



# Incontinence in children with treated attention-deficit/hyperactivity disorder

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## Summary

### Introduction

Attention-deficit/hyperactivity disorder (ADHD) and incontinence (nocturnal enuresis, daytime urinary incontinence and fecal incontinence) are common disorders in childhood. Both disorders are strongly associated with each other.

### Objective

ADHD can affect compliance to incontinence therapy in a negative way; it can also affect outcome. The aim of the present study was to assess the prevalence of incontinence, age of bladder and bowel control, and psychological symptoms in children having treatment for ADHD compared to a control group.

### Study design

Forty children having treatment for ADHD (75% boys, mean age 11.4 years) and 43 matched controls (60.5% boys, mean age 10.7 years) were assessed. Their parents filled out questionnaires to assess: child psychopathology (Child Behavior Checklist), incontinence (Parental Questionnaire: Enuresis/Urinary Incontinence; Encopresis Questionnaire – Screening Version) and symptoms of the lower urinary tract (International-Consultation-on-Incontinence-Questionnaire – Pediatric Lower Urinary Tract Symptoms). The ICD-10 diagnoses and children's IQ were measured by standardized instruments (Kinder-DIPS, Coloured Progressive Matrices/Standard Progressive Matrices).

## Results

Rates of incontinence in the ADHD group (5% nocturnal enuresis, 5% daytime urinary incontinence, 2.5% fecal incontinence) did not differ significantly from incontinence rates in the control group (4.7% daytime urinary incontinence). More children in the ADHD group had Child Behavior Checklist scores in the clinical range. Further ICD-10 disorders were present in eight children with ADHD and in one control child. More children with ADHD had delayed daytime and nighttime bladder control, as well as delayed bowel control, than the controls.

## Discussion

The present study showed that if children are treated for their ADHD, according to standard practice guidelines, incontinence rates are similar to those without ADHD. More children with ADHD reached continence at a later age than the controls, which could be an indicator of maturational deficits in the central nervous system. Additionally, children with ADHD showed higher rates of clinically relevant psychological symptoms.

## Conclusion

This study provides further information of the association between ADHD and incontinence. Treatment of ADHD may be associated with positive effects on incontinence outcomes. Therefore, children with ADHD should always be screened for incontinence problems and children with incontinence problems should also be screened for ADHD if symptoms of hyperactivity, inattention and/or impulsivity are also present.

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### Keywords

Attention-deficit/hyperactivity disorder; Functional incontinence; Enuresis; Daytime urinary incontinence; Fecal incontinence; Delayed bladder and bowel control

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Rates of incontinence and psychological symptoms in children with attention-deficit/hyperactivity disorder and the controls

	ADHD group ( <i>n</i> = 40)	Control group ( <i>n</i> = 43)
<b>Subtypes of incontinence</b>		
Any incontinence <i>n</i> (%)	4 (10.0)	2 (4.7)
NE <i>n</i> (%)	2 (5.0)	–
DUI <i>n</i> (%)	2 (5.0)	2 (4.7)
FI <i>n</i> (%)	1 (2.5)	–
<b>Clinically relevant CBCL scores</b>		
CBCL total score >90th percentile <i>n</i> (%)	23 (57.5)	1 (2.3)
CBCL Externalizing score >90th percentile <i>n</i> (%)	19 (47.5)	–
CBCL Internalizing score >90th percentile <i>n</i> (%)	16 (40.0)	4 (9.3)

ADHD, Attention-deficit/hyperactivity disorder; CBCL, Child Behavior Checklist; DUI, daytime urinary incontinence; FI, fecal incontinence; NE, nocturnal enuresis.

## Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is defined as a persistent pattern of inattention, hyperactivity and/or impulsivity that causes impairment, with an onset before the age of 12 [1,2]. It is present in about 5% of children, with a higher risk for boys [2]. Three different presentations are diagnosable: predominantly inattentive, predominantly hyperactive/impulsive, and combined [2]. The etiology is multifactorial, with a high genetic component; environmental, social and biological factors also play a major role [3].

Functional incontinence such as nocturnal enuresis (NE), daytime urinary incontinence (DUI) and fecal incontinence (FI) are common in childhood. Nocturnal enuresis is diagnosed as intermittent leakage of urine during sleep in children older than 5 years, with at least one episode per month after excluding organic causes [2,4,5]. Daytime urinary incontinence is defined as wetting during the day in combination with lower urinary tract symptoms (LUTS) [4]. The terms fecal incontinence and encopresis are used synonymously; both describe defecation into inappropriate places in children older than 4 years, with at least one episode per month after ruling out organic factors [2]. Prevalence in 7-year-old children is about 10% for NE, 3% for DUI and 1–3% for FI [6].

Prevalence of ADHD is higher in children with incontinence than in continent children. In a population-based study, parents described attention and activity problems in 17.6% of bedwetting and in 24.8% of daytime wetting children [7,8]. In FI, rates of ADHD are 9.2% for children with frequent soiling (1 x/week or more) [9]; vice versa, rates of incontinence are higher in children with ADHD. Most studies have focused on NE, with a prevalence of 20.9–28.6% of NE in children with ADHD [10–12]. Fewer studies have addressed DUI and FI. In one study, DUI was 6.5% in 6-year-old children and 13.1% in 6–14-year-old children [11]. In another study, children with ADHD had higher rates of lower urinary tract symptoms (LUTS) compared to the controls [13]. In a population-based study, the rate of FI in ADHD was 4.1% [14].

All mentioned studies indicate a special association of incontinence and ADHD, with higher co-occurrence than expected by chance, which is described in detail in a recent review [15]. However, common etiological factors between incontinence and ADHD have not been clarified in detail. Genetic factors are important for NE and ADHD alone, but there is no evidence for a common genetic transmission of both disorders together [16]. Maturation deficits of the central nervous system are a possible shared etiological factor.

Further studies have shown that children with ADHD are less compliant to treatment of incontinence and have a less favorable therapy outcome, especially if this requires cooperation [17–19]. On the other hand, in anecdotal case reports, incontinence dissolved after treating ADHD with stimulants [20].

As previous literature has shown associations between ADHD, therapy of ADHD and incontinence, the aims of the present study were to assess the prevalence of incontinence, age of bladder and bowel control, and psychological symptoms in children with treated ADHD compared to a control group.

## Material and methods

All consecutively treated children with ADHD who were referred to a tertiary outpatient department of child and adolescent psychiatry over a period of 3 months (April–June 2013) were recruited. Children who were presented for the first time and received a diagnosis of ADHD, as well as children with confirmed ADHD who were presented for follow-up, were included. Children with severe medical conditions or intellectual disability (IQ < 70) were excluded ( $n = 3$ ).

The remaining ADHD group consisted of 30 boys (75%) and 10 girls, with a mean age of 11.4 years (SD 2.49 years, range 7–17 years). A total of 28 children were diagnosed with the inattentive subtype (70%), four with the hyperactive/impulsive (10%) subtype and eight with the combined subtype (20%) according to the criteria of the Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition (DSM-IV). All children were treated by a multimodal approach according to evidence-based guidelines consisting of psychoeducation, behavioral therapy (including parental training, positive reinforcement) and additional pharmacotherapy, if needed. A total of 77.5% of the ADHD group were treated with stimulants (methylphenidate) and one child was treated with atomoxetine. A healthy control group of 43 children, who were matched regarding gender and age (60.5% male, mean age 10.7 years, SD 3.03 years, range 5–17 years), was recruited from sports clubs or schools. The groups did not differ significantly in age or gender distribution.

Children of the ADHD group received standard psychological and physical examination in the outpatient clinic. Children of both groups were assessed in the 3-month study interval. A structured diagnostic interview to assess comorbid psychiatric disorders in children (“Diagnostisches Interview bei psychischen Störungen von Kindern und Jugendlichen” = Kinder-DIPS) [21] was conducted with parents of both groups. Parents were also asked to fill out the Child Behavior Checklist (CBCL) [22] to assess child psychopathology, the Parental Questionnaire: Enuresis/Urinary Incontinence and Encopresis Questionnaire – Screening Version [23,24] and the German version of the International-Consultation-on-Incontinence-Questionnaire – Pediatric Lower Urinary Tract Symptoms (ICIQ-CLUTS) [25]. Additionally, IQ was measured in all children by a one-dimensional intelligence test (Coloured Progressive Matrices (CPM) or Standard Progressive Matrices (SPM)) [26,27].

Nocturnal enuresis and DUI were diagnosed according to the International Children’s Continence Society (ICCS) criteria [4] (i.e. from the age of 5 years onwards when wetting occurs at least once per month). Fecal incontinence was diagnosed from the age of 4 years if soiling occurred at least once per month, according to DSM-5 criteria [2]. A mean LUTS score >13 in the ICIQ-CLUTS was considered to be clinically relevant. Delayed bladder control was defined by reaching urinary continence at an age of 5 years or older. Delayed bowel control was defined in children reaching bowel continence at 4 years of age or older. The CBCL total, internalizing and externalizing scale were regarded as clinically relevant with a T-value >63 (90th percentile).

Statistical analyses were conducted with IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp., Armonk, NY;

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