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QUESTIONING THE CHALLENGE TO SCREEN USE GUIDELINES

Cuestionando el desafío a las recomendaciones sobre el uso de pantallas electrónicas

Catherine L'ECUYER*, José Víctor ORON SEMPER**, Irene MONTIEL***, Alfonso OSORIO****, Jesús LÓPEZ-FIDALGO*****, M. Angustias SALMERÓN RUIZ******
* *Universidad de Navarra / Fundación CLE. Spain.*
** *Universidad Francisco de Vitoria. Spain.*
*** *Universitat Oberta de Catalunya. Spain.*
**** *Universidad de Navarra. Spain.*
***** *Universidad de Navarra. Spain.*
****** *Hospital Ruber Internacional. Spain.*
catherine@catherinelecuyer.com; josevictor.oron@ufv.es; imontielj@uoc.edu; aosorio@unav.es; fidalgo@unav.es; mariasalmeronruiz@gmail.com
https://orcid.org/0000-0003-1485-6849; http://orcid.org/0000-0003-4959-050X; https://orcid.org/0000-0002-0537-2458; https://orcid.org/0000-0003-4337-5382; https://orcid.org/0000-0001-7502-8188; https://orcid.org/0009-0005-8859-9744

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ABSTRACT

In September 2023, "An umbrella review of the benefits and risks associated with youths' interactions with electronic screens" was published in *Nature*. This review aimed at understanding the influence of electronic screens on the health and educational outcome of children and adolescents from 0-18 years old. The authors concluded that current screen use guidelines may be too simplistic, that they mischaracterize the strength of the evidence or do not acknowledge the important nuances of the issue. As a result, they supported the trend of moving away from recommendations to reduce screen use and instead focus on the type of screen use. Our contribution focuses on answering the question of whether the results of this review are sufficient to challenge current screen use guidelines. To do so, we explain the current literature on screen use guidelines that the review generically referred to as well as the rationale behind them, and then we proceed to explain why the review's findings are insufficient to challenge these guidelines. We demonstrate that some of the review's main conclusions are not consistent with its own findings and that they fail to explain the relationship between their findings and the discreditation of current guidelines. Absence of evidence is not evidence of absence and investigators should be careful in questioning public health recommendations based on incomplete evidence.

Keywords: electronic screens; public health; pediatrics; education; child development.

RESUMEN

En septiembre de 2023, *Nature* publicó "An umbrella review of the benefits and risks associated with youths' interactions with electronic screens". Esta revisión tenía como objetivo comprender la influencia de las pantallas electrónicas en la salud y el rendimiento educativo de niños y adolescentes de 0 a 18 años. Los autores concluían que las pautas actuales sobre el uso de pantallas pueden ser demasiado simplistas, que no caracterizan adecuadamente la fuerza de la evidencia o que no reconocen los matices importantes de la cuestión. Por lo tanto, los autores respaldaban la tendencia a alejarse de la reducción del tiempo de uso de pantallas que se encuentra en las recomendaciones, para centrarse en el tipo de uso de las pantallas. Nuestra contribución se centra en responder a la pregunta de si los resultados de la revisión son suficientes para poder cuestionar las recomendaciones actuales sobre el uso de las pantallas. Para ello, resumimos la literatura actual sobre las recomendaciones a las que los autores se refirieron genéricamente, así como la justificación que las fundamentan y, a continuación, explicamos por qué los resultados de la revisión son insuficientes para cuestionar esas recomendaciones. Demostramos que algunas de las principales conclusiones de la revisión no son coherentes con sus propios resultados y que no se establece una relación entre sus hallazgos y la desacreditación de las recomendaciones actuales. La ausencia de evidencia no es evidencia de ausencia y los investigadores deben ser cuidadosos al cuestionar las recomendaciones de salud pública basándose en evidencia incompleta.

Palabras clave: medios electrónicos; salud pública; pediatría; educación; desarrollo infantil.

1. INTRODUCTION

In September 2023, "An umbrella review of the benefits and risks associated with youths' interactions with electronic screens" (Sanders *et al.*, 2023) ("the Review") was published. Despite its title ("youth"), the Review aims at understanding the influence of electronic screens on the health and educational outcome of children and adolescents from 0-18 years old. After the usual selection process, it deals with 102 meta-analyses, encompassing a total of 2,241 primary studies, involving 1,937,501 participants. Here is a summary of its results:

Educational outcomes:

- General screen use, television viewing and video games were all negatively associated with learning.
- E-Books that included narration, touchscreen education interventions and augmented-reality-based education interventions were positively associated with learning.
- General screen use was negatively associated with literacy outcomes. However, if the screen use involved co-viewing (for example, watching with a parent), or the content of television program was educational, the association with literacy was positive and significant.
- Numeracy outcomes were positively associated with screen-based mathematics interventions and video games that contained numeracy content.
- All credible effects related to educational outcomes were small to moderate and most effects showed high levels of heterogeneity.
- Social media was one type of exposure that showed consistent—albeit small—associations with poor health, with no indication of potential benefit. Social media showed strong evidence of harmful associations with risk taking in general, as well as unsafe sex and substance abuse.

Health outcomes:

- Digital advertising of unhealthy foods—both traditional advertising and video games developed by a brand for promotion—was associated with higher unhealthy food intake.
- Social media use and sexual content were positively associated with risky behaviors.
- Television viewing was negatively correlated with sleep duration, but with stronger evidence only observed for adolescents.
- Both television and video games were associated with body composition.
- Screen-based interventions which target health behaviors seemed to be mostly effective.

– Most of the health outcomes were significant; however, most of the credible effects exhibited high levels of heterogeneity and most effects were small, with the association between internet use and depression the largest.

The Review concludes:

1) "Broadly, our findings align with the recommendations of others who suggest that current guidelines may be too simplistic, mischaracterize the strength of the evidence or do not acknowledge the important nuances of the issue" (p. 6).
2) "Given our results, we support the continuing trend of guidelines moving away from recommendations to reduce screen use and instead focus on the type of screen use" (p. 6).

1.1. *Scope and structure of this paper*

Our contribution does not aim at doing an integral revision of the Review, or at bringing additional evidence to that brought by the Review. Rather, we focus on answering the question of whether it's results can properly lead to challenging current screen use guidelines. We start by briefly explaining the literature on screen use guidelines that the authors generically refer to, as well as the rationale behind them. We then proceed to explain why the Review's findings and argumentation are not appropriate to challenge screen use current guidelines. To do so, we demonstrate that some of the Review's main conclusions are not consistent with its own findings and that its authors fail to explain the relationship between their findings and the discreditation of current guidelines.

1.2. *Background: Current screen use guidelines*

Over the last decades, the American Academy of Pediatrics (AAP) has issued several guidelines regarding the use of digital media in early childhood (AAP Committee on Public Education, 1999; AAP Council on Communications and Media, 2010, 2011, 2016a, 2016b; AAP, 2022; Reid-Chassiakos et al., 2016). The AAP initially discouraged screen exposure for children under 2 years of age and recommended that children over 2 years old should not be exposed to more than 2 hours a day. In 2016, faced with the technological tsunami caused by the arrival of the tablet and the smartphone and seeing that consumption was soaring among minors, the American Academy of Pediatrics feels the need to update its position considering recent literature. Despite the high consumption rate among children, it maintains its recommendation to "avoid digital media use for children younger than 18-24 months" (AAP, 2016a, p. 3). For children 2 to 5 years of age, it decides to reduce the recommended consumption from 2 to less than "1 hour per day of high-quality

programming coviewed with children" (AAP, 2016a, p. 3). These recommendations were reaffirmed in 2022 (AAP, 2022). In 2017, and again in 2023, the Canadian Paediatric Society (2017, 2023) made similar recommendations.

Based on the available pediatric literature, the main arguments of the pediatric associations for these two age groups are the following:

- Children most learn from human interactions and real sensory experiences, not from screens.
- Children need to interact to establish an attachment relationship with their primary caregiver and screen time subtracts from those opportunities (displacement effect).
- Children 0-5 years old should avoid fast-paced contents during this time of critical brain development.
- Children under 18 months exposed to screens may suffer from delayed language development and inattention.
- Children under 30 months old have difficulty transferring a two-dimensional experience to a three-dimensional plane, which implies a deficit in technology-mediated learning.
- For families that find it difficult to reduce the amount of screen use, they should mitigate the negative effect through co-viewing and changing to high-quality TV programs, such as Dora, Sesame Street or Mister Rogers' Neighborhood.

All in all, the Canadian Paediatric Society (CPS) summarizes its conclusions: "there is no evidence to support introducing technology at an early age" (Canadian Paediatric Society, 2017, p. 465). For school-age children and adolescents, the AAP (2016b) recommends to "place consistent limits on hours per day of media use as well as types of media used" (p. 3).

In 2019, the World Health Organization (WHO) published *Guidelines on physical activity, sedentary behaviour and sleep for children under 5 years of age*. It discusses the implication of screens from the point of view of activity and sedentary behavior to conclude that sedentary screen time is not recommended for infants. For those aged 2 to 4 years, "sedentary screen time should be no more than 1 hour; less is better" (WHO, 2019, p. 11).

2. Discussion: why the review's findings and argumentation are insufficient for challenging screen use current guidelines

The Review questions current screen use guidelines. As stated earlier, we believe that the Review's findings are insufficient to question current guidelines on screen use. The Review' conclusions go astray from its findings and fail to properly explain

the relationship between its findings and the discreditation of current guidelines. We will now proceed to detail the arguments that support that claim.

2.1. *The literature on screen use guidelines referred to by the authors is deficient*

The authors conclude that current screen use guidelines should be questioned. The guidelines that they refer to in their review come from the following entities:

> Citing the negative associations between screen use and health (for example, increased risk of obesity) and health-related behaviours (for example, sleep), guidelines from the World Health Organization and numerous government agencies and statements by expert groups have recommended that time spent using electronic media devices by young people for entertainment purposes should be limited (Sanders et al., 2023, p. 2).

The entities' guidelines and corresponding literature that the authors generically refer to and recommend for review are the following four:

1) The American Academy of Pediatrics (2016b; Reid-Chassiakos et al., 2016)
2) The Canadian Society for Exercise Physiology (Tremblay *et al*., 2016)
3) The World Health Organization (WHO, 2019)
4) The Australian Government, Department of Health and Aged Care (2021)

The authors' discussion is deficient because it does not explain the specific guidelines that it disagrees with, for each entity and for each age group. Nor do they present the argumentation that would lead to this presumed contradiction. Furthermore, they refer to the AAP as a mere "expert group". The authors cite the AAP's 2016 Technical Report (Reid-Chassiakos et al., 2016), as well as the AAP's Policy Statement for school-aged children and adolescents (2016b). However, they fail to cite and refer to the AAP's Policy Statement (AAP, 2016a) where guidelines for screen use can be found for early years (0-5 years old) and to the 2022 AAP reaffirmation (2022). Also, the authors cite the 2016 Canadian Society for Exercise Physiology physical activities' guidelines (Tremblay et al., 2016) that indirectly deals with screens, but they omit to cite the most recent CSEP (2021) recommendation and the Canadian Paediatric Society (2017) guidelines that deals specifically with the issue of screen use, as well as its reaffirmation (Canadian Paediatric Society, 2023) which was available online since 2022 (Canadian Paediatric Society, 2022).

It is striking that three out of four of the recommendations referred to by the authors deal with screens indirectly, from the point of view of sedentarism and physical activity, and that the most recent and relevant literature on pediatric recommendations is either missing or incomplete. We can therefore conclude that the literature on screen use guidelines referred to by the authors is deficient. As

we will explain later, this has an impact on the set of variables that were included in the Review.

2.2. *In light of the current guidelines, the rationale behind them for early years is missing*

As explained earlier, the recommended limitation on screen use varies for every age range (AAP, 1999, 2016a). For early years, the AAP Policy Statement discusses brain development issues that are not discussed in the Review, which focuses mainly on learning and health issues related to sedentarism such as obesity, eating disorder, or depression.

In the Review, the authors deplore the limitation of specific studies and introduce the importance of trade-offs between positive and negative effects:

> Focusing on a single domain or exposure makes it difficult to understand what trade-offs are involved in any guidelines around screen use. For example, prohibiting screen use might reduce exposure to advertising but may also thwart learning opportunities from interactive educational tools (Sanders *et al.*, 2023, p. 2).

The authors fail to acknowledge what the pediatric criteria is with respect to trade-offs between learning and health and developmental issues for early years. It fails to discuss well-known general principles and hypotheses in the media literature for early years, such as 'displacement effect' and the 'video deficit effect' (AAP, 2016a). These issues are raised in three pediatric recommendations that the authors fail to cite (AAP, 2011; 2016b; Canadian Paediatric Society, 2017). In a nutshell, adverse health and development effects are especially sensitive for young children, who are going through a crucial period of rapid brain development. Discussions and conclusions about screens' possible positive effects in relation to learning during infancy cannot stand alone or be seen as a mere trade-off, but rather must be understood as a whole that takes into account the screen's potential adverse interference in the child's critical period of development.

The authors question current screens use guidelines in relation to their findings:

> Our findings suggest that screen use is a complex issue, with associations based not just on duration and device type but also on the content and the environment in which the exposure occurs. Many current guidelines simplify this complex relationship as something that should be minimized (Sanders et al., 2023, p. 6).

However, they fail to argue and demonstrate this simplification.

We can therefore conclude that the discussion of what the current guidelines are for early years, the rationale behind the recommendations on screen use limitation and how these recommendations relate to the Review's findings are deficient.

2.3. *Deficient argumentation to justify the introductory statements that "evidence to support the concerns of parents is inadequate" and that "some researchers argue that a more nuanced approach to screen use guidelines is required"*

The authors compare the preoccupation about screen use with what they describes as the "hysteria" around the invention of school, of the printing press or of the radio. They conclude that "evidence to support the concerns of parents [about screen usea] is inadequate" (Sanders et al., 2023, p. 2). This argument is more emotional than scientific. This metaphor might seem intuitive, but the investigation that supports each field is completely different. The authors then cite the editorial from The Lancet (2019), concluding that "our understanding of the benefits, harms, and risks of our rapidly changing digital landscape is sorely lacking" (p. 611). The Lancet editorial does not support, as the authors suggest, this claim that "the evidence to support the concerns of parents is inadequate" (Sanders et al., 2023, p. 2). Rather, the editorial addresses and deplores the fact that technological obsolescence and innovation will always be ahead of science:

> Without leadership from the health community, we risk not protecting—or worse, harming— our greatest asset: the future generation's mental health. As per the speed with which young people adopt social media, the evidence is also moving very quickly, and by the time frameworks are imposed, they might be obsolete to young users who have already left those particular digital platforms behind. Our understanding of the benefits, harms, and risks of our rapidly changing digital landscape is sorely lacking (The Lancet, 2019, p. 611).

Far from supporting the claim that parents' concern about screen use is unfounded, The Lancet Editor introduces the idea that scientific evidence and technological obsolescence have different rhythms and makes a case for prevention. Therefore, the context does not support the interpretation of the fragment quoted.

Therefore, the authors fail to justify the statement that evidence to support the concerns of parents is inadequate. Moreover, there is already plenty of evidence to support any educator's concern, which is precisely the body of evidence current screen use guidelines refer to. The authors fail to address them and to convincingly argue for a need to modify current screen use guidelines.

In its introduction, the Review refers to Kaye et al. (2020); it affirms that "some researchers argue that a more nuanced approach to screen use guidelines is required" (Sanders et al., 2023, p. 2). As it is, Kaye *et al.* (2020) do not challenge current screen use guidelines, they do not even refer to any of the pediatric recommendations; they merely refer to a study that does (Houghton et al., 2015), but this study was published in 2015, prior to current screen use guidelines cited by the Review (AAP, 2016b; Australian Government Department of Health and Aged Care, 2021; Tremblay *et al.*, 2016; World Health Organization, 2019) and prior to other recommendations that the Review fails to cite (AAP, 2016a, 2022; Canadian Paediatric Society, 2017, 2023).

Furthermore, when a few positive associations are found in the Review, they are attributed to specific contexts: "if the screen use involved co-viewing […], or the content of television program was educational […], the association with literacy was positive and significant […]" (Sanders et al., 2023, p. 3). In one of the most comprehensive existing studies on child care (National Institute of Child Health and Human Development [NICHD], 2006) a principal caregiver's sensitivity (a mother's responsiveness to her children's true needs) has been considered the most consistent predictor of a child's healthy development. So, parents who care about content and find time to co-view with their children might tend to be more sensitive and responsive parents since they attune with their children's needs. This introduces a confounding factor; positive results may not be attributed to the content, but rather to the parents who choose content and to co-view with their children. As Madigan et al. (2020) says,

> it is possible that when co-viewing screens, caregivers are more attuned to the quality of programming being viewed, and therefore, children are more likely to watch programs intended for their age group, which may in turn increase comprehension and language learning (pp. 6-7).

So, it is not only that "content matter", but that "parents who select good content matter". So, rather than saying that evidence to support the concerns of parents about screen use is inadequate, we should rather say that there is evidence suggesting that concerned parents are better able to mitigate the adverse effects of screen use.

2.4. *The educational content that a 2023 child watches and the devices now used are different from what existed a few decades ago in the studies included in the Review*

Madigan et al. (2020) refer to very slow-paced content such as Mr. Rogers's Neighborhood, Dora or Sesame Street. In fact, the studies that were reviewed were all published between 1982 and 2017. All studies published after 2010 noted that educational programs led to lower child language abilities, a detail that was not taken into consideration in the Review's discussion. In fact, Madigan *et al*. (2020) recommend caution: "caution should be exercised in interpreting that all educational programs are beneficial to children" (p. 6). Needless to say, content produced, and devices used in 2023 are different from the ones that were offered three decades ago: "previous reports suggest that caregivers co-view approximately 50% of the time the child is watching programming (although this number may be on the decline, with solitary tablet use on the incline)" (Madigan *et al*., 2020, p. 6). So, it is inappropriate to extrapolate conclusions based on studies conducted as early as the eighties and come to the conclusion that screen use guidelines should be loser and that there is no evidence for parents to be concerned in 2023.

2.5. *A recommendation to prefer quality content in co-viewing mode was already taken into account in the 2016's AAP recommendations*

> For children 2 to 5 years of age, limit screen use to 1 hour per day of high-quality programming, co-view with your children, help children understand what they are seeing, and help them apply what they learn to the world around them (AAP, 2016a, p. 3).

In Madigan *et al*. (2020), the authors conclude that their findings "support pediatric recommendations to limit children's duration of screen exposure, to select high-quality programming, and to co-view when possible" (Madigan *et al*. 2020, p. 1). It is incongruent that the Review, on the basis of Madigan *et al*. (2020), concludes that these recommendations should be modified.

2.6. *The fact that moderate use of screens in youth is not related to extreme situations such as delinquency does not mean that screen use is free of any adverse health or developmental effect for children or adolescents, that it generates educational or developmental benefits for them or that it might benefit their well-being*

The authors cite Ferguson (2017) to conclude that longer exposure may not have adverse effects, it may in fact benefit teenagers' well-being:

> However, recent evidence suggests that longer exposure may not have adverse effects on the behaviour or mental health of children—and might, in fact, benefit their well-being—as long as exposure does not reach extreme levels (for example, 7 h per day) (Sanders *et al*., 2023, p. 2).

Once again, a more rigorous interpretation of the study is needed. Ferguson (2017) measures extreme situations such as delinquency, risky driving, illegal substance use, depression, school failure, or eating disorder using the Youth Risk Behavior Survey (Centers for Disease Control and Prevention (CDC), 2013). Concluding that a moderate use of screens from grade 9 to 12 is not related to extreme situations such as delinquency does not mean that screen use is free of any adverse health or developmental effect for children or teenagers, or that it generates educational or developmental benefits. In fact, contrary to what the Review says, there is no discussion whatsoever in the article on any kind of "benefit" of screens for children's "well-being". Also, extrapolating the study's conclusions to early ages is inappropriate. The study found absence of evidence, not evidence of absence, and not even with respect to general outcomes, but to specific and extreme harmful effects.

Additionally, Ferguson (2017) compares screen time with media abstinence (p. 801). However, when the Review defines abstinence and other consumption categories, it only includes TV and video game screen time during weekdays; it does not include other screen types such as smartphone or tablets and does not contemplate screen use during weekends. The abstinence group is not well defined,

there is no way of knowing if it consumes other types of screens or screen time on the weekend. Therefore, the parameters of comparison are not rigorous.

Furthermore, both screen time and extreme situations were self-reported by the teenagers using an unvalidated survey. The authors themselves of the Youth Risk Behavior Surveillance System affirm that "no study has been conducted to assess the validity of all self-reported behaviors that are included on the YRBSS questionnaire" (CDC et al., 2013, p. 8).

Finally, the study is cross-sectional and the time sequence between the exposure (screen time) and the outcomes is unclear. The questions about screen time in Ferguson (2017) are presented in present tense ("On an average school day, how many hours do you watch TV"), but the author does not detail how all outcomes were assessed. If they were equally assessed in present, the causal relationship between screen time and outcomes is unclear. In the 2013 State and Local Youth Risk Behavior Survey from which data is drawn (CDC, 2013), most of these outcomes were assessed in the past tense (e.g., "During the past 12 months, how many times were you in a physical fight?", "During the past 30 days, on how many days did you carry a gun?"), or it referred to the entire life (e.g., "During your life, on how many days have you had at least one drink of alcohol?). In that case, the "outcome" would happen before the "exposure". Consequently, caution should be exercised when interpreting the results, refraining from inferring causal relationships that have not been statistically confirmed or refuted.

2.7. *The authors extrapolate their conclusions from one age range to another, without making distinction between what is concluded and proper to one age or another in the literature*

Conclusions for a specific age range cannot be extrapolated to another. Doing so is a mistake because the implications for different age ranges is different (e.g. the effects on neurodevelopment during the critical period of development in early years). In fact, Madigan *et al.* (2020) acknowledges that too much screen exposure, regardless of quality, is associated with lower language skills in early years:

> Although better quality of screen exposure was associated with language skills, too much screen exposure, introduced too early in development, is associated with lower language skills. Thus, consistent with the pediatric guidelines, high-quality screen programming should be used in moderation and should not replace important individual or family activities and health behaviors, such as device-free family interactions, adequate sleep, book reading, and active play (Madigan *et al.*, 2020, p. E8).

The Review says: "our process yielded 252 unique effect–outcome combinations (retaining multiple effects for different age groups or study designs) contributed from 102 reviews" (Sanders *et al.*, 2023, p. 2). It then recognizes the limitation of not giving age-specific results:

> Largely owing to a small number of studies or missing individual study data, there were few age-based conclusions that could be drawn from reviews that met our criteria for statistical certainty. Given the differences in development across childhood and adolescence and the different ways children of various ages use screens, further examination of age-based differences is needed. However, in the absence of this work, our study showed how children are affected by screens in general (Sanders *et al.*, 2023, p. 6).

However, while it acknowledges that limitation, the Review fails to take it into consideration when concluding that, in light of their findings, current screen use guidelines should be reviewed. Time limitation in current screen use guidelines is age specific: each age is supported by a different set of evidence and there is a different argumentation for every age range. This argumentation is not addressed at all. The authors call for a looser approach to time limitation without specifying any age range.

2.8. *Pediatric recommendations are baseline or minimum standard; educational recommendations should not be laxer, but rather stricter*

Pediatric recommendations are a baseline or minimum standard to avoid potential developmental harmful effects for public health reasons. Education, however, cannot conform itself to baseline or minimum standards that aim at avoiding public health issues. Education deals with learning, so it should aim at excellency. Its methods should be evidence-based and meet a double burden of proof: it should be proven that they should positively contribute to education and proven that they do not to have any undesirable collateral effect. In fact, the Review recognizes the needs to balance the negative effects against the positive ones:

> By analogy, reading is a sedentary behaviour, and only by comparing the health risks against the educational benefits can researchers and policy makers make clear recommendations about what young people should do (Sanders *et al.*, 2023, p. 2).

The Review reports that e-books were positively associated with learning. It should have gone further. On one hand, it should balance the benefits in relation with the downsides associated with educational method. On the other hand, it should compare the benefits and the downsides of e-book reading with reading on paper. While screen use may have general collateral negative effects, reading on paper usually does not (Li et al., 2024). The Review does not offer information regarding the risks associated with either reading method.

2.9. *The literature that it brings to argue for positive effects on education is deficient; instead of comparing homework done with a computer versus homework done on paper, it compares much versus little time dedicated to doing homework*

The Review cites another study (Sanders et al., 2019) to support the claim that "Indeed, educational screen use is positively related to educational outcomes" (Sanders

et al., 2023, p. 2). Once again, the detail of the study introduces nuances that are not taken into consideration in the Review's discussion. In this study, 4013 students from 10 to 15 years old were involved. Overall screen time was associated with worse educational outcomes; however, educational screentime (defined as time using an electronic device to do homework) showed positive effects. What is compared in this study is not the time doing homework 'using electronic devices' versus 'using paper'; the study compares the amount of time students do their homework using electronic devices. So, in a context where students are expected to use their computers to do their homework, what the study is really comparing is students investing more time doing their homework with electronic devices versus those who spend little time doing so. In the absence of a control group, the authors cannot conclude that "educational screen use is positively related to educational outcome" (Sanders *et al*., 2023, p. 2) because it is more likely that the positive effect is due to the time invested in doing the homework, rather than to the device that is used to do it. In fact, in Figure 2 (Sanders *et al*., 2019), the two variables "school achievement" and "persistence" behave in a similar way; it supports the hypothesis that rather than time spent on the device, what matters is persistence, effort and dedication.

2.10. *The interpretation that the Review makes to argue for positive educational effect of touchscreens is incorrect; the Review fails to report a key conclusion found in one of the studies that it uses: touchscreens cannot be suggested as educational intervention because it must still be proven that there is no potential adverse effect*

The Review concludes that it "found evidence that touch screens had strong evidence for benefits on learning" (Sanders *et al*., 2023, p. 6) referring to Xie et al. (2018). However, this study does not conclude that way, but rather that:

> Young children benefited more from touchscreen learning when comparing touchscreen with baseline [non learning situation] than when comparing it with other non-touchscreen learning methods [such as traditional classroom teaching, mouse-based computer, paper, physical objects, etc.]. The comparison between touchscreen and baseline reflects the effect of touchscreen per se. (Xie *et al*., 2018, p. 12)

The authors consider that this study brings strong evidence, but we consider that there is a series of conceptual issues in its design. For example, it discusses touchscreen learning as a "physical experience" and discusses the "physical interactivity" that occurs between the child and the touchscreen. Touchscreens do not provide a physical experience, but rather a virtual one, triggered through the movement of a finger, not through manipulation. Also, physical interactivity occurs between two persons, not between a person and a screen. In fact, the study does not discuss the 'video deficit effect' discussed in the pediatric literature (AAP, 2016a) which emphasizes the importance of 3D real-life experience for learning in comparison

with the interaction with a flatscreen. As mentioned earlier in the pediatric literature, children learn from sensorial experiences and from human interactions with principal caregivers. It would have been interesting to compare touchscreen with the methods that attune with the way children are known to learn from 0-5 years old. For example, traditional classroom teaching tends to be an inadequate comparison standard for children in preschool age and for babies because it is usually done through verbal direct instruction or explanation, which requires the capacity for abstraction that is not yet developed at that age.

It would have been interesting to know how learning was measured as well. If children are taught to mechanically repeat exercises on the screen by moving virtual objects using the external motivation provided by digital stimuli, they may have learnt to master repetition on the screen, but that does not mean that they have understood what they have done, and that they can replicate it in another context. So, this is more like a behaviorist approach to learning than real learning where the child has a deep sense of agency.

Actually, the effect was larger when learning was tested through touchscreen devices, lower when it was tested using paper, even lower (and less significant) when using physical objects, and negligible when tested orally. We wonder what the effect would be in studies where the comparison group is not baseline and the test is not done through touchscreen devices (Xie *et al.*, 2018).

As explained earlier, Sanders *et al.* (2023, p. 6) use this study to conclude that there is "strong evidence for benefit on learning" in touchscreen and disregard this limitation.

On the contrary, Xie *et al.* (2018) prudently conclude:

> However, it should be acknowledged that touchscreens are not suggested as educational intervention techniques in any condition or at any age point because the current study cannot respond to the question whether using touchscreen devices has underlying negative influence on other aspects (e.g., sleep quality, the ability of deferred gratification) (p. 12).

So, on one hand, the Review criticizes the limitation of specific studies and points out to the need for its Review, arguing that "focusing on a single domain or exposure makes it difficult to understand what trade-offs are involved in any guidelines around screen use" (Sanders *et al.*, 2023, p. 2). On the other hand, it concludes that there is a need to review current guidelines, moving from a 'reducing screen use' approach towards a 'focusing on the type of screen use' approach. It bases its finding of "strong evidence for benefit on learning" in a study that calls for precaution and specifically says that it does not suggest that this type of screen be used for educational intervention. The 'reducing screen use approach' found in screen guidelines is exactly that: the result of a trade-off between potential educational or developmental benefits and potential adverse health and development effects (AAP, 2011). The Review fails to discuss these trade-offs in a meaningful way.

It discusses some of the variables involved in the screen use literature, such as obesity, depression, and literacy, but fails to address other key variables such as deferred gratification, neurodevelopment, inattention, addictions, problematic Internet use, or dealing with basic issues discussed by current screen use guidelines for early ages, such as the displacement effect and the video deficit effect.

2.11. *The authors suggest that the results of their Review have unveiled a new "complexity"; yet they consider that current screen use guidelines should be reviewed even before this complexity is further investigated*

The Review says:

> Our findings suggest that screen use is a complex issue, with associations based not just on duration and device type but also on the content and the environment in which the exposure occurs. Many current guidelines simplify this complex relationship as something that should be minimized. We suggest that future guidelines need to embrace the complexity of the issue m…… (Sanders *et al.*, 2023, p. 6).

When a new complexity is found, this complexity must be further investigated, clearly defined and resolved before new recommendations are made. In this case, the prudent conclusion should have been to aim in the direction of future investigation.

In any case, when the Review claims that "many current guidelines simplify this complex relationship" (Sanders *et al.*, 2023, p. 6), it fails to cite the pediatric recommendations that do take more aspects into consideration than the Review does (e.g. age-specific recommendations; trade-offs between potential educational and developmental benefits and potential harmful health and development effects; variables and principles such as the displacement effect, the video deficit effect, etc.).

2.12. *Prudence and precaution are necessary, considering that the majority of screen use research relies on self-reported data*

The authors are aware of the potential bias in screen use research: most measurement tools for both screen-time and screen effects are self-reported:

> Screen-use research has a well-established measurement problem, which affects the individual studies of this umbrella review. The majority of screen-use research relies on self-reported data, which not only lacks the nuance required for understanding the effects of screen use but may also be inaccurate (Sanders *et al.*, 2023, p. 7).

They even recognize that it poses a serious validity problem: "It has been established that self-reported screen use data have questionable validity" (p. 7). It is surprising that the authors, aware of this serious bias, conclude that screen use guidelines should be less restrictive.

2.13. *Results do not support a "there is no problem" conclusion*

Despite covering the 0-to-18 years range of age, the variables measured are insufficient. It is especially so given that their objective is to discuss a "holistic perspective" (Sanders *et al.*, 2023, p. 8), but also in comparison to the variables used to define pediatric guidelines (which the Review is questioning). The Review does not mention cyberbullying, self-harm, risky content access, problematic online behaviors, suicidal ideation, online grooming, sexting, among others.

As mentioned previously, the interpretation of the results of some studies used to support its conclusions is ambiguous. When the evidence found is low, the standard recommendation would be to recommend further research, not a revision of current public health recommendations on screen use.

2.14. *There are specific issues in relation with the methodology and theory about umbrella reviews*

In a systematic review, it is necessary to come with a clear, concrete, and structured clinical question or hypothesis. In this study the question is diffuse: "The primary goal of this review was to provide a holistic perspective on the association between screen use and a broad range of health- and education-related aspects of children's lives." (Sanders *et al.*, 2023, p. 8). The objective is so broad that all possible outcomes are not likely to be embraced. Furthermore, by synthesizing all areas of life (for example, school and home), defining the study population as 0 to 18 years old and cover many screen types, the search strategy is also excessively broad. In fact, Choi & Kang, (2022) say that "typically, the umbrella review imposes overall coherence by dividing a broad issue into targeted populations, interventions, or both" (p. 127). Also, Belbasis et al. (2022) highlight that, despite having broader eligibility criteria than systematic review and meta-analysis, "the exact breadth should be carefully defined to ensure that the umbrella review is informative and comprehensive from a clinical or scientific perspective" (p. 4).

Furthermore, two golden rules for umbrella review are to clearly define the variables of interest and acknowledge the limitations (Fusar-Poli, 2018). In this case, the Review does not define age as a relevant variable. It did acknowledge age extrapolation as an intrinsic limitation but did not take this limitation into consideration in its conclusions. On one hand, the title of the Review refers to "youth"; on the other hand, the Review covers 0-18 years old and makes recommendations that are not age specific.

The validity of umbrella review findings depends on the quality of the eligible systematic reviews and meta-analyses. "Quality problems and biases might also exist in primary studies and in the umbrella review process itself, and these problems and biases could be compounded and difficult to clarify" (Belbasis *et al.*, 2022, p. 2).

We consider that the Review does not appropriately take this into consideration. In fact, it uses the National Heart, Lung and Blood Institute's Quality Assessment Tool for Systematic Reviews and Meta-Analyses that, although it could be useful, is not a standardized tool (National Heart, Lung, and Blood Institute, 2021). A validated tool might have been used to minimize quality problems and biases (Fusar-Poli & Radua, 2018). Also, the Review addressed several studies without a control group, as noted by Sanders *et al*. (2023) in the tables 'Associations between exposures and education outcomes' (p. 7) and 'Associations between exposures and health-related outcomes' (p. 8). This is an especially important issue.

Furthermore, the variables of interest are too limited, in comparison to those used to define pediatric guidelines.

Finally, the inclusion/exclusion criteria stated in the protocol (PROSPERO CRD42017076051) and in the Review are not specific enough, which makes the replication of the Review very difficult.

3. Conclusion

It must be acknowledged that pediatric associations' recommendations are not merely educational; they are public health guidelines. What does that mean? On one hand, they are not a mere consensus of researchers' or experts' opinions; they are supported by scientific evidence of high methodological quality and issued on behalf of a recognized professional body. On the other hand, they are based on the "first, do not harm" Hippocratic oath principle (Christakis, 2010).

For an effect to be relevant from an educational point of view, it should be a significant positive effect size; "low or moderate positive effects" are not necessarily enough when there might be other unknown or potential adverse correlative effects. On the contrary, even a small negative effect should raise concern when discussing potential adverse health or developmental effects. Even if the risk is low, it is sufficient to justify prudence and precaution, considering what is at stake. The Review's conclusions could have been that further studies are necessary to better understand the impact of screens in clearly defined aspects and populations.

All in all, the Review's conclusions do not support the idea that public health recommendations on screen use should be reviewed.

Innovation and obsolescence are at the core of the technology industry's business model, for which reason its products will tend to be ahead of the investigation. Answering the question of 'what will or might not necessarily happen' if our children use a device occasionally or continuously might be interesting from a theoretical point of view, but investigators have a social responsibility to be cautious in their statements, especially when they go astray from public health recommendations.

Absence of evidence is not evidence of absence and investigators should be careful in questioning public health recommendations on the basis of incomplete

evidence (Salmerón-Ruiz *et al.*, 2024). In an article published in *The Conversation*, the authors of the Review said: "We found some things that should reassure parents […]. It's not the screen itself that really matters but what's on it and the way kids use it […]. 'Screen time' is a bit of a useless term" (Lonsdale et al., 2023). In the aftermath of the Review's publishing, headlines came out with statements that did not nuance its findings on the basis of ages, some of them suggesting that new evidence had emerged putting in question the public health recommendations on screen use: "Experts affirm that, for the moment, the data does not justify the alarm about the use of screens and call for not making judgment about the devices but rather on the use that is made with them" (Mediavilla, 2023); "Screen effects in youth: not good nor bad, it depends on the content […]. It is not about screen time but rather about content" (Palomo, 2023).

Not finding evidence of association between screen use and delinquent behaviors in teenagers such as carrying a gun is not enough to meet the burden of proof that leads to supporting the claim that there is no evidence to justify parents' concern and to recommend a looser approach to current screen use guidelines. Also, finding insignificant or moderate educational benefits might not be enough to compensate for the potential, known or unknown, harmful effects (some of which have not been discussed at all in the Review). Rather, the burden of proof is double: it must demonstrate that digital devices bring significant educational and developmental benefits and that they do not bring potential adverse health and developmental effects. This exercise must be done for each age range, specifically. These burdens of proof were not met.

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