

A coordinate-based meta-analysis comparing brain activation between attention deficit hyperactivity disorder and total sleep deprivation

Jared M Saletin, Stephanie Jackvony, Katherina A Rodriguez, Daniel P Dickstein

Sleep, Volume 42, Issue 3, March 2019, zsy251, <https://doi.org/10.1093/sleep/zsy251>

Published: 12 December 2018 **Article history** ▼

Views ▼ Cite Permissions Share ▼

Abstract

Study Objectives

Sleep disruption is common in attention deficit hyperactivity disorder (ADHD). Likewise, deficits in attention are a hallmark of sleep deprivation in healthy individuals. Whether ADHD and sleep deprivation modulate common, or disparate, neural systems is unknown. No study has yet utilized functional magnetic resonance imaging (fMRI) to investigate sleep loss in ADHD. We address this gap by performing a novel meta-analysis to compare patterns of fMRI activation during sleep deprivation and ADHD.

Methods

We performed a coordinate-based activation likelihood estimate (ALE) meta-analysis using the GingerALE software. A systematic review of task-based fMRI studies of sleep deprivation vs. rested and also ADHD vs. healthy controls (HC) yielded 134 articles. fMRI coordinates were extracted for each contrast (i.e. “ADHD vs. HC,” “TSD vs. Rested”) and normalized to the Talairach-atlas. Separate ALE analyses were performed for ADHD and sleep deprivation. We directly compared these initial estimates to determine shared vs. distinct areas of fMRI neural activation in ADHD and sleep deprivation.

Results

Conjunction analyses revealed overlapping hypoactivations between ADHD and sleep loss in executive function regions, notably the dorsal anterior cingulate cortex. Sleep deprivation, however, was associated with significantly exaggerated hyperactivation in the thalamus.

Conclusions

Our study indicates that ADHD and sleep deprivation share a common neural signature: hypoactivation of executive function neuroanatomy. In contrast, sleep loss, but not ADHD, was associated with thalamic hyperactivations, intimating a potential compensatory response in sleep loss not present in ADHD. By elucidating shared and distinct patterns of functional neuroanatomy, these data provide novel targets for future experimental investigations of sleep loss in ADHD.

[ADHD](#), [sleep](#), [sleep deprivation](#), [meta-analysis](#), [ALE](#), [fMRI](#)

© Sleep Research Society 2018. Published by Oxford University Press on behalf of the Sleep Research Society. All rights reserved. For permissions, please e-mail journals.permissions@oup.com.

This article is published and distributed under the terms of the Oxford University Press, Standard Journals Publication Model

Topic:

[attention-deficit/hyperactivity disorder](#)

[sleep deprivation](#)

[sleep](#)

[functional magnetic resonance imaging](#)

[adult attention deficit hyperactivity disorder](#)

Issue Section: [Cognitive, Affective and Behavioral Neuroscience of Sleep](#)

You do not currently have access to this article.

Sign in

Don't already have an Oxford Academic account? [Register](#)

Oxford Academic account

Email address / Username [?](#)

Password

[Sign In](#)

[Forgot password?](#)

[Don't have an account?](#)

Sleep Research Society members



[Sign in via society site](#)

American Academy of Sleep Medicine members



[Sign in via society site](#)

Sign in via your Institution

[Sign in](#)

Purchase

[Subscription prices and ordering](#)

Short-term Access

To purchase short term access, please sign in to your Oxford Academic account above.

Don't already have an Oxford Academic account? [Register](#)

A coordinate-based meta-analysis comparing brain activation between attention deficit hyperactivity disorder and total sleep deprivation - 24 Hours access

EUR €36.00

GBP £28.00

USD \$45.00

Rental



This article is also available for rental through DeepDyve.

[View Metrics](#)

Email alerts

[New issue alert](#)

[Advance article alerts](#)

[Article activity alert](#)

[Subject alert](#)

[Receive exclusive offers and updates from Oxford Academic](#)

More on this topic

Modafinil Activates Cortical and Subcortical Sites in the Sleep-Deprived State

Restless legs syndrome and iron deficiency in adults with attention-deficit/hyperactivity disorder

Sleep deprivation differentially affects subcomponents of cognitive control

Heart rate variability rebound following exposure to persistent and repetitive sleep restriction

Related articles in

Google Scholar

Related articles in PubMed

Acute myeloid leukaemia presenting with diabetes insipidus.

Imaging of Multiple Myeloma.

Tractography-based parcellation does not provide strong evidence of anatomical organisation within the thalamus.

Comparison of Prostate Imaging Reporting and Data System (PI-RADS) version 1 and version 2 and combination with apparent diffusion coefficient as a predictor of biopsy outcome.

Citing articles via

Google Scholar

CrossRef

Latest | **Most Read** | **Most Cited**

Characterization of the sleep disorder of anti-IgLON5 disease

Actigraphic detection of periodic limb movements: development and validation of a potential device-independent algorithm. A proof of concept study

Simultaneous tonic and phasic REM sleep without atonia best predicts early phenocconversion to neurodegenerative disease in idiopathic REM sleep behavior disorder

Residual symptoms after natural remission of insomnia: associations with relapse over 4 years

Sleep duration and fragmentation in relation to leukocyte DNA methylation in adolescents

Looking for your next opportunity?

Chair of Pain Research
Boston, Massachusetts

PEDIATRIC EMERGENCY PHYSICIAN
Saskatoon Shines, Saskatchewan

Endowed Chair of Occupational
Health/Medicine
Saint John, New Brunswick

CHIEF OF THE DIVISION OF ALLERGY,
IMMUNOLOGY AND INFECTIOUS
DISEASE
New Brunswick, New Jersey

[View all jobs](#)

OXFORD
UNIVERSITY PRESS

[About SLEEP](#)

[Editorial Board](#)

[Author Guidelines](#)

[Facebook](#)

[Twitter](#)

[Contact Us](#)

[Purchase](#)

[Recommend to your Library](#)

[Advertising and Corporate Services](#)

[Journals Career Network](#)

Online ISSN 1550-9109

Print ISSN 0161-8105

Copyright © 2019 Sleep Research Society

[About Us](#)

[Contact Us](#)

[Careers](#)

[Help](#)

[Access & Purchase](#)

[Rights & Permissions](#)

[Open Access](#)

Resources

[Authors](#)

[Librarians](#)

[Societies](#)

[Sponsors & Advertisers](#)

[Press & Media](#)

[Agents](#)

Connect

[Join Our Mailing List](#)

[OUPblog](#)

[Twitter](#)

[Facebook](#)

[YouTube](#)

[Tumblr](#)

Explore

[Shop OUP Academic](#)

[Oxford Dictionaries](#)

[Oxford Index](#)

[Epigeum](#)

[OUP Worldwide](#)

[University of Oxford](#)

Oxford University Press is a department of the University of Oxford. It furthers the University's objective of excellence in research, scholarship, and education by publishing worldwide

Copyright © 2019 Oxford University Press

[Cookie Policy](#)

[Privacy Policy](#)

[Legal Notice](#)

[Site Map](#)

[Accessibility](#)

[Get Adobe Reader](#)