

Systematic literature review of the relationship between adolescents' screen time, sleep and mental health

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The objective of this systematic review was to summarise the published experimental and longitudinal evidence on adolescent mobile device screen time or use, and the association with sleep and mental health and wellbeing. Five research questions guided this review, which included evidence from quantitative and qualitative studies conducted in Western countries classified as high-income by the World Bank.

Key findings

- The body of evidence based on longitudinal or experimental studies is very small: nine quantitative studies and two qualitative studies met the inclusion criteria for this study.
- The quality of individual studies was low and they lacked detailed descriptions of methodology, limiting assessment of risk of bias. This means findings and conclusions should be interpreted with caution.
- The body of evidence is incomplete. There were various definitions of mobile device screen use (e.g. time spent using a mobile device, social media use) and various outcomes (e.g. sleep duration, sleep quality), and only one or two studies that assessed each exposure/outcome relationship, making it difficult to draw conclusions beyond these individual studies.

- Only one study provided suitable data to explore potential causal mechanisms. Experiences of cybervictimisation were indirectly associated with sleeping less than the recommended 8 hours per night. The factor linking cybervictimisation with shorter sleep was repetitively thinking and obsessing about distressing thoughts, emotions and memories.
- No study asked young people explicitly about the connections between screen use, sleep and mental health and wellbeing.

Introduction

Poor sleep has been linked to a range of mental health issues. Research shows that young people often get less than the recommended amount of sleep and access to and use of a media device at bedtime has been associated with poor sleep quality, inadequate sleep quantity and daytime sleepiness in young people. There is increasing evidence of an association between mobile screen use and adverse mental health and wellbeing outcomes in young people. However, the evidence is based primarily on cross-sectional studies which cannot address temporality or causality. The Scottish Government released a report in 2019 titled: 'Exploring the reported worsening of mental wellbeing among adolescent girls in Scotland'¹. The report highlighted interrelated factors that could be influencing worsening mental wellbeing in Scottish adolescents, including inadequate sleep and social media use. This systematic review follows on from that report, addresses the identified gap in the literature, and adds to the existing evidence reviews as the focus of investigation is on the relationship between screen time, sleep and mental health.

Methods

A literature search was undertaken of 9 electronic databases with key terms related to: young people; mobile devices and related software; sleep outcomes and mental health. The following inclusion and exclusion criteria were applied:

Population

- Young people aged 10-19 years, general population
- High-income Western countries

Exposures

- Use of digital/electronic mobile devices and software accessible through device
- Excluded television use

Outcomes

- 1) Sleep and
- 2) mental health and wellbeing measures

¹ <https://www.gov.scot/publications/exploring-reported-worsening-mental-wellbeing-adolescent-girls-scotland/>

Study types

- Literature reviews from 2007 to 2019 →identification of experimental and longitudinal studies
- Experimental and longitudinal studies from 2017 to 2019
- Excluded cross-sectional evidence

A selection, extraction & quality assessment process were applied and the number of included studies for each Research Question was as follows: RQ1 = 9 (15-23); RQ2 = 1 (18); RQ3 = 3 (21-23); RQ4 = 0; RQ5 = 2 (24, 25).

1. To what extent does adolescents' mobile device screen time impact on sleep outcomes?

- Mobile phone use around bedtime and cybervictimisation, but not the overall time spent engaging in mobile phone activities per se (at any time of the day), was linked to lower sleep duration.
- Sleep quality was negatively influenced by mobile phone use in general and social media use in particular.
- Experiencing pressure to engage socially using a mobile phone was associated with poor bedtime behaviours that might promote poor sleep quality (i.e. sleep hygiene).
- Stopping phone use one hour before bedtime was not linked to earlier sleep.
- One pilot study (a small scale, preliminary study) showed that use of a smartphone app (under development) that teaches about the importance of consistent sleep and wake times, and recommended bedtimes was associated with a potential improvement in sleep duration, sleep quality and earlier sleep onset.

Table 1. Summary of findings for Research Question 1

	Number of studies	Number of participants + ages	Outcomes	Summary findings
Mobile device screen time	1	N=26205 Age: 9-12 graders	Sleep duration	-/+
Mobile phone use	3	N=1755 Age: 14-16 years	Sleep duration Sleep quality Bedtime/sleep onset Sleep problem	- - -/+ -/+
Social media use	2	N=1071 Age: 14 & 18 years	Sleep quality	-
Adverse digital communication	3	N=28625 Age: 10-19 years	Sleep hygiene* Sleep duration	- -
Smartphone app	1	N=28-34 Age: 12-16 years	Insomnia Sleep quality Sleep onset Night awakening Sleep duration Sleep refreshingness Time in bed after waking up Use of sleep mediation	+ + + + + + -/+ -/+

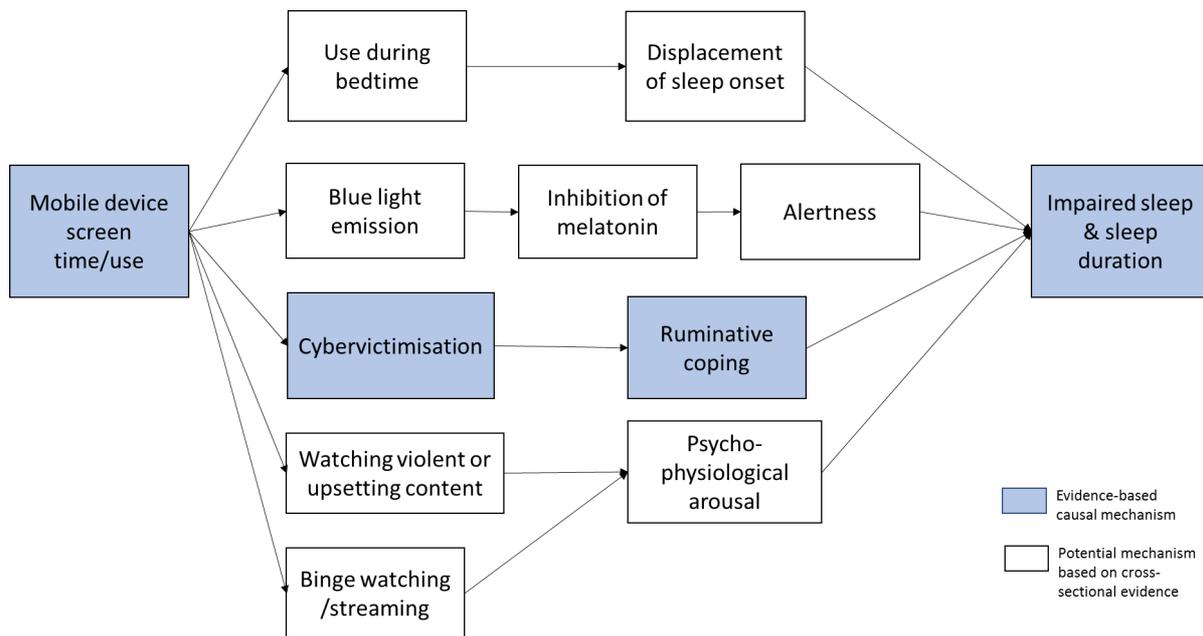
-/+ No association; + Positive association; - Negative association

* Sleep hygiene = bedtime behaviours that promote good sleep quality

2. What are the potential causal mechanisms through which mobile device screen time affects sleep outcomes amongst adolescents?

- Experiences of cybervictimisation were indirectly associated with sleeping less than the recommended 8 hours per night. The factor linking cybervictimisation with shorter sleep was repetitively thinking and obsessing about distressing thoughts, emotions, and memories.
- Other **potential** mechanisms (based on cross-sectional mechanisms) through which mobile device screen time or use affect sleep outcomes are: sleep displacement (i.e. using the phone instead of sleeping), delaying sleep time, increased alertness through blue light exposure, psychological arousal which can result in bodily responses (e.g. faster heart beat) through binge watching and/or watching violent or upsetting content.

Figure 1. Potential causal pathways between mobile device screen time/use and impaired sleep



3. What are the implications of the potential impact of mobile device screen time on sleep for adolescents' mental health and wellbeing?

- Night-time mobile use and problematic social media use were linked to depressed mood through experiences of poor quality sleep. Poor sleep quality also played a role in the link between night-time mobile phone use and low self-esteem, poor coping skills and higher externalising behaviour (e.g. disobeying rules, physical aggression).
- One pilot study showed that use of a smartphone app (under development) that teaches healthy sleep habits was associated with potentially lower depressive symptoms and reduced anxiety.

Table 2. Summary of findings for Research Question 3

	Number of studies	Number of participants + ages	Mediator	Outcomes	Summary findings
Night-time mobile use	1	N=1101 Age: 13-16 years	Sleep quality	Depressed mood Externalising behaviour Self-esteem Coping	- - - -
Social media use	1	N=874 Age: 14 years	Sleep quality	Depressed mood Externalising behaviour	- -/+
Smartphone app	1	N=50 Age:12-16 years	App-based sleep education	Depressive Symptoms Anxiety	+ +

+/- no mediation effect, - negative mediating effect, + positive mediation effect

4. To what extent might girls' and boys' differential mobile device screen time, and its relationship with sleep, contribute to inequalities in mental health and wellbeing by gender?

- None of the included quantitative studies reported separate data for boys' and girls' mobile device screen time or use and its relationship with sleep that in turn might contribute to inequalities in mental health and wellbeing for boys and girls.
- In August 2019, a new eligible study was published which we did not include in our evidence synthesis because it became available after we had completed our literature search.
 - The study found that using social media multiple times daily when aged 13-15 predicted lower life satisfaction, lower happiness, and higher anxiety among girls 1- to 2-years later but not among boys.
 - It also found that sleeping less than 8 hours per night, not being physically active most days, and experiencing cyberbullying play a detrimental role in the association between social media use and lower wellbeing in girls only.

5. What existing evidence is there on adolescents' views of how mobile device screen time affects their sleep, and following on from this, their mental health and wellbeing?

- In the qualitative studies both adolescent boys and girls reported using smartphones in bed and recognised that it may negatively affect their sleep.

- Adolescents felt that sleep issues were connected to the content in video games rather than their use.
- Boys were more likely to report trying to follow guidelines (e.g. putting electronics away one hour pre-bedtime) whilst girls suggested they specifically used their mobile screen devices as a tool to aid sleep (e.g. listening to music).
- No study asked young people directly about their view of the relationship between sleep and mental health. However, when young people thought about the importance of sleep they mentioned the ‘energising, relaxing, stress-reducing and restorative qualities of sleep’.
- No study asked young people explicitly about the connections between screen use, sleep and mental health and wellbeing.

Recommendations

Policy and practice initiatives could target all or a combination of the identified modifiable factors (Figure 1) within the causal pathway between mobile device screen exposures and impaired sleep, but the current evidence severely limits the recommendations that can be made. Only one study provided suitable data to explore potential causal mechanisms through which mobile device exposure influences sleep outcomes. It suggests:

- Young people should be protected from cybervictimisation and mandatory requirements of social media platforms to develop algorithms that block aggressive and upsetting content could be put in place. Education around the impact of cybervictimisation and how to avoid it (e.g. adequate privacy settings) could be embedded in the school curriculum.
- Repetitively thinking and obsessing about distressing thoughts, emotions, and memories as a consequence of cybervictimisation could potentially be targeted by initiatives that strengthen resilience in adolescents in particular teaching young people and their parents healthy coping strategies (e.g. help seeking and sharing thoughts/emotions, mindfulness).

Further research investigating the causal relationship between mobile device screen use, impaired sleep and poor mental health and wellbeing is needed. Therefore, future research studies should use multiple time points of mobile device screen use, sleep and mental health data.

The full description of the methodology and list of references is available in the main report.



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