



Available online at
ScienceDirect
www.sciencedirect.com

Elsevier Masson France
EM|consulte
www.em-consulte.com



The effect of sleep restriction on neurobehavioural functioning in normally developing children and adolescents: Insights from the attention behaviour and sleep laboratory

L'effet de la restriction de sommeil sur les fonctions neurocomportementales des enfants et des adolescents qui développe normalement : perspectives de la laboratoire de l'attention, du comportement et du sommeil

J. Cassoff^{a,b}, J.A. Bhatti^c, R. Gruber^{d,*}

^a Attention behavior and sleep laboratory, Douglas mental health university institute, 6875, LaSalle Boulevard, H4H 1R3 Verdun, QC, Canada

^b Department of psychology, McGill university, 1205, Dr.-Penfield, H3A 1B1 Montreal, QC, Canada

^c Addiction research program, Douglas mental health university institute, 6875, LaSalle Boulevard, H4H 1R3 Verdun, QC, Canada

^d Department of psychiatry, attention behavior and sleep laboratory, Douglas mental health university institute, McGill university, 6875, LaSalle Boulevard, H4H 1R3 Verdun, QC, Canada

ARTICLE INFO

Article history:

Received 13 February 2014

Accepted 13 May 2014

Available online 7 August 2014

Keywords:

Sleep restriction
 Neurobehavioral functioning
 Attention
 Children
 Adolescents

Mots clés :

Restriction de sommeil
 Fonctions neurocomportementales
 Attention
 Enfants
 Adolescents

ABSTRACT

In the current paper, we first introduce the research themes of the attention, behaviour and sleep (ABS) laboratory, namely, sleep and ADHD, sleep and obesity, and sleep and academic performance. We then focus in on the topic to be reviewed in the current paper – the association between sleep restriction and neurobehavioral functioning (NBF) in typically developing children. We review the research thus far conducted by the ABS lab specific to this topic and posit the unique methodological contributions of the ABS lab (e.g. home-based assessment of sleep architecture and patterns, extensive phenotyping, etc.) in terms of advancing this research area. In the second section of the paper, we review 13 studies investigating the causal association between experimental sleep restriction and NBF in normally developing pediatric populations. Eight of the 13 studies found that sleep restriction causes impairments in neurobehavioural functioning. However, given the inconsistency in outcome measures, experimental protocols and statistical power, the studies reviewed herein are difficult to interpret. Strategies used by the ABS including implementing home assessments of sleep, restricting sleep relative to the participants' typical sleep schedules, blinding raters who assess NBF, and using valid and reliable NBF assessments are an attempt to address the gaps in this research area and clarify the causal relationship between sleep restriction and NBF in typically developing children and adolescents.

© 2014 Published by Elsevier Masson SAS.

R É S U M É

Dans cet article, nous introduisons d'abord les thématiques de recherche du laboratoire d'attention, de comportement et de sommeil (LACS), notamment les liens entre le sommeil et le TDAH, entre le sommeil et l'obésité, ainsi qu'entre le sommeil et la performance scolaire. Ensuite, nous discutons de l'association entre le manque de sommeil et les fonctions neurocomportementales (FNC) parmi les enfants se développant normalement. Nous présentons une revue de la recherche effectuée jusqu'à maintenant par notre laboratoire sur ce sujet ainsi que la contribution méthodologique unique (ex. l'évaluation du sommeil à domicile, le phénotypage élargi, etc.) vers une meilleure compréhension dans ce domaine de recherche. Dans la deuxième section de l'article, nous présentons les résultats de 13 études examinant l'association causale entre le manque de sommeil expérimental et les FNC parmi les enfants au

* Corresponding author.

E-mail address: reut.gruber@douglas.mcgill.ca (R. Gruber).

développement normal. Huit études parmi les 13 présentées démontrent que la restriction de sommeil entraîne une diminution importante des FNC. Par contre, l'interprétation globale de ces études est difficile en raison de différences sur la façon de mesurer les résultats, sur les protocoles de recherche et sur la puissance statistique entre les études. Les stratégies utilisées par le LACS, dont l'évaluation du sommeil à domicile, la restriction de sommeil relatif aux horaires habituels de sommeil des participants, l'évaluation des FNC de façon aveugle, et l'utilisation de mesures de FNC valides et fiables forment dans leur ensemble une tentative importante de combler les manques présents dans ce domaine de recherche et d'éclaircir l'association causale entre la restriction de sommeil et les FNC parmi les enfants et les adolescents au développement normal.

The first goal of this paper is to introduce the research objectives and themes of the attention, behaviour and sleep (ABS) laboratory. We will then present the focus of this paper, namely, sleep restriction and neurobehavioral functioning (NBF) in normally developing pediatric populations. We will discuss the research thus far conducted by the ABS lab specific to this theme and posit the unique contributions of the ABS lab in terms of advancing this area of research. Next, we will review other studies investigating sleep restriction and NBF. We will conclude by integrating the findings of the reviewed studies and evaluating how the contribution of the ABS lab may be useful in advancing this field of research.

1. The attention behaviour and sleep laboratory

Increasing evidence indicates that sleep has beneficial effects on learning and memory [1], emotional regulation [2], health [3], and academic achievement [4]. Conversely, fatigue and insufficient sleep negatively affect these life domains, each of which must function well to ensure optimal development. However, a considerable proportion of children and adolescents do not achieve adequate sleep, in terms of either quantity or quality [5,6]. Clinical studies [7] strongly suggest that poor sleep is implicated in the development and persistence of prevalent childhood disorders affecting youth mental (e.g., attention deficit/hyperactivity disorder [ADHD]) and physical (e.g., obesity) health. Appropriate use of sleep knowledge by educators and clinicians may significantly improve youth performance and health [8]. However, the mechanisms that underlie the associations mentioned above remain unclear and translation of available knowledge for the benefit of youth is currently lacking. Uncovering the mechanisms is important because it is likely that a key means of using existing information to improve the health and success of children is being overlooked. Thus, the objectives of the ABS lab research program led by Dr. Reut Gruber are to fill these knowledge gaps, by examining the mechanisms underlying the associations between sleep, and cognition and health in youth, and by developing a means whereby such knowledge can be used to improve the health and learning capacity of young persons. The *rationale* of this research program is that a better understanding of how sleep affects mental and physical health will allow identifying ways of modulating such interactions, forming the basis for developing innovative prevention and intervention programs in three domains:

- sleep and ADHD (theme 1);
- obesity (theme 2);
- sleep and academic performance (theme 3).

This research program is situated within the integrative field of developmental cognitive neuroscience, pediatrics, and psychiatry, and within the expanding field of knowledge translation.

1.1. Theme 1 – Sleep and ADHD

ADHD, one of the most prevalent child psychiatric conditions, is characterized by core symptoms of chronic and significant inattention and/or impulsivity/hyperactivity [9]. ADHD is estimated to occur in approximately 5% of school-aged children, and clinical manifestations frequently continue into adolescence and adulthood [10]. If left untreated, individuals with ADHD remain impaired in crucial functional domains (academic, occupational, and social). In clinical practice, sleep problems are reported in up to 55% of children and adolescents with ADHD [11]. However, the association between ADHD and sleep disturbance remains poorly understood. The ABS lab conducted a series of studies [12–15] in order to characterize the sleep of children with ADHD, to identify causes of sleep differences in children with ADHD, and to measure their impact on the daytime functioning of children with ADHD. The lab seeks to use this knowledge to develop strategies to prevent or treat daytime problems caused or exacerbated by sleep deficiencies.

1.2. Theme 2 – Sleep and obesity

Childhood obesity continues to rise both in Canada and worldwide [16], despite medical and behavioral interventions seeking to prevent weight gain and the implementation of various significant public health initiatives. Recent research has found evidence of a link between shorter sleep duration and overweight and obesity in children and youth [3]. Shorter sleep duration results in hormonal changes [17] comparable to those associated with increased risks of obesity [18], diabetes [19], and hypertension [20]. Hence, sleep curtailment may be an important, modifiable risk factor for obesity. Evidence is growing that obesity not only features elevated caloric intake and poor weight management, but is also linked to adverse neurocognitive outcomes, specifically poorer executive functions [21]. Consistent with this notion, there is evidence that obese children are more impulsive than are normal-weight children and have less cognitive control. The ABS lab studies the overlap that may exist among cognitive processes pertaining to decision-making, self-control, and impulsivity affected by sleep disruption and those associated with obesity [22].

1.3. Theme 3 – Sleep and academic performance

The third theme of the ABS lab is related to sleep and academic performance. Academic success plays an important role in improving future lifetime opportunities. Considerable research data support a relationship between sleep and academic success [4]. Although a myriad of factors relevant to academic achievement have been identified, the role played by sleep in this process, in particular the negative impact of insufficient sleep on NBF, has been largely ignored. Information on the connection between sleep and academic achievement has been gathered in multiple

Download English Version:

<https://daneshyari.com/en/article/4135906>

Download Persian Version:

<https://daneshyari.com/article/4135906>

[Daneshyari.com](https://daneshyari.com)