Sleep in children with attention-deficit hyperactivity disorder (ADHD): a review of naturalistic and stimulant intervention studies

Cohen-Zion M, Ancoli-Israel S

CRD summary
This review assessed the effects of psychostimulants on sleep in children with attention-deficit hyperactivity disorder. The authors found limited evidence to suggest a possible increase in some sleep complaints, but concluded that further studies are required. Despite some methodological limitations to this review, the authors' cautious conclusions and recommendation for further research appear reasonable.

Authors' objectives
To assess the relationship between attention-deficit hyperactivity disorder (ADHD) symptomatology and sleep, and the effects of psychostimulants on sleep, in children with ADHD. Only the review of the effects of psychostimulants is summarised in this DARE abstract.

Searching
MEDLINE and PsycINFO were searched from 1980 to March 2004 for papers published in English. The reference lists of included studies and relevant review articles were checked for further studies.

Study selection
Study designs of evaluations included in the review
No inclusion criteria for the study design were specified, but single case reports, descriptive reports with no statistical data analysis and open-label clinical trials were excluded.

Specific interventions included in the review
Studies of stimulant medications were eligible for inclusion. Most of the included studies compared immediate-release methylphenidate or dextroamphetamine medication with placebo.

Participants included in the review
Studies of children and adolescents (aged 3 to 19 years) with ADHD were eligible for inclusion. Studies in which participants had co-morbid psychiatric diagnoses (other than learning disabilities, conduct disorder and oppositional defiant disorder) were excluded. In some of the included studies the control groups contained children without ADHD.

Outcomes assessed in the review
No inclusion criteria for the outcomes were specified. However, the authors stated that studies that did not follow a preset data collection protocol (e.g. where parent reported the outcomes using an unstructured narrative method) were excluded. The included studies reported a variety of sleep outcomes, recorded by actigraphy, polysomnography or self-reported.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
The authors did not state that they assessed validity.

Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data
Methods of synthesis

How were the studies combined?
The studies were grouped according to the type of outcome assessment used (actigraphy, polysomnography or self-reported) and combined in a narrative.

How were differences between studies investigated?
Differences between the studies were not formally investigated.

Results of the review

Eleven stimulant intervention studies, involving 604 participants in total, were included in the review. There were 8 controlled and blinded studies with a crossover design (497 participants) and 3 studies of other designs (107 participants).

Subjective (mostly parental) report (8 studies, 549 participants).

Four studies reported increases in trouble sleeping or insomnia with medication, compared with placebo or non-medicated controls; one study found no difference. Stimulants were found to have no effect on total sleep time (2 studies), sleep onset latency or difficulties falling asleep (3 studies).

Actigraphy (2 studies, 55 participants).

One study found a shorter total sleep time with stimulant medication compared with placebo. Two studies found no difference between stimulant and placebo or non-medicated groups in sleep onset latency, sleep percentage or activity level.

Polysomnography (2 studies, 25 participants).

One study found stimulant intake to be associated with lower total sleep time and sleep efficiency. Two studies noted effects of stimulant medication on rapid eye movement sleep, but not on slow wave sleep.

Authors' conclusions

The authors appear to conclude that, although parental reports suggest an increase in some sleep complaints in stimulant-medicated children with ADHD compared with unmedicated children, actigraphy and polysomnography evidence is limited and further research is needed.

CRD commentary

The review question was clear and the inclusion criteria were reasonably well defined. Only studies published in English were sought, meaning that relevant studies might have been excluded from the review; there is also a possibility of language and publication bias. It was unclear whether the authors took steps to minimise the introduction of errors and bias during the study selection and data extraction stages, as these processes were not fully described. The review included a variety of study designs and the quality of the included studies was not assessed, making it difficult to judge the reliability of the evidence presented. Given the differences between the studies in terms of design and outcomes, the narrative synthesis was appropriate. Despite the methodological limitations to this review, the authors' cautious conclusions and recommendations for further research appear reasonable.

Implications of the review for practice and research

Practice: The authors stated that clinicians should evaluate children's sleep prior to and following the administration of stimulants. They should be especially cautious when prescribing a night-time dose of stimulants, by closely monitoring any sleep changes and making appropriate alterations to the treatment regimen to avoid initiation or exacerbation of
sleep difficulties.

Research: The authors stated that additional actigraphic and polysomnography treatment studies, with large sample sizes, are needed to examine short- and/or long-term effects of stimulants on sleep architecture and sleep quality in children with ADHD.

**Funding**
NIH, grant number MH65793; NIA, grant number AG08415; NCI, grant number CA25864; Research Service of the VASDHS.

**Bibliographic details**

**PubMedID**
15336238

**DOI**
10.1016/j.smrv.2004.06.002

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Adolescent; Attention Deficit Disorder with Hyperactivity/diagnosis/drug therapy/epidemiology; Central Nervous System Stimulants/adverse effects/therapeutic use; Child; Child, Preschool; Clinical Trials as Topic; Comorbidity; Humans; Polysomnography; Reaction Time/drug effects; Sleep Wake Disorders/diagnosis/drug therapy/epidemiology; Treatment Outcome

**AccessionNumber**
12004006589

**Date bibliographic record published**
31/08/2006

**Date abstract record published**
31/08/2006

**Record Status**
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.