HHS Public Access

Author manuscript

J Pediatr Health Care. Author manuscript; available in PMC 2023 March 21.

Published in final edited form as:

J Pediatr Health Care. 2022 ; 36(2): 99–109. doi:10.1016/j.pedhc.2021.06.003.

Screen Media Overuse and Associated Physical, Cognitive, and Emotional/Behavioral Outcomes in Children and Adolescents: An Integrative Review

Jianghong Liu, PhD, RN, FAAN [Professor of Nursing],
Department of Family and Community Health, University of Pennsylvania School of Nursing, Philadelphia, PA.

Susan Riesch, PhD, RN, FAAN [Professor Emeritus],
School of Nursing, University of Wisconsin-Madison, Madison, WI.

Joyce Tien, BA,
University of Massachusetts Medical School, Worcester, MA.

Terri Lipman, PhD, CRNP, FAAN [Professor of Nursing],
Department of Family and Community Health, University of Pennsylvania School of Nursing, Philadelphia, PA.

Jennifer Pinto-Martin, PhD, MPH [Proessor of Nursing],
Department of Family and Community Health, University of Pennsylvania School of Nursing, Philadelphia, PA.

Ann O'Sullivan, PhD, FAAN, CRNP [Professor of Nursing]
Department of Family and Community Health, University of Pennsylvania School of Nursing, Philadelphia, PA.

Abstract

Introduction: Screen media overuse is seen as a public health concern because of its negative effects on child and adolescent health. This integrative literature review examines recent empirical evidence on the relationship between screen media overuse and physical, cognitive, and emotional/behavioral outcomes in children and adolescents.

Methods: Empirical research of experimental design, observational studies, and systematic reviews from several data sources was reviewed and synthesized to form the basis of this integrative review.

Results: Screen media overuse is associated with poor sleep quality, shorter sleep duration, greater likelihood for overweight/obesity, lower executive functioning, poorer academic performance, and increased internalizing and externalizing problems. Bidirectional associations may exist.

Correspondence: Jianghong Liu, PhD, RN, FAAN, Department of Family and Community Health, University of Pennsylvania School of Nursing, Claire M. Fagin Hall Room 426, 418 Curie Blvd., Philadelphia, PA, 19104; jhliu@nursing.upenn.edu.

Conflicts of interest: None to report.

Discussion: Findings support the importance of understanding the impact of screen media use on health and wellbeing. Generating screen time guidelines and developing effective prevention/intervention strategies are critical to mitigating screen media overuse and its adverse outcomes in children and families.

Keywords

Screen media overuse; sleep; obesity; cognition; internalizing/externalizing; children/adolescents

INTRODUCTION

In today's digital age, the rising prevalence of screen media use in the daily lives of children and adolescents is an increasingly important public health concern, with exposure beginning as early as infancy (Kabali et al., 2015; Riesch et al., 2019; Trinh et al., 2020). The interactive ability, entertainment value, and increasing mobility of using devices such as television, phones, tablets, laptops, and computers, have led to their rapid integration into the day-to-day lives of youth. In the past two decades, screen time among children aged 0−2 years have doubled (Chen & Adler, 2019). Furthermore, 95% of adolescents report having access to smartphones, a 22% increase in 3 years (Anderson & Jiang, 2018). Concerningly, 39% of children in the U.S. report feeling addicted to their mobile devices, and 58% feel distracted by their mobile devices at least once per day (Robb, 2019). Although electronic devices have revolutionized learning, communication, and the dissemination of information, recent data have suggested that screen media use may have significant negative repercussions on child and adolescent health in both the short and long term, rendering this a pressing public health issue (Riesch et al., 2019). Nevertheless, research on the effects of screen media overuse continues to lag behind the rate at which they are being adopted (Kabali et al., 2015; Radesky, Schumacher, & Zuckerman, 2015; Liu et al., 2019).

Given the adverse public health consequences linked with screen media overuse, understanding these associations is critical for the development of evidence-based guidelines on creating a safe and healthy digital environmental for children and adolescents. The current literature review aims to comprehensively examine the empirical evidence on the relationship between screen media overuse and its associations with physical (sleep problems and obesity), cognitive (executive functioning and academic performance), and emotional/behavioral factors (internalizing/externalizing problems) outcomes (Figure), as well as their potential mechanisms of action. Specific strategies and recommendations for research, policy, and practice to prevent screen media overuse problems in children and adolescents will also be addressed.

METHODS

EBSCO, Web of Science, PubMed, Google Scholar, and Scopus databases were used to search for studies examining the association between screen media overuse and physical, cognitive, and emotional/behavioral problems, using keywords "screen media use" in combination with "sleep," "overweight/obesity," "executive functioning," and "internalizing/externalizing." All relevant articles, including experimental research, cross-sectional and

longitudinal epidemiological studies, and systematic reviews, were reviewed and synthesized in this integrative review.

Association Between Screen Media Overuse and Associated Outcomes

This section reviews empirical evidence on the association between screen media overuse and various associated outcomes. A summary of key findings is reported in Table 1.

Screen media overuse—Currently, there exists much debate surrounding the definition of screen media overuse. Most studies examine hours of use, with large variation in the conceptualization of "overuse." For example, some studies characterize "overuse" as 4−6 hr/day for pre-adolescents and over 10 hr/day for adolescents (Parent, Sanders, & Forehand, 2016), whereas others have suggested 3 hr or more of electronic gaming daily in children (Przybylski, 2014). Apart from duration of use, recent research is also investigating other measures of overuse, including parental use (Robb, 2019), the number of electronic devices in the household (Chaput et al., 2014), and environment/timing/frequency of use (Huber, Highfield, & Kaufman, 2018; Moorman, Morgan, & Adams, 2019). Furthermore, the debate regarding screen media overuse may be more nuanced than simply examining the variables used to measure "overuse." For example, the Royal College of Paediatrics and Child Health's recent screen time guidelines emphasize that the amount of use is not the issue; rather, it is the activities, such as sleep, exercise, and socializing, displaced by screen media use that is the cause for concern and should be further investigated. Taken together, the variability in the conceptualization of media overuse suggests the lack of consensus on safe practices with regard to screen media use. Given the wide range of measures, overuse is operationally defined in this review as screen media use that interferes with an individual's daily functioning and wellbeing as determined by physical, cognitive, and emotional/behavioral problems.

Physical Health Outcomes

Sleep problems—Adequate sleep is critical for children's and adolescents' physical and psychosocial development (Liu, Glenn, Cui, & Raine, 2021). However, according to the Centers for Disease Control and Prevention, 57.8% and 72.7% of middle and high school students, respectively, in the U.S. report short sleep duration (Wheaton, Jones, Cooper, & Croft, 2018), rendering insufficient sleep and other sleep problems a significant public health issue. Screen media use is one vital factor that has long been associated with reduced sleep duration and poor sleep quality (Riesch et al., 2019). These effects have been broadly studied with consideration for the type, timing, content, environment, and duration of screen media use across infancy, childhood, and adolescence. A cross-sectional study of 715 infants and toddlers from the United Kingdom reported that increased frequency of portable touchscreen device use was associated with reduced sleep duration, longer sleep onset, and increased daytime sleepiness; with every hour of screen media use, nearly 16 min of total sleep was lost per day (Cheung, Bedford, Saez De Urabain, Karmiloff-Smith, & Smith, 2017). Longitudinal analyses of United States (Cespedes et al., 2014) and Thai (Vijakkhana, Wilaisakditipakorn, Ruedeekhajorn, Pruksananonda, & Chonchaiya, 2015) infants demonstrated similar results, with greater screen media exposure predictive of 7 and 28 min fewer total sleep per day, respectively. Among children and adolescents, a strong

and consistently reported association exists between screen media use and sleep problems, with even higher usage times and prevalences (Calamaro, Mason, & Ratcliffe, 2009).

Although most research has focused on the potential negative impact of screen media use on sleep, the relationship may be bidirectional. In a longitudinal study of Australian children, Magee, Lee, & Vella (2014) found that not only does increased screen media use predict shorter sleep duration, but also shorter sleep duration was associated with increased subsequent screen time, especially for television (TV) viewing. This reciprocal relationship may be due to shorter sleep, leading to tiredness, fatigue, and reduced energy, and promoting engagement in sedentary behaviors, including screen media use.

Overweight and obesity—According to the American Academy of Pediatrics (AAP), screen media use plays an important role in the current global child and adolescent obesity epidemic (Communications & Media, 2011). In addition, epidemiological studies have consistently demonstrated significant positive associations between screen media use and obesity. For example, a recent United Kingdom cross-sectional study (N = 4,495) using child self-report measures and objective measures of physical activity, fasting cardiometabolic risk marker assessments, and anthropometry measurements found strong, graded associations between screen time and adiposity (Nightingale et al., 2017). This finding was consistent with several previous cross-sectional studies in children from Australia (Hesketh, Wake, Graham, & Waters, 2007; Robinson, Daly, Ridgers, & Salmon, 2015), Denmark, Estonia, and Portugal (Ekelund et al., 2006). Longitudinal cohort studies revealed similar results, indicating a strong, dose−response relationship between television viewing time per day and the prevalence of overweight in children aged 10−15 years (Robinson et al., 2017). However, several of these studies did not adjust for race/ethnicity or socioeconomic status, key roles in overweight/obesity, potentially leading to uncontrolled confounding (Wang & Zhang, 2006; Whitaker & Orzol, 2006).

A few randomized controlled trials have found direct causal effects of reducing screen time in community settings on reducing weight gain in children. For example, in a randomized controlled school-based trial of elementary school children, students in the intervention group received classroom lessons on reducing TV and video game over 6 months. Although body mass index (BMI) increases were observed in both groups over the school year, there were statistically significant decreases in TV viewing and significantly slower relative increases in BMI in the intervention group (Robinson, 1999). A later study found that children and families receiving screen time reduction interventions demonstrated significant decreases in television viewing/computer use and BMI compared with controls. These changes persisted for 2 years and were mediated by reductions in dietary energy intake. Interestingly, TV viewing is most consistently associated with increased BMI (Bickham, Blood, Walls, Shrier, & Rich, 2013; Falbe et al., 2013), possibly because of the influence of TV commercials that advertise energy-dense, micronutrient-poor foods, and excessive snacking while watching TV.

Adverse Cognitive Outcomes

For children's and adolescents' cognitive outcomes, screen media use may have both positive and negative consequences. Screen media devices have the potential to create a positive impact on learning and education. For example, promising research has indicated that digital educational games, learn-to-read apps, and electronic books may enhance children's early literacy skills (Kucirkova, 2014; Neumann, 2014; M. Neumann & D. Neumann, 2014) and creative thinking abilities (Doron, 2017). Emerging data suggest that these positive cognitive benefits may be influenced by several factors, including the age of the child (Anderson, Subrahmanyam, & Cognitive Impacts of Digital Media Workgroup, 2017), quality and kind of interactive media, and type of guidance provided by parents and/or teachers (M. Neumann & D. Neumann, 2014).

In contrast, studies have also supported adverse consequences of screen media use on several cognitive domains, including sensorimotor development, executive functioning, and academic outcomes (Suggate & Martzog, 2021; Liu et al., 2020). A study found that young children who watched fast-paced, fantastical shows intended to be educational had lower executive functioning than children in a control group who either played or watched a slow, realistic show (Lillard, Drell, Richey, Boguszewski, & Smith, 2015). In adolescents, frequent media multitasking was found to be negatively associated with executive functioning, specifically working memory, inhibition, and the ability to shift between tasks (Baumgartner, Weeda, van der Heijden, & Huizinga, 2014).

Addressing academic outcomes, studies across several age groups have demonstrated negative effects of screen media use. During infancy, the Quebec Longitudinal Study of Child Development cohort study found that each 1-hr increase of TV exposure at 2 years of age corresponded to a 7% unit decrease in classroom engagement and a 6% unit decrease in math achievement (Pagani, Fitzpatrick, Barnett, & Dubow, 2010) in the fourth grade, indicating a lasting association between early screen media exposure and cognitive abilities. In adolescence, a Spanish study found academic performance to be inversely related to screen media use (Peiró-Velert et al., 2014), and a U.S. study similarly found greater media multitasking was linked to statistically significant poorer performance on standardized test scores measuring academic performance in math and English (Cain, Leonard, Gabrieli, & Finn, 2016). During young adulthood, several studies have found a negative relationship between screen media use and college students' test performance and grade point average (Jacobsen & Forste, 2011; Walsh, Fielder, Carey, & Carey, 2013); however, adverse academic outcomes may be confounded by the poorer attention and focus from multitasking behaviors rather than solely from screen media overuse, and more research is necessary to tease out this relationship. Thus, there are significant, albeit indirect, effects of screen media use on academic outcomes.

Emotional/Behavioral Problems

Internalizing behavior—A growing body of research has demonstrated the relationship between screen use and internalizing behavior problems, including depression, anxiety, suicidal thoughts and behaviors, feelings of loneliness, and low self-esteem. Multiple studies with high school students have shown positive associations between depression and anxiety

symptoms and increased use of both mobile phones (Demirci, Akgönül, & Akpinar, 2015) and the Internet (Jenaro, Flores, Gómez-Vela, González-Gil, & Caballo, 2007). Data from two nationally representative surveys on U.S. adolescents since the 1990s revealed a stark increase in depressive symptoms and suicide-related outcomes (Twenge, Joiner, Rogers and Martin, 2018) because of the rise in media use and the subsequent decline in engagement in nonmedia-related activities. More recently, a sample of 11,831 adolescents from the Shandong Adolescent Behavioral and Health Cohort (Liu et al. 2019) found that mobile phone use of over 2 hr/day on weekdays and 5 hr/day on weekends were associated with depressive symptoms. However, these associations were partially mediated by short sleep duration and insomnia, suggesting that the effects of mobile screen media use on mental health may result, at least in part, from the direct effect of sleep disturbances. Thus, there is a need for further research examining the dynamics between screen media use, mental health disorders, and sleep.

In addition to its effects on depression and anxiety, recent research has demonstrated the positive association between the use of screen media and loneliness (Caplan, 2007; Kim, LaRose, & Peng, 2009). A study conducted on Chinese students demonstrated that those who scored higher in loneliness on the UCLA Loneliness Scale were more likely to demonstrate addictive use of their smartphones (Bian & Leung, 2015). Moreover, this compensatory use of media only serves to exacerbate these feelings of loneliness by increasing isolation and negatively reinforcing the behavior (Kim et al., 2009). Thus, the relationship between screen media use and loneliness is likely bidirectional.

Similarly, self-esteem may be negatively impacted by extensive screen media use (Ha, Chin, Park, Ryu, & Yu, 2008). A large cross-sectional study conducted on Taiwanese adolescents revealed a relationship between mobile phone use and low self-esteem (Yang, Yen, Ko, Cheng, & Yen, 2010). Conversely, students reporting low self-esteem were more likely to spend time using mobile phones and become addicted than those reporting high self-esteem (Ehrenberg, Juckes, White, & Walsh, 2008). Therefore, the directionality of the association between self-esteem and screen media use is unclear, and further research is needed to determine the mechanism behind this relationship.

Externalizing behavior—Many studies have investigated the impact of screen media use on externalizing behavior across childhood, including attentional deficits, hyperactivity, aggression, and delinquency. In a longitudinal study of U.S. toddlers, increased TV exposure before the age of 3 years was associated with attentional problems at school age, with a one standard deviation increase in TV viewing time associated with a 28% increase in the probability of attentional problems at age 7 years (Christakis, Zimmerman, DiGiuseppe, & McCarty, 2004). A longitudinal cohort study of Latino toddlers yielded similar results, with screen media use at 21 months significantly associated with aggressive behavior and overall externalizing problems at 33 months (Tomopoulos et al., 2007). These effects have also been observed during adolescence, in which screen media use is linked with conduct disorders (Galica, Vannucci, Flannery, & Ohannessian, 2017), attention deficit hyperactivity disorder symptoms, aggression, and delinquency (Holtz & Appel, 2011). Nevertheless, other researchers have found inconsistent results between screen media use and externalizing behavior. Among a cohort of 6,595 U.S. adolescents, Riehm et al. (2019) found that

although social media use is associated with increased risk of comorbid internalizing and externalizing problems, it shares no association with externalizing symptoms alone. These mixed results demonstrate the need for more extensive research on the long-term effects of screen media use on externalizing behaviors.

Although numerous studies have demonstrated the negative impact of screen media overuse on externalizing behavior, a considerable number have not adjusted for violent content as a potential confounder, making it possible that it is the content being viewed, rather than overuse itself, that is associated with externalizing symptomology in children. For example, in a randomized controlled trial of preschool-aged children in which aggression-laden programming was substituted with high-quality, prosocial, and educational programing without reducing total screen media use time, investigators found that children demonstrated better scores on the Social Competence and Behavior Evaluation by 2.11 points 6 months postintervention, as well as significantly lowered angry, aggressive, and oppositional behavior (Christakis et al., 2013). By focusing on content rather than quantity, the results of this study indicate that violent content may mediate the adverse relationship between screen media use and externalizing behavior, warranting a need for future studies to further elucidate these interactions.

Potential Mechanisms

To date, the specific mechanisms of action through which screen media overuse acts on physical, cognitive, and behavioral consequences in children and adolescents are not well understood; however, several potential mechanisms have been proposed. In terms of sleep changes, screen media use near bedtime may act as a direct displacement of sleep, cause physiological arousals that make it more difficult for children and adolescents to relax and suppress melatonin production by blue light emission from electronic devices that leads to subsequent circadian rhythm delay (Hersh, Sisti, Richiutti, & Schernhammer, 2015). In turn, these problems lead to reduced total sleep time, longer sleep latency, later bedtimes, and altered sleep architecture, thereby contributing to overall poor sleep quantity and quality. With respect to obesity, the displacement of physical activity by increased screen-based sedentary lifestyle (LeBlanc et al., 2015), increased caloric intake via cravings for unhealthy snack foods and sweetened drinks during TV watching and video game playing (Borgogna et al., 2015), and exposure to advertisements of calorie-dense foods with low nutritional value (Robinson et al., 2017) have all been suggested as potential mechanisms.

The displacement hypothesis suggests the mechanism through which excessive media exposure may influence learning and thereby affect cognition (Huston, Wright, Marquis, & Green, 1999). It proposes that screen media use, a highly reinforcing activity that is low in cognitive complexity, displaces academic behaviors, such as studying, material preparation, and class attendance. Furthermore, screen media activities like video gaming may generate physiological arousal that produces alterations in the processing and shaping of child and adolescent neural networks (Green, Li, & Bavelier, 2010).

Increasingly, literature has found sleep to be a significant mediator of the relationship between internalizing and externalizing behavior and screen media use. Because sleep is significantly related to mood regulation, children and adolescents with sleep disruptions

because of screen media use may face a greater likelihood of anxious, depressive, withdrawn, aggressive, and oppositional behavior (Palmer & Alfano, 2017). Apart from biological mechanisms, the type of content (prosocial/educational content vs. violent content) may also contribute to the development of emotional/behavioral problems (Christakis et al., 2013). More research is necessary to elucidate the psychological and neural mechanisms that underly the relationships between screen media use and its wide array of adverse physical, cognitive, and behavioral/emotional outcomes, as well as their possible shared complex, interconnected mechanistic relationships.

Directionality: Potential Converse Associations

Screen media overuse and its associated adverse outcomes are the focus of this review. However, one important caveat that should be considered is the possibility of potential converse associations, depicted as dashed arrows in the Figure. Emerging research has demonstrated bidirectional associations between several variables, including sleep, obesity (Hashem et al., 2019), executive functioning, internalizing/externalizing behaviors, and screen media overuse. Several studies have found that children/adolescents with decreased sleep quality/quantity (Magee et al., 2014), lowered self-regulation/overall executive functioning (Cliff, Howard, Radesky, McNeill, & Vella, 2018), symptoms of depression, anxiety (Houghton et al., 2018), and loneliness (Kim et al., 2009), decreased self-esteem (Ehrenberg et al., 2008), interpersonal skills (Poulain et al., 2018), and increased impulsivity/attention problems (Gentile, Swing, Lim, & Khoo, 2012) may spend more time on-screen media devices, which subsequently further exacerbates existing problems. Thus, future research using longitudinal or randomized control trial study designs are critically needed to tease out the directionality of these associations.

IMPLICATIONS

The use of screen media has rapidly improved the availability of information and increased the convenience of communication. Despite these positive effects on society, screen media overuse has repeatedly been shown to negatively impact health outcomes, especially among children and adolescents. Although children and adolescents are most susceptible to the harmful effects of screen media, the physical, cognitive, and behavioral outcomes potentially caused by screen media use can have far-reaching effects carrying into adulthood and later life, underscoring the need for strategies to prevent screen media overuse and its associated detrimental effects. Table 2 summarizes the key strategies and recommendations for preventing screen media overuse in children and adolescents.

Given the wide array of methodological limitations that exist in screen media research to date, future research should seek to address these shortcomings. Specifically, considerable research currently relies on parental or youth self-report, but seldom by both parents and youth, or by other sources such as teachers, rendering the data susceptible to substantial inaccuracies and biases (Marshall, Gorely, & Biddle, 2006). Future studies should use rigorous screen media use measurement methods, such as direct observation or usage monitoring programs installed within screen media devices, as well as multiple reports from youth, parents, and teachers, to obtain comprehensive, accurate data (Segev et

al., 2015). Another limitation widely existing in current research is the use of cross-sectional, survey, correlational, and observational study designs, raising issues of duration of findings and temporal precedence. Large, population-based randomized controlled trials are necessary to establish causality and elucidate the potential mechanisms involved in the pathways between screen media overuse and adverse physical, cognitive, and emotional/behavioral outcomes. In addition, confounders, including parent/family/peer network use of screen media (Ferguson, 2017), level of in-person social interaction (Twenge, Martin and Campbell, 2018), diet, exercise, behavioral/emotional problems, and other activities of daily living, should be controlled in future research to enhance the accuracy and validity of findings. Researchers should also perform comprehensive assessments of screen use type, content, context, environment, parental mediation, and timing (Straker, Zabatiero, Danby, Thorpe, & Edwards, 2018), as well as examine effective implementation methods to promote sustained positive behavioral change in reducing screen media overuse.

In addition to implications for future research, several strategies may also be implemented regarding policy and practice. Children and adolescents can prevent screen media overuse by reducing engagement in recreational sedentary screen time and engage in alternate hobbies and activities such as exercise, reading, arts and crafts, and listening to music (Jongenelis, Scully, Morley, Pratt, & Slevin, 2018); reducing media multitasking behaviors and use of social networking sites; limiting use of screen media while in class, studying, or doing homework (Jacobsen & Forste, 2011; May & Elder, 2018); and developing self-regulated rules/routines for screen media use that balance school work with entertainment. Parents and caregivers should also play a role by following the AAP family media use plan (http://www.healthychildren.org/MediaUsePlan), considering the appropriate screen media types and behaviors for each child (Reid Chassiakos et al., 2016); placing consistent limits on the duration of screen media use; designating media-free times, including mealtimes, parent−child playtimes, and an hour before bedtime; removing screen media devices from children/adolescents' bedrooms (Council on Communications and Media, 2016b); working with adolescents to develop consistent routines that limit screen media use and help them develop the ability, responsibility, and autonomy to self-regulate screen media use; modeling healthy screen use by limiting parental screen media use (Canadian Paediatric Society & Digital Health Task Force, 2019); and fostering increased physical activity and reduced sedentary behavior in the home (Carlson et al., 2010).

Moreover, health care providers should ask parents/caregivers about their family's screen media use; provide information about benefits and health risks of screen media use and educate families on recommended use guidelines during well-child visits (Radesky, Schumacher, & Zuckerman et al., 2015); help parents/caregivers create screen media use guidelines to meet the individualized needs of each family; and assess children and adolescents for the duration, content, timing, and environment of screen media use during well-child visits using standardized instruments. Health care providers should also help develop research-informed uniform guidelines for screen media use practices that protect children and adolescents' health and wellbeing. School nurses are in particularly good positions to help children, adolescents, and families understand the potentially detrimental effects of screen media use and develop appropriate usage guidelines, working on individual and community levels to promote healthy screen media use. At the individual level, nurses

can meet with students regularly to screen for overuse and educate them about the adverse effects of overuse. In addition, nurses can help develop community-wide education programs by collaborating with other health professionals, schools, and families (Puskar & Bernardo, 2007). Currently, the guidelines for screen media use conflict. For example, the AAP states that parents should place limits on time spent on-screen media use to ensure it does not displace time for adequate sleep and physical activity for children aged > 6 years (Pediatrics); the Australian 24-hr Movement Guidelines, meanwhile, state screen time should be limited to no more than 2 hr/day. The establishment of consistent, authoritative, evidence-based guidelines through investigation of short-term and long-term effects of screen media use is crucial.

In addition, teachers and educators should monitor and guide their students' technology use in the classroom; receive professional development and training to successfully implement technology use in the classroom; designate media-free zones at school, such as cafeterias and classrooms; advocate for schools to sponsor screen-free days throughout the school year and develop media education programs; and collaborate with parent−teacher associations to encourage at-home guidance of appropriate screen media us (Hale et al., 2018; Riesch et al., 2019). Furthermore, the industry should collaborate with educators, pediatricians, and developmental psychologists to create educational, high-quality, and age-appropriate content and develop electronic monitoring programs and systems in screen media devices to help parents/caregivers limit children's usage (Council on Communications and Media, 2016a).

Finally, governmental institutions should allocate federal and private funding for screen media use research. Although there may exist a critical period during development in which screen media-related adverse outcomes are established (Tamana et al., 2019), current evidence-based screen media guidelines vary widely; thus, the funding of research in this area is critical. Furthermore, governmental agencies should fund intervention strategies and public health campaigns for children, families, and communities to promote healthy screen media use guidelines, as well as collaborate with the Department of Education for the development of media education curriculum in school settings (Riesch et al., 2019).

Given that technology has become embedded within the lives of children and adolescents, it is vital to understand its impact on health and wellbeing. Although screen media use has positive benefits to the learning environment, growing evidence also suggests that overuse has adverse effects on a wide range of physical, cognitive, and emotional/behavioral problems. Childhood and adolescence are critical windows of development during which youth may be particularly susceptible to the negative social, psychological, and biological effects of screen media use, thus rendering more research in this area essential. Specifically, although research studies have extensively investigated the effects of screen media overuse on sleep disturbances, there continues to be conflicting data with regard to externalizing behavior, as well as potential bidirectional relationships shared with the adverse outcomes discussed in this review. Understanding its impacts and mechanisms are critical to generating screen time guidelines by practitioners and developing effective prevention/intervention strategies to mitigate screen media overuse and its adverse outcomes in children and adolescents.

Funding/support

This work was supported by the National Institutes of Health: the National Institute of Environmental Health Sciences (R01-ES-018858, K02-ES-019878, K01-ES015877 and P30-ES013508) and Eunice Kennedy Shriver National Institute of Child Health and Human Development (R01-HD087485).

REFERENCES

Anderson DR, Subrahmanyam K, & Cognitive Impacts of Digital Media Workgroup. (2017). Digital screen media and cognitive development. Pediatrics, 140(Suppl. 2), S57–S61. [PubMed: 29093033]

Anderson M, & Jiang J. (2018). Teens, social media & technology 2018. Pew Research Center, 31, 1673–1689.

Baumgartner SE, Weeda WD, van der Heijden LL, & Huizinga M. (2014). The relationship between media multitasking and executive function in early adolescents. The Journal of Early Adolescence, 34, 1120–1144.

Bian M, & Leung L. (2015). Linking loneliness, shyness, smartphone addiction symptoms, and patterns of smartphone use to social capital. Social Science Computer Review, 33, 61–79.

Bickham DS, Blood EA, Walls CE, Shrier LA, & Rich M. (2013). Characteristics of screen media use associated with higher BMI in young adolescents. Pediatrics, 131, 935–941. [PubMed: 23569098]

Borgogna N, Lockhart G, Grenard JL, Barrett T, Shiffman S, & Reynolds KD (2015). Ecological momentary assessment of urban adolescents ' technology use and cravings for unhealthy snacks and drinks: Differences by ethnicity and sex. Journal of the Academy of Nutrition and Dietetics, 115, 759–766. [PubMed: 25482855]

Cain MS, Leonard JA, Gabrieli JD, & Finn AS (2016). Media multitasking in adolescence. Psychonomic Bulletin & Review, 23, 1932–1941.

Calamaro CJ, Mason TB, & Ratcliffe SJ (2009). Adolescents living the 24/7 lifestyle: Effects of caffeine and technology on sleep duration and daytime functioning. Pediatrics, 123, e1005–e1010. [PubMed: 19482732]

Canadian Paediatric Society, & Digital Health Task Force, Ottawa, Ontario. (2019). Digital media: Promoting healthy screen use in school-aged children and adolescents. Paediatrics & Child Health, 24, 402–417.

Caplan SE (2007). Relations among loneliness, social anxiety, and problematic Internet use. Cyberpsychology and Behavior, 10, 234–242. [PubMed: 17474841]

Carlson SA, Fulton JE, Lee SM, Foley JT, Heitzler C, & Huhman M. (2010). Influence of limit-setting and participation in physical activity on youth screen time. Pediatrics, 126, e89–e96. [PubMed: 20547642]

Cespedes EM, Gillman MW, Kleinman K, Rifas-Shiman SL, Redline S, & Taveras EM (2014). Television viewing, bedroom television, and sleep duration from infancy to mid-childhood. Pediatrics, 133, e1163–e1171. [PubMed: 24733878]

Chaput JP, Leduc G, Boyer C, Bélanger P, LeBlanc AG, Borghese MM, & Tremblay MS (2014). Electronic screens in children's bedrooms and adiposity, physical activity and sleep: Do the number and type of electronic devices matter? Canadian Journal of Public Health, 105, e273–e279. [PubMed: 25166130]

Chen W, & Adler JL (2019). Assessment of screen exposure in young children, 1997 to 2014. JAMA Pediatrics, 173, 391–393. [PubMed: 30776061]

Cheung CH, Bedford R, Saez De Urabain IR, Karmiloff-Smith A, & Smith TJ (2017). Daily touchscreen use in infants and toddlers is associated with reduced sleep and delayed sleep onset. Scientific Reports, 7, 46104. [PubMed: 28406474]

Christakis DA, Garrison MM, Herrenkohl T, Haggerty K, Rivara FP, Zhou C, & Liekweg K. (2013). Modifying media content for preschool children: A randomized controlled trial. Pediatrics, 131, 431–438. [PubMed: 23420911]

Christakis DA, Zimmerman FJ, DiGiuseppe DL, & McCarty CA (2004). Early television exposure and subsequent attentional problems in children. Pediatrics, 113, 708–713. [PubMed: 15060216]

Cliff DP, Howard SJ, Radesky JS, McNeill J, & Vella SA (2018). Early childhood media exposure and self-regulation: Bidirectional longitudinal associations. Academic Pediatrics, 18, 813–819. [PubMed: 29704999]

Council on Communications and Media. (2016a). Media and young minds. Pediatrics, 138, e20162591.

Council on Communications and Media. (2016b). Media use in school-aged children and adolescents. Pediatrics, 138, e20162592.

Demirci K, Akgönül M, & Akpinar A. (2015). Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students. Journal of Behavioral Addictions, 4, 85–92. [PubMed: 26132913]

Doron E. (2017). Fostering creativity in school aged children through perspective taking and visual media based short term intervention program. Thinking Skills and Creativity, 23, 150–160.

Ehrenberg A, Juckes S, White KM, & Walsh SP (2008). Personality and self-esteem as predictors of young people's technology use. Cyberpsychology and Behavior, 11, 739–741. [PubMed: 18991531]

Ekelund U, Brage S, Froberg K, Harro M, Anderssen SA, Sardinha LB, .. . Andersen LB (2006). TV viewing and physical activity are independently associated with metabolic risk in children: The European Youth Heart Study. PLoS Medicine, 3, e488. [PubMed: 17194189]

Falbe J, Rosner B, Willett WC, Sonneville KR, Hu FB, & Field AE (2013). Adiposity and different types of screen time. Pediatrics, 132, e1497–e1505. [PubMed: 24276840]

Ferguson CJ (2017). Everything in moderation: Moderate use of screens unassociated with child behavior problems. Psychiatric Quarterly, 88, 797–805. [PubMed: 28168645]

Galica VL, Vannucci A, Flannery KM, & Ohannessian CM (2017). Social media use and conduct problems in emerging adults. Cyberpsychology, Behavior and Social Networking, 20, 448–452. [PubMed: 28715261]

Gentile DA, Swing EL, Lim CG, & Khoo A. (2012). Video game playing, attention problems, and impulsiveness: Evidence of bidirectional causality. Psychology of Popular Media Culture, 1, 62–70.

Green CS, Li R, & Bavelier D. (2010). Perceptual learning during action video game playing. Topics in Cognitive Science, 2, 202–216. [PubMed: 25163784]

Ha JH, Chin B, Park DH, Ryu SH, & Yu J. (2008). Characteristics of excessive cellular phone use in Korean adolescents. Cyberpsychology and Behavior, 11, 783–784. [PubMed: 18991536]

Hale L, Kirschen GW, LeBourgeois MK, Gradisar M, Garrison MM, Montgomery-Downs H, .. . Buxton O. M. (2018). Youth screen media habits and sleep: Sleep-friendly screen behavior recommendations for Clinicians, Educators, and Parents. Child and Adolescent Psychiatric Clinics of North America, 27, 229–245. [PubMed: 29502749]

Hashem R, Rey-López JP, Hamer M, McMunn A, Rowlands A, Whincup PH, .. . Stamatakis E. (2019). Associations between objectively assessed and questionnaire-based sedentary behaviour with body mass index and systolic blood pressure in Kuwaiti adolescents. BMC Research Notes, 12, 588. [PubMed: 31533859]

Hersh C, Sisti J, Richiutti V, & Schernhammer E. (2015). The effects of sleep and light at night on melatonin in adolescents. Hormones(Athens, Greece), 14, 399–409. [PubMed: 26233931]

Hesketh K, Wake M, Graham M, & Waters E. (2007). Stability of television viewing and electronic game/computer use in a prospective cohort study of Australian children: Relationship with body mass index. International Journal of Behavioral Nutrition and Physical Activity, 4, 60. [PubMed: 18021422]

Holtz P, & Appel M. (2011). Internet use and video gaming predict problem behavior in early adolescence. Journal of Adolescence, 34, 49–58. [PubMed: 20303580]

Houghton S, Lawrence D, Hunter SC, Rosenberg M, Zadow C, Wood L, & Shilton T. (2018). Reciprocal relationships between trajectories of depressive symptoms and screen media use during adolescence. Journal of Youth and Adolescence, 47, 2453–2467. [PubMed: 30046970]

Huber B, Highfield K, & Kaufman J. (2018). Detailing the digital experience: Parent reports of children's media use in the home learning environment. British Journal of Educational Technology, 49, 821–833.

Huston AC, Wright JC, Marquis J, & Green SB (1999). How young children spend their time: Television and other activities.Developmental Psychology, 35, 912–925. [PubMed: 10442861]

Jacobsen WC, & Forste R. (2011). The wired generation: Academic and social outcomes of electronic media use among university students. Cyberpsychology, Behavior and Social Networking, 14, 275–280.

Jenaro C, Flores N, Gómez-Vela M, González-Gil F, & Caballo C. (2007). Problematic internet and cell-phone use: Psychological, behavioral, and health correlates. Addiction Research and Theory, 15, 309–320.

Jongenelis MI, Scully M, Morley B, Pratt IS, & Slevin T. (2018). Physical activity and screen-based recreation: Prevalences and trends over time among adolescents and barriers to recommended engagement. Preventive Medicine, 106, 66–72. [PubMed: 28987330]

Kabali HK, Irigoyen MM, Nunez-Davis R, Budacki JG, Mohanty SH, Leister KP, & Bonner RL (2015). Exposure and use of mobile media devices by young children. Pediatrics, 136, 1044–1050. [PubMed: 26527548]

Kim J, LaRose R, & Peng W. (2009). Loneliness as the cause and the effect of problematic Internet use: The relationship between Internet use and psychological well-being. Cyberpsychology and Behavior, 12, 451–455. [PubMed: 19514821]

Kucirkova N. (2014). IPads in early education: Separating assumptions and evidence. Frontiers in Psychology, 5, 715. [PubMed: 25071678]

LeBlanc AG, Katzmarzyk PT, Barreira TV, Broyles ST, Chaput JP, Church TS, .. . ISCOLE esearch Group. (2015). Correlates of total sedentary time and screen time in 9−11 year-old children around the world: The international study of childhood obesity, lifestyle and the environment. PLoS One, 10, e0129622.

Lillard AS, Drell MB, Richey EM, Boguszewski K, & Smith ED (2015). Further examination of the immediate impact of television on children's executive function. Developmental Psychology, 51, 792–805. [PubMed: 25822897]

Liu J, Liu CX, Wu T, Liu BP, Jia CX, & Liu X. (2019). Prolonged mobile phone use is associated with depressive symptoms in Chinese adolescents. Journal of Affective Disorders, 259, 128–134. [PubMed: 31450134]

Liu Jianghong, Glenn Andrea, Cui Naixue, & Raine Adrian (2021).Longitudinal bidirectional association between sleep and behavior problems at age 6 and 11 years. Sleep Medicine, 83, 290–298. [PubMed: 34091178]

Liu Xianchen, Luo Yanchen, Liu Zhen-Zhen, Yang Yanyun, Liu Jianghong, & Jia Cun-Xian (2020). Prolonged Mobile Phone Use Is Associated with Poor Academic Performance in Adolescents. Cyberpsychology, Behavior, and Social Networking, 23(5).

Magee CA, Lee JK, & Vella SA (2014). Bidirectional relationships between sleep duration and screen time in early childhood. JAMA Pediatrics, 168(5), 465–470. [PubMed: 24589672]

Marshall SJ, Gorely T, & Biddle SJ (2006). A descriptive epidemiology of screen-based media use in youth: A review and critique. Journal of Adolescence, 29, 333–349. [PubMed: 16246411]

May KE, & Elder AD (2018). Efficient, helpful, or distracting? A literature review of media multitasking in relation to academic performance. International Journal of Educational Technology in Higher Education, 15 13.

Moorman JD, Morgan P, & Adams TL (2019). The implications of screen media use for the sleep behavior of children ages 0−5: A systematic review of the literature. Current Sleep Medicine Reports, 5, 164–172.

Neumann MM (2014). An examination of touch screen tablets and emergent literacy in Australian pre-school children. Australian Journal of Education, 58, 109–122.

Neumann MM, & Neumann DL (2014). Touch screen tablets and emergent literacy. Early Childhood Education Journal, 42, 231–239.

Nightingale CM, Rudnicka AR, Donin AS, Sattar N, Cook DG, Whincup PH, & Owen CG (2017). Screen time is associated with adiposity and insulin resistance in children. Archives of Disease in Childhood, 102, 612–616. [PubMed: 28288985]

Pagani LS, Fitzpatrick C, Barnett TA, & Dubow E. (2010). Prospective associations between early childhood television exposure and academic, psychosocial, and physical well-being by middle childhood. Archives of Pediatrics and Adolescent Medicine, 164, 425–431. [PubMed: 20439793]

Palmer CA, & Alfano CA (2017). Sleep and emotion regulation:An organizing, integrative review. Sleep Medicine Reviews, 31, 6–16. [PubMed: 26899742]

Parent J, Sanders W, & Forehand R. (2016). Youth screen time and behavioral health problems: The role of sleep duration and disturbances. Journal of Developmental and Behavioral Pediatrics, 37, 277–284 JDBP. [PubMed: 26890562]

Peiró-Velert C, Valencia-Peris A, González LM, García-Massó X, Serra-An~ó P, & Devís-Devís J. (2014). Screen media usage, sleep time and academic performance in adolescents: Clustering a self-organizing maps analysis. PL0S One, 9, e99478.

Poulain T, Vogel M, Neef M, Abicht F, Hilbert A, Genuneit J, .. . Kiess W. (2018). Reciprocal associations between electronic media use and behavioral difficulties in preschoolers. International Journal of Environmental Research and Public Health, 15, 814. [PubMed: 29690498]

Przybylski AK (2014). Electronic gaming and psychosocial adjustment. Pediatrics, 134, e716–e722. [PubMed: 25092934]

Puskar KR, & Bernardo LM (2007). Mental health and academic achievement: Role of school nurses. Journal for Specialists in Pediatric Nursing, 12, 215–223. [PubMed: 17956370]

Radesky JS, Schumacher J, & Zuckerman B. (2015). Mobile and interactive media use by young children: The good, the bad, and the unknown. Pediatrics, 135, 1–3. [PubMed: 25548323]

Reid Chassiakos YL, Radesky J, Christakis D, Moreno MA, Cross C, , & Council on Communications and Media. (2016). Children and adolescents and digital media. Pediatrics, 138, e20162593.

Riehm KE, Feder KA, Tormohlen KN, Crum RM, Young AS, Green KM, .. . Mojtabai R. (2019). Associations between time spent using social media and internalizing and externalizing problems among US youth. JAMA Psychiatry, 76, 1266–1273. [PubMed: 31509167]

Riesch SK, Liu J, Kaufmann PG, Doswell WM, Cohen S, & Vessey J. (2019). Preventing adverse health outcomes among children and adolescents by addressing screen media practices concomitant to sleep disturbance. Nursing Outlook, 67, 492–496. [PubMed: 31375198]

Robb MB (2019). The new normal: Parents, teens, screens, and sleep in the United States. Common Sense Media.

Robinson S, Daly RM, Ridgers ND, & Salmon J. (2015). Screen-based behaviors of children and cardiovascular risk factors. Journal of Pediatrics, 167, 1239–1245. [PubMed: 26434372]

Robinson TN (1999). Reducing children's television viewing to prevent obesity: A randomized controlled trial. JAMA, 282, 1561–1567. [PubMed: 10546696]

Robinson TN, Banda JA, Hale L, Lu AS, Fleming-Milici F, Calvert SL, & Wartella E. (2017). Screen media exposure and obesity in children and adolescents. Pediatrics, 140(Suppl. 2), S97–S101. [PubMed: 29093041]

Segev A, Mimouni-Bloch A, Ross S, Silman Z, Maoz H, & Bloch Y. (2015). Evaluating computer screen time and its possible link to psychopathology in the context of age: A cross-sectional study of parents and children. PLoS One, 10, e0140542.

Straker L, Zabatiero J, Danby S, Thorpe K, & Edwards S. (2018). Conflicting guidelines on young children's screen time and use of digital technology create policy and practice dilemmas. Journal of Pediatrics, 202, 300–303. [PubMed: 30139534]

Suggate Sebastian, & Martzog Philipp (2021). Children's sensorimotor development in relation to screen-media usage: A two-year longitudinal study. Journal of Applied Developmental Psychology, 74. doi:10.1016/j.appdev.2021.101279

Tamana SK, Ezeugwu V, Chikuma J, Lefebvre DL, Azad MB, Moraes TJ, .. . Mandhane PJ (2019). Screen-time is associated with inattention problems in preschoolers: Results from the CHILD birth cohort study. PLoS One, 14, e0213995.

Tomopoulos S, Dreyer BP, Valdez P, Flynn V, Foley G, Berkule SB, & Mendelsohn AL (2007). Media content and externalizing behaviors in Latino toddlers. Ambulatory Pediatrics, 7, 232–238. [PubMed: 17512884]

Trinh Mai-Han, Sundaram Rajeshwari, Robinson Sonia, et al. (2020). Association of Trajectory and Covariates of Children's Screen Media Time. JAMA Pediatrics, 174, 71–78. [PubMed: 31764966]

Twenge JM, Joiner TE, Rogers ML, & Martin GN (2018). Increases in depressive symptoms, suicide-related outcomes, and suicide rates among US adolescents after 2010 and links to increased new media screen time. Clinical Psychological Science, 6, 3–17.

Twenge JM, Martin GN, & Campbell WK (2018). Decreases in psychological well-being among American adolescents after 2012 and links to screen time during the rise of smartphone technology. Emotion, 18, 765–780. [PubMed: 29355336]

Vijakkhana N, Wilaisakditipakorn T, Ruedeekhajorn K, Pruksananonda C, & Chonchaiya W. (2015). Evening media exposure reduces night-time sleep. Acta Paediatrica, 104, 306–312. [PubMed: 25521612]

Walsh JL, Fielder RL, Carey KB, & Carey MP (2013). Female college students' media use and academic outcomes: Results from a longitudinal cohort study. Emerging Adulthood, 1, 219–232. [PubMed: 24505554]

Wang Y, & Zhang Q. (2006). Are American children and adolescents of low socioeconomic status at increased risk of obesity? Changes in the association between overweight and family income between 1971 and 2002. American Journal of Clinical Nutrition, 84, 707–716. [PubMed: 17023695]

Wheaton AG, Jones SE, Cooper AC, & Croft JB (2018).Short sleep duration among middle school and high school students—United States, 2015. MMWR. Morbidity and Mortality Weekly Report, 67, 85–90. [PubMed: 29370154]

Whitaker RC, & Orzol SM (2006). Obesity among US urban pre-school children: Relationships to race, ethnicity, and socioeconomic status. Archives of Pediatrics and Adolescent Medicine, 160, 578–584. [PubMed: 16754818]

Yang YS, Yen JY, Ko CH, Cheng CP, & Yen CF (2010). The association between problematic cellular phone use and risky behaviors and low self-esteem among Taiwanese adolescents. BMC Public Health, 10, 217. https://pediatrics.aappublications.org/content/128/5/1040.short. Accessed 7 July 2021. [PubMed: 20426807]

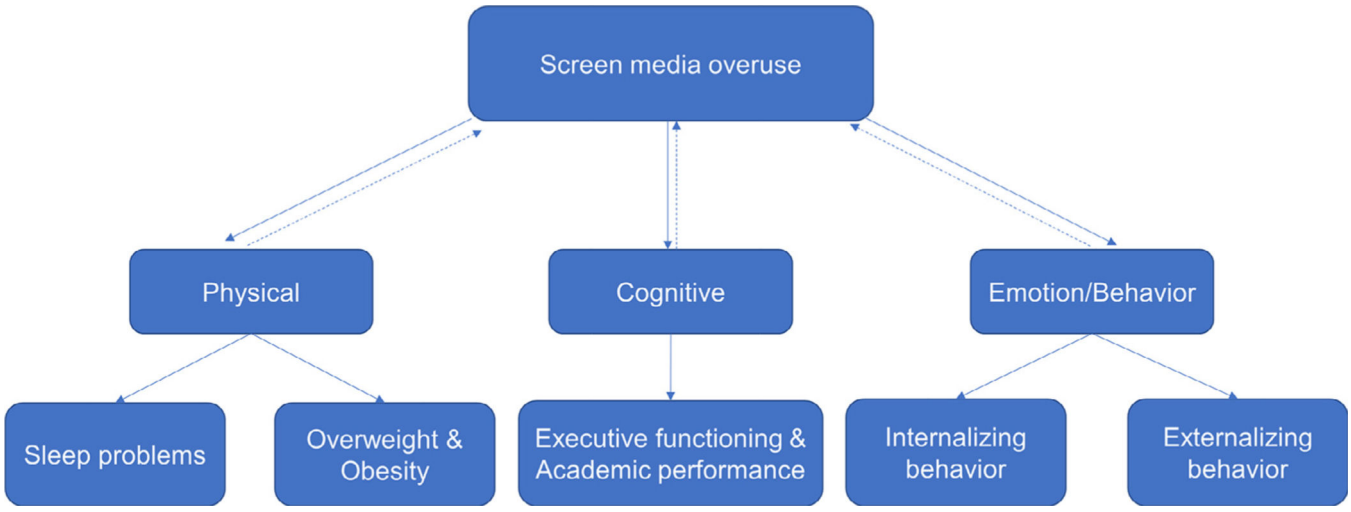

FIGURE.
Screen media overuse and associated outcomes.

TABLE 1.

Summary of key research findings on-screen media overuse and adverse outcomes

	Physical Health		Cognition		Emotion/Behavior	
	Sleep Problems	**Overweight and Obesity**	**Executive Functioning**	**Academic Performance**	**Internalizing Behavior**	**Externalizing Behavior**
SMO	In infancy, SMO is associated with shorter sleep duration and increased daytime sleepiness In childhood and adolescence, SMO is associated with lowered sleep quantity and quality SMO and sleep problems may share a bidirectional relationship, with shorter sleep duration linked with increased subsequent screen media use	Screen time has strong, graded associated with adiposity and prevalence of overweight in childhood and adolescence Children who reduced their screen media use saw significant reductions in sedentary behavior as well as slower increases in BMI SMO and overweight/obesity may share a bidirectional relationship, with obese children more likely to engage in greater screen media use	In childhood, SMO is negatively associated with language development and overall executive functioning In adolescence, SMO is negatively associated with working memory, inhibition, and task-shifting ability SMO and executive functioning may share a bidirectional relationship, with lower self-regulation/ overall executive functioning linked with increased subsequent screen media use	In early childhood, SMO has a lasting adverse impact on classroom engagement and academic achievement In adolescence, SMO is inversely associated with overall academic performance In young adulthood, SMO has inverse associations with college test performance and GPA	In adolescents, SMO is linked to depression and anxiety symptoms SMO is also associated with feelings of loneliness, lowered self-esteem, and worsened interpersonal relationships SMO and internalizing behavior may share a bidirectional relationship, with depression and anxiety linked with increased subsequent screen media use	Human studies have revealed mixed results regarding the association between SMO and externalizing behaviors Preliminary animal studies have demonstrated that SMO models produce ADHD-like symptomology SMO and externalizing behavior may share a bidirectional relationship, with impulsivity and attention problems linked with increased subsequent screen media use

Note: SMO, screen media oversee; BMI, body mass index; GPA, grade point average; ADHD, attention deficit hyperactivity disorder.

J Pediatr Health Care. Author manuscript; available in PMC 2023 March 21.

TABLE 2.

Strategies and recommendations for preventing screen media overuse in children/adolescents

Intervention Target		Strategies and Recommendations
Research		
		• Implement robust design designs by (1) performing comprehensive assessments of screen use type, content, context, environment, parental mediation, and timing and (2) use measurement methods such as direct observation, usage monitoring programs, and reports from multiple sources (youths, parents, teachers, etc.)
		• Use large, population-based longitudinal studies to tease out directionality
		• Design randomized controlled trials examining effective intervention methods to reduce screen media overuse and promote sustained positive behavioral change in children/families
		• Control for potential confounders, including parent/family/peer network use of screen media, level of in-person social interaction, diet, exercise, and other activities of daily living
Policy and practice	Children and adolescents	• Reduce engagement in recreational sedentary screen time, and engage in alternate hobbies and activities such as exercise, reading, arts and crafts, and listening to music
		• Reduce media multitasking behaviors and use of social networking sites
		• Limit the use of screen media while in class, studying, or doing homework
		• Develop self-regulated rules/routines for screen media use that balance schoolwork with entertainment
	Parents and caregivers	• Develop and follow family media use plan (http://www.healthychildren.org/MediaUsePlan), placing consistent limits on the duration of screen media use and considering appropriate usage for each individual child
		• Designate media-free times (e.g., mealtimes, parent−child playtimes, an hour before bedtime)
		• Remove screen media devices, including TVs, computers, tablets, and smartphones, from children/adolescents' bedrooms
		• Work with adolescents to develop consistent routines that limit screen media use and help them develop the ability, responsibility, and autonomy to self-regulate screen media use
		• Model healthy screen use by limiting parental screen media use
	Institutions	• Foster increased physical activity and reduced sedentary behavior in the home Health care
		• Ask parents/caregivers about their family's screen media use, provide information about benefits and health risks of screen media use, and educate families on recommended use guidelines
		• Help parents/caregivers create screen media use guidelines to meet the individualized needs of each family
		• Assess children and adolescents for the duration, content, timing, and environment of screen media use during well-child visits, using standardized instruments
		• Develop research-informed updated screen media use guidelines, and disseminate information to educators/legislators Schools
		• Monitor and guide their students' technology use in the classroom
		• Receive professional development and training to successfully implement technology use in the classroom
		• Designate media-free zones at schools, such as cafeterias and classrooms
		• Advocate for schools to sponsor screen-free days throughout the school year and develop media education programs

Intervention Target	Strategies and Recommendations
	• Collaborate with parent−teacher associations to encourage at-home guidance of appropriate screen media use Industry • Collaborate with educators, pediatricians, and developmental psychologists to create educational, high-quality, and age-appropriate content • Develop electronic monitoring programs and systems in screen media devices to help parents/caregivers limit children's usage Government • Allocate federal and private funding for screen media use research • Fund intervention strategies and public health campaigns for children, families, and communities to promote healthy screen media use guidelines • Collaborate with the Department of Education for the development of media education curriculum in school settings