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Letter to Editor Open Access

Why we must Care about the Interrelationship between Media, Sleep and Memory in Children and Adolescents: A Commentary on Dworak and Walter

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Letter to Editor

The paper presented by Dworak and Walter [1] raises some important and interesting points. Rightly they note that media usage has been steadily increasing over recent years, but more particularly that it has increased disproportionately in the last 5 years [2]. The paper delineates the impact of media usage on sleep, followed by the importance of sleep for memory consolidation in order to explore their relationships.

Dworak and Walter alert us to the fact that media is pervasive and increasingly so with every new generation [2]. Given that Dworak and Walter suggest that media usage "is a serious problem in modern society" it is imperative to identify the terms of references of this claim. "Media" of course represents an umbrella term that includes not only screens but also print and audio media. The vast majority of recent literature on the effects of media usage on the health and wellbeing of children focus on screen media. Distinguishing between written media and screen media is necessary, given the advantages for children in learning and language evident in print media [3] and the differential effects and impact, if any, on the non-screens versions of 'media'.

Several factors are reported in this paper that demonstrates the impact of media usage on sleep and in turn on memory. These include the alerting nature of screen content, whether this is physiological or psychological, the replacement of physical activity for otherwise more sedentary screen time behaviour and the exposure to bright light emitted from the screens. Further details reported in other studies have expanded on these themes and should be mentioned here. Whereas screen usage replaces activity during daytime use, screen usage at bedtime directly replaces sleep time, often resulting in delayed sleep onset subsequently reduced sleep quantity [4]. Several reviews [5] and studies [6-9] have cited this phenomenon although in recent data is lacking. It is known that screens attached to smaller portable devices such as phones and tablets are more commonly utilised since these studies have been undertaken [2]. There is reason to assume that these portable devices are likely to similarly displace sleep and delay bedtimes in greater numbers given their pervasiveness.

Whilst Dworak and Walter note the impact of bright light on sleep, notably melatonin secretion, it is important to note that the type of light, (blue light) that is most detrimental to sleep, is omnipresent in screens. Controlled laboratory based studies have demonstrated that melatonin is particularly sensitive to short-wavelength ("blue") light and is the most effective at suppressing it [10]. In addition, a dose response relationship between the amount of time exposed to blue light intensive screens has been observed with increased suppression of melatonin after prolonged viewing [11] with the closer the screen to the retina, the greater the likely impact. Manufacturers may be encouraged to determine how their products will affect melatonin levels and endeavor to develop screens that have less deleterious effect on the circadian system.

Dworak and Walter suggest the "most powerful predictor" for sleep problems amongst these age groups is TV in the bedroom. Whilst the paucity of randomized control trials makes this a difficult assertion to make, it is surely impacted by the concept of media usage being 'excessive'. Understanding the exact nature of 'excessive' media usage is therefore central to this argument. In an earlier paper by the lead author [12] it was hypothesised that 'excessive' screen use should be categorized as > 4 hours of recreational screen media use per day. The American Paediatric Association [13] has recently released guidelines of 2 hours per day of recreational per day. Many studies have been cited by Dworak and Walter reporting negative relationships between increased screen media usage and reduced sleep quantity and quality, but causal relationships remain unclear. In the absence of broad based empirical evidence, it is still unknown exactly what 'excessive' usage entails. Given the current paucity of literature, researchers must increase efforts by testing the application of these recent guidelines and hypotheses to assist in assessing how much media and screen use is too much at sleep onset or in the bedroom.

This paucity of evidence for recent media studies is concerning. This is particularly salient given that screen exposure (most particularly) is changing at such a rapid rate and researchers are unable to keep abreast of understanding the impact on the health and well being of children and adolescents. For the relationship between sleep and media exposure for example, the most recent reviews are already nearly five years old [5] and so much has changed in the last 5 years [2].

Finally, Dworak and Walter discuss the need to understand the necessary sleep quantity and/or quality required for the optimal consolidation of memory. For optimal memory consolidation from short term to long term memory [14] there may be a basal sleep need, albeit one that is age dependent. "Poor" sleepers do worse than "good sleepers" [15]. Whilst Sadeh et al. [15] defined these, what is 'good' or 'good enough' sleep for optimal consolidation of memory and how doe's media impact this?

Sleep quantity contains elements of duration, timing (e.g. sleep predominantly over night or staggered later into the morning [16] and variability (e.g. differences between sleep duration from school days to non-school days [17]. Sleep quality contains elements continuity (e.g. fragmented vs restful sleep [18] and sleep architecture (e.g. the cyclical nature of sleep stages). In a recent study, Eide and Showalter [19] explored the relationship between sleep and student performance for children/adolescents aged 10-19 years, estimating the optimal hours of sleep to maximize test score performance of neurocongenitive measures. They estimated an age-specific optimal amount of sleep that

resulted in the highest value of the predicted test score. This optimal sleep duration changed with age and was based on the type of task. For 12 year olds, 8 hours 20 minutes hours were needed for letter-word and comprehension tasks, but 8 hours 25 minutes for broad reading tasks. This changed with age, when at 16 years of age a general reduction sleep duration to approximately 7 hours was needed for best performance with 7 hours 20 minutes required for applied problem-solving tasks compared to reading tasks which required 7 hours 1-3 minute. Although these data are not specifically for memory, they suggest, as do Dworak and Walter that optimal sleep need for cognitive function is variable and age dependent. These factors need to be considered when we discuss the optimal sleep needed for functioning and how media usage may impact on that optimal sleep.

Dworak and Walter show diagrammatically that the secondary consequences of media usage on memory via the physiological consequences of less than optimal sleep are interdependent. This dual pathway has been previously noted [20], suggesting that any difficulty in consolidating memory can be due to a simple and direct consequence of increased tiredness with subsequent difficulty concentrating and through the indirect suboptimal recovery of the pre-frontal cortex during sleep, which is instrumental in regulating executive functions needed for memory consolidation [21].

Conclusions

Screen media usage is here to stay. Moderate use, the timing of use and a balance of media/non media activities must be a priority for parents, teachers, school communities and policy makers. Dworak and Walter begin to unravel the complex relationship between sleep media and memory performance. However, the complex natures of this relationship are yet to be fully understood. Questions are rife for future studies which will evaluate these factors in greater detail.

References

1. Dworak M, Walter A (2013) Media, sleep and memory in children and adolescents. J Sleep Disorders Ther 2: 147.
2. Rideout V, Foehr U, Roberts D (2010) Generation M: Media in the lives of 8-18 year old-Report. TKF Foundation.
3. Beck IL, McKeown MG (2009)Text Talk: Capturing the benefits of read aloud experiecnes for young children. Essential readings on vocabulary instruction by Graves MF, International Reading Association p.7.
4. Olds T, Ridley K, Dollman J (2006) Screenieboppers and extreme screenies: the place of screen time in the time budgets of 10-13 year-old Australian children. Aust N Z J Public Health 30: 137-142.
5. Cain N, Gradisar M (2010) Electronic media use and sleep in school-aged children and adolescents: A review. Sleep Med 11: 735-742.
6. Ozmert E, Toyran M, Yurdakök K (2002) Behavioral correlates of television viewing in primary school children evaluated by the child behavior checklist. Arch Pediatr Adolesc Med 156: 910-914.
7. Van den Bulck J (2004) Television viewing, computer game playing, and Internet use and self-reported time to bed and time out of bed in secondary-school children. Sleep 27: 101-104.
8. Kappos AD (2007) The impact of electronic media on mental and somatic children's health. Int J Hyg Environ Health 210: 555-562.
9. Owens J, Maxim R, McGuinn M, Nobile C, Msall M, et al. (1999) Television-viewing habits and sleep disturbance in school children. Pediatrics 104: e27.
10. Phelps J (2008) Dark therapy for bipolar disorder using amber lenses for blue light blockade. Med Hypotheses 70: 224-229.
11. Lockley SW, Brainard GC, Czeisler CA (2003) High sensitivity of the human circadian melatonin rhythm to resetting by short wavelength light. J Clin Endocrinol Metab 88: 4502-4505.
12. Dworak M, Schierl T, Bruns T, Strüder HK (2007) Impact of singular excessive computer game and television exposure on sleep patterns and memory performance of school-aged children. Pediatrics 120: 978-985.
13. AAP (2013) Children, adolescents and the media. America Academy of Pediatrics 24: 958-962.
14. Stickgold R, Walker MP (2007) Sleep-dependent memory consolidation and reconsolidation. Sleep Med 8: 331-343.
15. Sadeh A, Gruber R, Raviv A (2002) Sleep, neurobehavioral functioning, and behavior problems in school-age children. Child Dev 73: 405-417.
16. Carskadon MA, Wolfson AR, Acebo C, Tzischinsky O, Seifer R (1998) Adolescent sleep patterns, circadian timing, and sleepiness at a transition to early school days. Sleep 21: 871-881.
17. Olds T, Blunden S, Dollman J, Maher CA (2010) Day type and the relationship between weight status and sleep duration in children and adolescents. Aust N Z J Public Health 34: 165-171.
18. Bonnet MH (1986) Performance and sleepiness as a function of frequency and placement of sleep disruption. Psychophysiology 23: 263-271.
19. Eide ER, Showalter MH (2012) Sleep and Student Achievement. Eastern Econ J 38: 512-524.
20. Blunden S, Hoban TF, Chervin RD (2006) Sleepiness in children. Sleep Medicine Clinics 1: 105-118.
21. Anderson P (2002) Assessment and development of executive function (EF) during childhood. Child Neuropsychol 8: 71-82.