



ORIGINAL ARTICLE

A scoping review of methods of measuring smartphone usage



Carmen Cendrero-Luengo^{a,b}, Sonia de Paz-Cantos^{b,c}, Adrián González-Marrón^{b,c},
Cristina Lidón-Moyano^{b,c}, Ana Díez-Izquierdo^{b,d}, José M. Martínez-Sánchez^{a,c,*}

^a Grupo de Evaluación de Determinantes de la Salud y Políticas Sanitarias, Universidad de Extremadura, Mérida, Badajoz, Spain

^b Centro de estudios del uso saludable de pantallas durante la infancia (Kenko Lab), Spain

^c Grupo de Evaluación de Determinantes de Salud y Políticas Sanitarias, Departamento de Medicina, Universitat Internacional de Catalunya, Sant Cugat del Vallés, Barcelona, Spain

^d Sección de Neumología y Alergología Pediátricas, Servicio de Pediatría, Hospital Universitari Vall d'Hebron, Barcelona, Spain

Received 24 July 2025; accepted 10 November 2025

Available online 23 February 2026

KEYWORDS

Child health;
Media use;
Mobile phone use;
Public health;
Screen time;
Surveys and
questionnaires

Abstract

Introduction: Screen usage patterns have shifted significantly in recent years, with a notable increase in the use of internet-enabled smartphones among children and adolescents.

Objective: The aim of this scoping review was to describe the measurement tools used to estimate smartphone screen time in individuals aged less than 18 years.

Methods: We conducted a systematic search in MEDLINE Complete (via PubMed) and ScienceDirect for studies published between May 2014 and May 2024. A total of 89 population-based surveillance studies were included for analysis.

Results: The most common assessment method was the use of non-validated self-report questionnaires completed by parents. Only seven studies used a validated instrument, and in six of these cases, the tool was not specifically designed to measure screen time. Only one study applied a validated scale developed expressly for this purpose: the Screen Time Questionnaire (STQ).

Conclusion: The heterogeneity of current findings on smartphone usage time among minors is evident. There is a clear need for a standardized questionnaire to accurately measure this variable and to support the development of evidence-based guidelines and recommendations.

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DOI of original article: <https://doi.org/10.1016/j.anpedi.2026.504156>

* Corresponding author.

E-mail address: jmmartinezs@unex.es (J.M. Martínez-Sánchez).

PALABRAS CLAVE

Salud infantil;
 Uso de medios;
 Uso de teléfono
 móvil;
 Salud pública;
 Tiempo de pantalla;
 Encuestas y
 cuestionarios

Revisión de alcance de las herramientas de medición de uso de teléfonos inteligentes**Resumen**

Introducción: Los patrones de uso de pantallas han cambiado de manera significativa en los últimos años, con un aumento notable en el uso de teléfonos inteligentes con acceso a internet entre niños y adolescentes.

Objetivo: El objetivo de esta revisión de alcance es describir las herramientas de medición utilizadas para estimar el tiempo de uso de pantallas en teléfonos inteligentes en individuos menores de 18 años.

Métodos: Se realizó una búsqueda sistemática en MEDLINE Complete (a través de PubMed) y ScienceDirect para estudios publicados entre mayo de 2014 y mayo de 2024. En total, se incluyeron 89 estudios de vigilancia poblacional para el análisis.

Resultados: El método de evaluación más común fue el uso de cuestionarios de autorreporte no validados, completados por los padres. Solo siete estudios emplearon un instrumento validado y, en seis de estos casos, la herramienta no fue diseñada específicamente para medir el tiempo de pantalla. Únicamente un estudio aplicó una escala validada desarrollada expresamente para este fin: el *Screen Time Questionnaire (STQ)*.

Conclusión: La heterogeneidad de los hallazgos existentes sobre el tiempo de uso de teléfonos inteligentes en menores es evidente. Existe una clara necesidad de desarrollar un cuestionario estandarizado que permita medir esta variable con precisión y apoyar la creación de guías y recomendaciones basadas en evidencia.

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Introduction

New generations live with electronic devices and media as a central part of their daily lives.^{1,2} Today, usage patterns have evolved, and smartphones have become the most widely used devices for digital consumption across all age groups and are now ubiquitous in modern society.^{3,4} Smartphones provide immediate access to a vast range of applications, content, and services.³⁻⁵ Device ownership is occurring at increasingly younger ages, and due to the limited current understanding of the effects of these devices, many parents may not fully grasp the potential repercussions of their children's use.^{3,4} Thus, the features of these devices and their widespread acceptance by families have contributed to a rise in screen time in the pediatric population worldwide.^{3,4} Limited parental supervision, combined with exposure to inappropriate or potentially harmful content—sometimes influenced by specific digital platforms—can increase the risks associated with smartphone use and contribute to an unsafe environment for children and adolescents.⁷

It is difficult to find a balance in this area, although it all depends on the variables and populations of interest, and it is an active research topic and a subject of considerable public and scientific debate.^{1,3,5,8} There is controversy about the possible effects and patterns of screen use in children and adolescents.^{8,9} Although some beneficial effects of interactive screen time have been identified, excessive use has been associated with negative impacts on the physical, behavioral, and cognitive development of young people.¹⁰ Excessive screen time may interfere with a child's learning opportunities and overall development, potentially emerg-

ing as a new determinant of health that warrants further investigation in the pediatric population.¹¹

Many children and adolescents in developed countries exceed recommended screen time limits, and social media, audiovisual platforms, and games are the contents consumed most frequently, often at the expense of time spent on face-to-face interactions.^{1,2,6,12} As mobile screen exposure is increasingly seen as an addictive activity, with the pediatric population being particularly vulnerable, organizations such as the Spanish Association of Pediatrics (SAP), the American Academy of Pediatrics (AAP), and the World Health Organization (WHO), among others, have issued reports with recommendations for appropriate global screen time limits.^{8,9,13} However, it is important to note that most of the scientific evidence on which these recommendations are based concerns television watching.^{8,9,13}

For scientific advances to be relevant to society and applicable to public health policy, the correct assessment of health determinants in relation to screen time is necessary to establish effective surveillance, oversight and evaluation systems to monitor and reduce the impact on the health of the population of possible future addictive behaviors.¹⁴ While new measurement trends, such as mobile applications and tracking tools, are emerging, the methodology is still inconsistent and the analysis of screen time continues to be a secondary concern.¹⁵

Research in this area is growing; however, to date, no review has been published that all the recent literature on how screen time is measured in cross-sectional studies in children aged less than 18 years. Therefore, we performed a scoping review with the aim of describing the measurement

tools used to assess smartphone screen time in children aged less than 18 years in cross-sectional studies.

Methods

The reporting in this review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) method.¹⁶

We conducted a scoping review to systematically detail the available scientific evidence on the measurement instruments used to assess the variable “smartphone screen time” in children and youth. The following research question was formulated:

“What measurement methods are utilized to assess smartphone screen time among children and adolescents aged less than 18 years?”.

Eligibility criteria

For this review, specific inclusion and exclusion criteria were established to ensure the selection of relevant studies. Studies were included if they assessed smartphone screen time in children and adolescents aged less than 18 years, had a cross-sectional design, were published between May 2014 and May 2024, and were available in English, Spanish, French, or Italian. We included all studies whose primary objective was to assess smartphone use in children aged less than 18 years that specifically reported the time they spent using these devices. We excluded any articles that did not directly measure smartphone screen time, were conducted in individuals aged more than 18 years, or that were reviews, editorials, letters to the editor, or case reports. We also excluded studies that did not provide sufficient information regarding the measurement methods employed.

Information sources

The following databases were searched to identify all relevant literature: MEDLINE Complete among PubMed and Science direct, filtering for articles published between May 2014 and May 2024.

Search

After filtering with different possible search terms, we selected the following terms because others did not yield sufficient results and/or retrieved articles that did not fit the objective of the review.

The search terms used for this review included “screen time”, “children*”, “adolescent*”, “pediatric*”, “infant*”, “preschool*”, “prevalence” OR “cross-sectional”, “smartphone”, “mobile phone”, “cell” combining all of them and selecting the search that yielded the most papers.

Selection of sources of evidence

RefWorks was used to store information on the selected studies. The title and abstracts of all articles obtained during the initial broad search were reviewed independently by two

reviewers (CCL and JMMS) to identify potential eligible studies. Two reviewers (CCL and JMMS) independently extracted and assessed full-text articles that were considered candidates for further analysis based on predefined eligibility criteria.

Two investigators (CCL and JMMS) independently extracted and reported data on the following aspects of each study using standardized forms: study design; year of publication; description of study population; measurement of smartphone screen time; and study outcomes. Any differences of opinion were resolved through group meetings between all reviewers to reach consensus. Fig. 1 shows the flow diagram of the study selection process (adapted from PRISMA).

Finally, we divided the review in two sections according to the different characteristics of the sources: (1) articles measuring only smartphone screen time (n = 14); (2) articles measuring screen time for smartphones and other devices (n = 75). The variables for which we retrieved data for each of these sections were: (1) Articles measuring only smartphone screen time: first author and year of publication, study objective, study design, measuring instrument, validation of questionnaire, item measuring smartphone usage, answer options, respondent, and main outcome concerning smartphone screen time. (2) Articles measuring screen time for smartphones and other devices: first author and year of publication, study objective, study design, measuring instrument, validation of questionnaire, item measuring screen time for smartphones and other devices, answer options, respondent, types of screen studied and main outcome concerning smartphone screen time (Supplementary Table).

Results

A total of 321 potentially relevant articles were identified. After reading the titles and abstracts and removing duplicates, a total of 146 full text articles were assessed for eligibility; of these, 57 articles were excluded for the following reasons: not original articles (review, non-scientific articles or not in included languages) (n = 31); reporting parental smartphone screen time (n = 8); studying other devices, not measuring smartphone screen time (n = 18) (Fig. 1). Of the 89 included studies, seven used standardized questionnaires, of which only one had been designed for the primary purpose of assessing smartphone screen time.

Table 1 presents the main characteristics of the 89 studies. The target population varied. Most studies included more than one age group (34.8%), and adolescents were the most studied age group (28.1%). The sample size was also heterogeneous. More than a third of the articles (37.1%) were conducted in samples greater than 500. The continent with the most published articles was Asia (40.4%), followed by Europe (34.8%), America (21.4%) and, lastly, Oceania (2.2%). Almost all studies (82%) used self-report questionnaires to assess screen time. The questionnaire was completed by the child in almost half of the articles (48.3%). When it came to the reporting of the screen time variable, more than half of the researchers expressed the results in hours per day (53.9%). The questionnaires used were not validated in 90.1% of the included articles. Only 15.7% of the articles measured smartphone screen time alone, the rest

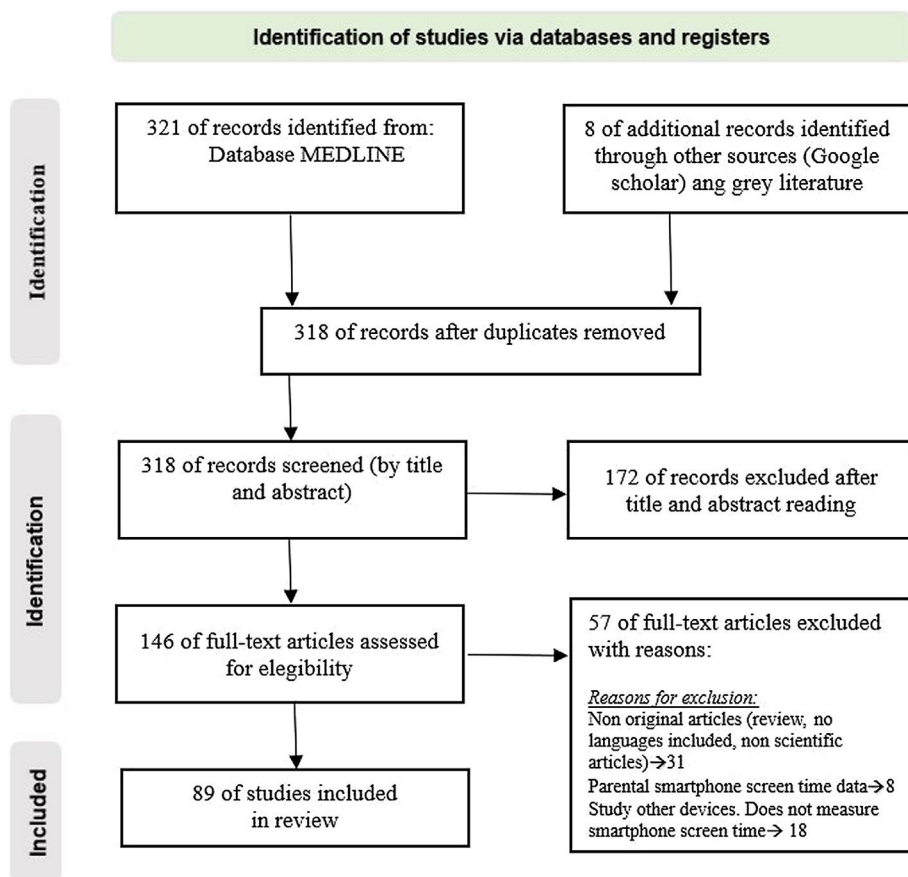


Figure 1 The following patches are recommended to bring the diagram closer to the PRISMA format.

(84.3%) included smartphone and other devices. In addition, 95.5% of the studies did not document the first or last use of the day. Most of the studies were published before 2020 (79.8%).

Table 2 presents a summary of the studies who focused exclusively on smartphone screen time. Most of the articles included in this section measured smartphone screentime by means of self-report questionnaires that had not been validated.^{17–26}

Self-report questionnaires generally directed children or parents to freely report their estimated time of smartphone use in a day or the last week. Only two of them^{18,19} presented a Likert scale to provide the answer. In all other studies, the answer was given in hours per day.

Two researchers used a self-developed application as a measuring instrument. Einthoven et al.¹⁵ did not use a questionnaire, but a monitoring application installed on the teenagers' smartphones for five weeks. Similarly, Marin Dragu et al.²⁷ used an application installed in the smartphone as a measuring instrument for 30 days. Both applications tracked usage time in the background.

Only two studies, by Olivella-Cirici et al.²⁸ and Al-Amri et al.,²⁹ used validated questionnaires to assess smartphone usage time. The primary purpose of both instruments, the Mobile-Related Experiences Questionnaire (CERM), in Spanish language,³⁰ and the Smartphone Addiction Scale-Short Version,³¹ is to assess for smartphone addiction.

With the exception of the studies by Park and Park,¹⁹ Poujoul et al.,²⁰ and Shah and Phadke,²⁶ it was the children who completed the questionnaires. In the studies by Olivella-Cirici et al.¹⁹ and Shah and Phadke,²⁶ the questionnaires were completed by the parents, whereas Poujoul et al.²⁰ collected responses from both children and parents.

In addition, Olivella-Cirici et al.²⁸ and Goel et al.²² described a prevalence of smartphone usage at bedtime of 70%–80% and 90%, respectively.

On the other hand, the main objective of most of the articles was to assess the association of smartphone screen time with another variable, frequently obesity, sleep or mental health. Only the study by Shah et al.²⁶ focused on the measurement of smartphone screen time. Specifically, it analyzed the age at acquisition of the first phone, daily frequency and duration of mobile phone use, and primary purpose of use (educational, entertainment, or communication). The study also assessed parental perceptions of the appropriate age for introducing the device attitudes toward the child's use. The statistical analysis was performed using the χ^2 and Fisher exact tests, and we defined statistical significance as $P < .05$.

Discussion

Our review, based on the available evidence, shows that most children and adolescents living in developed countries

Table 1 Characteristics of the 89 studies that assessed screen time with questionnaires*.

	n (%)
Target population^a	
Preschoolers	22 (24.7)
School-aged children	11 (12.4)
Adolescents	25 (28.1)
Different age groups	31 (34.8)
Sample size^a	
<500	33 (37.1)
500–1000	22 (24.7)
>1000	34 (38.2)
Geographical area	
Asia	36 (40.4)
Africa	0
America	19 (21.4)
Europa	31 (34.8)
Oceania	2 (2.2)
More than one	1 (1.1)
Questionnaire administration	
Face-to-face	2 (2.2)
Self-administered	73 (82.0)
Online	11 (12.4)
Telephone	1 (1.1)
More than one	2 (2.2)
Respondent	
Children/Adolescent	43 (48.3)
Parents or guardian	38 (42.7)
Both	8 (8.9)
Reporting of screen time variable	
Hours/day	48 (53.9)
Hours/week	3 (3.4)
Hours/weekday-Hours/weekend day	4 (4.5)
Hours/device	1 (1.1)
No screentime data	33 (37)
Validated screen time questionnaire	
Yes	8 (8.9)
No	81 (90.1)
Studied devices	
Only smartphone	14 (15.7)
Smartphone and other devices	75 (84.3)
Reported first/last use	
Yes	4 (4.5)
No	85 (95.5)
Year published	
<2020	70 (78.6)
>2021	19 (21.3)

^a Not available for all studies.

* Search conducted in 2024.

use screens for more than 2 h a day. Organizations such as the WHO, the AAP and the SAP have defined screen time at early ages as using these devices for more than 2 h a day. Still, the studies that support these recommendations are outdated, as most of them focused on television watching, without taking into account the use of multiple screens or the rise of the smartphone.^{8,9,13} In addition, because the range of devices is increasing, as is the purpose and duration of their use, an accurate assessment of screen time would

have to include not only time, but also measures of quality of use, content and context.

In relation to this, almost 30% of the reviewed literature studied different age groups without segregation. The needs, content and duration of screen time should not be the same in preschool age as in adolescence, for example. The fact that researchers are beginning to include this variable as a determinant of health brings us closer to the existing problem, although the reported data are not very accurate due to the inadequate monitoring of screen time.

Despite the rise of the smartphone and the concern it is creating within the scientific community, although they try to include this variable as a determinant of health, almost a third of the available studies did not seek to measure the prevalence of smartphone use, but investigated it as a secondary, associated variable. It is not treated as an emerging and key determinant of health in our young. Only a minority of authors^{18,19,26} focused their research specifically on this objective, and even they rarely used validated measurement instruments. Of the 89 studies reviewed, only 7 employed standardized questionnaires to assess smartphone screen time, and in 6 of these cases, the primary aim was not to directly measure screen time but rather to evaluate broader aspects such as addiction, lifestyle habits or sedentary behavior. This highlights the scarcity of validated tools specifically designed for measuring smartphone screen time and the urgent need for their development in future research. Moreover, very few studies have examined the type of activity or content to which screen time is devoted. The use of current contents or features to which screen time is devoted is studied by few authors. Following the rise of social networks in recent years, some authors have included it in their work (WhatsApp, Snapchat, Instagram. . .) although with a vague and imprecise approach.^{18,23}

Similarly, some authors are beginning to innovate in screen time measurement tools by installing applications on the smartphone itself and act in the background, tracking the activity.^{15,27} However, this measurement option does not take into account multiscreen use and is limited exclusively to the monitoring of the selected device.

Other works on the subject try to find sociodemographic characteristics that influence the increase in excessive smartphone use time. Rodrigues et al.^{61,108} found that a low level of parental communication was associated with an increased probability of excessive screen time. Likewise, Olivella et al.²⁸ and Song et al.¹⁸ reported a higher screen time in girls than in boys. In developing a measurement instrument, it would be interesting to take these sociodemographic factors into account and to focus on these target populations.

At the legislative level, some countries are beginning to take measures in the school setting by regulating the use of smartphones through internal policies.²⁹ European countries such as Spain, France and the Netherlands have had internal rules in place for years. Currently, the responsibility lies with the school board, and most schools prohibit the use of phones in the school setting and establish penalties for adolescents.¹⁰⁹ In Asia, the Chinese government has officially proposed limiting the use of cell phones by minors. The proposal advocates a “minor mode” in the manufacture of cell phones that will limit the time of use according to the age of the minor.³⁰ In the United States, there is leg-

Table 2 Characteristics of studies and instruments used to measure smartphone screen time in the pediatric population.

Author, publication year (ref)	Main objective	Study design	Measuring instrument	Validated questionnaire	Item measuring smartphone usage	Answer options	Respondent/ data source
Ryu, 2022 ¹⁷	To evaluate the association between usage patterns and dietary risk factors	Cross-sectional study	Self-administered questionnaire	No	Questionnaire not reported nor published by authors	Questionnaire not reported nor published by the authors	Child
Song, 2022 ¹⁸	To investigate the factors associated with smartphone use time	Cross-sectional and secondary descriptive study	Self-administered questionnaire	No	“How often do you usually use your smartphone for each type of content?” including messengers, social media, games, videos/movies/TV, information-searching/web-surfing, and educational videos ^a	Likert scale (1 = never, 5 = very often) ^a	Child
Park, 2021 ¹⁹	To identify usage patterns associated with problematic smartphone use (PSU)	Cross-sectional study	Self-administered questionnaire	Yes- Korean-language Smartphone Overdependence Scale (S-scale)	“How often did your child use a smartphone on a typical day in the last month?”	Likert Scale 0 = not at all, 1 = rarely, 7 = very frequently	Parents
Enthoven, 2021 ¹⁵	To investigate the association between smartphone use and refractive error	Cross-sectional population-based study	App Smartphone: Myopia app	No	No item- Application installed in the smartphone for 5 weeks to track usage time	No answer	Child’s smartphone
Poujol, 2022 ²⁰	To analyze the association between mobile phone screen exposure and cognitive health	Cross-sectional study	Self-administered questionnaire	No	How many minutes per day do you use your phone? For specific purposes (ie, gaming, email, messaging, social media) ^a	Low: less than 9 min per day, Medium: from 9 to 20 min per day	Parents and child

Table 2 (Continued)

Author, publication year (ref)	Main objective	Study design	Measuring instrument	Validated questionnaire	Item measuring smartphone usage	Answer options	Respondent/data source
Olivella, 2023 ²⁸	To describe the association between problematic mobile phone use and social traits, health and health-related behaviors	Cross-sectional study	Self-administered scale: Mobile-Related Experiences Questionnaire (CERM) (30)	Yes	Mobile-Related Experiences Questionnaire (CERM) (30)	High: more than 20 min per day ^a Mobile-Related Experiences Questionnaire (CERM) (30)	Child
Maurya, 2022 ²¹	To examine the association between smartphone screen time and sleep problems	Cross-sectional and longitudinal study	Self-administered questionnaire	No	1-Do you have your own mobile phone or have access to a family member's mobile phone that you can use? 2. What all do you do with mobile phone? 3. How much time did you spend on all of these in the last day? ^b	1-Yes, have own mobile/yes, can access family member's/No 2.Phone call, SMS, money transaction, online shopping, listening to music, taking pictures, WhatsApp/Facebook, gaming, streaming, educational content, other 3-Number of hours ^b	Child
Marin-Dragu, 2023 ²⁷	To analyze the various ways in which measured smartphone use was associated with mental health	Cross-sectional analysis	Smartphone app, <i>PROSIT-Predicting Risks and Outcomes of Social Interactions</i>	No	No items. Application installed for approximately 30 days to track use in background	No answers. The app collected data on smartphone interactions, accelerometer, location, screen time activity, ambient noise and light, and connectivity	Child's smartphone

Table 2 (Continued)

Author, publication year (ref)	Main objective	Study design	Measuring instrument	Validated questionnaire	Item measuring smartphone usage	Answer options	Respondent/data source
Shah, 2023 ²⁶	To assess the prevalence of mobile phone use	Cross-sectional study	Self-administered questionnaire	No	Questionnaire not specified or published by authors	Questionnaire not specified or published by authors	Parents
Al-Amri, 2023 ²⁹	To assess the effect of smartphone addiction on cognitive function and physical activity	Cross-sectional study	Self-administered questionnaire and Smartphone Addiction Scale-Short Version (SAS-SV) (31)	Self-reported questionnaire (not validated) and SAS-SV (validated)	Self-reported daily smartphone usage time and number of years the child had owned a smartphone ^a	Number of hours and age	Child
Goel, 2023 ²²	To assess the association between smartphone use and quality of sleep	Cross-sectional study	Self-administered questionnaire via WhatsApp	No	Questionnaire not specified or published by authors	Questionnaire not specified or published by authors	Child
Fortunato, 2023 ²³	To establish categories of adolescents with homogeneous patterns of smartphone or social media use and assess psychosocial variables	Cross-sectional study	Self-administered questionnaire	No	Child asked to report the time (hours in a day) spent both on all mobile screen time activity (overall time spent on the smartphone) and on each social media app (Instagram, Facebook, TikTok, Snapchat, and Twitter) and WhatsApp ^a	Hours in a day	Child
Ikeda, 2024 ²⁴	To examine the association between screen time, including smartphone screen time, and overweight/obesity	Cross-sectional study	Self-administered questionnaire	No	Asked participants for information on smartphone screen time and non-smartphone screen time per day on weekdays and weekends ^a	Hours in a day	Child
Tatar, 2023 ²⁵	To analyze the factors associated with insomnia	Cross-sectional study	Self-administered questionnaire online	No	Asked participants if they used their smartphone just before bedtime ^a	Yes, No	Child

isolation that regulates the use of mobile telephones in the school setting. Under the Technology in Public Schools K-12 Act (CS/HB 379), which became effective July 1, 2023, section 1006.07(2)(f) of the Florida Statutes now states that "a student may not use a wireless telephone communication device during instructional time".³¹ Awareness of the issue has gone further in the United States, with nearly one-third of the states suing Meta Platforms, claiming that their social networks Instagram and Facebook are addictive and harmful to children and adolescents and their use is associated with depression, anxiety and insomnia and interferes with education and daily life.³²

However, it is difficult to establish appropriate health policies when the monitored health determinant, in this case, excessive smartphone use, is not measured effectively. The wide range of measures used and the limited agreement between the assessments themselves create a scientific gap on the correct measurement of screen time. In this regard, data on screen use, especially smartphones, available for Europe (national health surveys, Eurobarometer, etc) and the rest of the world do not allow for comprehensive surveillance because they do not differentiate between the type of device used (smartphone, computer, console, TV, etc.) and do not provide information on relevant aspects of use that could determine possible addiction in the future.

The main limitation of our review is that it does not include longitudinal studies. We only included cross-sectional studies with greater external validity that would allow extrapolation of the results to the target population. Although longitudinal studies on the impact of screens on the health of the pediatric population include questionnaires to assess screen use, including the use of mobile phones, these questionnaires are not aimed at extrapolating the pattern of use in the pediatric population (external validity), which was the objective of our review.

It is important to note that the source of information used can introduce bias: children tend to underestimate their screen time due to social desirability, recall issues, or, in the case of younger children, difficulties understanding the questions, whereas parents may overestimate it due to not accurately knowing their children's behaviors. These limitations highlight the need for future research to include validated questionnaires and to focus on the development of standardized and validated tools for this purpose.

Another limitation is the heterogeneity of the studies included, which makes it difficult to synthesize the results. Although our initial intention was to perform a meta-analysis of the studies, this was not possible due to the heterogeneity of the data. In addition, the variation in the terminology used by the authors and the lack of consensus on the definition of screen time made the work difficult. Nevertheless, we were able to identify many common conclusions among the included studies.

This scoping review highlights the scientific gap in the measurement of smartphone screen time in the pediatric population. For public health policies to be applicable and relevant, the use of validated methodology is of the essence. Bani-Issa et al.,³³ who used an appropriate instrument, were the authors that reported the highest usage time (up to 7h/day), consistent with the current boom and lack of control. For usage patterns to be applicable to today's society, it is especially important to create a measurement instru-

ment that standardizes measurement and, therefore, the results of smartphone screen time in the pediatric population. In this way, existing problems will be correctly identified, allowing development of appropriate usage recommendations and guidelines.

Ethics approval

Not applicable.

Funding

This study was funded by the "Ministerio de Ciencia e Innovación" of the Government of Spain (ref.: PID2021-122272OB-I00) and by FEDER funds/European Regional Development Fund (ERDF) –a way to build Europe. The Group of Evaluation of Health Determinants and Health Policies of Universidad de Extremadura received support of Junta de Extremadura [grant number CTS063].

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.anpedi.2026.504156>.

Declaration of competing interest

The authors declare no conflicts of interest.

References

1. Chassiakos YR, Radesky J, Christakis D, Moreno MA, Cross C, Hill D, et al. Children and adolescents and digital media. *Pediatrics*. 2016;138.
2. Jacobson C, Bailin A, Milanaik R, Adesman A. Adolescent health implications of new age technology. *Pediatr Clin North Am*. 2016;63:183–94.
3. Park CS. Examination of smartphone dependence. *Comput Human Behav*. 2019;93:123–8.
4. Busch PA, McCarthy S. Antecedents and consequences of problematic smartphone use: a systematic literature review of an emerging research area. *Comput Human Behav*. 2021:114.
5. Chen W, Adler JL. Assessment of screen exposure in young children, 1997 to 2014. *JAMA Pediatr*. 2019;173:391–3.
6. Bilgrami Z, McLAUGHLIN L, Milanaik R, Adeadesman A. Health implications of new-age technologies: a systematic review. *Minerva Pediatr*. 2017;69:348–67.
7. Barr R, Kirkorian H, Radesky J, Coyne S, Nichols D, Blanchfield O, et al. Beyond screen time: a synergistic approach to a more comprehensive assessment of family media exposure during early childhood. *Front Psychol*. 2020;11.
8. Bar-On ME, Broughton DD, Buttross S, Corrigan S, Gedissman A, González De Rivas MR, et al. Children, adolescents, and television. *Pediatrics*. 2001;107:423–6.
9. Muppalla SK, Vuppalapati S, Reddy Pulliahgaru A, Sreenivasulu H. Effects of excessive screen time on child development: an updated review and strategies for management. *Cureus*. 2023;15:e40608.
10. Madigan S, Browne D, Racine N, Mori C, Tough S. Association between screen time and children's performance on a developmental screening test. *JAMA Pediatr*. 2019;173:244.

11. Hill D, Ameenuddin N, Chassiakos YR, Cross C, Radesky J, Hutchinson J, et al. Media and young minds. *Pediatrics*. 2016;138.
12. Alonzo R, Hussain J, Stranges S, Anderson KK. Interplay between social media use, sleep quality, and mental health in youth: a systematic review. *Sleep Med Rev*. 2021;56:101414.
13. Organization WH. In: Guidelines on physical activity, sedentary behaviour and sleep for children under 5 years of age. World Health Organization; 2019.
14. Byrne R, Terranova CO, Trost SG. Measurement of screen time among young children aged 0-6 years: a systematic review. *Obes Rev*. 2021;22:e13260.
15. Enthoven CA, Polling JR, Verzijden T, Tideman JW, Al-Jaffar N, Jansen PW, et al. Smartphone use associated with refractive error in teenagers: the Myopia app study. *Ophthalmology*. 2021;128:1681-8.
16. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med*. 2018;169:467-73.
17. Ryu S, Jang H, Oh H. Smartphone usage patterns and dietary risk factors in adolescents. *J Nutr*. 2022;152:2109-16.
18. Song HY, Kim JH. Smartphone use type, fear of missing out, social support, and smartphone screen time among adolescents in Korea: interactive effects. *Front Public Health*. 2022;10:822741.
19. Park JH, Park M. Smartphone use patterns and problematic smartphone use among preschool children. *PLoS One*. 2021;16.
20. Pujol MC, Pinar-Martí A, Persavento C, Delgado A, Lopez-Vicente M, Julvez J. Impact of mobile phone screen exposure on adolescents' cognitive health. *Int J Environ Res Public Health*. 2022;19:12070.
21. Maurya C, Muhammad T, Maurya P, Dhillon P. The association of smartphone screen time with sleep problems among adolescents and young adults: cross-sectional findings from India. *BMC Public Health*. 2022;22:1-11.
22. Goel A, Moinuddin A, Tiwari R, Sethi Y, Suhail MK, Mohan A, et al. Effect of smartphone use on sleep in undergraduate medical students: a cross-sectional study. *Healthcare (Basel)*. 2023;11:2891.
23. Fortunato L, Lo Coco G, Teti A, Bonfanti RC, Salerno L. Time spent on mobile apps matters: a latent class analysis of patterns of smartphone use among adolescents. *Int J Environ Res Public Health*. 2023;20:6439.
24. Ikeda I, Fujihara K, Yoshizawa SM, Takeda Y, Ishiguro H, Harada MY, et al. Association between screen time, including that for smartphones, and overweight/obesity among children in Japan: NICE EVIDENCE Study 4. *Endocr J*. 2024;71:171-9.
25. Tatar D, Dębski P, Bocian B, Bąkowska M, Będkowska J, Tropiejko M, et al. How do teenagers sleep? Analysis of factors related to sleep disorders in a group of Polish high school students. *BMC Pediatr*. 2023;23:498.
26. Shah SA, Phadke VD. Mobile phone use by young children and parent's views on children's mobile phone usage. *J Family Med Prim Care*. 2023;12:3351-5.
27. Marin-Dragu S, Forbes A, Sheikh S, Iyer RS, Pereira dos Santos D, Alda M, et al. Associations of active and passive smartphone use with measures of youth mental health during the COVID-19 pandemic. *Psychiatry Res*. 2023;326.
28. Olivella-Cirici M, Garcia-Continente X, Bartroli Checa M, Serral Cano G, Pérez Albarracín G. El uso problemático del teléfono móvil: análisis transversal del perfil individual y factores asociados. *Rev Esp Salud Pública*. 2023;97.
29. Al-Amri A, Abdulaziz S, Bashir S, Ahsan M, Abualait T. Effects of smartphone addiction on cognitive function and physical activity in middle-school children: a cross-sectional study. *Front Psychol*. 2023;14.
30. Carbonell X, Chamarro A, Griffiths M, Oberst U, Cladellas R, Talarn A. Uso problemático de Internet y teléfono móvil en adolescentes y jóvenes estudiantes españoles. *Ana Psicol*. 1984;28:789-96.
31. Cámara de Representantes de los Estados Unidos, Available from: In: Análisis del personal de la Cámara de Representantes [Internet]. Washington (DC): Cámara de Representantes; 2024 <https://www.security.org/resources/cyberbullying-facts-statistics>
32. U.S. Department of Justice, Civil Rights Division – Housing C, Enforcement Section C. Complaint – United States v. Meta Platforms Inc., f/k/a Facebook, Inc. (S.D. N.Y.) [accessed 11 Jul 2024]. Available from: <https://www.justice.gov/opa/press-release/file/1482991/download>.
33. Bani-Issa W, Radwan H, Saqan R, Hijazi H, Fakhry R, Alameddine M, et al. Association between quality of sleep and screen time during the COVID-19 outbreak among adolescents in the United Arab Emirates. *J Sleep Res*. 2023;32:e13666.