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## Critically Appraised Articles

### The use of electronic devices before sleeping affects the quality and quantity of sleep

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**English key words:** sleep, sleep disturbances, technology, electronic media, interactive devices.

**Palabras clave en español:** sueño, trastornos del sueño-vigilia, tecnología, dispositivos electrónicos, multimedia.

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# The use of electronic devices before sleeping affects the quality and quantity of sleep

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**Original article:** Carter B, Rees P, Hale L, Bhattacharjee D, Paradkar MS. Association between portable screen-based media device access or use and sleep outcomes: a systematic review and meta-analysis. *JAMA Pediatr.* 2016;170:1202-8.

## Abstract

**Authors' conclusions:** bedtime use of a media device was significantly associated with inadequate sleep quantity, poor sleep quality, and excessive daytime sleepiness. An integrated approach among teachers, health care professionals, and parents is required to minimize device access at bedtime.

**Reviewers' commentary:** it seems that the use of portable screen media devices at least one hour before sleep time can induce qualitative and quantitative disturbances in child's sleep and daytime sleepiness. Although the quality of the evidence is low, the importance of sleep in childhood and the probability of its disturbance by electronic devices make it advisable to minimize their use at least 1 hour before bed time and their presence at the child's room.

**Key words:** sleep, sleep disturbances, technology, electronic media, interactive devices.

## Resumen

**Conclusiones de los autores del estudio:** el uso de dispositivos multimedia a la hora del sueño se asocia a una cantidad y calidad de sueño inadecuadas y a somnolencia diurna. Es necesario un trabajo coordinado de profesores, sanitarios y padres para minimizar el uso de estos dispositivos en los niños a la hora de dormir.

**Comentario de los revisores:** parece que el uso de dispositivos electrónicos con pantalla al menos una hora antes de acostarse puede producir alteraciones cualitativas y cuantitativas en el sueño del niño y somnolencia diurna. A pesar de que la calidad de la evidencia es baja, la importancia del sueño en la infancia y la probabilidad de que los dispositivos electrónicos lo alteren hacen aconsejable minimizar su uso antes del sueño y evitar su presencia en la habitación de los niños.

**Palabras clave:** sueño, trastornos del sueño-vigilia, tecnología, dispositivos electrónicos, multimedia.

## STRUCTURED ABSTRACT

**Objective:** to determine whether there is an association between the use of media devices (MDs) and a decrease in sleep quantity and quality and an increase in daytime sleepiness.

**Design:** systematic review (SR) with meta-analysis (MA) following the PRISMA guidelines.

**Data sources:** the authors searched for experimental and observational studies using 24 MeSH terms across 12 databases (British Education Index, Cumulative Index to Nursing

and Allied Health Database, Cochrane Library, Educational Resources Information Center, International Biography of Social Sciences, Ovid MEDLINE [EMBASE, MEDLINE and PsycINFO], PubMed, Science Direct, Scopus and Web of Science). The reviewers searched for grey literature in the OpenGrey Online Database. Bibliographies of included studies were hand searched and authors of included studies were contacted to identify additional works. There were no language restrictions. Articles that studied other electronic devices, such as desktop or laptop computers, were excluded.

**Study selection:** the search identified 463 studies. After two reviewers independently assessed the methodological quality

of the studies following a structured procedure (with disagreements resolved by a third reviewer), 11 cross-sectional studies were selected for the MA (random-effects model).

**Data extraction:** two reviewers extracted the data independently, and a third one resolved any disagreements. Exposure to MDs was measured using three categories: no access to a MD at bedtime (understood as access to MD < 3 nights a week), access to a MD at bedtime (access to MD > 3 nights/week) and use of MD at bedtime (use of MD around bedtime). Inadequate sleep duration was defined as less than 10 hours in children and less than 9 hours in adolescents. Sleep quality was also assessed (with poor quality defined as difficulty with sleep initiation or maintenance), as was excessive daytime sleepiness (defined as poor daytime functioning as a result of reduced sleep quantity or quality).

**Main outcomes:** 1) sleep quantity (seven studies): the use of MDs was associated with inadequate sleep quantity (adjusted odds ratio [aOR], 2.52; 95% confidence interval [95 CI], 1.79 to 3.55;  $I^2 = 72\%$ ); 2) sleep quality (five studies): access to MDs was associated with poor sleep quality (aOR, 1.46; 95 CI, 1.14 to 1.88;  $I^2 = 76\%$ ); daytime sleepiness (two studies): the use or access to MDs at bedtime was associated with increased daytime sleepiness (aOR, 2.27; 95 CI, 1.54 to 3.35;  $I^2 = 24\%$ ).

**Conclusion:** the use or access to MDs at bedtime is associated with a reduced sleep quality and quantity at night and with daytime sleepiness.

**Conflict of interest:** none disclosed.

**Funding sources:** grant R01HDO73352 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development. The funding source did not participate in the study.

## COMMENTARY

**Justification:** in few years, MDs have flooded our lives and the lives of children. Some studies suggest that they play a role in childhood sleep disorders. Sleep is vital in the physical and psychological development of the child.<sup>1,2</sup> This article reviewed the current literature on the association between sleep and exposure to MDs in children.

**Scientific rigour or validity:** it is a well-designed SR that adhered to the PRISMA guidelines, with the inclusion of the most important databases and grey literature, no language restrictions, review of the references cited in the articles and contacting authors. The selected articles were cross-sectional studies. The risk of bias was low, although only 2 out of 17 were considered of high quality. The meta-analysis was only

performed on data deemed to be sufficiently clinically homogeneous. There was substantial heterogeneity in the studies ( $I^2$  of 64%-76%), the authors used random-effects meta-analysis and explored the sensitivity of the results to the exclusion of specific studies. The level of evidence of the results was low due to the heterogeneity of the data and the type of study included in the analysis.

**Clinical relevance:** children and adolescents that used MDs at bedtime or an hour prior were 2.52 more likely to sleep fewer than recommended hours (attributable proportion of those exposed of 53.9% compared to 41% in the population; estimated from the data), their quality of sleep (difficulties falling asleep, frequent wakings or non-refreshing sleep) was 1.4 times poorer, and they were 2.7 times more likely to experience daytime sleepiness. The review also found sleep disturbances in children that had access to MDs before and during sleep time, even if they did not use them. When it came to the above outcomes, the results were: reduction of the hours of sleep below age recommendations by a factor of 1.7 times, reduction in sleep quality by a factor of 1.5; and 2.3-times increase in daytime sleepiness. The impact of these estimated risks is significant, as between one third and half of sleep disturbances can be attributed to the use of MDs. This is the first systematic review on the subject, and cannot be compared to any others. Most of the studies included in the review found an association between MD use and sleep disorders.

**Applicability to clinical practice:** despite the low level of evidence of the results, which was due to the quality of the sources, given the importance of sleep disorders in relation to child development, the clinical relevance of the findings of the SR and the low cost of interventions to be applied toward the resolution of this hypothetical problem it is advisable to educate families on restricting MD use in children for at least one hour before bedtime. Families should also be advised against allowing the presence of MDs in children's bedrooms during this period, even if their use is not expected.

**Conflicts of interest:** the authors of the commentary have no conflicts of interest to declare.

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