

# Education, occupation and risk-taking behaviour among adults with attention-deficit/hyperactivity disorder

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## ABSTRACT

**INTRODUCTION:** No Danish studies examining functional impairments in a naturalistic sample of clinically referred adults with attention-deficit/hyperactivity disorder (ADHD) are available. Our study aimed to examine educational and occupational outcomes and risk-taking behaviour in a Danish clinical sample of adults with ADHD.

**METHODS:** Naturalistic, cross-sectional study of 155 ADHD adults consecutively referred to a Danish ADHD clinic from 2010 to 2011.

**RESULTS:** A total of 51% had primary/lower secondary school only as their highest education, and 65% were not self-supporting at the time of their assessment. Criminal behaviour was found in more than 50%, suspension of driving licence in 16% and risk-taking sexual behaviour in 37-51%. Co-morbidity did not significantly increase the odds for a low educational level or of risk-taking behaviours. Having a personality disorder (PD) increased occupational vulnerability. Male gender and ADHD-C (combined type) were significantly associated with criminality and suspension of driving licence. Patients with substance use disorders and PD had non-significantly increased odds for risk-taking behaviours.

**CONCLUSION:** Functional impairments were evident in this Danish sample of adults with ADHD. Most of our findings could not be accounted for by co-morbidity, underlining the importance of targeting treatment at ADHD itself.

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Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder with childhood onset and defined in the Diagnostic and Statistical Manual of Mental Disorders, fourth edition, Text Revised (DSM-IV-TR) DSM-IV-TR by three subtypes: ADHD-C (combined type), ADHD-I (predominantly inattentive type) and ADHD-HI (predominantly hyperactive/impulsive type). In the WHO's International Classification of Diseases, Version 10 (ICD-10), this subtyping is not an option and, generally, the ICD-10 diagnostic criteria are stricter than the DSM-IV-TR concerning pervasiveness of symptoms and presence of co-morbid disorders. ADHD has recently

been validated as a diagnosis in adults with a cross-national adult prevalence of 2.5% [1].

Several studies have shown that adults with ADHD have high rates of co-morbid psychiatric disorders and psychosocial impairments [2], e.g. educational and occupational underachievement. It has been established that adults with ADHD constitute a high-cost group due to their multiple impairments in terms of e.g. greater working disability [3] than matched controls from the general population and clinic. Furthermore, impulsivity, one of the core symptoms of ADHD, is linked to an increase in risky decision-making and risk-taking behaviour [4]. The consequences are higher risks of criminality [5], risky driving [6] and risky sexual behaviour in adults with ADHD [7]. Although functional impairments in terms of educational attainment, occupational status and risk-taking behaviour among adults with ADHD are well-documented in the international literature, we believe that the documentation of these impairments in a Danish sample would be of high national and clinical importance. Danish register-based studies [8-10] have recently examined these impairments, but – to the best of our knowledge – no previous study has examined these among adults with ADHD in a Danish naturalistic clinical setting.

## METHODS

A total of 199 patients, 127 (64%) males and 72 (36%) females with a mean age of 30.3 years (standard deviation (SD) = 9.9) started assessment at the adult ADHD unit, Regional Psychiatric Services West, Herning, Central Denmark Region, during the period from September 2010 to September 2011 and were eligible for this naturalistic cross-sectional study. The patients were consecutively referred from general practitioners (78%) and specialised psychiatric authorities (22%). Due to assessment discontinuation (n = 10) or failure to meet the ADHD criteria as assessed by the ADHD unit (n = 34), a total of 44 patients were excluded. Hence, 155 ADHD diagnosed patients constituted the study sample (patients' flow chart, ADHD symptoms and co-morbid disorders are described elsewhere [11]). Due to the naturalistic setting of

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the present study, our data are constituted by the information from the patients' records only. The study was registered and approved by the Danish Data Protection Agency and the use of data from psychiatric records was approved by the Danish Health and Medicines Authority. The study was conducted in accordance with the Helsinki Declaration.

#### **Diagnostic assessment of attention-deficit/hyperactivity disorder**

No structured diagnostic interview for ADHD was available in Danish at the time of data collection. The assessment of ADHD therefore consisted of a thorough clinical interview with systematic questioning of present and childhood ADHD symptoms, developmental, medical and psychiatric history. These data were obtained during a median of three sessions ( $2^{p25}$ - $3^{p75}$ ) and a median of 19 days ( $8^{p25}$ - $38^{p75}$ ) by an experienced psychiatrist in collaboration with an experienced psychiatric nurse or clinical psychologist. ADHD assessment was based on international guidelines [12] and followed the DSM-IV-TR, although the patients, according to Danish practise, were registered with an ICD-10 diagnosis of hyperkinetic disorder, disturbance of activity and attention. Parent interviews, school documents and medical records were used to document symptoms and impairment before the age of seven years and any cross-situational impairment.

Current ADHD symptoms were assessed by the Danish version [13] of the Adult ADHD Self-Report Scale (ASRS v1.1 Symptom Checklist). The ASRS v1.1 consists of 18 items based on the DSM-IV-TR symptoms of ADHD and measured on a five-point scale (0 = never, 1 = rarely, 2 = sometimes, 3 = often and 4 = very often) with a total score of 0-72. Nine items cover the symptoms of inattention, and 9 items cover the symptoms of hyperactivity and impulsivity. When defining clinically significant symptom levels, we followed optimal simple scoring method proposed by Kessler et al [14], and dichotomisation of the ASRSv1.1. ADHD subtypes were assessed according to ASRSv1.1 ratings.

#### **Diagnostic assessment of co-morbid disorders**

Co-morbid disorders were assessed by the Present State Examination and personality disorders (PD) by the Structured Clinical Interview for DSM-IV Axis I Personality Disorders (SCID-II) ( $n = 4$ ), the ICD-10 International Personality Disorder Examination (IPDE) ( $n = 10$ ) or by a clinical reconfirmation of a previously established clinical diagnosis ( $n = 7$ ). Co-morbidity data were transformed into binary variables. The category emotional disorder (ED) encompassed patients with anxiety disorders (F40-48.9) and mood disorders (F30-39).

#### **Outcome variables**

Socio-demographic and risk-taking behaviour data were collected by a semi-structured protocol designed for the study to achieve a systematic collection of psychiatric record information. The protocol was administered by the ADHD unit staff and filled in during assessment. The variable highest educational level was dichotomised into two categories: primary/lower secondary school only and education higher than primary/lower secondary school, the latter encompassing vocational and/or higher education. The variable current occupational status referred to whether the patients were self-supporting (working or studying on ordinary terms) or whether they were not self-supporting (temporarily or permanently incapable of working or studying on ordinary terms).

Regarding risk-taking behaviour patients were systematically asked "How often have you: 1. Been involved in violent crime? 2. Been involved in property crime? 3. Had your driving licence suspended? 4. Exercised high-risk sexual behaviour with the risk of catching a sexually transmitted disease? 5. Exercised high-risk sexual behaviour with the risk of unwanted pregnancy for you or your sexual partner?" The answers were registered in five categories, ranging from "Never" to "15 times or more". Violent and property crime data as well as suspension of driving licence were dichotomised into "once or more" and "never". Sexually transmitted disease and unwanted pregnancy data were dichotomised into "0-14 times" and " $\geq 15$  times".

#### **Statistics**

Socio-demographic and clinical data were first described by counts (percentages). Logistic regression was used to analyse gender, age, co-morbidity and ADHD subtype associations with outcome variables. The results of the logistic regression analyses were adjusted for gender and age. No analyses were made regarding the ADHD-HI type because of too few participants.

The number of cases ( $n$ ) varies slightly in the tables presented due to missing information. Due to missing ASRS v1.1 Symptom Checklist data, only 128 of the 155 patients could be subtyped. No difference in gender and age was found between the subtyped and not subtyped participants ( $p = 0.28$  and  $p = 0.93$ , respectively).

All point estimates are presented with 95% confidence intervals (CI), and a  $p$ -value (two-sided)  $< 0.05$  was considered statistically significant. We used STATA 11.2 IC (Stata Corp, College Station, TX) for all statistical analyses.

*Trial registration:* not relevant.

## RESULTS

### Socio-demographic characteristics

Two-thirds in our sample were males (**Table 1**). Half of the patients reported completion of primary/lower secondary school only. A total of 65% were not self-supporting. The annual gross income was less than 200,000 DKK for 71%.

### Clinical characteristics in attention-deficit/hyperactivity disorder group

The most frequent co-morbid disorders were substance use disorders (SUD) (26%), mood disorders (19%) and PD (14%) (**Table 2**).

### Associations of gender, age, co-morbidity and attention-deficit/hyperactivity disorder subtypes with educational level and occupational status

Significantly more patients in the age group < 25 years had primary/lower secondary school only as their highest education (**Table 3**). The group with any co-morbid disorder, and the group with PD specifically, had significantly higher odds for not being self-supporting. These differences remained significant after adjusting for gender and age.

### Associations of gender, co-morbidity and attention-deficit/hyperactivity disorder subtype with risk-taking behaviour

A total of 51% had been involved in violent crime, 53% in property crime, 16% had suspension of driving licence, 51% had exercised sexual behaviour with high risk of catching a sexually transmitted disease and 37% with high risk of unwanted pregnancy (**Table 4**).

Men had significantly higher odds for violent crimes and suspension of driving licence than women. No significant differences regarding risk-taking behaviours were found between the group with any co-morbid disorder and the group with ADHD only after adjusting for gender and age. Finally, the ADHD-C group had significantly higher odds for violent crime than the group with ADHD-I.

## DISCUSSION

A total of 51% in our sample and 72% in our youngest group had completed mandatory school only compared with 21% in the general Danish population, and only 33% in the Danish population < 25 years [15]. Furthermore, 18% in our total sample and 7% in our young group had attained high school and/or higher education of ≤ 4 years of duration compared with 42% in the general Danish population and as many as 49% in the Danish population < 25 years [15]. Additionally, in our sample 65%, equally distributed on gender and age groups, were not self-supporting at the time of data collection

**TABLE 1**

Socio-demographic characteristics at assessment (N = 155).

	n (%)
<i>Gender</i>	
Male	101 (65)
Female	54 (35)
<i>Age, yrs</i>	
< 25	62 (40)
≥ 25	93 (60)
<i>Municipality<sup>a</sup></i>	
Rural (≤ 50.000 inhabitants)	31 (20)
Urban (> 50.000 inhabitants)	121 (80)
<i>Civil status<sup>a</sup></i>	
Married/cohabiting	74 (49)
In a relationship/not cohabiting, single	78 (51)
<i>Children<sup>b</sup></i>	
No	88 (59)
Yes	62 (41)
<i>Highest educational level<sup>a</sup></i>	
Primary/lower secondary school only	77 (51)
Vocational education	47 (31)
Higher education	28 (18)
<i>Current occupational status<sup>b</sup></i>	
Self-supporting	52 (35)
Not self-supporting	98 (65)
<i>Annual gross income, DKK<sup>c</sup></i>	
≥ 300.000	15 (10)
200,000-299,999	27 (19)
< 200,000	103 (71)

a) Information from 152 patients; b) Information from 150 patients. c) Information from 145 patients.

**TABLE 2**

International Classification of Disease, 10th revision, Diagnostic Criteria for Research: clinical characteristics in attention-deficit/hyperactivity disorder group.

	n (%)
Organic disorders	2 (1)
Substance use disorders total <sup>a</sup>	41 (26)
Alcohol	8 (5)
Substances other than alcohol	34 (22)
Psychotic disorders	4 (3)
Mood disorders total (incl. disorders in remission)	29 (19)
Bipolar disorder	2 (1)
Depressive episode	8 (5)
Recurrent depressive disorder	19 (12)
Anxiety disorders (incl. phobias)	8 (5)
Personality disorders total <sup>b</sup>	21 (14)
EUPD impulsive type, EUPD borderline type, dissocial, histrionic, other (narcissistic)	14 (9)
Obsessive-compulsive, avoidant, dependent	4 (3)
Mixed, unspecified	6 (4)
Mental retardation	3 (2)
Pervasive developmental disorders	9 (6)

EUPD = emotionally unstable personality disorder.

a) Total number of patients with ≥ 1 substance use disorders.

b) Total number of patients with ≥ 1 personality disorders.

TABLE 3

Associations of gender, age, co-morbidity and attention-deficit/hyperactivity disorder subtypes with educational level and current occupational status.

	Highest educational level <sup>a</sup>			Current occupational status <sup>b</sup>		
	n (%)	odds for primary/lower secondary school only		n (%)	odds for being not self-supporting <sup>c</sup>	
		OR <sub>unadj</sub> (CI)	OR <sub>adj</sub> (CI) <sup>d</sup>		OR <sub>unadj</sub> (CI)	OR <sub>adj</sub> (CI) <sup>d</sup>
<i>Gender</i>						
Male	99 (65)	1	1	97 (65)	1	1
Female	53 (35)	0.91 (0.46-1.77)	0.91 (0.44-1.85)	53 (35)	1.05 (0.52-2.12)	1.05 (0.52-2.13)
<i>Age, yrs</i>						
< 25	61 (40)	1	1	60 (40)	1	1
≥ 25	91 (60)	0.22 (0.11-0.44)***	0.22 (0.11-0.44)***	90 (60)	1.48 (0.75-2.92)	1.48 (0.75-2.92)
<i>Co-morbidity</i>						
No	66 (43)	1	1	66 (44)	1	1
Yes	86 (57)	0.76 (0.40-1.44)	0.97 (0.48-1.94)	84 (56)	3.01 (1.50-6.04)*	2.91 (1.44-5.90)*
<i>Substance use disorder</i>						
No	113 (74)	1	1	112 (75)	1	1
Yes	39 (26)	1.27 (0.61-2.61)	1.46 (0.66; 3.26)	38 (25)	1.27 (0.58; 2.77)	1.28 (0.57; 2.88)
<i>Emotional disorder</i>						
No	118 (78)	1	1	116 (77)	1	1
Yes	34 (22)	0.83 (0.39-1.78)	1.04 (0.45-2.38)	34 (23)	2.44 (0.98-6.08)	2.38 (0.94-6.01)
<i>Personality disorder</i>						
No	132 (87)	1	1	130 (87)	1	1
Yes	20 (13)	0.48 (0.18-1.27)	0.58 (0.20-1.67)	20 (13)	12.27 (1.59-94.47)*	12.23 (1.57-95.48)*
<i>ADHD subtype</i>						
ADHD-C	99 (78)	1	1	99 (79)	1	1
ADHD-I	23 (18)	1.59 (0.63-4.00) <sup>e</sup>	1.22 (0.45-3.29) <sup>e</sup>	22 (17)	0.5 (0.20-1.27) <sup>f</sup>	0.55 (0.21-1.44) <sup>f</sup>
ADHD-HI <sup>g</sup>	5 (4)	–	–	5 (4)	–	–

ADHD = attention-deficit/hyperactivity disorder; adj = adjusted; C = combined; CI = 95% confidence interval; HI = hyperactive/impulsive; I = inattentive; OR = odds ratio.

\*) p < 0.05; \*\*\*) p < 0.001.

a) Information from 152 patients.

b) Information from 150 patients.

c) Including patients on social security, on long-term sickness leave, in social training programs, in flexible jobs, on disability pension and students on special terms.

d) Adjusted for gender and age.

e) Information from 127 patients.

f) Information from 126 patients.

g) No analysis was made due to too few patients in the ADHD-HI group.

compared with 19% in the general Danish population [16]. Two Scandinavian studies and recent Danish studies reported similar results [8-10, 17, 18], and our study was in line with numerous other studies documenting educational and occupational impairments in ADHD adults compared with controls [2, 3]. However, in our study, the youngest group seemed to be the most impaired group across gender- and age subgroups compared with similar subgroups in the general population.

Co-morbidity, and PD specifically, added negatively and significantly to occupational impairment, but neither to educational nor to risk-taking behaviour outcomes. This could indicate that ADHD per se is actually the most critical disorder related to educational and risky behaviour impairments, which again would emphasise the importance of focusing on the treatment of ADHD itself. As such, our results supported several previous studies documenting that ADHD itself is a profoundly impairing condition. That occupational outcome

is associated with ADHD in combination with co-morbidity is supported by other studies [3, 18]. However, this finding has not been made consistently [18], and a clinical implication should still be that it is crucial to focus a treatment on ADHD.

Regarding subtype differences in terms of education and occupation, earlier findings are somewhat equivocal. One study [17] found that ASRS inattentiveness correlated negatively with the degree of occupational participation, whereas another recent study [8] showed that ADHD-C correlated with poor occupational outcome in terms of unemployment. Our results showed no significant differences in educational or occupational outcome between subtypes. Likewise, Murphy et al [19] found no differences between ADHD-C and ADHD-I in terms of educational attainment. One reason for these ambiguities could be differences in the definition of the subgroups. Another reason could be that the specific, inattentive impairments of the ADHD-I type may not be



TABLE 4

Associations of gender, co-morbidity and attention-deficit/hyperactivity disorder subtypes with risk-taking behaviour.

	n (%) <sup>a</sup>	Violent criminality <sup>a</sup>		Property criminality <sup>a</sup>		Suspension of driving licence <sup>b</sup>		High risk sexual behaviour/sexually transmitted disease <sup>c</sup>		High risk sexual behaviour/unwanted pregnancy <sup>d</sup>	
		OR <sub>unadj</sub> (CI)	OR <sub>adj</sub> (CI) <sup>h</sup>	OR <sub>unadj</sub> (CI)	OR <sub>adj</sub> (CI) <sup>h</sup>	OR <sub>unadj</sub> (CI)	OR <sub>adj</sub> (CI) <sup>h</sup>	OR <sub>unadj</sub> (CI)	OR <sub>adj</sub> (CI) <sup>h</sup>	OR <sub>unadj</sub> (CI)	OR <sub>adj</sub> (CI) <sup>h</sup>
<i>Gender</i>											
Male	94 (64)	1	1	1	1	1	1	1	1	1	1
Female	52 (36)	0.26 (0.13-0.54)***	0.26 (0.13-0.54)***	0.52 (0.26-1.03)	0.52 (0.26-1.04)	0.07 (0.01-0.50)*	0.06 (0.01-0.49)*	0.94 (0.47-1.87)	0.95 (0.47-1.89)	0.71 (0.34-1.46)	0.71 (0.34-1.49)
<i>Co-morbidity</i>											
No	63 (43)	1	1	1	1	1	1	1	1	1	1
Yes	83 (57)	1.30 (0.68-2.51)	1.29 (0.64-2.60)	1.44 (0.74-2.77)	1.42 (0.72-2.80)	1.54 (0.61-3.90)	1.29 (0.48-3.50)	0.76 (0.39-1.49)	0.71 (0.36-1.41)	0.69 (0.35-1.38)	0.59 (0.29-1.22)
<i>Substance use disorder</i>											
No	109 (75)	1	1	1	1	1	1	1	1	1	1
Yes	37 (25)	2.61 (1.19-5.70)*	1.97 (0.87-4.46)	1.78 (0.83-3.80)	1.53 (0.70-3.36)	2.58 (1.02-6.52)*	1.82 (0.68-4.90)	0.88 (0.41-1.86)	0.83 (0.38-1.83)	0.89 (0.41-1.95)	0.76 (0.33-1.72)
<i>Emotional disorder</i>											
No	113 (77)	1	1	1	1	1	1	1	1	1	1
Yes	33 (23)	0.63 (0.29-1.37)	0.78 (0.33-1.79)	0.94 (0.43-2.04)	1.06 (0.47-2.37)	0.71 (0.22-2.25)	0.87 (0.25-3.05)	0.68 (0.31-1.51)	0.65 (0.29-1.46)	1.09 (0.48-2.48)	1.08 (0.46-2.53)
<i>Personality disorder</i>											
No	126 (86)	1	1	1	1	1	1	1	1	1	1
Yes	20 (14)	1.18 (0.46-3.05)	1.67 (0.59-4.73)	2.33 (0.84-6.46)	2.87 (0.99-8.33)	1.98 (0.64-6.13)	2.71 (0.70-10.59)	1.95 (0.73-5.23)	1.94 (0.71-5.32)	1.47 (0.56-3.81)	1.45 (0.54-3.93)
<i>ADHD subtype<sup>e</sup></i>											
ADHD-C	97 (80)	1	1	1	1	1	1	1	1	1	1
ADHD-I	21 (17)	0.47 (0.18-1.24)	0.34 (0.12-1.00)*	0.55 (0.21-1.42)	0.47 (0.17-1.28)	0.46 (0.10-2.16)	0.56 (0.11-2.92)	0.99 <sup>f</sup> (0.39-2.55)	1.09 <sup>f</sup> (0.41-2.87)	1.27 <sup>f</sup> (0.49-3.31)	1.45 <sup>f</sup> (0.54-3.93)
ADHD-HI <sup>g</sup>	3 (3)	-	-	-	-	-	-	-	-	-	-

ADHD = attention-deficit/hyperactivity disorder; adj = adjusted; C = combined; CI = 95% confidence interval; HI = hyperactive/impulsive;

I = inattentive; OR = odds ratio.

\*) p < 0.05; \*\*\*) p < 0.001.

a) Information from 146 patients.

b) Information from 145 patients.

c) Information from 141 patients.

d) Information from 140 patients.

e) Information from 121 patients.

f) Information from 118 patients.

g) Due to only slight variances in n (ranging from 146-140), n and % are shown only once, applicable for every outcome variable.

h) Adjusted for gender and age.

i) No analysis was made due to too few patients in the ADHD-HI group.

detected by the DSM diagnostic criteria, and that the attention problems of ADHD-I may be qualitatively different from those of ADHD-C [19]. This argument is further elaborated by Barkley [20], which suggests that the DSM-IV-TR subtyping does not optimally detect a certain and qualitatively different disorder, Sluggish Cognitive Tempo (SCT). Barkley argues that SCT is often mistaken for ADHD-I. If this is true, then it can be problematic to use the DSM-IV-TR-defined subtypes since they specify symptomatically and functionally heterogeneous subgroups. More research, however, is needed within this field.

The criminality rates in our study were somewhat higher than in two recent studies [5, 8]. However, these two studies relied on register-based data, whereas our

study relied on self-reported data. Hence, our data may have detected crimes that never resulted in actual arrests or convictions. Research on the associations of risky sexual behaviour and adult ADHD is limited. Furthermore, a lack of terminological consistency in data collection is evident. In line with another study [7], our results indicated that risky sexual behaviour is more associated with ADHD only than with ADHD together with co-morbid disorders. In general, however, more research is needed to examine whether risky sexual behaviour in adults with ADHD is, indeed, a topic of clinical, individual and societal importance.

Our study documented that clinically referred Danish adults with ADHD are impaired in terms of education, occupation and risk-taking behaviour. The pres-

Functional impairments in terms of low educational level, occupational difficulties and risk-taking behaviour are common among adults with attention-deficit/hyperactivity disorder.



ence of co-morbidity did not significantly increase the odds for poor educational attainment and risky behaviours, which highlights the importance of targeting treatment at ADHD itself. Co-morbidity, especially PD, significantly increased one's occupational vulnerability. Male gender and ADHD-C were significantly associated with criminality and suspension of driving licence.

#### Strengths and limitations

Our study is one of the first to examine and document functional impairments in a Danish clinical sample of adults with ADHD. All assessed patients were included and, thus, our results should be generalisable to other naturalistic, clinical Danish samples.

There are a number of limitations. Our study sample was relatively small, there was no control group, no structured diagnostic interview for ADHD was applied, two different methods for diagnosing PD were applied, and missing data limited the number of observations in some analyses. Our results should therefore be considered in the light of these limitations.

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