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JAMA. 2009;301(7):724-726 (doi:10.1001/jama.2009.136)

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ing (with psychological tests) the person's behaviors; nevertheless, these measurements are often sufficient to test psychological theories.¹ Moreover, measurements become less arbitrary when scores are linked to meaningful events in the lives of respondents,¹ as in our study that demonstrated associations between residents' professionalism scores and fundamental markers of residents' performance, including medical knowledge, clinical skills, and conscientious behaviors.

Peeters and Beltyukova argue that all measurements, including those of professionalism, should be unidimensional. There is a distinction between the multidimensional nature of professionalism and our study methods. The prevailing model for measuring professionalism requires the triangulation of professionalism assessments by multiple observers in realistic contexts over time.² Consequently, our outcome measure comprised professionalism scores assigned by peers, senior residents, faculty, medical students, and nonphysician professionals over 1 year. The average of these ordinal source evaluations yielded a numerically continuous summary outcome measure. Treating such data as interval is a common practice that is usually considered acceptable.³ Additionally, we used nonparametric statistics that are appropriate for ordinal data.

We agree that the psychometric properties of measures should be examined; thus, we thoroughly evaluated the validity of our professionalism assessment. Strong validity evidence⁴ included content validity based on established models,² internal structure validity based on measurements of dimensionality and reliability, and relations to other variables (criterion validity) that included markers of dutifulness and standardized scores of knowledge and clinical skill. Our validation methodology compares favorably with the literature, since only a minority of medical education studies using psychometric scores report an adequate range of validity evidence.⁵

We disagree that professionalism should be measured like the physical characteristics of length, volume, and weight. We believe that this narrow focus on measurement would neglect the rich and complex nature of professionalism. However, we agree that efforts to optimally define measurement in professionalism are needed and hope our study will stimulate additional work to this end.

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Financial Disclosures: None reported.

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RESEARCH LETTER

Atopic Eczema and Attention-Deficit/Hyperactivity Disorder in a Population-Based Sample of Children and Adolescents

To the Editor: Atopic eczema (AE, also known as atopic dermatitis) is the most prevalent chronic inflammatory condition in children.¹ The prevalence of AE at age 6 years reaches 20% in Western countries.¹ The typical itchy lesions may cause substantial psychosocial impairment and are a leading cause of sleep loss in childhood.² Approximately every third child with AE develops asthma or allergic rhinitis.¹

Attention-deficit/hyperactivity disorder (ADHD) is the most frequent psychiatric disorder in childhood, with a worldwide prevalence greater than 5%, and imposes a significant economic burden.^{3,4} Higher prevalence rates of asthma in children with ADHD suggested a common etiology, but further research failed to identify any substantial pathophysiological relationship.⁵ However, previous studies did not control for AE as a possible confounding factor. We examined the relationship of AE with ADHD in a population-based sample, hypothesizing that AE is a potential cause or exacerbation factor of ADHD symptoms.

Methods. We performed a correlational study using the GKV-database Saxony, an anonymized, population-based administrative health care database with complete information on outpatient health care and sociodemographic characteristics of 600 000 individuals from Germany in 2003 and 2004. Ethics committee approval and waiver of consent were given by the appropriate institutions.

Children (age 6-12 years) and adolescents (age 13-17 years) documented as having AE (code L20 from the *International Statistical Classification of Diseases, 10th Revision [ICD-10]*) at least twice within the study period were individually matched for age and sex to randomly selected controls without AE. To minimize misclassification, we defined a priori that the ICD-10 code for ADHD (F90) had to be documented at least twice to classify patients as having ADHD.

Two logistic regression models were fitted to investigate the relationship of AE, allergic and psychiatric comorbidities, and sociodemographic factors (age and sex) with ADHD, using backward elimination. In the primary analysis, AE was modeled as a binary variable (presence vs absence). The secondary exploratory analysis treated the frequency of consultation due to AE (as a presumptive indicator of AE severity) as a continuous variable. Assuming a prevalence of

ADHD of 5% among controls, the study had 80% power to detect an odds ratio (OR) of 1.56 (with a 2-sided $\alpha = .05$). Data were analyzed using Stata version 8 (StataCorp, College Station, Texas).

Results. The study population consisted of 1436 patients with AE and 1436 matched controls (mean age, 12.6 years; 59.9% female). Patients with AE and controls were

balanced in terms of sociodemographic characteristics and overall health care use (TABLE 1). The prevalence of ADHD was 5.2% among patients with AE and 3.4% among controls. In the unadjusted analysis, ADHD was significantly associated with AE (OR, 1.54; 95% confidence interval [CI], 1.06-2.22; $P = .02$) (TABLE 2). Allergic comorbidities were not significantly associated with ADHD (asthma OR, 1.72;

Table 1. Characteristics of Patients With Atopic Eczema and Matched Controls

Characteristic	No. (%)			P Value ^b
	Total (n = 2872)	Patients With Atopic Eczema (n = 1436)	Controls Without Atopic Eczema ^a (n = 1436)	
Sociodemographic Characteristics				
Age, mean (SD), y	12.6 (3.8)	12.6 (3.8)	12.6 (3.8)	
Children (6-12 y)	1250 (43.5)	625 (43.5)	625 (43.5)	
Adolescents (13-17 y)	1622 (56.5)	811 (56.5)	811 (56.5)	
Female	1720 (59.9)	860 (59.9)	860 (59.9)	
Health Care Use				
Physician contacts within 2-y study period, mean (SD), No. ^c	11.1 (7.3)	10.9 (7.5)	11.2 (7.0)	.26
≥1 consultation within study period, by specialty ^c				
Family medicine	1615 (54.3)	784 (52.7)	831 (55.9)	.08
Pediatrics	1898 (63.8)	935 (62.9)	963 (64.8)	.28
Internal medicine	379 (12.7)	197 (13.3)	182 (12.2)	.41
Psychiatry	182 (6.1)	98 (6.6)	84 (5.7)	.28
Dermatology	727 (24.5)	366 (24.6)	361 (24.3)	.83
Comorbidity				
Psychiatric (<i>ICD-10</i> code)				
ADHD (F90)	123 (4.3)	74 (5.2)	49 (3.4)	.02
Affective disorders (F30-39)	29 (1.0)	17 (1.2)	12 (0.8)	.35
Neurotic, stress-related, and somatoform disorders (F40-48)	187 (6.5)	120 (8.4)	67 (4.7)	.001
Eating disorders (F50)	17 (0.6)	8 (0.6)	9 (0.6)	.81
Personality and behavior disorders (F60-69)	36 (1.3)	24 (1.7)	12 (0.8)	.04
Allergic (<i>ICD-10</i> code)				
Asthma (J45)	189 (6.6)	148 (10.3)	41 (2.9)	<.001
Allergic rhinitis (J30)	825 (28.7)	588 (41.0)	237 (16.5)	<.001

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; ICD-10, International Statistical Classification of Diseases, 10th Revision.

^aMatched on age and sex.

^bComparing patients with atopic eczema and controls without atopic eczema using Wilcoxon rank-sum test to test for differences in means and χ^2 test for the other characteristics.

^cFor reasons other than atopic eczema.

Table 2. Logistic Regression Analyses on Prevalent Attention-Deficit/Hyperactivity Disorder

Independent Variable	Bivariable (Unadjusted) Analysis		Multivariable (Adjusted) Analysis			
	OR (95% CI)	P Value	Primary Model		Secondary Model	
			OR (95% CI) ^a	P Value	OR (95% CI) ^b	P Value
Atopic eczema, presence vs absence	1.54 (1.06-2.22)	.02	1.47 (1.01-2.15)	.046	NA	NA
Frequency of consultation due to atopic eczema, per visit	1.05 (1.00-1.11)	.06	NA	NA	1.06 (1.00-1.11)	.046
Age, per 1-y increase	0.83 (0.79-0.88)	<.001	0.84 (0.80-0.89)	<.001	0.84 (0.80-0.88)	<.001
Sex, male vs female	3.82 (2.57-5.68)	<.001	3.40 (2.27-5.09)	<.001	3.40 (2.27-5.08)	<.001
Psychiatric comorbidity, presence vs absence	9.27 (4.36-19.68)	<.001	9.63 (4.14-22.39)	<.001	10.23 (4.43-23.60)	<.001

Abbreviations: CI, confidence interval; NA, not applicable; OR, odds ratio.

^aAtopic eczema modeled as a binary variable.

^bFrequency of consultation due to atopic eczema modeled as a continuous variable.

95% CI, 0.95-3.13; $P=.07$; allergic rhinitis OR, 1.46; 95% CI, 0.99-2.13; $P=.055$). Multivariable analysis showed that the association between AE and ADHD was independent of age, sex, and comorbid psychiatric disorder (adjusted OR, 1.47; 95% CI, 1.01-2.15; $P=.046$) and that the likelihood of prevalent ADHD increased with each physician visit due to AE (OR, 1.06; 95% CI, 1.00-1.11; $P=.046$) (Table 2).

Comment. These findings suggest an independent association between AE and ADHD, possibly related to AE severity. However, the results require cautious interpretation. Residual confounding and misclassification of AE and ADHD cannot be ruled out. The observed association, if real, may be an association between ADHD with atopy in general, and not specific for AE. The clinical relevance of the observed association might be small. Because the cross-sectional design does not allow establishing causal relationships or determining the direction of the observed association, prospective studies are required. It remains unclear whether the observed association is due to shared etiological factors or whether secondary phenomena like itching, sleep disturbance, or psychosocial impairment in the course of AE induce or exacerbate ADHD symptoms in a subgroup of patients, with the potential for misclassifying AE symptoms as ADHD.^{2,6}

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Financial Disclosures: None reported.

Additional Contributions: The Regional Association of Statutory Health Insurance Physicians Saxony and the Saxony Compulsory Health Insurance, Allgemeine Ortskrankenkasse (AOK) Sachsen, provided technical support in data utilization. None of these organizations received any compensation for their support.

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