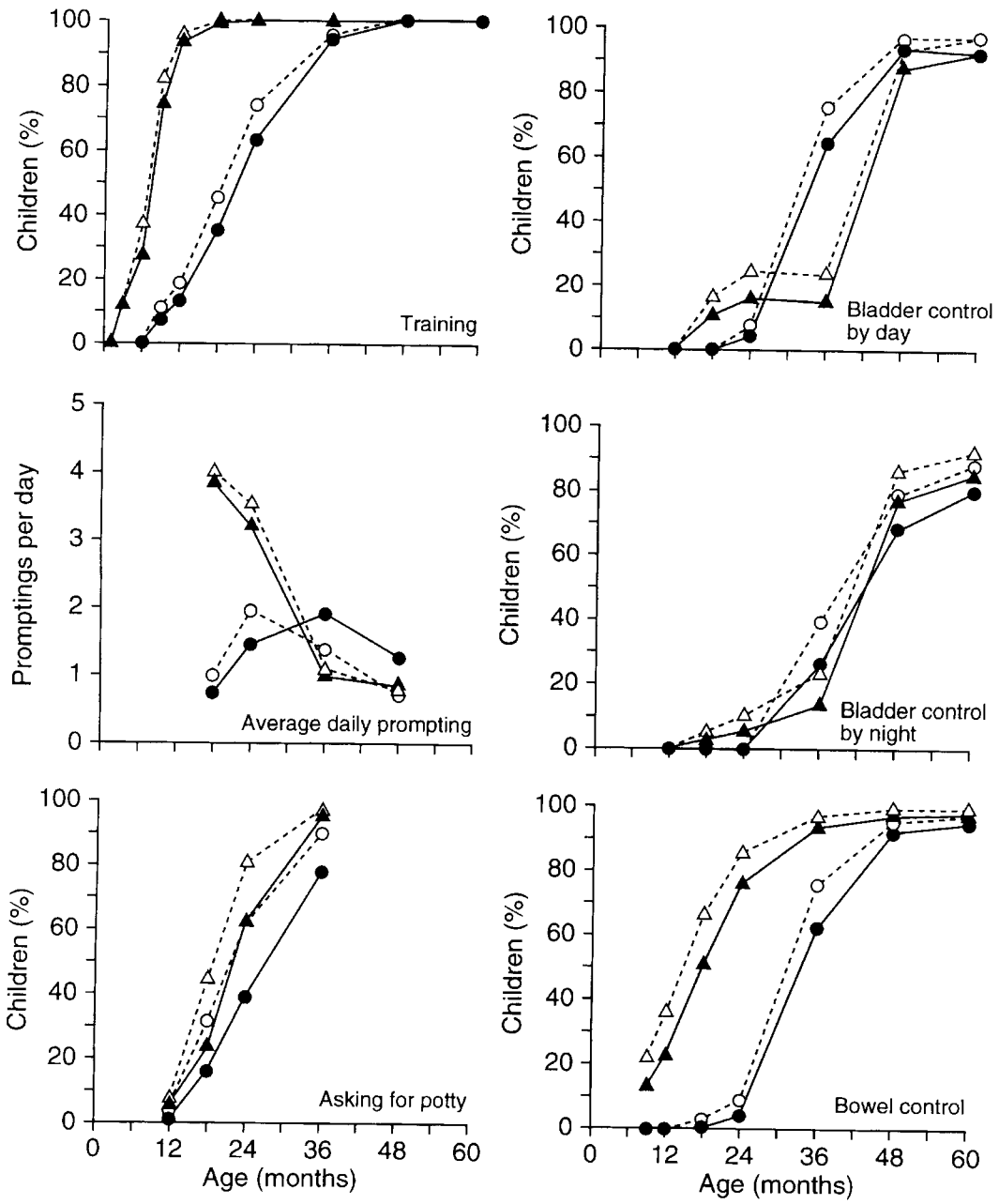


***Fig. 1.*** *Course of toilet-training and of development of continence in study 1 (children born between 1954 and 1956) and study 2 (children born between 1974 and 1984). Study 1* ▲ = boys, Δ = girls, Study 2 ● = boys, ○ = girls.

age of 1 month in a few infants (see Fig. 1). At age 3 months, 13%, and at 6 months, 32% of the children were held out over a towel, pot or toilet by their mothers. By 12 months, 96% were being placed on the potty. In study 2, toilet-training started between ages 9 and 12 months. At age 12 months, only 20% of the girls and 16% of

the boys were put on the potty. Toilet-training was initiated in 90% of the children by 30 months of age. The median age of the onset of toilet-training was 7 months for both sexes in study 1, and 19 months for girls and 21 months for boys in study 2 (Wilcoxon test, $p<0.01$ for both sexes). The girls in study 2 were placed on the potty on average 12 months later, and the boys 14 months later, than those of study 1. With respect to the 90th centile, the postponement of the training reached as high as 24 months between the two studies.

*Incidence of daily prompting*

The mean developmental course of daily prompting in both studies is illustrated in Figure 1. The change in parental attitudes becomes even more apparent if one looks at the extreme values of daily prompting (see Table II). In study 1 the percentage of children not prompted at all during the first three years of life was less than 10, whereas in study 2 no prompting was reported in 32 to 72% of the children. At 18 and 24 months, between 34 and 47% of children in study 1 were prompted more than five times per day. Such intensive daily potty-training was observed in fewer than 3% of the children in study 2. Thus, there was a highly significant reduction in daily prompting between the two studies at the ages of 18, 24 and 36 months ($\chi^2$ test; $p<0.001$). In study 2, girls tended to be prompted more frequently than boys before the age of 24 months but less frequently thereafter.

## Influence of potty-training on bladder and bowel control

*Bladder control*

Although toilet-training was initiated about a year later in study 2 than in study 1, bladder control by day developed quite similarly in the two studies (see Fig. 1). There was a small but significant difference of the developmental course between the studies, for two reasons. First, a small proportion of children in study 1 were completely dry at 18 and 24 months. However, in these children, bladder control was significantly correlated with the incidence of daily prompting, indicating strong maternal command ($\chi^2$ test between daily prompting at 12 and 18 months and bladder control at 18 and 24 months; $p<0.001$; Largo and Stützle 1978*b*). Second, a higher percentage of children in study 2 than in study 1 achieved complete bladder control at 36 months. This difference becomes less impressive if one takes into account the fact that 78% of the children in study 1 reached 75 to 99% daytime bladder control at this age (see Table II).

The development of bladder control at night was even more similar across the studies than that of bladder control by day. The developmental courses differed significantly between the sexes in both studies. However, the median ages of complete bladder control in girls differed by two months in favour of those in study 2, whereas in boys they were the same in the two studies.

*Bowel control*

At first glance, a strong effect of training was noted in the development of bowel control (see Fig. 1). A delay of the median onset of toilet-training by 11 months in girls of study 2 was accompanied by a delay of 17 months in the median age of complete bowel control; in boys the corresponding delay was 15.5 months. However, in a more detailed analysis of study 1 this training-effect turned out to be questionable. Frequency of daily prompting and regularity of bowel movement were found to be significantly associated with the degree of bowel control ($\chi^2$ test; $p<0.001$). Thus, maternal command ('catching the child's bowel movement') and not the child's competence to control bowel function seemed to be the dominant factor. This interpretation is supported by two additional observations: relapses subsequent to attainment of complete control were significantly more frequent between 12 and 24 months than thereafter ($\chi^2$ test; $p<0.001$) (see Table II), and complete bowel control preceded the child's initiative by a year, making endogenous control unlikely (see below).

## The child's initiative

*Incidence of asking for the potty*

The children expressed their need for evacuation verbally, by miming expressions and gestures, by approaching the toilet or by grabbing the potty. The proportion of children aged 18 or 36 months who

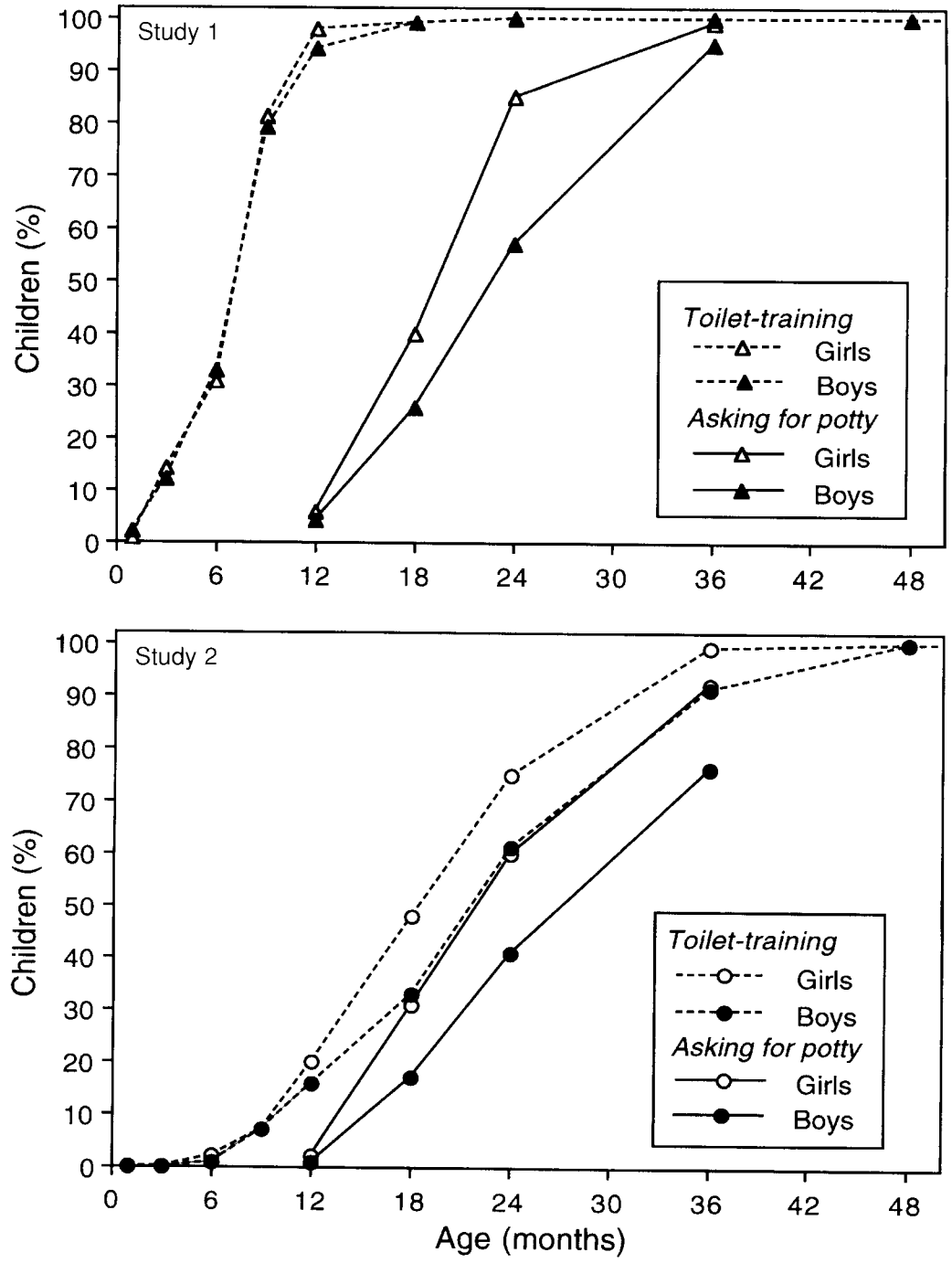


***Fig. 2.*** *Onset of toilet-training and child's initiative in the two studies. Study 1: △ girls, ▲ boys; study 2: ○ girls, ● boys.*

asked for the potty, verbally or non-verbally, was higher in study 1 than in study 2 (see Fig. 1). In study 1, the children were placed on the potty on average 12 months before they became active by themselves, while in study 2, the onset of toilet-training was much more closely co-ordinated with the child's initiative (Fig. 2).

The child's initiative, bowel control and bladder control by day displayed a similar developmental course (Fig. 3). The child's initiative only slightly preceded the onset

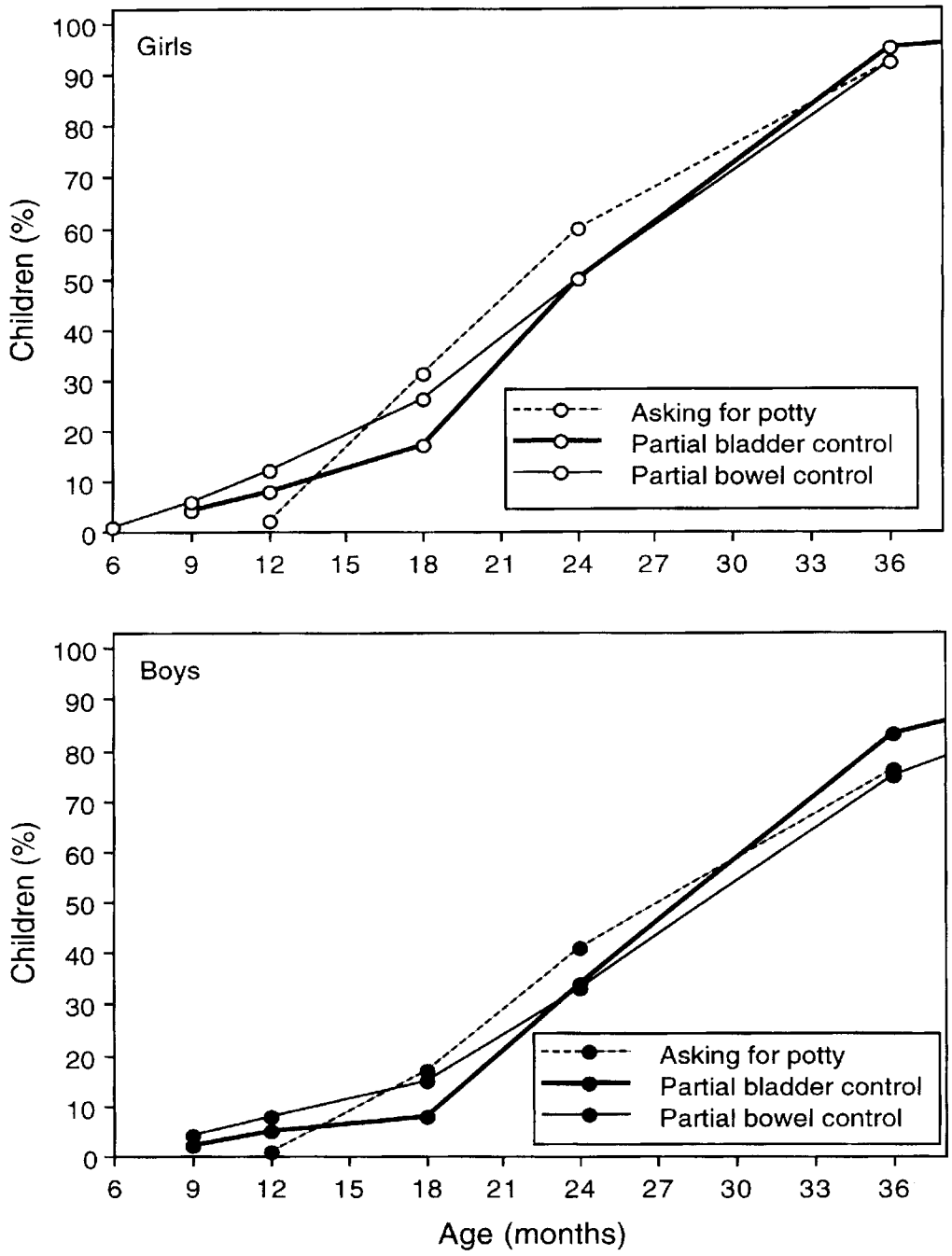


*Fig. 3. Comparison of ages at which child asked for potty and attainment of partial continence in study 2: ○ girls, ● boys.*

of partial bowel and bladder control in girls and boys between 18 and 36 months. The onset of complete bowel and bladder control by day and at night was more strongly correlated with the child's initiative than with toilet-training (Table III).

SOCIO-ECONOMIC STATUS

There was a significant difference in socio-economic status between the two studies (mean socio-economic status 5.6 and 7.4, respectively; $p<0.05$). However, the children from both cohorts formed a

TABLE III
**Spearman correlations between age at onset of toilet-training and of asking for potty, with achievement of continence (study 2)**

| | *Onset of toilet-training (N=123)* | *Onset of asking for potty (N=121)* |
|---|---|---|
| Onset of asking for potty | 0.54** | |
| Complete bowel control | 0.49** | 0.59** |
| Complete bladder control, day | 0.43** | 0.49** |
| Complete bladder control, night | 0.21 | 0.27* |

*$p<0.05$ **$p<0.001$.

TABLE IV
**Spearman correlations between socio-economic status and age at onset and various aspects of training for an achievement of continence (study 2)**

| | *Socio-economic status* | |
|---|---|---|
| | *Girls (N=123)* | *Boys (N=121)* |
| Onset of training | –0.09 | –0.10 |
| Duration of training | 0.09 | 0.08 |
| Onset of asking for potty | 0.06 | 0.05 |
| Complete bowel control | –0.12 | 0.00 |
| Complete bladder control, day | –0.06 | 0.14 |
| Complete bladder control, night | 0.09 | 0.00 |

representative selection of the Swiss urban population, according to the occupational status of the parents for the corresponding time periods, 1950–60 and 1970–80, respectively. No significant correlations were noted between socio-economic status and age at onset and duration of toilet training, frequency of daily prompting, age at onset of asking for potty, or complete bowel and bladder control by day or night (Table IV).

## Discussion

In the mid-fifties, most parents began toilet-training in the first year of a child's life, an age at which their children could not yet sit without support (Douglas and Bloomfield 1958, Hindley 1968, Klackenberg 1971, Largo and Stützle 1977*a*). This early onset of toilet-training may have reflected a high degree of confidence in success through training. There were strong practical reasons for early training, namely the labour-saving effects of avoiding extra laundry. Toilet-training was initiated less early in Sweden, where disposable nappies were already available at that time (Klackenberg 1971). Klackenberg could not conclusively answer the question whether Swedish parents were also more liberal in their child rearing attitudes than parents in other European countries. About a generation later, in the late seventies and early eighties, toilet-training in Swiss families was postponed by about a year. Most children had been able to sit independently for more than a year before their parents put them on the potty. The introduction of disposable nappies and information campaigns in the media stressing the need for a parental adjustment of the training pace to their child's individual stage of development were probably the main contributors to this profound change in toilet-training.

This significant postponement of toilet-training and the marked reduction in daily prompting did not lead to a corresponding delay in the development of bladder control by day or at night. These findings strongly support earlier reports

indicating that the development of bladder control is largely a maturational process which cannot be accelerated by an early onset and high intensity of training (Klackenberg 1971, Largo and Stützle 1977*b*). Bladder control by day and at night in study 1 was somewhat later, at 36 months, than in study 2, a finding that suggests an inverse relation between the onset and duration of training and the onset of complete bladder control. However, a significant effect of a long period of extensive training on the development of bladder control could not be established.

In study 2, the postponement of toilet-training was accompanied by an even greater delay of bowel control. This delay was probably due not to a lack of training, but to the abandonment of maternal controlling behaviour. In study 1, the mothers achieved an exogenously controlled cleanliness of their children by closely attending to their children, for example by frequent daily prompting, and closely observing such signs as the regularity of bowel movements. This early success was incomplete: the risk of relapses after the attainment of complete control was much higher in study 2 than in study 1.

Because maturational rates vary so greatly between children, a great deal of sensitivity is required by the parents to catch children when they are developmentally ready to become clean and dry. The appearance of the child's initiative and the initiation of bowel and bladder control corresponded strongly. Thus, the child's behaviour expressing a need for evacuation by non-verbal communication, such as mimicry, posture or gestures, and by words, is a reliable indicator for the parents to start toilet-training. The appearance of the child's initiative cannot be accelerated by an early onset and high intensity of toilet-training. There was a close correspondence in study 2 between the onset of potty-training and the appearance of the child's initiative indicating that nowadays parents do a good job of adjusting the pace of training to their children's individual needs.

The development of bowel and bladder control in girls was moderately but significantly more advanced than in boys. Comparable findings have emerged from previous investigations (Oppel *et al.* 1968, Klackenberg 1971, Largo and Stützle 1977*a*, Weir 1982). This is probably due to faster maturity rates in the girls. A similar sex-related difference in the onset of toilet-training was noted in study 2, but not in study 1. These findings and the fact that no significant influence of the socio-economic status on toilet-training was noted also indicate that in recent years parents have adapted to the individual needs of their children to a high degree.

*Accepted for publication 13th March 1996.*

*Acknowledgement*
This work was supported by the Swiss National Science Foundation (Grant Nr 32-45829.95) and the Hermann-Klaus Stiftung.

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SUMMARY
A major change in toilet-training was observed in two successive generations. The median onset of toilet-training was postponed by 13 months between the First Zürich Longitudinal Study (320 children born between 1954 and 1956) and the Second Zürich Longitudinal Study (309 children born between 1974 and 1984). Bladder control, both day and night, was not affected, but bowel control was delayed by 16 months, due not to a lack of training, but to the abandonment of maternal control. The results strongly confirm earlier findings that the development of bowel and bladder control is a maturational process which cannot be accelerated by early onset and high intensity of potty-training. The child's initiative proved to be a reliable indicator that the child was developmentally capable of being clean and dry. Girls were consistently earlier than boys, indicating different maturation rates. No significant correlations were noted between the socio-economic status and start and intensity of toilet-training, onset of the child's initiative or development of bladder and bowel control.

RÉSUMÉ

*Profondes modifications de l'apprentissage de toilettes : interviennent-elles sur le contrôle rectal et vésical?*

Durant les vingt années séparant la première étude longitudinale de Zürich sur l'apprentissage de la toilette (sur 320 enfants nés entre 1954 et 1956) et la seconde étude (sur 309 enfants nés entre 1974 et 1984), le médian du début de l'apprentissage de toilette fut retardé de 13 mois. Le contrôle vésical, de jour et de nuit, ne fut pas affecté mais le contrôle rectal fut différé de 16 mois, non par défaut d'apprentissage mais par abandon du contrôle maternel. Ces résultats confirment fortement des données antérieures indiquant que le développement des contrôles rectaux et vésicaux est un processus de maturation qui ne peut être accéléré par un entra'nement précoce au pot. L'initiative de l'enfant s'est révélé un indicateur fidèle du fait d'être prêt à être propre et sec. Les filles étaient plus précocement continentes que les garçons, indiquant une vitesse différente de maturation. Aucune corrélation significative n'a été notée entre le statut socio-économique et le début et l'intensité de l'apprentissage de la toilette, le début des initiatives de l'enfant ou le développement du contrôle rectal et vésical.

ZUSAMMENFASSUNG

*Grundlegende Veränderung bei der Sauberkeitserziehung: Wird dadurch die Darm- und Blasenkontrolle beeinflußt?*

In den 20 Jahren zwischen der ersten Züricher Langzeitstudie über Sauberkeitserziehung (an 320 Kindern, die von 1954 bis 1956 geboren wurden) und der zweiten Studie (an 309 Kinder der Geburtsjahre 1974 bis 1984) war der mittlere Beginn der Sauberkeitserziehung um 13 Monate postponiert worden. Die Blasenkontrolle bei Tag und bei Nacht wurde dadurch nicht beeinflußt, die Darmkontrolle jedoch wurde um 16 Monate verzögert, nicht aus Mangel an Training sondern aufgrund fehlender mütterlicher Kontrolle. Die Ergebnisse bestätigen frühere Befunde, die besagen, daß die Entwicklung der Blasen- und Darmkontrolle ein Reifungsprozeß ist, der nicht durch eine frühe, intensive Sauberkeitserziehung beschleunigt werden kann. Die Initiative des Kindes erwies sich als verläßliches Anzeichen für die entwicklungsmäßige Bereitschaft, sauber und trocken zu sein. Mädchen waren durchwegs früher kontinent als Jungen, was auf unterschiedliche Reifungsgeschwindigkeiten hinweist. Es wurden keine signifikanten Korrelationen des sozio-ökonomischen Status mit dem Start und der Intensität der Sauberkeitserziehung, dem Beginn der Bereitschaft des Kindes oder der Entwicklung von Blasen- und Darmkontrolle gefunden.

RESUMEN

*Cambio profundo en el entrenamiento del retrete: afecta el desarrolo del control, intestinal y vesical?*

En los 2 años transcurridos entre el primer estudio longuitudinal hecho en Zürich sobre el entrenamiento en el retrete (en 320 niños nacidos entre 1954 y 1956) y el segundo estudio (en 309 niños nacidos entre 1974 y 1984) el promedio de inicio del entrenamiento en el retrete se pospuso en 13 meses. El control vesical, de dia y de noche, no se afectó, pero el control intestinal se retrasó 16 meses, no por una falta de entrenamiento, sino por abandono del control materno. Los resultados confirman fuertemente los hallazgos más anteriores de que el desarrollo del control intestinal y vesical es un proceso madurativo que no puede ser acelerado por un entrenamiento precoz o intenso. La iniciativa del niño mostró ser un indicador fiable de la disponibilidad de desarrollo para ser limpio y estar seco. Las niñas fueron continentes de forma consistente antes que los niños, lo que indica grados diferentes de maduración. No se observaron correlaciones significativas entre el estatus socio-económico, ni el inicio y la intensidad del entrenamiento, o el inicio de la iniciativa del niño y el desarrollo del control del intestino y vejiga.

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