Attention-deficit/hyperactivity disorder and the link to violence

5th Bergen International Conference on Forensic Psychiatry

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Attention-deficit/ hyperactivity disorder (ADHD)

The construct

European Neuropsychopharmacology (2018) 28, 1059–1088

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REVIEW

Live fast, die young? A review on the developmental trajectories of ADHD across the lifespan

Barbara Franke[a,b,*], Giorgia Michelini[c], Philip Asherson[c], Tobias Banaschewski[d], Andrea Bilbow[e,f], Jan K. Buitelaar[g], Bru Cormand[h,i,j,k], Stephen V. Faraone[l,m], Ylva Ginsberg[n,o], Jan Haavik[m,p], Jonna Kuntsi[c], Henrik Larsson[n,o], Klaus-Peter Lesch[q,r,s], J. Antoni Ramos-Quiroga[t,u,v,w], János M. Réthelyi[x,y], Marta Ribases[t,u,v], Andreas Reif[z]

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Attention-deficit/hyperactivity disorder (ADHD) most common neurodevelopmental disorder in childhood

Highly heritable

Substantial proportion do not remit in puberty, but persists into adulthood

Extensive comorbidity

Course and symptoms of ADHD, and comorbidities, may change over time, and even childhood onset recently been questioned

European Neuropsychopharmacology (2018) 28, 1059-1088

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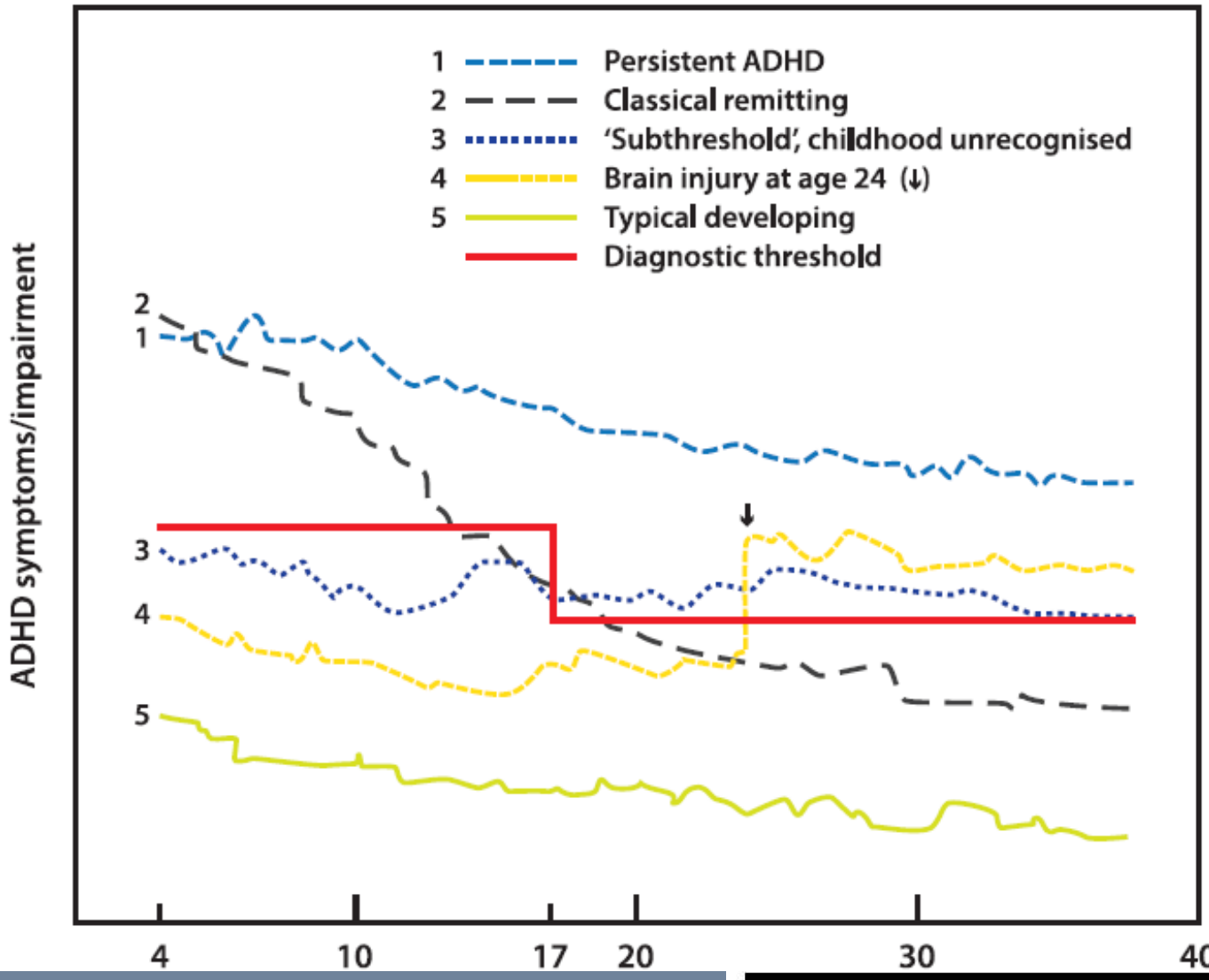

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REVIEW

Live fast, die young? A review on the developmental trajectories of ADHD across the lifespan

Molecular Psychiatry
https://doi.org/10.1038/s41380-018-0248-5

ARTICLE

Do borderline personality disorder and attention-deficit/hyperactivity disorder co-aggregate in families? A population-based study of 2 million Swedes

Ralf Kuja-Halkola[1] · Kristina Lind Juto[1] · Charlotte Skoglund[2] · Christian Rück[2] · David Mataix-Cols[2] · Ana Pérez-Vigil[2] · Johan Larsson[2] · Clara Hellner[2] · Niklas Långström[1,3] · Predrag Petrovic[4] · Paul Lichtenstein[1] · Henrik Larsson[1,5]

Received: 7 February 2018 / Revised: 6 August 2018 / Accepted: 8 August 2018

Abstract

Large-scale family studies on the co-occurrence of attention-deficit/hyperactivity disorder (ADHD) and borderline personality disorder (BPD) are lacking. Thus, we aimed to estimate the co-occurrence and familial co-aggregation of clinically ascertained ADHD and BPD diagnoses using the entire Swedish population. In a register-based cohort design we included individuals born in Sweden 1979–2001, and identified their diagnoses during 1997–2013; in total, 2,113,902 individuals were included in the analyses. We obtained clinical diagnoses of ADHD and BPD from inpatient and outpatient care. Individuals with an ADHD diagnosis had an adjusted (for birth year, sex, and birth order) odds ratio (aOR) of 19.4 (95% confidence interval [95% CI] = 18.6–20.4) of also having a BPD diagnosis, compared to individuals not diagnosed with ADHD. Having a sibling with ADHD also increased the risk for BPD (monozygotic twins, aOR = 11.2, 95% CI = 3.0–42.2; full siblings, aOR = 2.8, 95% CI = 2.6–3.1; maternal half-siblings, aOR = 1.4, 95% CI = 1.2–1.7; paternal half-siblings, aOR = 1.5, 95% CI = 1.3–1.7). Cousins also had an increased risk. The strength of the association between ADHD and BPD was similar in females and males, and full siblings showed similar increased risks regardless of sex. Among both males and females, ADHD and BPD co-occur within individuals and co-aggregate in relatives; the pattern suggests shared genetic factors and no robust evidence for etiologic sex differences was found. Clinicians should be aware of increased risks for BPD in individuals with ADHD and their relatives, and vice versa.

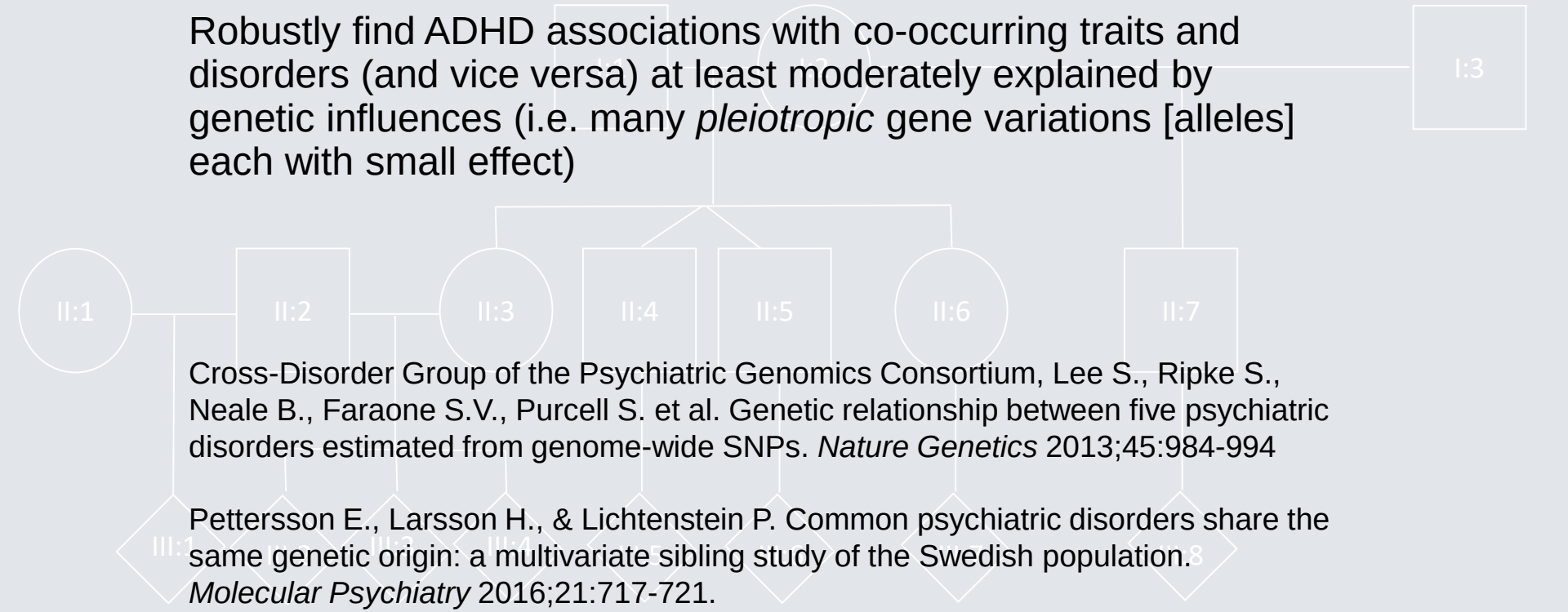
Co-occurence

Co-morbidity

ADHD is not alone out there

Family aggregation, twin and molecular genetic (SNPs and GWAS-based polygenic risk scores [PRS]) studies…

Robustly find ADHD associations with co-occurring traits and disorders (and vice versa) at least moderately explained by genetic influences (i.e. many *pleiotropic* gene variations [alleles] each with small effect)



Cross-Disorder Group of the Psychiatric Genomics Consortium, Lee S., Ripke S., Neale B., Faraone S.V., Purcell S. et al. Genetic relationship between five psychiatric disorders estimated from genome-wide SNPs. *Nature Genetics* 2013;45:984-994

Pettersson E., Larsson H., & Lichtenstein P. Common psychiatric disorders share the same genetic origin: a multivariate sibling study of the Swedish population. *Molecular Psychiatry* 2016;21:717-721.

Du Rietz E., Coleman J., Glanville K., Choi S.W., O'Reilly P.F., & Kuntsi J. Association of polygenic risk for Attention-Deficit/Hyperactivity Disorder with co-occurring traits and disorders. *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging* 2018;3:635-643.

Selzam et al. *Translational Psychiatry* (2018)8:205
DOI 10.1038/s41398-018-0217-4

Translational Psychiatry

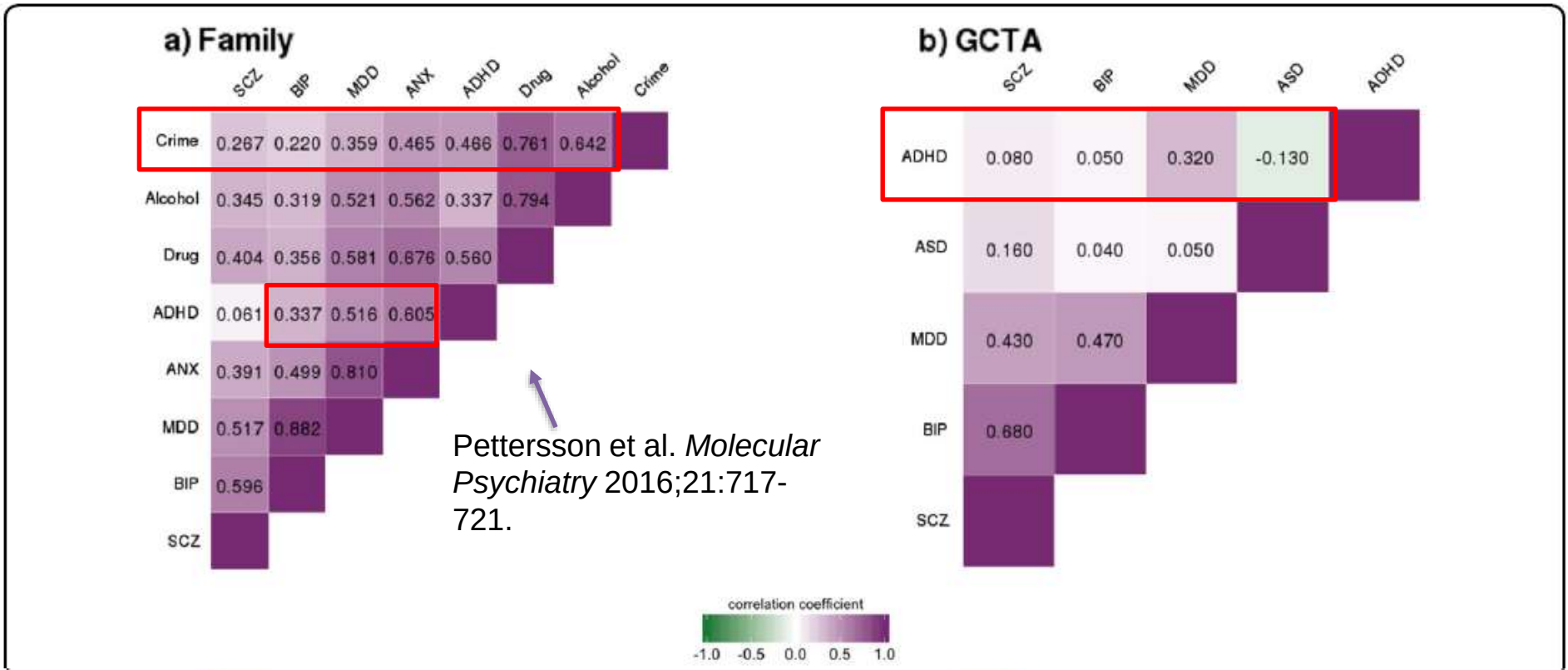
ARTICLE Open Access

A polygenic *p* factor for major psychiatric disorders

Saskia Selzam[1], Jonathan R. I. Coleman[1,2], Avshalom Caspi[1,3,4,5], Terrie E. Moffitt[1,3,4,5] and Robert Plomin[1]

Abstract

It has recently been proposed that a single dimension, called the *p* factor, can capture a person's liability to mental disorder. Relevant to the *p* hypothesis, recent genetic research has found surprisingly high genetic correlations between pairs of psychiatric disorders. Here, for the first time, we compare genetic correlations from different methods and examine their support for a genetic *p* factor. We tested the hypothesis of a genetic *p* factor by applying principal component analysis to matrices of genetic correlations between major psychiatric disorders estimated by three methods—family study, genome-wide complex trait analysis, and linkage-disequilibrium score regression—and on a matrix of polygenic score correlations constructed for each individual in a UK-representative sample of 7 026 unrelated individuals. All disorders loaded positively on a first unrotated principal component, which accounted for 57, 43, 35, and 22% of the variance respectively for the four methods. Our results showed that all four methods provided strong support for a genetic *p* factor that represents the pinnacle of the hierarchical genetic architecture of psychopathology.



Pettersson et al. *Molecular Psychiatry* 2016;21:717-721.

Fig. 1 Genetic correlations from family analysis (**a**), Genome-wide Complex Trait Analysis (**b**), Linkage-Disequilibrium Score Regression (**c**) and Genome-wide Polygenic Score (**d**) analysis. Values represent genetic correlations for (**a**), (**b**) and (**c**) and Pearson's correlation coefficients for (**d**). *SCZ* Schizophrenia, *BIP* Bipolar Disorder, *MDD* Major Depressive Disorder, *ASD* Autism Spectrum Disorder, *ADHD* Attention-Deficit/Hyperactivity Disorder, *ANX* Anxiety, *OCD* Obsessive-Compulsive Disorder, *AN* Anorexia Nervosa, *PTSD* Post-Traumatic Stress Disorder; Drug = Drug Abuse; Alcohol = Alcohol Abuse; Crime = Convictions of Violent Crimes

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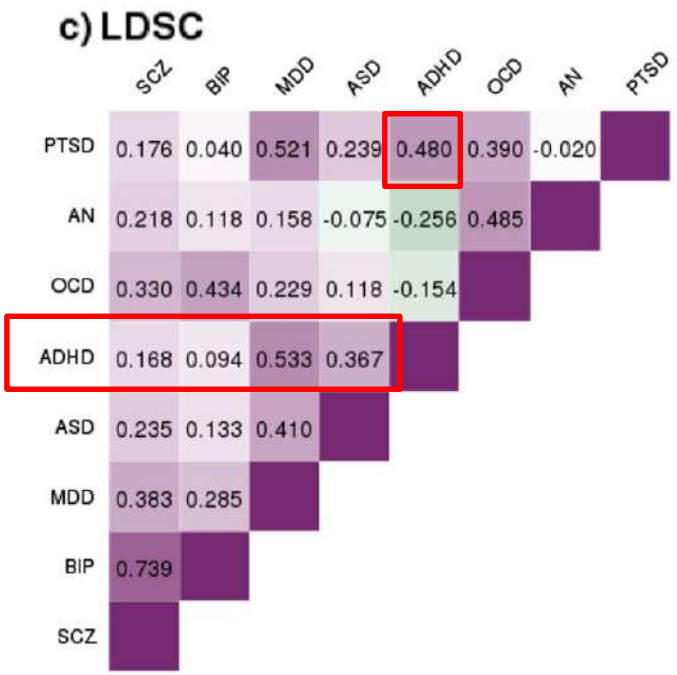

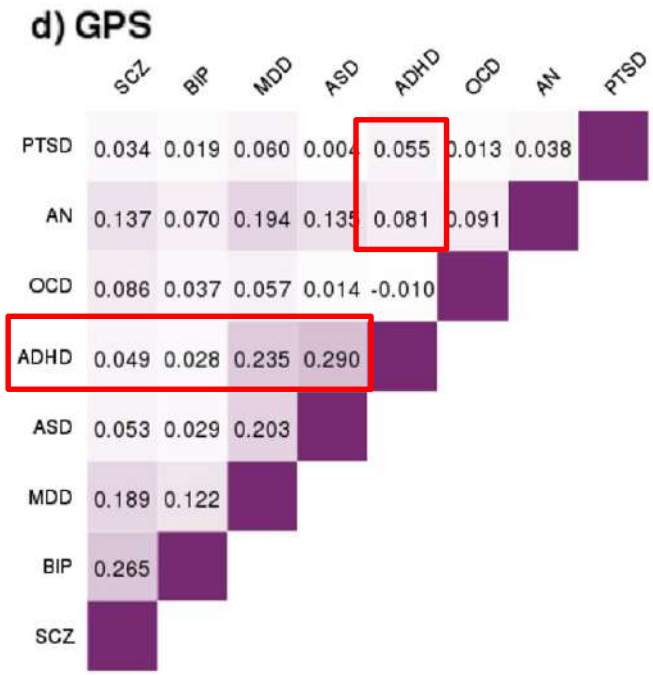

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Principal component analysis to matrices of genetic correlations between major psychiatric disorders estimated by family study, genome-wide complex trait analysis, and linkage-disequilibrium score regression and polygenic score correlations

All tested disorders loaded positively on a first unrotated principal component, accounting for 57, 43, 35 and 22% of variance, respectively, for the four methods

Conluded all four methods provided strong support for a *genetic p factor* that represents the pinnacle of the hierarchical genetic architecture of psychopathology

Selzam et al. *Translational Psychiatry* (2018)8:205
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Abstract

It has recently been proposed that a single dimension, called the *p* factor, can capture a person's liability to mental disorder. Relevant to the *p* hypothesis, recent genetic research has found surprisingly high genetic correlations

ADHD

Effective treatments for core symptoms exist

Table 1 Reported effect sizes (standardised mean difference) from meta-analysis for studies of treatment efficacy for ADHD core symptoms in childhood and adulthood.

Treatment and age-group	Treatment type	Effect size	Reference
Childhood: pharmacological treatment	Methylphenidate	0.72	Faraone and Buitelaar (2010)
Adulthood: pharmacological treatment	Methylphenidate	0.42–0.72	Castells et al. (2011b; Epstein et al. (2014
	Amphetamines	0.72–1.07	Castells et al. (2011a); Fridman et al. (2015)
	Atomoxetine	0.38–0.60	Asherson et al. (2014); Fridman et al. (2015)
Adulthood: non-pharmacological treatment	Cognitive-behavioural therapy	0.43–1.0	Jensen et al. (2016); Knouse et al. (2017); Young et al. (2016)
	Mindfulness-based therapies	0.53–0.66	Cairncross and Miller (2016)

Comparative efficacy and tolerability of medications for attention-deficit hyperactivity disorder in children, adolescents, and adults: a systematic review and network meta-analysis

Samuele Cortese, Nicoletta Adamo, Cinzia Del Giovane, Christina Mohr-Jensen, Adrian J Hayes, Sara Carucci, Lauren Z Atkinson, Luca Tessari, Tobias Banaschewski, David Coghill, Chris Hollis, Emily Simonoff, Alessandro Zuddas, Corrado Barbui, Marianna Purgato, Hans-Christoph Steinhausen, Farhad Shokraneh, Jun Xia, Andrea Cipriani

Summary

Background The benefits and safety of medications for attention-deficit hyperactivity disorder (ADHD) remain controversial, and guidelines are inconsistent on which medications are preferred across different age groups. We aimed to estimate the comparative efficacy and tolerability of oral medications for ADHD in children, adolescents, and adults

Lancet Psychiatry 2018; 5:727–38
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REVIEW

Live fast, die young? A review on the developmental trajectories of ADHD across the lifespan

Table 1 Reported effect sizes (standardised mean difference) from meta-analysis for studies of treatment efficacy for ADHD core symptoms in childhood and adulthood.

Treatment and age-group	Treatment type	Effect size	Reference
Childhood: pharmacological treatment	Methylphenidate	0.72	Faraone and Buitelaar (2010)
	Amphetamines	0.99	Faraone and Buitelaar (2010)
	Atomoxetine	0.64	Schwartz and Correll (2014)
	Guanfacine	0.63	Hirota et al. (2014)
	Clonidine	0.44	Hirota et al. (2014)
Childhood: non-pharmacological treatment	Omega-3	0.16	Sonuga-Barke et al. (2013)
	Diets	0.42	Sonuga-Barke et al. (2013)
		0.21	Hodgson et al. (2014)
		0.09	Hodgson et al. (2014)
		−0.02–0.20	Cortese et al. (2015); Hodgson et al. (2014)
		−0.03	Hodgson et al. (2014)
		−0.51	Hodgson et al. (2014)
		−5.91	Hodgson et al. (2014)
		−0.26–0.16	Hodgson et al. (2014); Richardson et al. (2015)
Adulthood: pharmacological treatment	Methylphenidate	0.42–0.72	Castells et al. (2011b; Epstein et al. (2014
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Prevalence among law-breakers/ violent individuals

The health of prisoners

Prevalence of mental disorders in prisoners in western countries in comparison with the general population (adapted from Fazel & Baillargeon, 2011)

	Male prisoners (%)	Male general population estimate (%)	Female prisoners (%)	Female general population estimate (%)
Any personality disorder[1]	65%	5–10%	42%	5–10%
Antisocial personality disorder[1]	47%	5–7%	21%	0.5–1%
ADHD[5]	25-30%	3-5%	25-30%	3-5%
Alcohol misuse/dependence[2]	18–30%	14–16%	10–24%	4–5%
Drug misuse/dependence[2]	10–48%	4–6%	30–60%	2–3%
Depression[1]	10%	2–4%	12%	5–7%
Post-traumatic disorder[4]	4–21%	2%	10–21%	3%
Psychosis[1]	4%	1%	4%	1%
Intellectual disability[3]	0.5–1.5%	1%	0.5–1.5%	1%

*General population estimates are based on individuals of similar ages where possible.

1) Fazel S, Danesh J. Serious mental disorder in 23 000 prisoners: a systematic review of 62 surveys. Lancet 2002;359:545–50. Fazel S & Seewald K. Br J Psychiatry 2012.

2) Fazel S, Bains P, Doll H. Substance abuse and dependence in prisoners: a systematic review. Addiction 2006;101:181–91.

3) Fazel S, Xenitidis K, Powell J. The prevalence of intellectual disabilities among 12,000 prisoners—a systematic review. Int J Law Psychiatry 2008;31:369–73.

4) Goff A, Rose S, Purves D. Does PTSD occur in sentenced prison populations? A systematic literature review. Crim Behav Ment Health 2007;17:152–62.

5) Young S, Moss D, Sedgwick O, Fridman M, Hodgkins P. A meta-analysis of the prevalence of attention deficit hyperactivity disorder in incarcerated populations. Psychol Med 2015; 45:247–58. Baggio S, Fructuoso A, Guimaraes M, Fois E, Golay D, Heller P, et al. Prevalence of Attention Deficit Hyperactivity Disorder in detention settings: A systematic review and meta-analysis. Front Psychiatry 2018;9.

J Autism Dev Disord (2014) 44:2707–2716
DOI 10.1007/s10803-013-1873-0

ORIGINAL PAPER

Childhood Neurodevelopmental Disorders and Violent Criminality: A Sibling Control Study

Sebastian Lundström · Mats Forsman · Henrik Larsson · Nora Kerekes · Eva Serlachius · Niklas Långström · Paul Lichtenstein

Violent crime conviction among 3000+ CAP patients diagnosed in greater Stockholm area vs. matched non-CAP controls. All born 1984-1994, followed to 2009 (ages 15-25)

Table 3 Odds ratios with 95 % confidence intervals, for violent offending in different neurodevelopmental disorders in a Swedish prospective study of four childhood neurodevelopmental disorders and risk of violent criminality

	ADHD	ASD	TD	OCD
Unadjusted model	**4.6 (3.7–5.7)****	1.3 (0.9–2.0)	2.2 (1.1–4.4)*	0.9 (0.5–1.7)
Adjusted for confounders[a]	**4.3 (3.4–3.6)****	1.3 (0.8–2.1)	**3.0 (1.5–6.4)****	1.3 (0.7–2.4)
Adjusted for CD and ODD[b]	**3.7 (2.9–4.9)****	1.3 (0.8–2.1)	**3.1 (1.5–6.7)****	1.2 (0.6–2.2)
Fully adjusted[c]	**2.7 (2.0–3.8)****	1.1 (0.6–1.9)	**3.2 (1.4–7.5)****	0.7 (0.3–1.5)

* $p < .05$, ** bolded figures are significant $p < .01$

[a] Adjusted for parental income and parental education

[b] Adjusted for parental income, parental education, ODD, and CD

[c] Adjusted for parental income, parental education, ODD, CD, schizophrenia, bipolar disorder, non-organic psychosis, substance abuse/dependence, and missing grades

Lundström S., Forsman M., Larsson H., Kerekes N., Serlachius E., Långström N., Lichtenstein P. Childhood neurodevelopmental disorders and violent criminality: A sibling control study. *J Autism Dev Disord,* 2014.

Psychiatric disorders and violent reoffending: a national cohort study of convicted prisoners in Sweden.

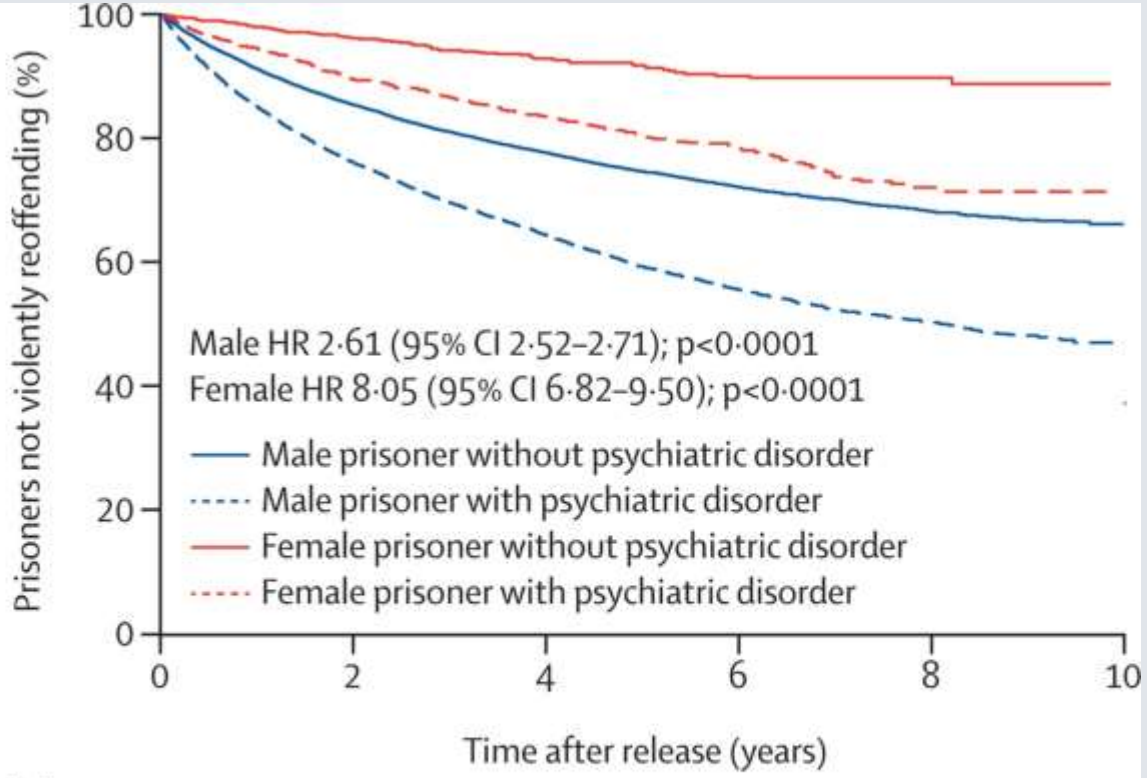
Methods

Longitudinal cohort study of 47 326 individuals imprisoned since Jan 1, 2000, and released before Dec 31, 2009, in Sweden

Diagnosed psychiatric disorders from both inpatient and outpatient registers, and sociodemographic and criminological factors from other population-based registers

Chang, Larsson, Lichtenstein, & Fazel. *Lancet Psychiatry.* 2015 Sep 2

Figure 1



Number at risk						
Male prisoner without psychiatric disorder	25277	15311	9781	5400	2180	0
Male prisoner with psychiatric disorder	18563	8997	4964	2475	922	0
Female prisoner without psychiatric disorder	1253	823	526	293	108	0
Female prisoner with psychiatric disorder	2233	1151	664	356	115	0

Chang Z, Larsson H, Lichtenstein P, & Fazel S. Psychiatric disorders and violent reoffending: a national cohort study of convicted prisoners in Sweden *Lancet Psychiatry.* 2015 Sep 2.

	Model 1*	Model 2†	Model 3‡
Men			
Alcohol use disorder	2·14 (2·05–2·24)	1·63 (1·56–1·71)	1·45 (1·38–1·53)
Drug use disorder	2·13 (2·05–2·22)	1·65 (1·58–1·72)	1·52 (1·45–1·59)
Personality disorder	2·29 (2·14–2·45)	1·64 (1·53–1·76)	1·30 (1·21–1·40)
Attention-deficit hyperactivity disorder	2·22 (1·89–2·61)	1·56 (1·31–1·85)	1·31 (1·10–1·55)
Other developmental or childhood disorder	1·82 (1·65–2·01)	1·46 (1·32–1·61)	1·33 (1·20–1·47)
Schizophrenia spectrum disorders	2·06 (1·87–2·26)	1·51 (1·37–1·67)	1·20 (1·09–1·33)
Bipolar disorder	1·96 (1·50–2·58)	1·75 (1·32–2·32)	1·50 (1·13–1·99)
Depression	1·41 (1·30–1·54)	1·28 (1·18–1·40)	1·09 (1·00–1·18)
Anxiety disorder	1·41 (1·32–1·51)	1·23 (1·14–1·32)	1·09 (1·01–1·17)
Women			
Alcohol use disorder	2·65 (2·15–3·26)	2·08 (1·66–2·60)	1·84 (1·46–2·32)
Drug use disorder	2·59 (2·10–3·20)	1·84 (1·46–2·30)	1·58 (1·26–2·00)
Personality disorder	2·57 (1·99–3·33)	1·66 (1·27–2·18)	1·27 (0·96–1·68)
Attention-deficit hyperactivity disorder	2·01 (0·95–4·25)	1·53 (0·72–3·27)	1·20 (0·56–2·57)
Other developmental or childhood disorder	1·84 (1·29–2·64)	1·20 (0·82–1·76)	1·04 (0·70–1·53)
Schizophrenia spectrum disorders	1·75 (1·11–2·74)	1·04 (0·64–1·69)	0·74 (0·45–1·20)
Bipolar disorder	2·84 (1·06–7·65)	1·81 (0·67–4·91)	1·35 (0·49–3·68)
Depression	1·49 (1·11–2·00)	1·36 (1·00–1·86)	1·16 (0·85–1·59)
Anxiety disorder	1·40 (1·07–1·83)	1·21 (0·92–1·60)	1·07 (0·81–1·41)

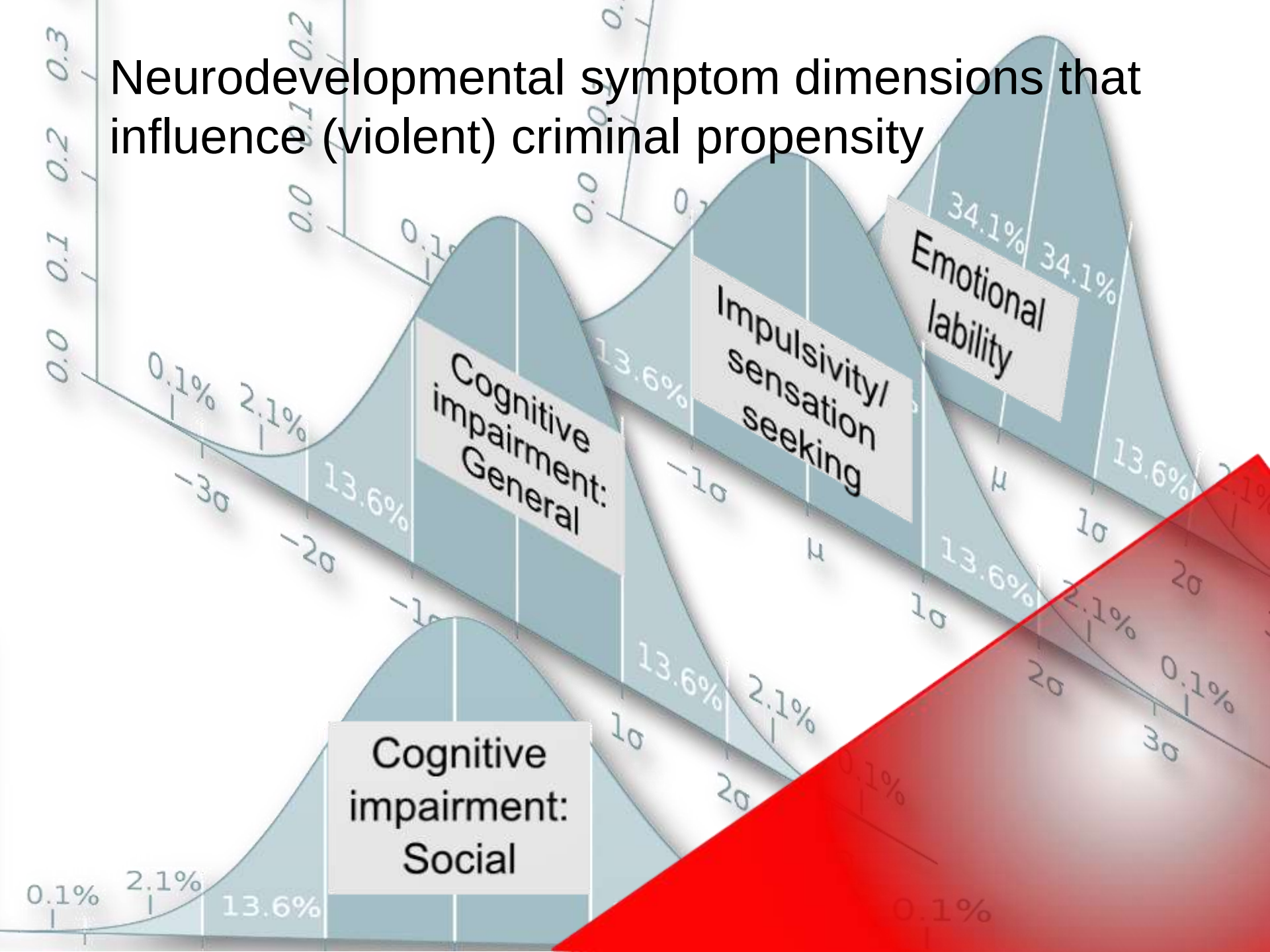
Data are hazard ratio (95% CI). *Adjusted for age and immigration status. †Adjusted for age, immigration status, and sociodemographic and criminological covariates. ‡Adjusted for age, immigration status, sociodemographic and criminological covariates, and alcohol and drug use disorders.

Table 3: **Association between individual psychiatric disorders and violent crime reoffending**

Chang, Larsson, Lichtenstein, & Fazel. Psychiatric disorders and violent reoffending: a national cohort study of convicted prisoners in Sweden. *Lancet Psychiatry.* 2015 Sep 2

Why links between (some) neurodevelopmental psychiatric conditions & antisocial behavior/ violence?

Neurodevelopmental symptom dimensions that influence (violent) criminal propensity

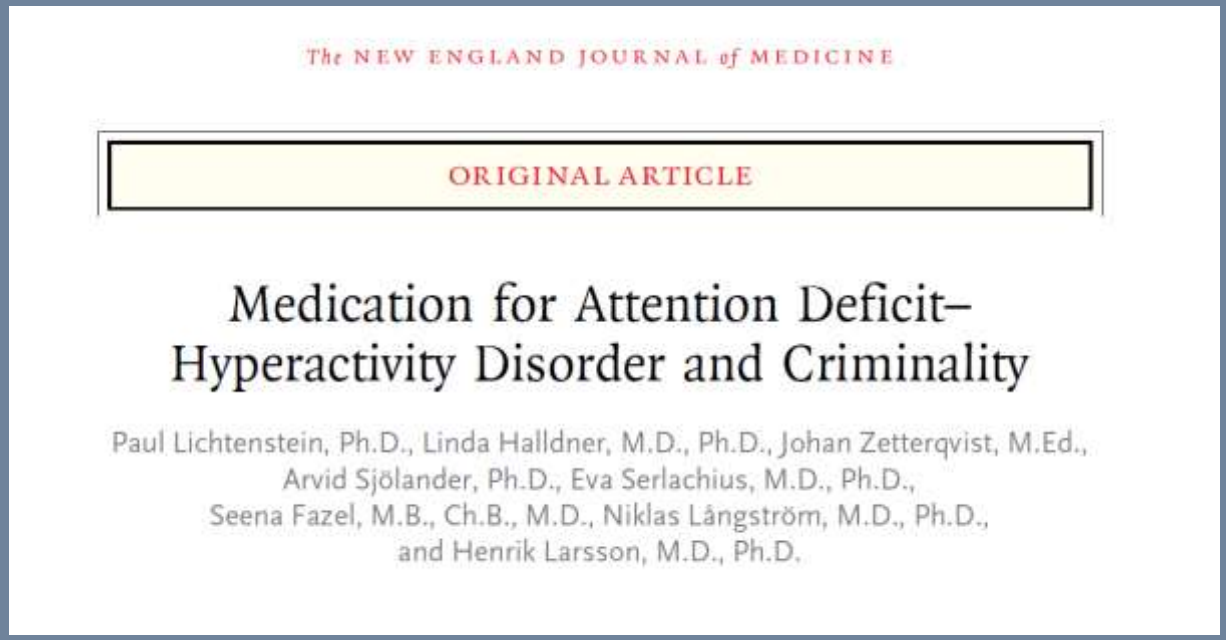


ADHD

Do treatments also affect violence risk/recidivism?

And, for practical and ethical reasons, can long-term effectiveness for pharmacological and psychological treatments be ascertained from randomized controlled trials?

ADHD treatment prevents violence?



The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Medication for Attention Deficit–Hyperactivity Disorder and Criminality

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- ✓ 25 000 individuals diagnosed with ADHD studied in within-individual analyses
- ✓ Periods when person used prescribed medication compared with periods when *same person* did not use same medication

RESULTS

Table 2. Hazard Ratio for Conviction for Any Crime during a Period of Treatment with an ADHD Medication, as Compared with a Nontreatment Period (2006–2009).*

Sex	No. of Patients	No. of Crimes	Hazard Ratio (95% CI)	
			Cox Regression	Stratified Cox Regression
Men	16,087	23,693	0.70 (0.66–0.75)	0.68 (0.63–0.73)
Women	9,569	4,112	0.78 (0.68–0.90)	0.59 (0.50–0.70)

RESULTS continued…

Table 4. Sensitivity Analyses among Men with ADHD, According to Types of Cohort, Medication, and Criminal Outcome (2006–2009).*

Types of Cohort, Medication, and Criminal Outcome	No. of Patients in Cohort	No. of Crimes	Hazard Ratio (95% CI)
ADHD diagnosed in National Patient Register	16,087		
Stimulant drug and any criminal conviction†		23,693	0.66 (0.61–0.71)
Nonstimulant drug and any criminal conviction†		23,693	0.76 (0.63–0.91)
ADHD medication			
Violent crime		3,985	0.54 (0.44–0.67)
Less severe crime‡		17,421	0.67 (0.62–0.73)
Drug-related crime		8,502	0.63 (0.55–0.71)
No coexisting disorder and any criminal conviction§		5,723	0.77 (0.66–0.90)
Suspected of crime		55,953	0.81 (0.77–0.84)
SSRI medication and any criminal conviction		23,693	1.04 (0.93–1.17)
Prescribed ADHD medication and any criminal conviction¶	17,141	27,416	0.64 (0.60–0.68)
Pastill Register, use of ADHD medication, and any criminal conviction‖	1,090	995	0.83 (0.54–1.29)

Association between prescription of major psychotropic medications and violent reoffending after prison release

Zheng Chang, Paul Lichtenstein, Niklas Långström, Henrik Larsson, & Seena Fazel. Association Between Prescription of Major Psychotropic Medications and Violent Reoffending After Prison Release. JAMA. 2016;316(17):1798-1807.

JAMA, 2016: Association between prescription of major psychotropic medications and violent reoffending after prison release

Medication	Medicated Periods			Nonmedicated Periods			Risk Difference in No. of Violent Reoffenses/ 1000 Person-Years (95% CI)	Hazard Ratio (95% CI)
	Individuals, No.	Person-Years	Violent Reoffenses, No.	Individuals, No.	Person-Years	Violent Reoffenses, No.		
Antipsychotics	2085	1596	100	2767	11026	1044	-39.7 (-57.7 to -11.3)	0.58 (0.39 to 0.88)
Antidepressants	5660	3846	224	7421	31135	2038	5.9 (-11.1 to 28.1)	1.09 (0.83 to 1.43)
Psychostimulants	1202	1648	94	1352	4553	513	-42.8 (-67.6 to -2.2)	0.62 (0.40 to 0.98)
Drugs used in addictive disorders	2077	1168	46	3055	15725	1103	-36.4 (-54.0 to -2.1)	0.48 (0.23 to 0.97)
Antiepileptics	2235	1976	152	2736	10750	800	10.4 (-15.6 to 48.3)	1.14 (0.79 to 1.65)
Adrenergic inhalants[a]	2387	1291	38	2878	12992	586	-7.6 (-17.1 to 55.4)	1.17 (0.62 to 2.23)

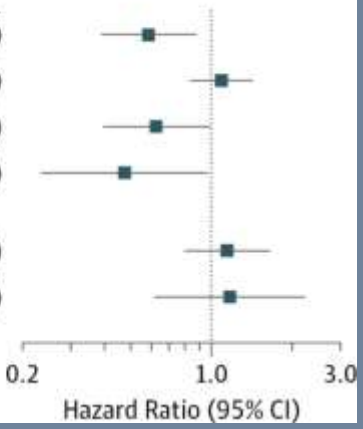

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Table 4. Psychotropic Medications and Criminal Reoffending in Released Prisoners by Diagnostic Subgroups, Severity of Outcome, and Duration of Follow-up

Cohort	Outcome Event	Medicated Periods			Nonmedicated Periods			Risk Difference in No. of Violent Reoffenses/1000 Person-Years (95% CI)	Hazard Ratio (95% CI)
		Individuals, No.	Person-Years	Events, No.	Individuals, No.	Person-Years	Events, No.		
Antipsychotics									
Individuals diagnosed as having SSD or BD	Violent crime	361	494	39	759	2646	331	−40.7 (−65.7 to −5.2)	0.67 (0.47 to 0.96)
Individuals diagnosed as having SUD	Violent crime	1179	936	83	6415	24 505	2214	−2.1 (−20.0 to 20.3)	0.98 (0.78 to 1.22)
Full cohort	Severe interpersonal violence	2063	1590	66	2727	10 942	742	−19.1 (−30.2 to −4.7)	0.72 (0.55 to 0.93)
Full cohort	Any crime	2063	1590	662	2727	10 942	6860	−96.5 (−138.0 to −51.4)	0.85 (0.78 to 0.92)
Individuals treated before release	Violent crime	621	747	58	1285	4189	434	−27.1 (−46.2 to −1.5)	0.74 (0.55 to 0.99)
Individuals treated only after release	Violent crime	1442	843	42	1442	6753	602	−33.9 (−49.4 to −12.4)	0.62 (0.45 to 0.86)
Individuals with a violent index crime	Violent crime	951	796	68	1264	4907	669	−35.9 (−59.1 to −5.9)	0.74 (0.57 to 0.96)
Individuals with a nonviolent index crime	Violent crime	1112	794	32	1463	6034	367	−10.5 (−25.9 to 11.6)	0.83 (0.57 to 1.19)
Full cohort with extended follow-up[a]	Violent crime	2649	2023	100	3253	15 418	1344	−25.0 (−37.0 to −10.1)	0.71 (0.58 to 0.88)
Psychostimulants									
Individuals diagnosed as having ADHD	Violent crime	306	450	35	624	1593	286	−57.3 (−94.8 to −3.2)	0.68 (0.47 to 0.98)
Full cohort	Severe interpersonal violence	1197	1647	71	1343	4538	381	−23.6 (−37.6 to −5.6)	0.72 (0.55 to 0.93)
Full cohort	Any crime	1197	1647	699	1343	4538	4047	−258.4 (−308.7 to −203.8)	0.71 (0.65 to 0.77)
Individuals treated before release	Violent crime	273	438	37	419	908	164	−75.6 (−108.3 to −28.1)	0.58 (0.40 to 0.84)
Individuals treated only after release	Violent crime	924	1209	57	924	3630	349	−45.2 (−59.1 to −26.0)	0.53 (0.38 to 0.73)
Individuals with a violent index crime	Violent crime	524	697	57	600	1981	297	−39.7 (−68.0 to −1.8)	0.73 (0.55 to 0.99)
Individuals with a nonviolent index crime	Violent crime	673	950	37	743	2557	216	−29.6 (−46.2 to −5.6)	0.65 (0.45 to 0.93)
Full cohort with extended follow-up[a]	Violent crime	1729	2348	94	1858	7481	813	−41.2 (−54.4 to −24.9)	0.62 (0.50 to 0.77)
Drugs Used in Addictive Disorders									
Individuals diagnosed as having SUD	Violent crime	1534	945	37	6417	24 496	2260	−32.1 (−49.0 to −8.5)	0.65 (0.47 to 0.91)
Individuals diagnosed as having SSD or BD	Violent crime	157	82	1	762	3059	369	−104.5 (−118.4 to −5.7)	0.13 (0.02 to 0.95)
Full cohort	Severe interpersonal violence	2590	1164	31	3499	15 565	750	−18.3 (−27.5 to −5.0)	0.62 (0.43 to 0.90)
Full cohort	Any crime	2590	1164	658	3499	15 565	7270	6.5 (−30.9 to 47.1)	1.01 (0.93 to 1.10)
Individuals treated before release	Violent crime	677	438	14	1586	5612	442	−42.9 (−58.1 to −16.4)	0.46 (0.26 to 0.79)
Individuals treated only after release	Violent crime	1913	725	32	1913	9953	656	−22.9 (−36.1 to −3.8)	0.65 (0.45 to 0.94)
Individuals with a violent index crime	Violent crime	937	301	17	1286	5742	660	−51.2 (−75.6 to −11.6)	0.55 (0.34 to 0.90)
Individuals with a nonviolent index crime	Violent crime	1653	862	29	2213	9823	438	−11.4 (−22.0 to 4.2)	0.74 (0.51 to 1.09)
Full cohort with extended follow-up[a]	Violent crime	3162	1611	46	4000	20 190	1344	−26.1 (−37.3 to −10.4)	0.61 (0.44 to 0.84)

Abbreviations: ADHD, attention-deficit hyperactivity disorder; BD, bipolar disorder; SSD, schizophrenia spectrum disorder; SUD, substance use disorder.

[a] Follow-up time was extended beyond any reincarceration (when any subsequent time as a convicted or remanded prisoner was excluded).

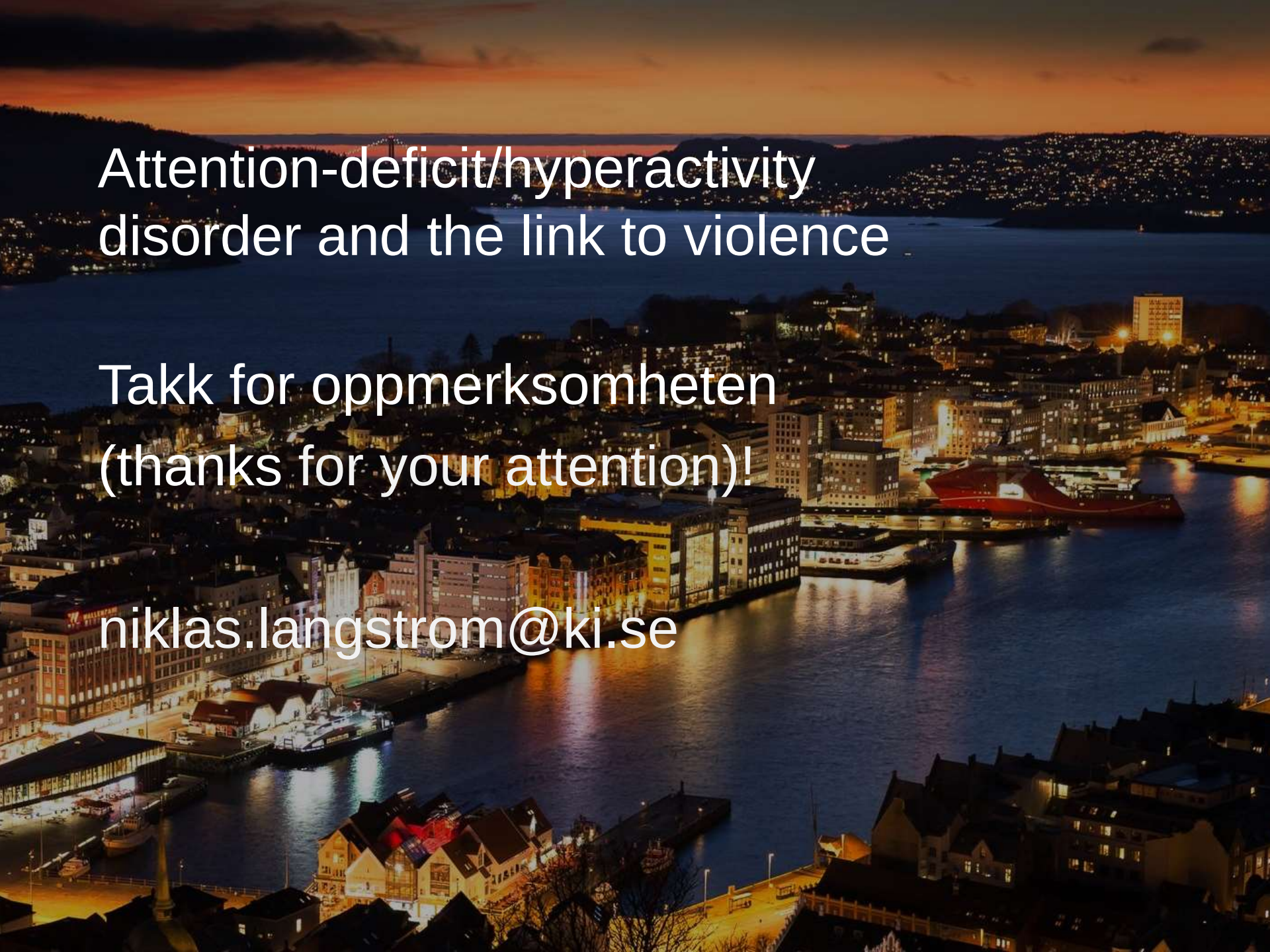
- ✓ ADHD risk factor for the development of violent crime

  (Young et al 2003; 2009; Satterfield et al., 2007; Mannuzza, Klein, & Moulton, 2008; Langley et al., 2010; Mordre, Groholt, Kjelsberg, Sandstad, & Myhre, 2011; Lundström et al., 2013; Chang et al., 2015)

- ✓ ADHD common in correctional and forensic psychiatric populations

- ✓ Effective treatment for ADHD core symptoms also appears to reduce violent criminality

- → *Substantial gains if identification and treatment improved*?



Attention-deficit/hyperactivity disorder and the link to violence

Takk for oppmerksomheten (thanks for your attention)!

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