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Electronic Screen Use and Children's Socioemotional Problems: A Systematic Review and Meta-Analysis of Longitudinal Studies

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Electronic screens are everywhere and are easily accessible to children. Parents report fears that screens cause socioemotional problems. But most research has been cross-sectional, making it difficult to establish causality. We reviewed the longitudinal evidence to answer two fundamental questions: Does screen use lead to socioemotional problems, and do socioemotional problems lead children to use screens more often? A total of 132 longitudinal studies met the inclusion criteria and were included in the systematic review. From these, 117 studies (292,739 children; 2,284 effects) were meta-analyzed. Small significant associations were found in both directions: Screen use led to socioemotional problems, $b = 0.06$, 95% confidence interval (CI) [0.02, 0.11], $p \leq 0.05$, $n = 200{,}018$, $K = 117$, and socioemotional problems led to greater screen use ($b = 0.06$, 95% CI [0.01, 0.12], $p = .01$, $n = 200{,}018$, $K = 117$). Moderation analyses showed stronger effects in both directions when screens were used for gaming than for other purposes: Socioemotional problems led to more gaming behavior ($b = 0.44$, 95% CI [0.29, 0.60], $n = 80{,}809$, $K = 31$), and playing games led to later socioemotional problems ($b = 0.32$, 95% CI [0.23, 0.42], $n = 80{,}809$, $K = 31$). The reciprocal relationship between socioemotional problems and screen use was moderated by children's age, total screen time at baseline, and type of socioemotional problem (i.e., externalizing and internalizing behavior). Compared with prior cross-sectional studies, our temporal evidence reinforces the benefits of screen time guidelines but suggests a change in focus. Instead of merely emphasizing the reduction of screen time, guidelines should prioritize improving the quality of screen content and enhancing social interactions during screen use. Additionally, screen time guidelines should discourage high levels of the most high-risk behaviors like gaming.

Public Significance Statement

Our review found that screen use can contribute to socioemotional problems, and children with these problems are more likely to use screens as a coping mechanism. The effects appeared stronger for gaming. These links highlight the need for close attention from parents, researchers, and policymakers. Our findings support screen time guidelines that not only limit exposure time but also emphasize content quality and a positive social context. Parents should consider monitoring not just how long children are on screens, but also what they are doing and who they are interacting with. Some types of screen use, like coviewing with parents, seem to have few harms, if any. Parents may be able to avoid a cycle of screen use by supporting their socioemotional development in other ways.

Keywords: video games, socioemotional problems, externalizing behavior, internalizing behavior, youth

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Social and emotional well-being is a key component of children's health. It refers to how they behave and feel, and how they deal with adverse life experiences (American Psychological Association, 2022). Children are said to have socioemotional disorders when how they feel and what they do differ from the expectations of their developmental stage (P. Cooper, 2011). Children who hit, kick, yell, scream, and challenge authority might be said to present an externalizing disorder, while those who withdraw, cower, avoid, or despair display internalizing behavior (Achenbach, 1978; American Psychiatric Association, 2013). Although these problems frequently co-occur (Merikangas et al., 2009; Rapee et al., 2019), they are generally understood to have distinct causes and developmental trajectories (Cosgrove et al., 2011). For example, externalizing behaviors are often linked to immediate and observable environmental interactions, such as conflicting parent–child relationships, exposure to domestic violence, and experiences of bullying (Burt et al., 2006; Caspi et al., 2004). In contrast, internalizing symptoms are more closely associated with less visible factors, such as unstable family environments, self-doubt, and conflicting cultural values (Eccles et al., 1993). Researchers and parents fear that screen use exacerbates both of these problems (Haidt, 2024), but most reviews of the evidence have focused on cross-sectional studies (Sanders et al., 2024). This review aims to assess whether screen use is associated with increased socioemotional problems across time and vice versa.

Socioemotional Problems in Children

Depression and anxiety are among the leading causes of illness and disability among adolescents, and suicide ranks as one of the leading causes of death among individuals aged 15–24 years (Global Burden of Diseases 2019 Mental Disorders Collaborators, 2022). Yet, according to the World Health Organization (2023), half of all mental health disorders begin before age 14. Meta-analytic evidence from 17 epidemiological studies (n = 18,282 children from eight countries) revealed that one fifth of children under 7 exhibited mental disorders (Vasileva et al., 2021). The most common disorders were anxiety (8.5%), oppositional defiant disorder (4.9%), and attention-deficit hyperactivity disorder (4.3%). The incidence of both internalizing (e.g., anxiety) and externalizing disorders (e.g., oppositional defiance) throughout childhood has been shown to be a predictor of mental health disorders in early adolescence (Hemmi et al., 2011; Kerr et al., 2007; Chassiakos et al., 2016). Many factors have an impact on the development of these problems, including poverty, discrimination, violence, and vulnerable living conditions (World Health Organization, 2023). More recently, researchers and policymakers have become concerned about the influence of electronic screens (American Academy of Pediatrics, 2013; Haidt, 2024; Mytton et al., 2024; Orben & Przybylski, 2019).

Children and adolescents spend an increasing amount of time on electronic screens for entertainment, homework, and socialization with friends (Barr et al., 2020; Kontostoli et al., 2021; Stiglic & Viner, 2019). A meta-analysis on the global prevalence of screen use among children found that three in four children younger than 2 years were being allowed screens, despite guidelines[1] recommending they wait until two (McArthur, Volkova, et al., 2022). In their study, among children from low-income communities, rates may be higher: Kabali et al. (2015) found that 92% of children from these communities started using mobile devices for entertainment before age 1. Screen use grows as children get older. For example, among those aged 2–5 years, one in three children exceed screen time limits of 1 hr per day (McArthur, Volkova, et al., 2022). A national report showed that about half of American children aged 2–4 years had their own tablet or smartphone, and more than two thirds of 5- to 8-year-olds (V. Rideout, 2020). These 5- to 8-year-olds spent an average of 3 hr per day on screens. Among older children (8–12 years), these

[1] Screen Time Guidelines for Children. For children under 2 years, the American Psychiatric Association (2013) recommends avoiding the use of electronic screens, except for video chatting. For children aged 2–5 years, limiting screen time to 1 hr per day of high-quality, educational programming is recommended. Children older than 5 can gradually increase their screen time, but it should still be balanced with other healthy activities, ensuring it does not replace essential activities like sleep and physical exercise.

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All data and code used for this review are available on the Open Science Framework (Vasconcellos et al., 2025).

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numbers were even more concerning: 41% spend more than 4 hr per day using screens and 15% more than 8 hr per day (Rideout et al., 2022).

While there is broad agreement that these high amounts of screen time are deleterious, it is still unclear what devices and purposes for screen time have different effects (Sanders et al., 2024). Computers, televisions, smartphones, and tablets can all be used for different purposes (e.g., gaming, social media, entertainment, learning). Researchers have long identified that different content (e.g., Sesame Street vs. advertising vs. social media) has different effects, and they have increasingly explored the outcomes from different devices (Sanders et al., 2024). Despite the variety of devices available, children of all ages still devote most of their daily screen "time" to watching television or streaming videos (e.g., YouTube or TikTok; Dredge, 2015; Radesky, Weeks, et al., 2020; V. Rideout, 2020; Rideout et al., 2022). The content accessed on these platforms also varies by age: While older children are very interested in unboxing/product demonstration, gameplay, and challenge/stunt videos, younger children spend more time watching learning videos, nursery rhymes or songs, and animal videos (V. Rideout, 2020). It is likely that these different uses of screens lead to different outcomes (Sanders et al., 2024)—for example, the peer comparison inherent in social media appears deleterious for young people, particularly young girls (Haidt, 2024). Most video games appear to increase adiposity and detract from learning unless they specifically target numeracy (Sanders et al., 2024). Parents can influence what their children do on screens, but older children have more autonomy in choosing what they watch (V. Rideout, 2020). Research has shown a high incidence of age-inappropriate content (e.g., tween/teen- and adult-targeted content) among this age group, not only in streamed videos but also in advertisements (Auxier, 2020; Chassiakos et al., 2016; Radesky, Schaller, et al., 2020). Additionally, gaming is increasingly moving online, with children interacting with others through connected or "social gaming" (V. Rideout, 2020). While this differs from what we typically understand as "social media," "social gaming" allows players to socially interact with other players and is becoming very popular in middle childhood, functioning as social media platforms (Chassiakos et al., 2016).

Screen Use and Socioemotional Problems

Many researchers and policymakers have expressed concern that such high rates of screen use lead to socioemotional problems in children (American Academy of Pediatrics, 2013; Haidt, 2024; Hinkley et al., 2014; Oswald et al., 2020; Russ et al., 2009; Stiglic & Viner, 2019; Tremblay et al., 2011). For example, Eirich et al. (2022) conducted a meta-analysis of 87 studies—including various study designs—to investigate the impact of screen use on the socioemotional well-being of children 12 years or younger. They found small but significant correlations between excessive screen time and children's internalizing and externalizing behavior problems. They also found stronger correlations between screen time and externalizing problems in boys compared with girls (Eirich et al., 2022). Similarly, Rega et al. (2023) systematically reviewed 35 mixed-methods studies in children younger than 10 years old. They reported that problematic media use was associated with increased behavior problems, higher depressive symptoms, and other negative developmental outcomes. Additionally, they found that children experiencing negative psychosocial symptoms, dysfunctional parent–child relationships, and lower school functioning were more likely to develop problematic media use (Rega et al., 2023). In both studies, however, the directionality of effects could not be inferred due to the limited temporal evidence available—most designs were cross-sectional. Indeed, an umbrella review synthesized findings from 102 meta-analyses conducted in children and adolescents (Sanders et al., 2024). Screen use was associated with an increase in obesity, developmental problems, depression, and psychosocial problems (Sanders et al., 2024). However, they found few reviews that looked at longitudinal associations among children. The longitudinal evidence that is available does suggest a deleterious effect of screen use: C. Li et al. (2020) systematically reviewed 15 longitudinal studies looking at behavioral and psychosocial health indicators among infants, toddlers, and preschoolers. They found that increased screen use was related to worse behavioral and emotional outcomes in all age groups.

There are a range of mechanisms by which screen use inhibits socioemotional development, causing socioemotional problems. Research indicates that time spent on screens displaces other behaviors that are crucial for a child's well-being (Oswald et al., 2020; Roberts et al., 1993). For instance, systematic reviews have shown that screen-based sedentary behavior is linked to lower levels of physical activity (Costigan et al., 2013). Screen time has also been associated with poor sleep quality and duration (Carter et al., 2016; Hale & Guan, 2015; Zhang et al., 2022). In particular, media devices at bedtime—particularly small mobile devices (e.g., smartphones; Falbe et al., 2015)—were significantly associated with insufficient sleep duration, poor sleep quality, and excessive daytime drowsiness (Carter et al., 2016; Lund et al., 2021). Finally, increased screen time seems to reduce face-to-face social interactions (Twenge et al., 2018), and deteriorate or limit parent–child interactions (Kostyrka-Allchorne et al., 2017). For example, time spent watching television was strongly negatively associated with time spent interacting with parents and siblings, particularly during middle childhood (Vandewater et al., 2006). Children with TVs in their bedrooms engage less in nonelectronic family activities (e.g., playing board games) compared to those without a TV in their own room (Gentile & Walsh, 2002). Screen use therefore appears to displace opportunities to be physically active, to have regular and good-quality sleep, and to have positive social interactions with family and peers.

By displacing those factors, children are missing opportunities for healthy socioemotional development, according to many models of socioemotional learning (e.g., American Academy of Pediatrics, 2022; Bowlby, 2008; Bronfenbrenner, 1979; Engel, 2012). For example, the biopsychosocial model (Engel, 2012) explains how socioemotional problems can develop from deficits in physical needs (e.g., sleep, physical activity). Sleep is critical for emotional regulation and cognitive functioning, and when screen time disrupts sleep patterns, it can lead to increased anxiety, mood disturbances, and difficulties in emotional regulation (F. T. W. Cheung et al., 2023). Similarly, physical activity is essential for reducing stress and promoting mental health (Belaire et al., 2024). Therefore, one theory connecting screens and socioemotional problems is how they displace protective behaviors (mostly sleep and physical activity).

Other theories are more directly psychological. For example, secure attachments form in environments where caregivers are attuned to the emotional state of their children and provide them

with skills for socioemotional competence (American Academy of Pediatrics, 2022; Bowlby, 2008). These attachments are typically nurtured through consistent and loving interactions with caregivers. However, excessive screen use can displace interactions that help build those attachments (e.g., family dinners). Similarly, children may use screens for comfort and emotion regulation, rather than relying upon their caregivers. Parents and caregivers are key vehicles for children to learn socioemotional competence (American Academy of Pediatrics, 2022; Bowlby, 2008). By using screens instead of learning resilience skills from their parents, children may develop avoidant forms of coping (Herman-Stabl et al., 1995), instead of healthier "approach coping" methods (Compas et al., 2001). For example, children with symptoms of anxiety or depression may use screens (e.g., watching TV or scrolling through social media) to escape from negative emotions (Jun, 2016; McKenna et al., 2002; Yen et al., 2009) or avoid dealing with stressors in their environment (Amichai-Hamburger et al., 2002; McKenna et al., 2002; Sharrer & Ryan-Wenger, 1995). This would cause a vicious cycle (Fitzpatrick et al., 2024): Excessive screen use could inhibit healthy parental attachments and the development of socioemotional skills; unhealthy attachment and lower socioemotional skills could cause socioemotional problems, so children use screens to cope. In this way, the link between screens and socioemotional problems could plausibly operate in either, or both, directions. According to Self-determination theory (Ryan & Deci, 2000), children may use screens when "real life" does not fulfill their basic psychological needs (i.e., autonomy, competence, and relatedness; Vansteenkiste et al., 2020). A child using screens in moderation is generally not a concern (Ryan et al., 2006) when real-life needs are consistently frustrated (e.g., due to factors like controlling parents, low self-esteem, and peer-relationship problems), children may become attached to screens to satisfy those needs (Ferguson & Olson, 2013). As a result, children with problems would be more likely to use screens (to satisfy unmet psychological needs), and children who overuse screens would be more likely to have unmet psychological needs (e.g., because they engage less in school, family, and peer relationships).

Cross-Sectional Versus Longitudinal Research

Cross-sectional research does not allow researchers to disentangle the direction of effect between screen use and socioemotional problems. Cross-sectional studies are also prone to confounding, so they provide weak causal evidence (Eirich et al., 2022; Koncz et al., 2023; C. Li et al., 2020; Orben, 2020; Oswald et al., 2020; Sanders et al., 2024; Suchert et al., 2015; Tremblay et al., 2011). For example, age, sex, and socioeconomic status are common confounders, as they can independently affect both a child's screen use behavior and psychological well-being (Oswald et al., 2020). Other confounders include different parenting styles (e.g., more permissive or authoritarian parents; Eirich et al., 2022; Rega et al., 2023) and methodological limitations (Koncz et al., 2023; Sanders et al., 2024; Tremblay et al., 2011) such as common method variance—where relationships between two variables can be exaggerated because researchers use the same method of measurement at the same time. Our review focuses on longitudinal evidence, which provides stronger, albeit fallible, causal evidence. The temporal lag helps researchers see whether screen use predicts later socioemotional problems or vice versa. For socioemotional problems, previous reviews found a small but statistically significant longitudinal association between screen use and externalizing problems (r = 0.06; Eirich et al., 2022; 19 studies); they found no significant effects on internalizing behaviors (r = 0.03; nine studies). Eirich et al. (2022) grouped all types of screens together, which is a limitation given that some content (e.g., violent video games, age-inappropriate content, and social media) may be more consequential than others (e.g., educational and prosocial content; Eirich et al., 2022; Mallawaarachchi et al., 2024). Similarly, the context in which children are using screens can lead to distinct outcomes (Mallawaarachchi et al., 2024). For example, longitudinal studies have found total screen time was associated with a lower quality of life, but watching TV and gaming with your parents led to a better quality of life (Lo et al., 2024). Researchers generally agree that the content and context of screen time matter (Lo et al., 2024; Sanders et al., 2024). We therefore aimed to assess whether the context and type of screen moderate these longitudinal effects but also test for reciprocal effects.

Reciprocal effects matter because the direction of causality may be reversed. Children might turn to screens as a way to cope with their socioemotional problems (Bender et al., 2020; Acevedo-Polakovich et al., 2007; Nikkelen et al., 2014; Rega et al., 2023). For example, longitudinal research among early adolescents has shown that attention problems can lead to pathological gaming, rather than the other way around (Ferguson & Ceranoglu, 2014; Peeters et al., 2018). Psychological problems were found to predict increased video game playing in children (Jeong et al., 2019; Poulain et al., 2018). Higher levels of internalizing and externalizing problems in childhood significantly predicted disordered gaming symptoms 6 years later in adolescence (Richard et al., 2022). Children from many cultural backgrounds appear to use TV as a stress-coping strategy (J.-L. Chen & Kennedy, 2005; Sharrer & Ryan-Wenger, 1995). Alternatively, those exhibiting socioemotional problems may seek—or be given access to—screens when their problems are affecting their functioning or that of their family (Radesky, Kistin, et al., 2016). For instance, parents often use screens as a behavior management tool to calm down their children when distressed (Radesky, Peacock-Chambers, et al., 2016), during meals (Domoff et al., 2017), or to create a peaceful environment at home (Radesky, Kistin, et al., 2016). As a result, children miss out on chances to learn self-regulation skills if both parents and children rely on screens to reduce negative emotions like irritability, frustration, boredom, or stress (Domoff et al., 2020). Overall, there are plausible mechanisms by which both screen use increases socioemotional problems, and socioemotional problems increase screen use.

Individual studies among preschoolers have found electronic media to be reciprocally related to behavioral difficulties (Poulain et al., 2018) and depressive symptoms (Jeong et al., 2019, 2020). Specifically, Jeong et al. (2020) found that parental marital conflict led to poor father–child attachment, which reduced the child's self-esteem and ultimately contributed to gaming addiction symptoms. While a reverse association—disordered gaming leading to depressive symptoms—was also observed, it was weaker than the association of depressive symptoms predicting gaming disorders (Jeong et al., 2020). Longitudinal reviews have seldom explored these reciprocal associations among children. Tang et al. (2021) conducted a systematic review of 35 longitudinal studies in adolescents (10–24 years). They did not find enough homogenous studies to assess these findings meta-analytically. Their narrative review described small to very small associations between screen use and later mental health

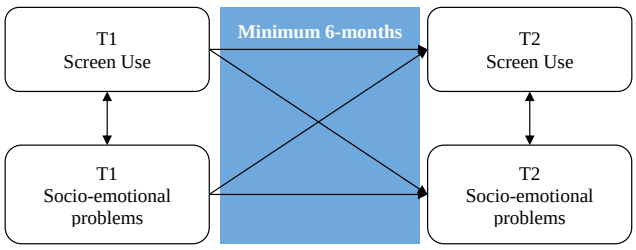
problems. They did not find evidence that mental health problems predicted adolescent screen use. Our review aims to explore these relationships among children. Childhood is a developmentally sensitive period—it is where the foundations for social and emotional functioning are established (Potegal et al., 2003). So, it is plausible that children's interactions with screens may lead to distinct socioemotional outcomes compared to those seen in older populations, such as adolescents and adults. For this reason, we focused our review on the effects of screen use on children.

Robust meta-analyses may help synthesize the existing literature and allow researchers to test if relationships differ on the basis of contextual or content-related moderators. Until recently, meta-analyses needed to be largely univariate, focusing on one relationship at a time (e.g., Time 1 screen use to Time 2 socioemotional problems). While these are simpler to implement, univariate meta-analyses have significant limitations. Most importantly, they do not allow researchers to easily control for "stability paths"—the relationships within variables across time (e.g., the effects of Time 1 socioemotional problems, in the above example). New statistical methods allow meta-analysts to identify an association of interest while controlling for other important variables (e.g., the effect of Time 1 screen time on Time 2 socioemotional problems, controlling for Time 1 socioemotional problems and Time 2 screen use; see Figure 1). While traditionally associated with primary research, structural equation modeling (SEM) is increasingly employed to this end in meta-analysis. Meta-analytic SEM can replicate conventional meta-analytic models—fixed effects, random effects, and three-level models—while also enabling the estimation of multivariate path models based on pooled correlation matrices. Meta-analytic SEM thus is a robust and flexible framework for meta-analysis (M. W.-L. Cheung, 2015). The overall aim of the present study was to investigate the longitudinal bidirectional relationship between screen use and socioemotional problems among children. In addition, this study aimed to determine some potential moderators of these relationships. Based on previous literature, we hypothesized a bidirectional and reciprocal relationship, such that screen use (at Time 1) predicts poorer socioemotional well-being (at Time 2), and socioemotional problems (at Time 1) predict increased screen usage (at Time 2). Last, we hypothesized that the relationship is moderated by:

- Different screen content (e.g., violent, educational, prosocial, recreational content). For example, compared to nonviolent content, we expected violent content to be more strongly associated with externalizing behaviors.
- The purpose of screen use (e.g., online gaming, academic learning, entertainment, information seeking, virtual socialization). For example, we expected online gaming to increase the risk of socioemotional problems more than engagement in screens for entertainment.
- The nature of socioemotional problems (i.e., compared to externalizing problems, internalizing problems have a stronger association with problematic screen use among children). Internalizing problems refer to emotional and mood-related issues, such as depression and anxiety, where distress is directed inward (Achenbach, 1978; Cosgrove et al., 2011). Externalizing problems involve behavioral dysregulations, such as aggressive behavior, attention/deficit hyperactivity disorder, and conduct problems, where distress is expressed outwardly (Achenbach, 1978; Cosgrove et al., 2011).

Figure 1

Cross-Lagged Panel Model Assessed via Two-Stage Structural Equation Modeling



Note. T = time. See the online article for the color version of this figure.

Given that different screen devices can serve multiple purposes (i.e., a computer might be used for online gaming, learning, or entertainment) and host a wide range of content on a single device (i.e., violent, educational, and prosocial content), we did not anticipate that different types of devices are associated with subsequent socioemotional problems.

Thus, this review aimed to answer the following research questions:

1. Does screen use lead to socioemotional problems in children?
2. Do socioemotional problems lead to problematic screen use?
3. Are these relationships moderated by the type, content, and purpose of screen use, and by the nature of socioemotional problems?

Method

Study Design

We conducted a systematic review and meta-analysis following the Preferred Reporting Items for Systematic Review and Meta-Analysis statement (Page et al., 2021). We prospectively registered this systematic review with the International Prospective Register of Systematic Reviews (Vasconcellos et al., 2021). Data and code to reproduce the analyses are also available on the Open Science Framework (Vasconcellos et al., 2025).

Changes After Registration

After registration, we decided to exclude studies that measured screen use or socioemotional problems during COVID-19 lockdown restrictions. Research shows that samples measured during these circumstances display both higher screen time, higher socioemotional problems, and a range of significant confounds (e.g., limited social interactions, reduced physical activity, disrupted routines, increased stress levels, and a shift to online education; McArthur et al., 2021; Racine et al., 2021). As a result, to maintain homogeneity among the primary analyses, we

excluded studies where exposure or outcome was measured during a COVID-19 lockdown.

We also conducted some moderation analyses that were not preregistered, in response to comments received during peer review. Specifically, we conducted separate moderation analyses (e.g., moderation by device) for samples of boys and girls separately. We did the same for older (6–10) versus younger children (aged 0–5). We moderated effects by the country of the study (specifically whether the country was Western or not, as operationalized by Klein et al., 2018), and racial groups (i.e., the proportion of European or American White children in the sample). We attempted moderation analyses by family ethnicity (Hispanic vs. non-Hispanic) and socioeconomic status, but robust analyses were not possible due to a dearth of available data. Finally, we added moderation analyses by the year of publication to test whether patterns between screen use and socioemotional problems changed after the advent of smartphones (∼2012) or changed after COVID-19 lockdowns had lifted (>∼2021; studies during lockdowns were excluded).

Eligibility Criteria

We included studies that met the following criteria:

1. Studies in which the mean or median age of the participants in the sample at baseline assessment was <10.5 years.[2] Because we were interested in outcomes at any age (e.g., childhood exposure to screens and adolescent mental ill health), we did not limit studies on the basis of the participant's age at follow-up assessment.

2. Studies that reported a quantitative analysis of the relationship between any type of screen use and any socioemotional problem among children, according to the criteria listed below:

   2.1 Any screen-based activity (e.g., social media, video game playing, TV watching, or online homework) that was self-reported or device-measured. We excluded studies that reported exposures that could involve a screen but did not explicitly refer to an electronic device (e.g., studies referring to "homework" generally or "phone use" without explicitly referencing a smartphone).

   2.2 Studies that assessed socioemotional problems using a scale with published evidence supporting validity (e.g., Strengths and Difficulties Questionnaire; Goodman et al., 1998). For socioemotional problems, we examined two distinct constructs:

   i. Externalizing problems, such as antisocial behavior (e.g., physical aggression and bullying behavior), conduct problems (e.g., rule-breaking behavior, oppositionality, noncompliance, temper tantrum), and attention problems (e.g., disruptive behavior and hyperactivity/inattention problems).

   ii. Internalizing problems (e.g., symptoms of depression and anxiety, psychological distress, loneliness, negative affect, withdrawal, somatic complaints, low self-esteem, and life dissatisfaction).

We excluded studies that only presented adaptive outcomes (e.g., socioemotional well-being, skills, and competencies), predictors of social or emotional functioning (e.g., exposure to sexualized materials and exposure to bullying), consequences of socioemotional problems (e.g., poor academic achievement or suspension/expulsion from school), or diagnoses of neurological disorders (e.g., autism spectrum disorder and intellectual disabilities). We also registered that we would exclude neurodevelopmental disorders (e.g., autism spectrum disorder). Research indicates that children with these disorders exhibit different patterns of screen use. For example, they may prefer specific types of screen content or spend more time on-screen-based activities than their typically developing peers (Mazurek & Wenstrup, 2013; Slobodin et al., 2019). Neurodevelopmental disorders may also be associated with distinct emotional and behavioral outcomes, including socioemotional problems (Ophir et al., 2023). Samples focused on these disorders would therefore be at increased risk of confounding. Similarly, these differences could introduce heterogeneity into our pooled effects, so we chose to exclude studies focused on this population. As noted above, we also excluded all studies that collected exposure or outcome data during COVID-19 lockdown restrictions.

3. Longitudinal studies, defined as any study that has measured either screen use or socioemotional problems at a minimum of two time points, with a temporal gap of at least 6 months. While experimental studies provide strong causal evidence, we did not include them to maintain heterogeneity in the design of our included studies. We conducted a preliminary search in the Cochrane Library for experimental studies investigating screen use and children's socioemotional outcomes but yielded only three studies. Nonlongitudinal design studies, qualitative studies, and literature reviews were also excluded from this review.

We used no exclusion criteria for publication status (e.g., preprint publications, grey literature), language of publication, or year of publication.

Information Sources and Search Strategy

To minimize subjectivity in the selection of search terms, we developed the search strategy using an "objective" approach, as opposed to a "conceptual" approach (Hausner et al., 2016). The objective approach increases search specificity without compromising its sensitivity (Hausner et al., 2016). First, we conducted a preliminary hand search of the top 10 journals in the fields of developmental psychology and public health to identify eligible studies to be included in the review (our "target set"). Next, we

[2] The onset of adolescence is difficult to define at a population level. While it has traditionally been 13, most authorities have been recently recommending children enter adolescence between 10 and 11 years (Sawyer et al., 2018). We chose an age cutoff of 10.5 such that studies reporting age to one or two decimal places (e.g., $M_{age} = 10.3$) were treated the same as those which rounded age to whole numbers (e.g., $M_{age} = 10$). This also complemented a similar article on screen time and mental health in adolescents aged 10–19 years at baseline assessments (Tang et al., 2021), allowing to cover the whole period of childhood and adolescence.

used those studies to generate search terms that identified all studies in our target set. We then used SearchRefiner (Scells & Zuccon, 2018) to exclude search terms that reduced specificity without increasing sensitivity. After defining search terms, we adjusted them to suit each database's specific search syntax (e.g., adding in truncations) and included the keywords (i.e., MeSH terms and subject headings) to create the final search strategy (see Supplemental Material 1). The searching process included two steps. First, to identify relevant articles, we conducted all searches in the following electronic databases: MEDLINE, APA PsycInfo, SPORTDiscus, ProQuest Central, and Web of Science. Primary database searches were conducted on August 9, 2021, and updated on June 10, 2024. For the secondary searches, we screened the reference lists of relevant studies (those included following full-text screening) to identify additional studies eligible for inclusion. To do that, we ran a backward and forward citation searching on Scopus (Hinde & Spackman, 2015).

Data Management and Selection Process

We imported all the search results into Systematic Review-Accelerator (J. Clark et al., 2020) to remove duplicate records. After that, we imported deduplicated results into Covidence (Veritas Health Innovation, Melbourne, Australia). Using Covidence, two researchers independently screened titles and abstracts of relevant studies, and then two researchers independently performed the full-text screening for eligibility. When there were disagreements between our judgments throughout the screening processes, it was discussed until a consensus was reached. A third reviewer was consulted for the final decision when needed.

Data Collection Process and Data Items

Data extraction was completed independently and in duplicate using a custom data extraction form. Disagreements were discussed and reexamined until reaching a consensus. If no consensus was reached, a third researcher was consulted. The following information was extracted:

1. Descriptive study information (i.e., authorship, publication year, country of publication, and follow-up period).
2. Sample characteristics (e.g., size, age range/mean age, sex, and socioeconomic status); For this study, we treated "sex" and "gender" as a single, combined variable.[3]
3. Aspects of screen use (i.e., duration, type of device, content, and purpose). The content of screen use was categorized according to classifications provided by individual studies, such as violent content, educational content, prosocial content, recreational content, and age-oriented content. If a study did not specify a particular type, or the type was mixed, the screen use content was classified under a "general" category. Similarly, the purpose of screen use was categorized based on classifications provided by individual studies, such as gaming, virtual socialization, academic learning, information seeking, and entertainment (e.g., television or video viewing). If a study did not specify a particular purpose, screen use was classified under a general category. We used the same process for device type.
4. Type of socioemotional problems such as externalizing (e.g., aggressive behavior, and conduct problems), internalizing behaviors (e.g., symptoms of anxiety and depression, and poor self-esteem), peer-relationship problems (e.g., affective problems and loneliness), and total socioemotional difficulties (including gaming disorder symptoms).
5. The results of statistical analyses that examined the relationship between screen use and socioemotional problems.
6. Measurement methods for screen use and socioemotional problems (e.g., parent or self-reported vs. objective data).

Where available, multiple effect sizes were recorded per study. In the event of studies reporting more than two time points, all effect measures between screen use and socioemotional problems were extracted. When data required for these analyses were not provided within the article or Supplemental Materials, we contacted the authors and asked them to provide us with the relevant correlation matrices. In case of nonresponse, the study was removed from the analysis.

Study Risk of Bias Assessment

Study risk of bias assessment was conducted independently and in duplicate using a customized risk of bias checklist. This checklist was based on a systematic review of tools for assessing methodological quality in observational studies provided by the Australia's National Health and Medical Research Council (Z. Wang et al., 2019). The review identified nine domains of potential bias; however, none of the 62 identified tools covered all nine domains. To create a customized tool, one question from each domain was selected: (a) selection bias (e.g., representativeness of sample to target population and nonresponse rate); (b) validity and reliability of exposure measurement; (c) validity and reliability of outcome measurement; (d) accounting for confounding variables; (e) amount of loss to follow-up and appropriate loss data handling (e.g., intention-to-treat analysis and imputation); (f) appropriate statistical analysis; (g) selective reporting; (h) conflict of interest (e.g., funding); and (i) other bias (e.g., deviations from the protocol and study/follow-up duration). All items were scored as "yes," "no," or "unclear." Discrepancies were discussed until consensus was reached. Given that different forms of bias do not equally influence the internal validity of results (Higgins et al., 2019), the risks on each criterion are reported individually, rather than as a total risk of bias score.

[3] Sex is typically defined as a biological characteristic, classified as either female or male, and assigned at birth. Gender refers to an individual's gender identity, which is shaped by social and cultural norms and can change over time or vary across different cultures and communities. Gender identity can also evolve over time or exist outside traditional binary categories, such as agender, gender fluid, or nonbinary (Martin & Hadwin, 2022).

Data Analysis

All the statistical analyses were performed using R Version 4.2.2 (R Core Team, 2024). Included studies reported different metrics of effect sizes, with the most common being Pearson's correlation. To facilitate the analyses and enhance the interpretability of results, we converted all raw estimates to Pearson's *r* using established formulae (Bonett, 2007; Bowman, 2012; Jacobs & Viechtbauer, 2017). We used 95% confidence intervals, hence a *p* value below .05 was used as the threshold for statistical significance.

Path Analysis

For the primary analysis, we employed a cross-lagged panel analysis using a two-stage SEM in the package "metaSEM" (M. W.-L. Cheung, 2015). Based on previous research, we hypothesized that screen use (at Time 1) predicts poorer socioemotional outcomes (at Time 2), and vice versa (Time 1 socioemotional problems led to Time 2 screen use; Figure 1). We extracted correlation matrices from each study. In cases when multiple estimates were available for a single study, we calculated pooled effect sizes by weighting the means inversely proportional to their respective sampling variances. The forest plots of standardized regression coefficient's (*b*) values for each study for the two longitudinal relationships investigated are presented in Supplemental Material 2 Figures 2.1 and 2.2. We then used a random effects model to pool all the correlation matrices into a unique correlation matrix (Stage 1), which was treated as a covariance matrix for testing the hypothesized structural equation model (Stage 2; M. W.-L. Cheung, 2015). We fixed the variances of screen use and socioemotional problems at baseline at 1 to enable model identification (M. W.-L. Cheung, 2015).

To describe effect sizes (e.g., as small vs. large), Schäfer and Schwarz (2019) recommend using benchmarks derived from within disciplines. According to these authors, global benchmarks (e.g., Cohen's benchmarks) may not be applicable across all fields of behavioral sciences. This concern is particularly relevant in longitudinal studies, where very large correlations (i.e., $r = 0.40$ or greater) are often unreliable and more likely to represent a gross overestimation of the true effect (Funder & Ozer, 2019). Based on these findings, we categorized the magnitude of effect sizes by using the revised benchmarks proposed by Funder and Ozer (2019): very small (0.05), small (0.10), medium (0.20), large (0.30), and very large (≥0.40).

Moderation Analyses

As preregistered, for moderation analyses (e.g., gender), we included a moderator level (e.g., studies on girls) when the moderator level met two criteria: at least two effect sizes and 100 participants for each relationship (e.g., Time 1 screen use to Time 2 socioemotional problems). We imposed this restriction because the sample size is an important parameter affecting subgroup analysis precision (Borenstein & Higgins, 2013). The analyses were moderated for girls versus boys, younger (0–5 years at baseline) versus older children (6–10 years at baseline), externalizing versus internalizing socioemotional problems, and specific aspects of screen use (e.g., violent vs. nonviolent content and low level vs. high level of exposure). Where available, we extracted the participants' exposure level at baseline, labeling groups who used screens below recommended limits as "low exposure" and those exceeding guidelines as "high exposure." When the study authors separated the groups based on low and high exposure, we extracted effect sizes for each subgroup separately. We only labeled exposure level when provided by the study authors (e.g., as an inclusion criterion) because, without the individual participant data, we could not determine if the exposure level was homogenous. As described above, we conducted moderation analyses for the culture of country (i.e., Eastern vs. Western countries), racial groups (i.e., proportion of White children in individual study samples: <25%; 25%–75%; >75%), and the year in which the study was conducted (i.e., prior to smartphones, after smartphones, after COVID-19 lockdowns). Additionally, we attempted moderation analyses based on the predominant ethnicity of participants in individual samples (i.e., Hispanic vs. non-Hispanic) and family socioeconomic status (e.g., mostly low socioeconomic status, mixed or moderate socioeconomic status, mostly high socioeconomic status). However, these models failed to converge due to insufficient data (i.e., few studies focused on, or reported effects for, Hispanic groups or children from low socioeconomic backgrounds). Finally, we conducted sensitivity analyses using the lag length as a moderator (<2 years; 2–4 years; >2 years) to evaluate the impact of variability in time lag on stability and longitudinal predictions (Card, 2019).

Sensitivity Analyses

We conducted sensitivity analyses for risk of bias by adding each risk of bias criterion as a moderator. We evaluated the potential impact of low-risk versus high-risk bias studies on our key paths of interest (longitudinal paths from screen time to socioemotional problems and vice versa). For the sensitivity analysis, all criteria scored as "unclear" were grouped with "high risk" of bias, as recommended in the Cochrane Handbook (Higgins et al., 2019).

We explored publication bias in three ways. First, we used a funnel plot to examine the relationship between effect sizes and standard errors (H. Cooper et al., 2019). Second, we performed a multilevel Egger's regression test (Egger et al., 1997) to quantitatively assess funnel plot asymmetry by regressing the effect size estimates against their standard errors. For this, we conducted a hierarchical three-level meta-analysis using the R package "metaSEM" (Stage 2; M. W.-L. Cheung, 2015) to account for the dependencies between effect sizes. Finally, we estimated the degree of publication bias that would be necessary to attenuate the meta-analytic pooled point estimate or its associated confidence interval to any non-null value (Mathur & VanderWeele, 2020).

In addition, we conducted a sensitivity analysis to identify the effects of any outlier estimates. Extreme or implausible effect size estimates—potentially arising from statistical artifacts or limitations of measurement instruments—can distort pooled effect sizes (Wiernik & Dahlke, 2020). So, we identified outlier estimates using the R package "metafor" (i.e., model diagnostics for "rma.mv" objects; Viechtbauer, 2020). Then, as a sensitivity analysis, we reran both the path analysis and moderation analyses without those outliers.

Results

Study Selection

The searches yielded 23,022 records, of which 8,695 were duplicates. After screening 14,327 titles and abstracts (7,856 from

database search; 6,471 from citation search), we screened 510 full-text articles (399 from database search; 111 from citation search) for inclusion. A total of 141 reports (120 from database search; 21 from citation search) met the inclusion criteria. References included in the systematic review are marked with an asterisk in the reference list. Nine reports were from the same sample of children; thus, the systematic review comprised 132 unique studies. Among these, 15 studies were included in a qualitative synthesis but excluded from the meta-analysis due to:

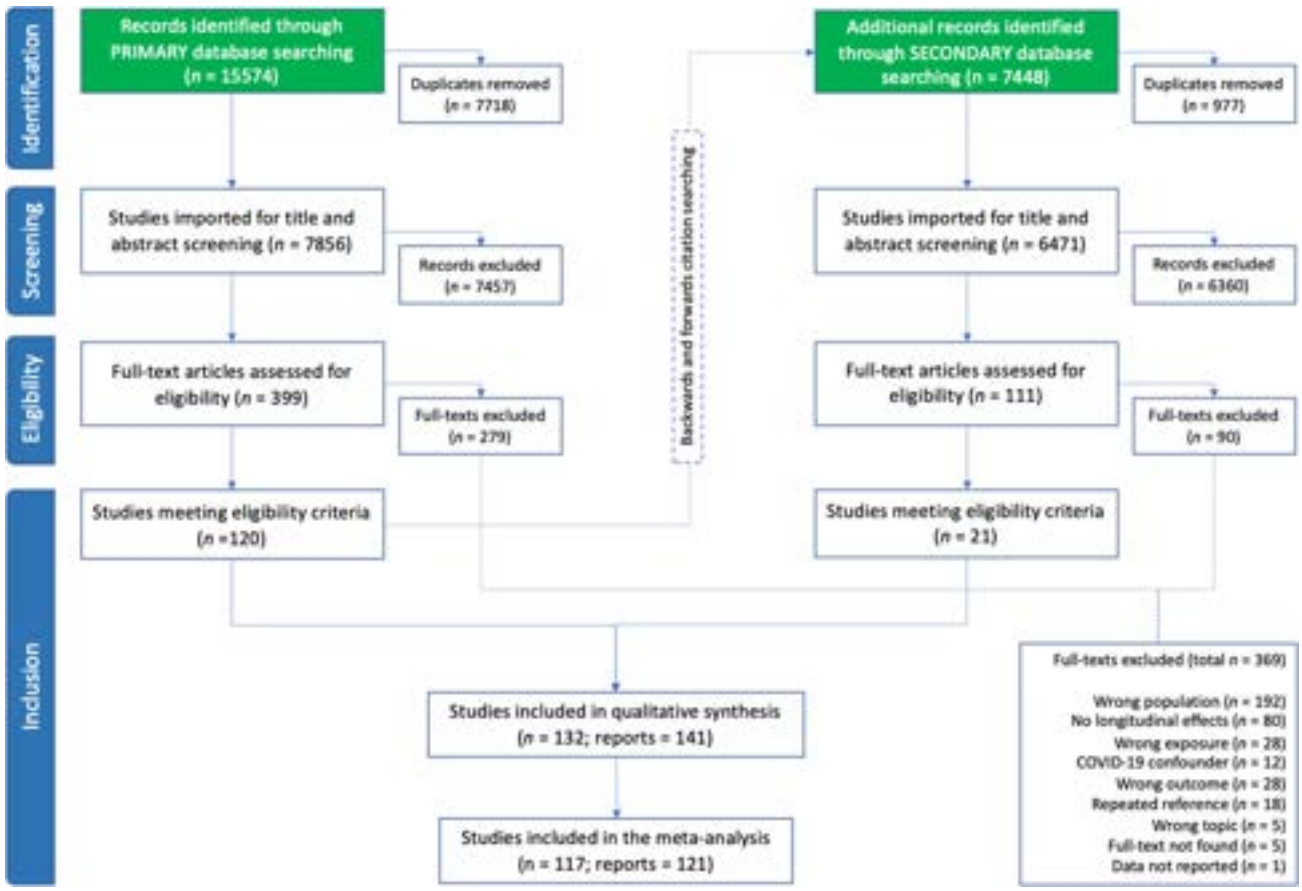
1. Analyses based on the temporal trajectory of screen use or socioemotional problems where it was not possible to determine the period between baseline and follow-up assessments (11 studies), or
2. Incompatibility of reported metrics (e.g., incidence rate ratio, hazard ratio, and unstandardized regression coefficients; four studies).

Therefore, the meta-analysis comprised 117 unique studies. Full details of the study selection process are also outlined in the Preferred Reporting Items for Systematic Review and Meta-Analysis flow diagram (Figure 2).

Risk of Bias Assessment of Studies Included in the Systematic Review

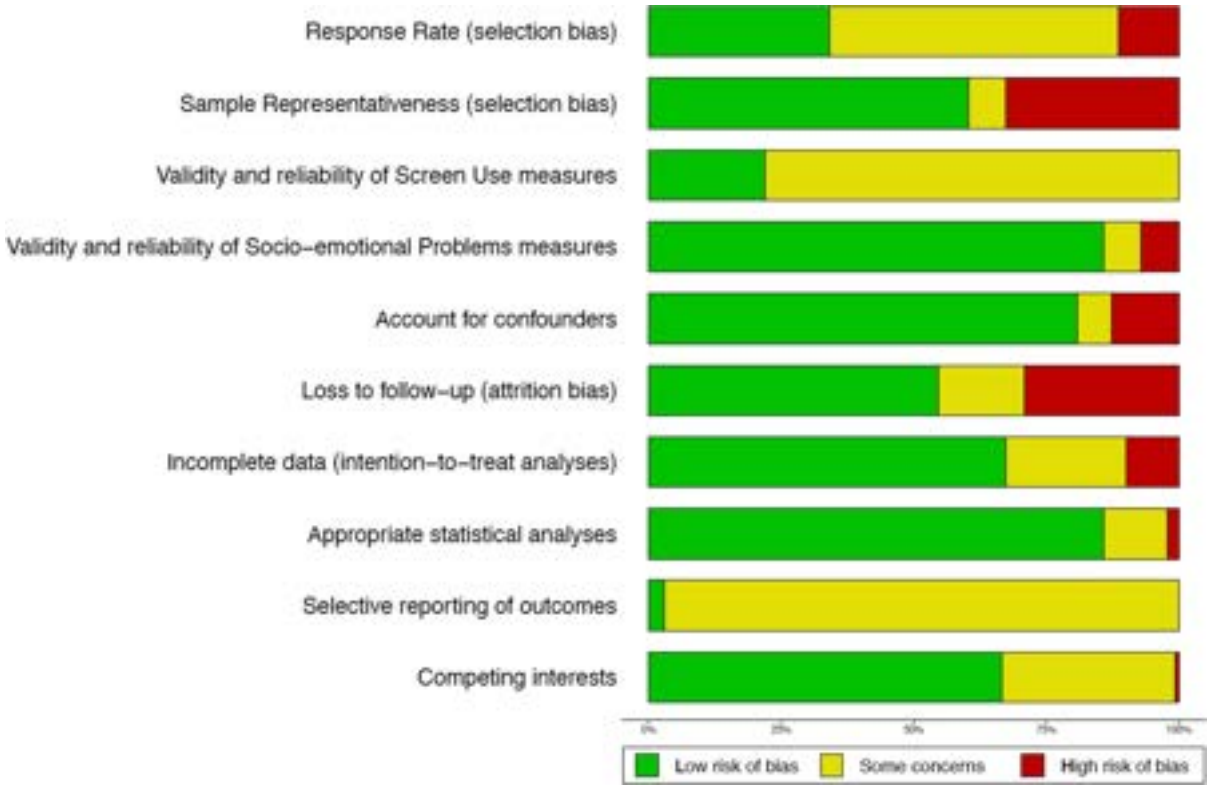
The risk of bias ratings for each study included in the systematic review are available in Supplemental Material 3. As shown in Figure 3, 66% of included studies were unclear or at high risk for selection bias, and 40% of studies were conducted in samples that may not be representative of the targeted population (usually because of convenience sampling). Over three quarters of studies (78%) used unvalidated measures of screen use, resulting in an unclear risk of bias. All studies used validated measures of social–emotional problems, but some studies (14%) did not clearly report how the items were scored, or they used an adapted—unvalidated—version of the scale. About 19% of the studies did not account for potential confounders in the relationship (e.g., socioeconomic status when the sample did not equally represent individuals from different socioeconomic levels). Almost half of the studies (46%) reported at least 20% attrition (or did not report rates of attrition), and 33% of the studies did not report how missing data were handled (or used high-risk methods, like complete case analysis and listwise deletion). In addition, approximately 14% of the studies did not provide clear and transparent documentation of their statistical analysis

Figure 2
PRISMA Flow Diagram



Note. PRISMA = preferred reporting items for systematic review and meta-analysis. See the online article for the color version of this figure.

Figure 3
Risk of Bias Summary: Authors' Judgments Broken Down for Each Risk of Bias Criterion Across All Studies Included in the Meta-Analysis



Note. See the online article for the color version of this figure.

procedures and may pose challenges in terms of reproducibility. Very few studies (3%) were prospectively registered, so it is unclear if all prespecified outcomes were reported.

Study Characteristics

The included studies were published between 1972 and 2024. Most studies were conducted in the United States of America (k = 41), followed by Canada (k = 13), Australia (k = 11), and Germany and the Netherlands (seven studies each). There were a total of 331,391 children across the 132 studies (reports = 141), with samples ranging from 47 to 32,439 participants. Overall, 48.1% of participants were boys, and 48.5% were girls; 17 studies (3.5% of participants) did not report gender breakdown. At baseline assessment, the mean age ranged from birth to 10.4 years old. Only 27 studies reported participants' socioeconomic status (n = 98,503). Among these, 34.8% were from high socioeconomic backgrounds, followed by 33.4% from middle, and 31.8% from low socioeconomic status. Follow-up periods were very diverse, ranging from 6 months to 33 years.

Only one of the included studies used device-based measures of screen use (i.e., video recording of family mealtimes; Domoff et al., 2017). Four studies did not provide information on how screen use was assessed. All other studies used self- or parent-reported measures of screen use, most of them based on recall surveys or daily diaries. Only 13 studies used a validated questionnaire (e.g., General Media Habits Questionnaire, Media Quotient Survey, and Screen Time Questionnaire). Children's screen use was mostly reported by parents or caregivers (n = 78), followed by self-reports (n = 41). In eight studies, screen use was reported by both parents and children.

The most investigated type of screen device was television (n = 71 studies), followed by screen devices in general (n = 63), game consoles (n = 21), and computers (n = 10). The use of portable devices (e.g., tablets and smartphones) was the focus of only four studies, although two other studies explicitly reported to have included mobile devices within the broader "general device category." In terms of the content of screen use exposure, most of the studies investigated the exposure to general content on screens (n = 112). The exposure to violent content was specifically investigated in 29 studies. Recreational content was investigated in seven studies, while seven studies looked at educational content. Five studies focused on age-related (i.e., appropriate and inappropriate), and only two looked at appearance-related contents. When it comes to the purposes for which children engage in screen use, most of the studies (n = 75) investigated the use of screens for entertainment purposes, followed by screen use for general purposes (n = 51) and electronic gaming (n = 33). Eight studies focused on screen use for online socialization on social media, and only six studies looked at screen use for learning purposes.

Children's socioemotional problems were assessed using a wide range of validated instruments, usually the Strengths and Difficulties

Questionnaire (n = 33; Goodman et al., 1998), the Children Behavior Checklist (n = 14; Achenbach, 1991), and the Behavior Problems Index (n = 10; Peterson & Zill, 1986). Socioemotional problems were mostly reported by the child's parents (n = 69), by the children themselves (n = 27), and by their teachers and peers (n = 10 each). In terms of the nature of socioemotional problems, externalizing problems were investigated in 100 studies, with 77 studies measuring internalizing problems. Specifically, attention-deficit/hyperactivity disorder (ADHD) symptoms (e.g., hyperactivity and attention problems) were the most investigated outcome (n = 48), followed by aggressive behavior (n = 39), emotional problems (n = 37), conduct problems (including oppositional defiant behavior; n = 30), total difficulties (n = 27), mental health problems (n = 20), peer-relationship problems (n = 19), antisocial behavior (n = 17), and low self-esteem (n = 11).

In terms of direction of effects, the longitudinal effect of screen use on children's socioemotional problems was the most investigated relationship (n = 99 reports). A small number of studies (n = 18) investigated the effects of socioemotional problems on children's screen use behavior. The reciprocal relationship between screen use and socioemotional problems was explored in 24 longitudinal investigations. Study characteristics details are presented in Supplemental Material 4.

Meta-Analysis

A total of 2,284 effect sizes from 117 studies (292,739 children) were meta-analyzed to investigate the magnitude and direction of effects in the relationship between screen use and socioemotional problems among children. Longitudinal effect sizes reported in each individual study are presented in Supplemental Material 5.

Path Analysis

As hypothesized, the bidirectional relationship between screen use and socioemotional problems was confirmed by the cross-lagged panel analysis using hierarchical two-stage structural equation models (SEM; see Figure 4). Specifically, children who engage with electronic screens were more likely to demonstrate later socioemotional problems (b = 0.06 [0.02, 0.11], n = 200,018, K = 117). Similarly, children with socioemotional problems (e.g., internalizing problems, externalizing problems) were more likely to increase their use of electronic screens (b = 0.06 [0.01, 0.12], n = 200,018, K = 117). The stability paths showed only small correlations within constructs over time (screen use: b = 0.13 [0.08, 0.19], n = 200,018, K = 117; socioemotional problems: b = 0.13 [0.05, 0.20], n = 200,018, K = 117).

Moderation Analysis

As expected, the moderation analyses revealed some important nuances in the relationship between screen use and socioemotional problems. The temporal relationship between screen use and socioemotional problems appears to be moderated by demographic characteristics (i.e., age and gender) and by different aspects of screen use behavior. A synthesis of the moderation analysis is described below and presented in Figure 5. Full results are presented in the Supplemental Material 2 Figure 2.3.

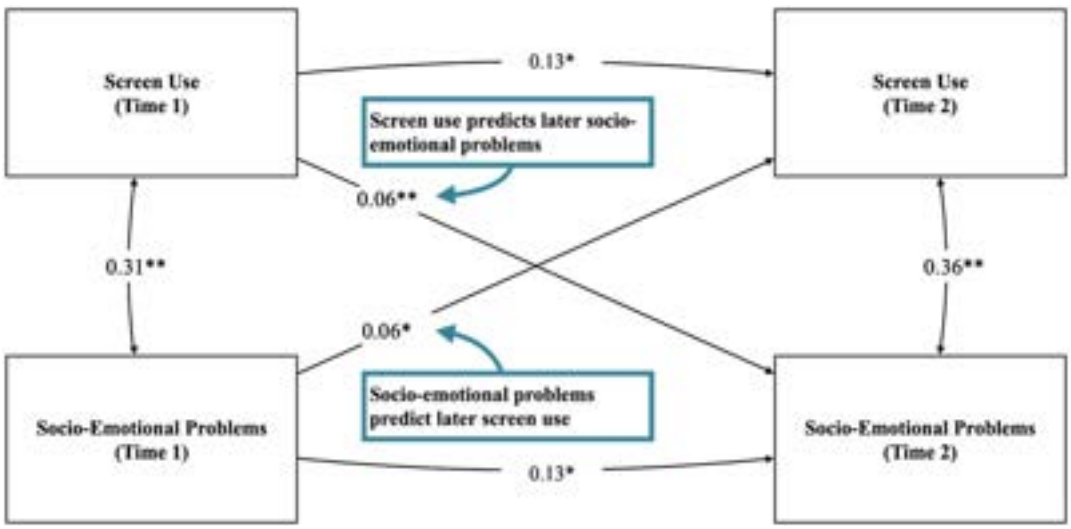
Screen Use Predicting Socioemotional Problems

Gender. There appear to be stronger effects for screen use predicting socioemotional problems among girls (b = 0.09 [0.03, 0.16], n = 25,566, K = 27) when compared to boys (b = 0.02 [−0.10, 0.15], n = 26,437, K = 25). Mixed-gender effects were very small and not significant (b = 0.04 [−0.01, 0.09], n = 195,100, K = 99). However, due to overlapping confidence intervals, it is hard to determine whether these associations significantly differ between boys and girls. Compared to boys, girls who are exposed to screens seem more likely to exhibit socioemotional problems at a later point.

Purpose of Screen Use. Some devices, like computers, can be used for a range of purposes (e.g., gaming, academic learning,

Figure 4

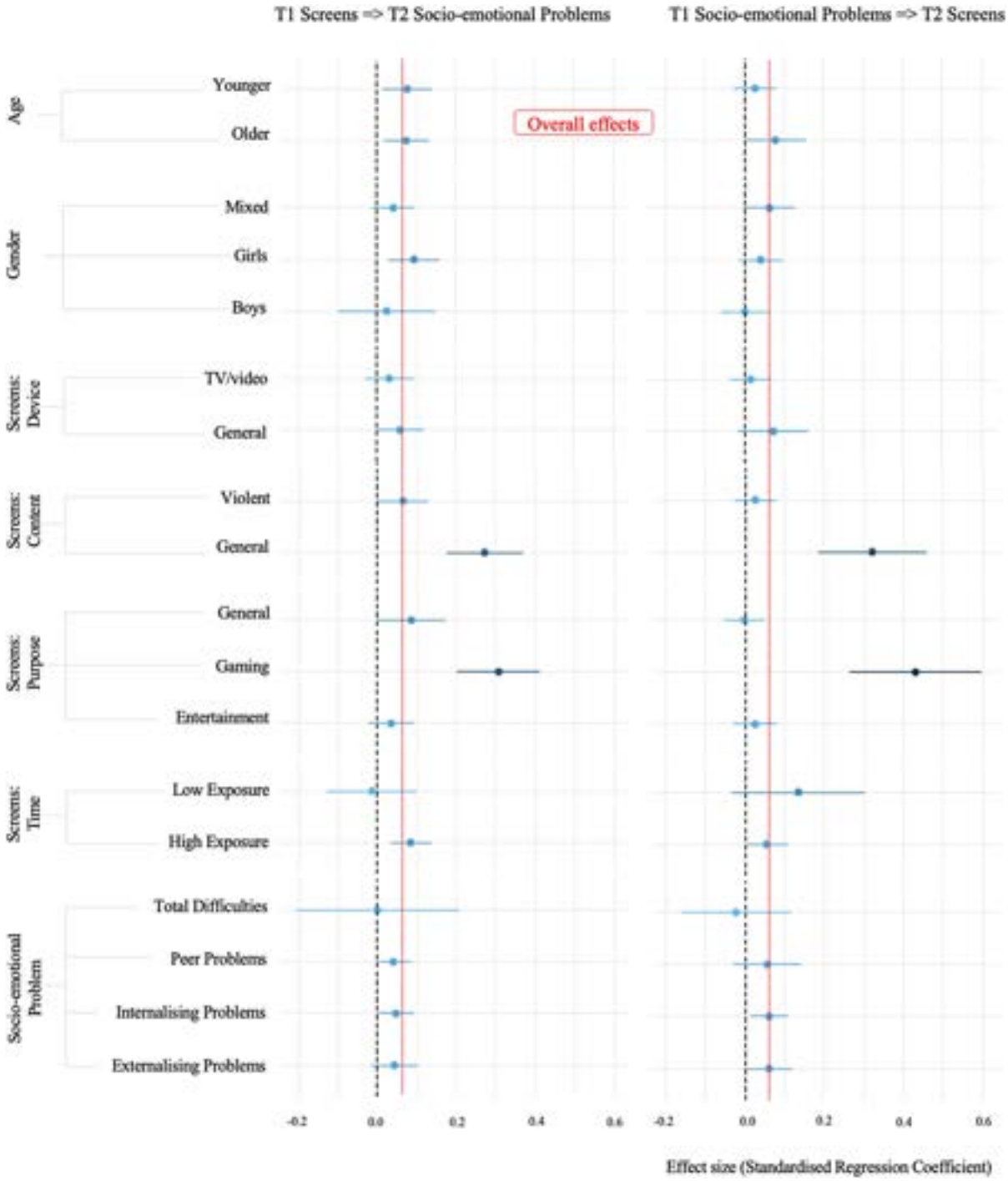
Reciprocal Relationship Between Screen Use and Socioemotional Problems Among Children



Note. See the online article for the color version of this figure.
* $p < .05$. ** $p < .01$.

Figure 5

Moderated Longitudinal Relationship Between Screen Use and Socioemotional Problems



Note. Screen use was defined based on the classifications provided by individual studies. *Device*: Among studies categorized under the "general device" category, some studies explicitly indicated the use of TV ($n = 10$), computers ($n = 10$), game consoles ($n = 9$), and mobile devices ($n = 3$). *Content:* None of the studies categorized as "general content" explicitly indicated the presence of "violent content." However, given the unlimited options that screens can provide, it is plausible to say that "general content" may represent a variety of content, including "violent content." *Purpose*: Studies under the classification of "general purposes" may also include gaming activities, social networking, and entertainment. This information, however, was not clearly reported in the individual studies. Nonetheless, studies looking at screen use for entertainment purposes mostly refer to TV viewing. *Duration:* Where available, we extracted the participants' exposure level at baseline, labeling groups who used screens below recommended limits as "low exposure" and those exceeding guidelines as "high exposure." T = time. See the online article for the color version of this figure.

entertainment, social networking, internet searching, and general purposes). Effects were much stronger for gaming compared with other types of screen use. Specifically, when children play video games, they are more likely to demonstrate later socioemotional problems ($b = 0.32$ [0.23, 0.42], $n = 80{,}809$, $K = 31$). Effects are not as strong when children use screens for general purposes ($b = 0.09$ [0.00, 0.17], $n = 115{,}265$, $K = 45$) or as entertainment such as recreational TV viewing ($b = 0.03$ [−0.02, 0.09], $n = 74{,}210$, $K = 67$).

Screen Use Duration at Baseline. When studies exclusively focused on children not meeting screen time guidelines (i.e., high exposure level), small but statistically significant effects were reported ($b = 0.08$ [0.03, 0.13], $n = 152{,}373$, $K = 76$). No significant associations were found when looking at children meeting the recommendations ($b = -0.01$ [−0.13, 0.10], $n = 48{,}280$, $K = 22$). So, heavy screen users are more likely to exhibit socioemotional problems later on than those moderately exposed to screens.

Type of Socioemotional Problem. Small, statistically significant effects were observed for internalizing problems ($b = 0.05$ [0.00, 0.09], $n = 121{,}575$, $K = 62$) and peer problems ($b = 0.04$ [0.00, 0.08], $n = 20{,}279$, $K = 17$). Similar effects were found for externalizing problems ($b = 0.04$ [−0.01, 0.10], $n = 172{,}556$, $K = 92$), although they did not reach statistical significance. That is, children who are exposed to screens are more likely to exhibit internalizing (e.g., anxiety, emotional problems, and low self-esteem) and externalizing behaviors (e.g., aggressive behavior, conduct problems, and attention problems), and face challenges in social relationships over time.

Lag Length. We conducted moderation analyses to assess the influence of variations in the lag period of included studies on effect sizes. We preregistered the following lag periods: (a) less than 2 years, (b) from 2 to 4 years, and (c) more than 4 years. Results suggested there were stronger effects for studies with lag periods exceeding 4 years ($b = 0.16$ [0.09, 0.23], $n = 114{,}254$, $K = 84$) compared to shorter periods. Effects were roughly the same for lag periods less than 2 years ($b = 0.04$ [−0.03, 0.11], $n = 121{,}062$, $K = 80$) and between 2 and 4 years ($b = 0.02$ [−0.06, 0.09], $n = 154{,}578$, $K = 91$). Thus, the adverse effects of screens seem to accumulate over prolonged periods of use (see Supplemental Material 2 Figure 2.4).

Age. Effects were similar for younger (aged 0–5 at baseline; $b = 0.08$ [0.02, 0.14], $n = 95{,}493$, $K = 60$) and older children (aged 6–10 at baseline; $b = 0.07$ [0.02, 0.13], $n = 114{,}566$, $K = 57$).

Type of Screen Device. The type of electronic screen to which children were exposed does not appear to moderate the relationship between screen use and later socioemotional problems: similar effects were found for screen devices in general ($b = 0.06$ [0.00, 0.12], $n = 141{,}675$, $K = 55$), and television device ($b = 0.03$ [−0.03, 0.09], $n = 56{,}007$, $K = 63$), although the latter did not reach statistical significance. That is, children's use of any screen devices, including TVs, seems to predict socioemotional problems.

Screen Content. Effects were much stronger for general screen content ($b = 0.28$ [0.18, 0.37], $n = 195{,}795$, $K = 96$) compared to violent content alone ($b = 0.07$ [0.00, 0.13], $n = 25{,}833$, $K = 29$). In other words, while violent content has a significant impact on children's socioemotional well-being, the broader range of content that children are exposed to (e.g., advertisement, age-inappropriate content, and social media) seems to have a more substantial association with socioemotional problems over time.

Socioemotional Problems Predicting Screen Use

Age. There appeared to be stronger effects for socioemotional problems predicting screen use among children aged 6–10 at baseline ($b = 0.08$ [0.00, 0.15], $n = 114{,}566$, $K = 57$) when compared to the younger ones (0–5 years at baseline; $b = 0.03$ [−0.03, 0.08], $n = 95{,}493$, $K = 60$). Older children with socioemotional problems were more likely to use screens at a later point, but this was less likely to be true for younger children.

Screen Content. Effects were much stronger for socioemotional problems predicting the exposure to general content on screens ($b = 0.33$ [0.20, 0.46], $n = 195{,}795$, $K = 97$) compared to violent content in particular ($b = 0.03$ [−0.02, 0.08], $n = 25{,}833$, $K = 29$). Overall, when children are socially and emotionally distressed, they tend to be interested in any kind of content displayed on screens at a later point, not necessarily in violent content.

Purpose of Screen Use. Children with socioemotional problems are more likely to be playing games at a later point ($b = 0.44$ [0.29, 0.60], $n = 80{,}809$, $K = 31$). Socioemotional problems did not appear to predict screen use for entertainment ($b = 0.03$ [−0.00, 0.08], $n = 74{,}210$, $K = 67$) or general purposes ($b = 0.00$ [−0.05, 0.05], $n = 115{,}265$, $K = 45$).

Screen Use Duration at Baseline. Wide confidence intervals make it hard to determine whether socioemotional problems predict screen use more among heavy screen users ($b = 0.05$ [0.00, 0.11], $n = 152{,}373$, $K = 76$) or normal screen users ($b = 0.13$ [−0.03, 0.30], $n = 48{,}280$, $K = 22$). There was a trend toward smaller effects among heavy screen users (perhaps due to restriction of range), but results were not significant among normal screen users.

Lag Length. Longitudinal associations between socioemotional problems and future screen use became stronger over time. Effects slightly increased from lag periods of less than 2 years ($b = 0.04$ [−0.01, 0.09], $n = 121{,}062$, $K = 80$) to lag periods between 2 and 4 years ($b = 0.05$ [−0.06, 0.17], $n = 154{,}578$, $K = 91$). However, significant effects were observed in studies looking at longer lag periods (i.e., greater than 4 years: $b = 0.19$ [0.09, 0.28], $n = 114{,}254$, $K = 84$). These findings indicated children with poor socioemotional well-being become more likely to use screens over time (see Supplemental Material 2 Figure 2.4).

Gender. The impact of socioemotional problems on later screen use was similar across samples of only girls ($b = 0.04$ [−0.01, 0.09], $n = 25{,}566$, $K = 27$) and only boys ($b = 0.00$ [−0.06, 0.06], $n = 26{,}437$, $K = 25$). Mixed-gender effects were small but significant ($b = 0.06$ [0.00, 0.13], $n = 195{,}100$, $K = 99$).

Type of Screen Device. Socioemotional problems appear to equally predict the use of screen-based devices in general ($b = 0.07$ [−0.02, 0.16], $n = 141{,}675$, $K = 55$) and of TV ($b = 0.02$ [−0.04, 0.07], $n = 56{,}007$, $K = 63$), although none of the effects were statistically significant. These results indicate that children with poorer socioemotional well-being tend to engage with all types of screens (i.e., game consoles, computers, tablets, television, and mobile phones) without systematically preferring any devices.

Type of Socioemotional Problem. Internalizing ($b = 0.06$ [0.01, 0.10], $n = 121{,}575$, $K = 62$), externalizing ($b = 0.06$ [0.02, 0.12], $n = 172{,}556$, $K = 92$), and peer-relationship ($b = 0.06$ [−0.03, 0.14], $n = 20{,}279$, $K = 17$) problems were similarly associated with increased use of electronic screens over time, although the latter did not reach statistical significance. That is, children with any type of socioemotional problems are more likely to engage in screen use.

Moderation Results Separated by Gender and Age

To check whether moderation patterns were consistent between boys and girls and between younger and older children, we reran the moderation analyses separately for each gender and each age group, where possible.

Screen Use Predicting Socioemotional Problems

Gender. General screen use was significantly associated with externalizing problems among girls (b = 0.10 [0.02, 0.19], n = 16,468, K = 19). For boys, the associations were very weak and nonsignificant (b = 0.03 [−0.14, 0.19], n = 48,280, K = 22). However, wide confidence intervals make it difficult to determine whether these associations differ between genders. Also, when children were older, the negative effects of general screen use were stronger for boys (b = 0.36 [0.16, 0.55], n = 20.117, K = 15) than girls (b = 0.09 [0.01, 0.17], n = 19,510, K = 16). Insufficient data prevented us from comparing the effects of violent content on socioemotional problems and from conducting other formal gender-based analyses (see Supplemental Material 2 Figure 2.5).

Age. The negative effect of excessive exposure to screens was meaningful among older (aged 6–10 at baseline; b = 0.10 [0.04, 0.16], n = 69,354, K = 30) but not younger children (aged 0–5 at baseline; b = 0.05 [−0.03, 0.14], n = 87,789, K = 47). However, overlapping confidence intervals make it hard to determine whether these associations differ between the two age groups. In addition, the effects of general screen content were much stronger in older (b = 0.28 [0.10, 0.46], n = 111,021, K = 43) than in younger children (b = 0.07 [0.00, 0.13], n = 94,815, K = 53). Conversely, using screens for general purposes had a stronger impact on younger children (b = 0.15 [0.07, 0.22], n = 53,298, K = 25) compared to older children (b = −0.03 [−0.23, 0.16], n = 72,139, K = 21). When screens were used for entertainment purposes, the effects were essentially the same for both age groups. Due to insufficient data, we could not formally compare the effects of violent content and screen use for gaming purposes between these two age groups (see Supplemental Material 2 Figure 2.6).

Socioemotional Problems Predicting Screen Use

Gender. The associations between externalizing problems and total screen use were small and similar between boys (b = 0.02 [−0.05, 0.09], n = 17,391, K = 21) and girls (b = 0.05 [−0.01, 0.11], n = 16,468, K = 19). However, the effects of preexisting socioemotional problems on later general screen use were stronger among older boys (b = 0.37 [0.10, 0.63], n = 20,117, K = 15) compared to girls of similar age (b = 0.03 [−0.04, 0.10], n = 19,510, K = 16). Insufficient data prevented us from comparing the influence of internalizing problems on children's preferences for violent screen content between boys and girls or from conducting further formal gender-based analyses (see Supplemental Material 2 Figure 2.5).

Age. Preexisting socioemotional problems were strongly associated with general screen content in older (aged 6–10 at baseline; b = 0.29 [0.08, 0.49], n = 111,021, K = 43) but not in younger children (aged 0–5 at baseline; b = 0.03 [−0.03, 0.09], n = 94,815, K = 53). Older children facing socioemotional problems seemed more likely to exceed screen "time" limits over time (b = 0.09 [0.02, 0.16], n = 69,354, K = 30) compared to the younger group (b = 0.01 [−0.06, 0.08], n = 87,789, K = 47). The associations between socioemotional problems and screen use for entertainment or general purposes were essentially the same across age groups. Insufficient data prevented us from making other formal comparisons (see Supplemental Material 2 Figure 2.6).

Cross-Cultural Variations: Moderation by Cultural Region, Ethnicity, and Race

We moderated our analyses by whether the dominant culture of the country was "Western" or not. Mean estimates for the relationship between screen use and subsequent socioemotional problems were similar for children from studies conducted in Western (b = 0.06 [0.01, 0.11], n = 156,670, K = 96) and non-Western countries (b = 0.05 [−0.03, 0.12], n = 43,348, K = 21; see Supplemental Material 2 Figure 2.7). Likewise, the mean estimates for the impact of socioemotional problems on later screen use were comparable between children from studies conducted in these countries (Western: b = 0.06 [0.00, 0.11], n = 156,670, K = 96; and non-Western: b = 0.08 [−0.02, 0.18], n = 43,348, K = 21). In contrast, the moderation analysis by the racial group revealed a notable influence of racial composition on the relationship between screen use and subsequent socioemotional problems (see Supplemental Material 2 Figure 2.8). The effects were significantly stronger in samples with a lower proportion of White children (b = 0.55 [0.49, 0.62], n = 37,375, K = 16), moderate in multiracial group samples (b = 0.15 [−0.00, 0.30], n = 52,487, K = 22), and negligible in predominantly White samples (b = 0.01 [−0.08, 0.10], n = 60,989, K = 35). Similarly, the predictive effects of socioemotional problems on subsequent screen use were stronger in non-White samples (b = 0.27 [0.06, 0.49], n = 37,375, K = 16), while the effects in mixed-race samples (b = 0.06 [0.00, 0.13], n = 52,487, K = 22) and predominantly White samples (b = 0.10 [−0.06, 0.25], n = 60,989, K = 35) were both smaller. Due to data constraints, we could not determine if the relationship between screen use and socioemotional problems was higher or lower among different ethnic groups (i.e., Hispanic vs. non-Hispanic).

Moderation by Before and After the Introduction of Smartphones

As noted above, we explored whether the relationship between screen use and socioemotional problems changed after the advent of smartphones (~2012) or after COVID-19 lockdowns were lifted (see Supplemental Material 2 Figure 2.9). Effects were somewhat stronger in studies published between 2012 and 2020 (b = 0.08 [0.00, 0.16], n = 42,908, K = 40). Effects were somewhat smaller during other periods: "before 2012" (b = 0.04 [−0.06, 0.14], n = 21,009, K = 35) and "after 2020" (b = 0.02 [−0.07, 0.10], n = 137,424, K = 43). In contrast, for the predicting effects of socioemotional problems on later screen use, the effects tended to be larger for studies conducted after 2020: from "before 2012" (b = 0.03 [−0.03, 0.10], n = 21,009, K = 35) to "2012–2020" (b = 0.03 [−0.06, 0.11], n = 42,908, K = 40) and "after 2020" (b = 0.08 [−0.02, 0.19], n = 137,424, K = 43). The overlapping

confidence intervals make it difficult to determine whether these associations significantly differ.

Sensitivity Analyses

We conducted sensitivity analyses to assess whether relationships were influenced by risk of bias assessments for the included studies. As the majority of studies were unclear or high-risk for selective reporting bias, a sensitivity analysis for this criterion was not possible. For all other criteria, only one finding appeared influential: sensitivity analyses suggested that the effects of screen use on socioemotional problems were influenced by attrition bias. Studies with higher levels of dropout demonstrated stronger effects (b = 0.40 [0.18, 0.62], n = 108,918, K = 58) than those with minimal dropout (b = 0.03 [−0.05, 0.11], n = 101,888, K = 61). However, many studies managed dropout with approaches that meet the expectation of the field (e.g., multiple imputation, maximum likelihood imputation); effects from those studies (b = 0.04 [−0.02, 0.09], n = 169,300, K = 78) did not differ from those that used less appropriate measures (e.g., listwise deletion; b = 0.09 [0.01, 0.17], n = 41,314, K = 41). Full results can be found in the Supplemental Material 2 Figure 2.10.

In addition, we used three methods to assess whether publication bias impacted our findings. First, we used a funnel plot to examine the relationship between effect size and standard error (H. Cooper et al., 2019). We observed a balanced pattern in the funnel plots, indicating no pronounced asymmetry, consistent with a low risk of publication bias (see Supplemental Material 2 Figures 2.11 and 2.12). Second, we performed a multilevel Egger's regression test (Egger et al., 1997). The results indicate that the predictive effects of screen use on socioemotional problems were not influenced by standard error coefficients, $F(1, 103) = 0.01$, $p = .931$. Similarly, the standard error did not appear to statistically significantly influence the effects of socioemotional problems on later screen use, $F(1, 36) = 1.25$, $p = .271$. Third, we estimated the degree of publication bias that would be necessary to attenuate the meta-analytic estimate to zero (Mathur & VanderWeele, 2020). Results indicate that in order to nullify the observed effects of screen use on socioemotional problems, statistically significant results would need to be at least nine times more likely to be published than nonsignificant results. For the inverse relationship between socioemotional problems and screen use, the observed shift in effects required to account for publication bias is not achievable, emphasizing the robustness of our findings. These results suggest that there is no compelling evidence of publication bias in our review.

Finally, we conducted a sensitivity analysis to identify the effects of any outlier estimates, identifying three studies with extreme effect sizes. After carefully reviewing these studies, we excluded them from the analysis (k = 37 effect sizes) and then reran the analyses. The sensitivity analysis showed no significant changes in the longitudinal associations between screen use and socioemotional problems: screen use predicting socioemotional problems (b = 0.06 [0.02, 0.11], n = 199,905, K = 114) and socioemotional problems predicting screen use (b = 0.05 [0.00, 0.11], n = 199,905, K = 114). The stability path estimates remained very similar, and the sensitivity analysis results also confirmed our primary findings in the moderation analysis, showing no substantial differences. Full details are provided in the Supplemental Material 6.

Qualitative Synthesis on Included Studies

Most studies included in the qualitative synthesis used methods that could not be harmonized with the majority of the studies (e.g., trajectory, moderation, dichotomized measures, or mediation analysis). Most supported the headline findings from the meta-analysis. For example, exceeding screen time limits emerged as a significant predictor of externalizing behaviors (e.g., inattention and aggression; X. Wu et al., 2021), depressed mood (Yu & Park, 2017), and mental health problems among older children (Loewen et al., 2019), with smaller and nonsignificant effects among younger children (Hinkley et al., 2020). The detrimental effects of excessive screen use in early years accumulate over time, with stronger associations with the onset of total behavioral difficulties in middle childhood (Zhao et al., 2022). Excessive computer or video game use was associated with greater symptoms of attention-deficit/hyperactivity disorder (Loewen et al., 2020; X. Wu et al., 2016), increased internalizing (X. Y. Wu et al., 2017; X. Wu et al., 2018), and externalizing problems (X. Wu et al., 2018), and depressive symptoms (Liau et al., 2015). Excessive television viewing during childhood was found to be significantly associated with ADHD in subsequent years (Peralta et al., 2018), as well as with behavioral problems (Robertson et al., 2013) anxiety symptoms (McAnally et al., 2019), and mental health problems (McVeigh et al., 2016), even over a decade later. Excessive gaming and TV viewing were linked to greater ADHD problems but were not significantly associated with internalizing behaviors (X. Wu et al., 2021). Excessive exposure to social media during preadolescence was linked to an increased likelihood of unhappiness during adolescence (Twigg et al., 2020). No significant associations were observed for TV viewing during childhood predicting major depressive symptoms in adulthood (McAnally et al., 2019). Overall, the studies using these other methods support meta-analytic findings: Screen use predicts socioemotional problems but is more robust for externalizing problems.

Five studies (from six reports) examined how preexisting socioemotional problems influenced later screen use behavior (Domoff et al., 2017; Hoare et al., 2019, 2020; McArthur et al., 2020; X. Wu et al., 2021; Yu & Park, 2017). Younger children displaying higher levels of externalizing behavior were more prone to exceeding screen time limits years later (McArthur et al., 2020; X. Wu et al., 2021). However, evidence from two large studies with over 9,300 children showed that children with depressive symptoms at the age of seven were more likely to become compulsive social media users during adolescence (Hoare et al., 2019, 2020). As above, studies using these alternative analyses supported meta-analytic findings: childhood socioemotional problems predict later screen use.

Studies with moderation and mediation analyses allow us to see when these relationships are strongest and why. For example, parenting stress can act as a mediator in the relationship between children's externalizing behaviors and subsequent screen use (McDaniel & Radesky, 2020): greater child externalizing behavior predicted heightened parenting stress, which in turn predicted increased media use by the child. The effects were strongest for game devices and tablets compared to TV and mobile phone use (McDaniel & Radesky, 2020). Some variables appear to act as protective factors, mitigating the effects of screen use on socioemotional problems, and vice versa. One study found that

physical activity moderated the association between screen time and behavioral difficulties in boys, but not girls (Neville, McArthur, et al., 2021). The link between screen use and behavioral difficulties was attenuated when boys frequently engaged in physical activity (Neville, McArthur, et al., 2021). Liau et al. (2015) found that familial factors (parent–child connectedness, positive family environment) were protective factors, reducing the risk that childhood screen use leads to pathological gaming or depressive symptoms. Negative emotions were found to predict screen time during meals, but only among children whose parents were either overreactive or lax in their disciplinary methods (Domoff et al., 2017). Similarly, high levels of parental surveillance increased the risk that internalizing problems lead to excessive internet use (Yu & Park, 2017). Overall, these studies provide some evidence that these relationships may be mediated and moderated by other factors (e.g., parenting, physical activity). It seems that attentive and supportive parenting styles—rather than laissez faire or controlling styles—may mitigate the risks described here.

Discussion

The main purpose of this study was to test the longitudinal relationships between screen use and socioemotional problems in children. We found evidence of a reciprocal relationship with small but meaningful associations in both directions. In models like ours that control for stability (screen use from Time 1 to Time 2), small effects can indicate meaningful associations (Adachi & Willoughby, 2015). Thus, our findings suggest there are causal effects between screens and poor socioemotional well-being in children. That is, screen use may increase the risk of children developing socioemotional problems, and children with socioemotional problems may be drawn to screens, possibly as a way to manage their distress (Poulain et al., 2018, 2019).

These reciprocal associations were comparable for internalizing and externalizing behaviors: Screen use predicted both internalizing and externalizing problems, and children showing such problems were more likely to use screens. Similar findings have been documented in previous longitudinal research. For example, peer-relationship problems were significantly associated with later computer/internet and mobile phone use in preschoolers (Poulain et al., 2018). Similarly, lower self-regulation at 4 years was significantly associated with higher television viewing and electronic gaming 2 years later (Cliff et al., 2018). Both internalizing and externalizing problems during childhood significantly predicted disordered gaming symptoms in early adolescence (Richard et al., 2022). Behavioral difficulties were found to increase passive media consumption (i.e., TV viewing) in adolescents (Poulain et al., 2019). A systematic review investigating predictors of internet gaming disorder in early adolescents found that poor self-concept—like low self-esteem, poorer body image, and low emotional competence (Green et al., 2020)—was linked to gaming disorders over time. Older children with depressive symptoms were more likely to develop internet gaming disorder in early adolescence (Jeong et al., 2019). Socioemotional challenges may also trigger the desire to spend time alone on screens (Domingues-Montanari, 2017). For example, research has shown that adolescents who use digital technologies to regulate their emotions see short-term reduction in negative emotions (Scott et al., 2024). However, screen use is generally "avoidance coping," which alleviates distress without addressing core issues (Herman-Stabl et al., 1995). Screen use may displace more healthy "approach coping," like discussing the socioemotional problems with parents or caregivers. Therefore, screen use may create a vicious cycle that stymies healthy socioemotional development (American Academy of Pediatrics, 2022): higher screen use displaces parental interaction (Brushe et al., 2024), lower interaction leads to lower parental knowledge of the child's socioemotional development, and fewer opportunities to be taught socioemotional competencies. While results are consistent with these hypotheses, our data do not provide conclusive evidence that these mechanisms are what underpin the links between screen use and socioemotional problems. Future research should therefore explore these factors as possible mediators of the relationships identified here.

In addition, our moderation analysis revealed some nuances in these relationships. Firstly, some researchers hypothesized children are particularly vulnerable to contextual influences in the first 5 years of life (Hetherington et al., 2020; Potegal et al., 2003). Our preregistered analyses do not support this belief. We found the reciprocal effects were comparable across age groups (0–5 vs. 6–10), with small significant associations for both age groups. However, when exploring different aspects of screen use for each age group separately, our findings suggest that older children may actually be at greater risk of developing socioemotional problems than their younger counterparts. Specifically, older children who exceed screen time limits appear to display more problems than younger children in similar situations. Also, the effects of general screen content were stronger among the older age group. One possible explanation is socioemotional problems are more obvious when children enter school: Socioemotional problems are usually identified by behaviors that are developmentally inappropriate (e.g., excessive anger for the child's age). "Developmentally appropriate" behavior is likely more tightly constrained once children enter school (five and up; Cole et al., 2020). Prior to children starting school, parents may set their own expectations for behavior, meaning socioemotional problems could go undetected. Once children enter school and are required to integrate with the expectations of teachers and their peers, two factors might explain a stronger link with screen use. First, children with socioemotional problems may find those problems become more severe with lower levels of parental support throughout the day. Second, those socioemotional problems may be more likely to be identified as they struggle to meet the expectations set by the school environment. Alternatively, older children may be more at risk because they are generally provided with more autonomy than their younger counterparts (Connell et al., 2015). This means they have more liberty to choose how they cope with socioemotional problems or have more liberty about how they spend their free time. In contrast, before children start school, parents may have more influence over how younger children spend their time (e.g., what screens they use and how much). For instance, the 2020 Common Sense Media Census surveyed a nationally representative sample of 1,440 parents of American children (V. Rideout, 2020). It found that most screen use among children aged 5–8 years happens without parental involvement. Their findings showed that parental coviewing significantly decreases as children age (from 61% among those under 2 years to just 18% for 5- to 8-year-olds). Prior to entering school, parents might also be more likely to directly observe socioemotional problems (e.g., withdrawing) so they can intervene. As children age, they are also more likely to be permitted to use social media

(American Psychological Association, 2023), despite it seeming to be a particularly deleterious form of screen use (Sanders et al., 2024). Another explanation is that the effects here take time to accumulate. Our time lag moderation analyses showed stronger effects for longer lag periods. This would be consistent with risks accumulating over time. Older children may have more cumulative time exposed to screens than their younger counterparts. Taken together, these findings align with studies showing that the detrimental effects of high screen time build up with age, becoming more evident from early adolescence onwards (Segev et al., 2015).

Moreover, the relationships at different ages appear moderated by gender. Across the whole sample, girls were at greater risk of developing socioemotional problems following their interactions with screens. However, when looking at older children only, boys seemed at greater risk than girls. Specifically, compared to older girls, older boys were more likely to present socioemotional problems over time and more likely to turn to screens when facing socioemotional problems. These findings are consistent with previous research in older children, which found stronger associations between screens and later socioemotional problems in boys compared to girls (Eirich et al., 2022; Gentile et al., 2010; Nikkelen et al., 2014). Other studies have found psychosocial problems were more strongly associated with problematic screen use in boys than girls (Ferguson & Ceranoglu, 2014; Segev et al., 2015). Such differences might be linked to the fact that boys typically spend more time using screens—especially playing video games—than girls (Rideout et al., 2022). Boys were found to be up to six times more likely to engage in problematic gaming than girls (Wichstrøm et al., 2019). As noted earlier, according to the displacement hypothesis, increased time spent gaming can come at the cost of other protective behaviors that are essential for a healthy socioemotional development. By missing out on these protective behaviors more than girls, boys might be more susceptible to socioemotional problems over time. Alternatively, these results may reflect normative sex-related characteristics that naturally differentiate boys and girls in terms of emotional and behavioral regulation. On average, boys tend to struggle more with controlling negative behaviors, managing impulses, and suppressing frustration or anger (Zahn-Waxler et al., 2008). On the other hand, girls typically exhibit higher levels of social awareness, greater self-restraint, and stronger emotional regulation skills throughout childhood and adolescence (Zahn-Waxler et al., 2008). These sex-related developmental trajectories could play a crucial role in shaping how boys and girls respond to their interactions with screens. From this perspective, older boys might be more likely to externalize their distress through behaviors such as aggression or hyperactivity than girls with similar age, making it easier for parents and caregivers to identify any signs of socioemotional impairment (Browne et al., 2020; Groh et al., 2012). This does not necessarily mean that older girls experience less psychological distress than boys; rather, their difficulties may go unnoticed due to their more subtle nature. Either way, parental involvement is important throughout childhood. Various aspects of children's well-being are still linked to parental interaction as children age, regardless of their gender: positive interactions with parents are associated with a lower likelihood of problem behaviors in early adolescents (Frick & Viding, 2009). Thus, rather than mostly focusing on the early years (5 and under), our meta-analyses suggest care should be devoted to screen use and socioemotional problems across the whole period, including childhood and adolescence, because effects appear to accumulate across time. Given the observed differences in how boys and girls respond to screen interactions as they age, implementing gender-targeted interventions is also warranted to address these distinct patterns effectively.

Reciprocal relationships were stronger for gaming than for other forms of screen use. That is, children using electronic games were more likely to develop socioemotional problems than those using screens for other purposes (i.e., entertainment, general reasons). Children with socioemotional problems were also more likely to increase their time spent gaming, compared with other uses for screens. Our findings align with previous longitudinal evidence, showing children with attention problems are at greater risk of engaging in problematic gaming, possibly due to difficulty attending to less engaging tasks (Ferguson & Ceranoglu, 2014; Gentile et al., 2012; Peeters et al., 2018). Children with depressive symptoms (Jeong et al., 2019) and poor parent–child relationships (Bender et al., 2020; Schneider et al., 2017) were more likely to develop internet gaming disorder. In the other direction, electronic gaming, but not TV, predicted increased anxiety (Segev et al., 2015) and depressive symptoms among older children (Houghton et al., 2018; Segev et al., 2015). Segev et al. (2015) found the risks from video gaming increased as children entered early adolescence. Again, this could be an indication that the effects of gaming intensify over time.

Given the educational benefits of some types of screen use (Sanders et al., 2024), it is perhaps not surprising that total screen use has weaker relationships with socioemotional problems compared with gaming. It is not necessarily a concern for a child experiencing socioemotional distress to occasionally play video games as a temporary escape from their frustrations. Some video game interactions can have positive effects on a player's well-being (Ryan et al., 2006). Compared with other forms of screen use, games are well designed to satisfy players' psychological needs: They provide a sense of autonomy by giving them a sense of control, a sense of competence by challenging them to achieve in-game goals and feel good at something, and a sense of relatedness by facilitating interactions with peers and participation in virtual communities (Rigby & Ryan, 2011; Ryan et al., 2006). However, concerns arise when using video games as an escape leads to problematic gaming behavior (Przybylski et al., 2009), or when gaming displaces healthier behaviors that could more sustainably meet their needs (e.g., friendships, school engagement, physical activity; Rigby & Ryan, 2011). The nature of online games may contribute to these risks. As online games do not stop when they log out, players feel compelled to remain connected for longer periods (Schneider et al., 2017). Trying to not miss out on their gaming interactions, they neglect other important real-life experiences such as outdoor leisure and physical activities, adequate sleep, and face-to-face social interactions. Additionally, online games allow the creation of personalized avatars, a virtual character that represents the player in the game (Bender et al., 2020). When children perceive these avatars as an extension of themselves and use them to compensate for unmet needs in real life (e.g., lack of physical strength, beauty, or social status), gaming interactions can pose a significant risk to their socioemotional well-being (Green et al., 2020).

Our findings suggest that while all parents should be vigilant about their child's gaming interactions—such as prioritizing educational games and ensuring that recreational games are age-appropriate—the focus should intensify as children enter later developmental stages.

Parents and policymakers should consider a proactive approach to supporting children with socioemotional difficulties. They may limit game use more tightly than educational screen time to prevent gaming from becoming a maladaptive coping mechanism (Eden et al., 2020). Importantly, parenting style matters (Pinquart, 2017), even in the way parents put boundaries around screens: research indicates that an autonomy-supportive style of communicating gaming rules is generally more effective than a controlling approach (Bjelland et al., 2015; Ramirez et al., 2011). Managing screen use is just one of many strategies parents can use to prevent socioemotional problems (Costantini et al., 2023). For example, interventions that foster positive peer relationships and family dynamics, enhance social skills, or provide emotional support are all valuable (Rega et al., 2023; Schneider et al., 2017). In parallel, parents should strive to remain actively involved in their child's gaming interactions for as long as possible (Schneider et al., 2017). This continued involvement may help strengthen parent–child relationships (Gentile et al., 2014; Lo et al., 2024), mitigating the chances of children becoming compulsive gamers (Kim et al., 2023; Liau et al., 2015). By doing that, parents and caregivers can help create a more supportive environment that addresses the root causes of problematic gaming and socioemotional problems.

While games increased risk of socioemotional problems and vice versa, overall relationships were not stronger for violent content. These findings are consistent with three meta-analyses on violent video games and aggressive behavior among children and adolescents (Mathur & VanderWeele, 2019). Those authors found consistent, but small, predictive effects of violent video games on aggressive behavior, consistent with our data. Similarly, a meta-analysis by Nikkelen et al. (2014) found violent content did not appear to increase the risk of ADHD-related behaviors in children and adolescents. Some parents and researchers may find this surprising. Researchers propose that violent media increases aggression via two key processes: (1) observational learning, where children—naturally inclined to imitate what they see—may adopt aggressive behaviors after being exposed to violent content on screens (Huesmann & Guerra, 1997); and (2) activation and desensitization, where repeated exposure to violent content makes children less sensitive to it and more likely to act out aggressively toward others (Funk et al., 2004; Huesmann, 2007; Nikkelen et al., 2014). Our data do not support these hypotheses. This may be a statistical artifact due to a restriction of range: the amount of violent content is by definition less than the total amount of content children see, so there may be a smaller statistical range to explain socioemotional problems. Alternatively, it may be that violent content is more intuitively delirious, so parents might more naturally control exposure: It is likely more obvious children should avoid violent adult movies than cartoons made for children. Either way, our results suggest that violent content has similar effects to other forms of screen use.

Despite the nuances observed, our findings suggest that the relationship between general screen use and socioemotional problems operates in both directions, with effects of similar magnitude. In other words, children on screens may be at greater risk of developing socioemotional problems, just as children with preexisting socioemotional problems may turn to screens in general as a way to cope with their emotional and social distress. Reciprocal relationships, by their nature, tend to reinforce each other over time (Slater et al., 2003). Thus, socioemotional problems appear to increase screen use, and screen exposure may increase the risk of socioemotional problems, creating a vicious cycle (Huesmann, 2007; Slater et al., 2003). Parents of children with socioemotional problems may attend to screen use as a possible risk factor and consider tighter controls on screen use to avoid this cycle.

Our results also reinforce the benefits of screen time guidelines for breaking these cycles among children. The risks from screen time among children who met the guidelines were very low. These data suggest that small amounts of screen use are not problematic—there appear to be few differences between outcomes for children watching 10 and 30 min per day. For children exceeding the guidelines, there was a substantial association between their screen use and socioemotional problems. At these levels, more is worse, likely because screens increasingly displace other essential protective behaviors (Roberts et al., 1993; World Health Organization, 2019). As noted earlier, meta-analyses have shown that screen usage is associated with lower levels of physical activity (Kontostoli et al., 2021), poor sleep duration or quality (Carter et al., 2016; Hale & Guan, 2015; Zhang et al., 2022), and reduced in-person social interactions (Twenge et al., 2018). Small increases in screen use are unlikely to displace these behaviors, but once exceeding guidelines, an extra hour of screen use likely means less sleep, social time, or physical activity. Given our findings above regarding some types of screen use being worse than others, guidelines might go beyond "amount of screen time" and focus more on the composition of screen time. Nutritional guidelines go beyond the amount of food children should eat and also describe what kinds of foods parents should prioritize, and what they should limit. Similarly, screen time guidelines could help parents identify the low-risk behaviors (e.g., coviewing with parents, educational TV and games, physically active games) and the high-risk ones (e.g., video gaming, social media). Such guidelines might help parents realize the benefits of screen time without the biggest risks.

Guidelines can be blunt instruments because they usually recommend the same thing across a population, but we found few variables that moderated effects across populations. Consistent with prior meta-analyses (Anderson et al., 2010), we found similar effects across Western and non-Western countries. This may be for a few reasons. While there are cultural differences in contextual factors (e.g., parenting) that influence screen use and socioemotional problems, the relationship between screen use and socioemotional problems may be similar. That is, some cultures may be more restrictive around screen use, but even in those cultures, children who use more screens appear more likely to develop problems. Alternatively, this finding may be an artifact of our design, where we could only use crude measures of culture (i.e., the country of the study). "Non-Western countries" are likely an insufficiently homogenous group to make meaningful inferences. Future studies could directly target this question by using the same measures across multiple countries at once (e.g., via Program for International Student Assessment or similar). In contrast, our moderation analysis revealed significant racial disparities in the relationship between screen use and socioemotional problems. Previous data suggest race or ethnicity may be influential. Research has shown that Black and

Hispanic children generally spend more time on screens than their White and non-Hispanic peers (Lowry et al., 2002; V. Rideout, 2020). Our findings indicate a stronger bidirectional relationship between screen use and socioemotional problems in non-White populations. This suggests these children may be more vulnerable to the negative effects of screen use and more likely to use screens to cope with their social and emotional challenges. Alternatively, this could reflect the disproportionate impact of screen use on the development of children from marginalized and low socioeconomic status communities (Cameron et al., 2015; Wilhite et al., 2023). Our data could not determine if the relationship between this screen use and socioemotional problems was higher or lower among these groups because few studies focused on—or reported effects for—these children. So, children from these backgrounds should likely be prioritized in future research.

In our data set, non-White samples were predominantly Asian children (18 out of 20 studies), aligning with previous systematic reviews showing stronger associations between screen use and socioemotional problems in Asian children compared to other racial groups (Dahl & Bergmark, 2020; Rega et al., 2023; Saunders et al., 2017). This relationship may be influenced by distal factors such as cultural differences, social norms, and family dynamics (Block, 2008; Dahl & Bergmark, 2020). However, the limited representation of non-Asian, non-White groups in our analysis—such as Black, Middle Eastern, Indian, and African children—highlights a critical gap in existing research. This lack of diversity underscores the need for studies that systematically examine racial and cultural differences in screen use patterns and their socioemotional impacts. Our conclusions are limited by the fact that these analyses are conducted at the study level. Future reviews could consider individual participant data meta-analyses (Tierney et al., 2023) to better assess the moderating roles of race, ethnicity, gender, age, or socioeconomic advantage.

Last, our exploratory moderation analysis by period of publication suggested the effects have been influenced by changing technology. The stronger associations observed between 2012 and 2020 suggest that the introduction of smartphones and electronic tablets may have intensified the negative effects of screens during this time. These devices not only made screens more accessible but also changed how children interact with them (e.g., less communal viewing of a TV). Since the COVID-19 pandemic, it seems that children with socioemotional problems are more likely to now turn to screen use. This pattern has been observed by other authors (Chen et al., 2022; Deng et al., 2023; Teng et al., 2021). The pandemic itself was associated with higher screen use and higher socioemotional problems (McArthur et al., 2021; Racine et al., 2021). During that time, children may have learned the short-term reprieve that screens could provide, or parents may have developed more lax standards for what "appropriate" levels of screen time entail. Those changes may mean children learned to—or were permitted to—use screens to cope. Alternatively, students without socioemotional problems may have emerged from the pandemic with renewed interest in physical activity and social engagement, but those with problems may have maintained habits developed during the pandemic. Either way, these findings highlight how context—both social and technological—can influence the relationship between screens and socioemotional well-being during childhood. Clearly, guidelines need to stay attuned to changes in the context to ensure recommendations stay current.

Strengths, Limitations, and Recommendations for Future Research

By relying on longitudinal evidence, our review provides stronger causal evidence than reviews focused on cross-sectional studies. However, longitudinal studies can still be subject to confounding. It is possible that a third variable explains both socioemotional problems and screen use. For example, permissive parenting styles may permit higher levels of screen use, and those parenting styles may explain socioemotional problems (Pinquart, 2017). Alternatively, lower executive function is associated with externalizing problems (Yang et al., 2022), and it is possible that children with low executive function are more strongly drawn to screens. Without using experimental designs or more sophisticated causal models, we cannot rule out possible confounds that may influence both screen use and socioemotional outcomes (e.g., parenting style, parental screen use, physical activity, sleep behaviors, and family socioeconomic status). Studies may consider using instrumental variables or other sophisticated methods of minimizing the effects of confounding (e.g., propensity score matching or inverse probability of treatment weighting). These methods are hard to meta-analyze but provide stronger causal evidence, so future reviews should consider synthesizing those kinds of data with those we summarize here. Experimental designs are challenging in this domain where screen exposure is relatively ubiquitous. Nevertheless, interventions to support parents and children to use fewer screens are valuable assessments of the causal model (Maniccia et al., 2011). As those studies become more prevalent, future reviews could synthesize those findings as a robust test of the hypotheses here.

Our study used a comprehensive search strategy and yielded many more studies than previous reviews on the same topic. We included grey literature and languages other than English, meaning our conclusions are less likely to be influenced by selection bias. We also explicitly tested for publication bias, and the findings seemed robust to even conservative assumptions. We also assessed longitudinal relationships using sophisticated hierarchical two-stage SEM. By simultaneously accounting for covariation, stability, and cross-paths between screen time and socioemotional problems, we were able to estimate the unique variance in socioemotional problems accounted for by earlier screen use (and vice versa). However, the complexity of our model posed challenges in conducting formal tests of moderation. Moderation analyses of meta-analytic SEMs test for variation in any of the paths in the model (Jak & Cheung, 2020). With those tests, a moderator could be "significant" even if it only changed relationships we were not focused on (e.g., cross-sectional correlations). As a result, we could either model stability and covariation or conduct significance tests for moderators on our paths of interest. For consistency across our modeling approaches, we chose the former: to always model stability, covariation, and our paths of interest; we identified moderators by inspecting point estimates and confidence intervals. As methods develop, we hope meta-analytic SEMs can assess moderation on specific paths (rather than the whole model).

Additionally, we hope researchers reproduce our analyses when more device-measured data is available. Our analyses were largely based on self- or caregiver-reported measures of screen use. Reported measures inherently carry the risk of response bias and recall inaccuracies, which can compromise the precision and reliability of the data (Barr et al., 2020; Orben, 2020; Parry et al., 2021). For instance, children may have difficulty reporting accurately on their own behavior and that of their peers. Parental reports are unreliable too: research involving children aged 3–5 years found that a significant portion of parents either underestimated (35.7%) or overestimated (34.8%) their child's use of mobile devices (i.e., smartphones and tablets) compared to objectively measured usage (Radesky, Weeks, et al., 2020). The associations between subjectively measured screen use and children's behavioral problems are also moderated by informants (peers vs. parents vs. teachers; Eirich et al., 2022). These discrepancies may stem from the measurement of both screen use and psychosocial health (De Los Reyes & Kazdin, 2005). For example, we might fear children are poor at reporting on their peers, but children may also have more opportunities to engage in aggressive behaviors when interacting with other children, making these behaviors more likely to be observed by their peers (De Los Reyes, 2011). Future research should aim to incorporate more precise methodologies, such as device tracking or direct observation, alongside reported uses and motivations of screen use. Utilizing multi-informant measures for both screen time behavior and psychosocial outcomes could also enhance the validity of future research (Eirich et al., 2022).

While our moderators describe some interesting patterns in the relationships explored here, some moderator levels may have low precision due to the small number of studies. For example, only 26 studies explored the effects of violent screen content. Only four studies looked exclusively at the effects of portable devices. Effect estimates for these moderators may be unreliable and should be replicated once more data are available.

It is also possible that required data are available but not reported in a way we could meta-analyze. For example, some studies looking at general screen content have also included violent content, without separating the effects of each. The same pattern is likely true of the device, where mobile phones and home computers and TVs have all been considered "screen time." Longitudinal research focusing on specific screen content (i.e., violent and age-inappropriate content) and newer forms of screen use (e.g., smartphones) may help researchers go beyond "screen time" as a monolith.

We planned to exclude studies where a screen might have been present but their presence was not explicitly reported (e.g., "school homework" and "games"). While we never needed to use this exclusion criterion, our search terms may not have identified these studies unless they also mentioned other "screen time" keywords (e.g., "computer" and "tablet"). While we hope our forward and backward citation searches would have detected these studies, we cannot guarantee to have found all these studies on screen use when the title or abstract used ambiguous language like "games."

We excluded studies focused on children with neurodevelopmental disorders because it would have increased the risk of confounding and introduced heterogeneity in our pooled estimates. However, doing so clearly means we cannot generalize our findings to neuroatypical populations. These students face different challenges when it comes to screen use and socioemotional problems, so future reviews directly focused on these populations are warranted so we can tailor interventions and recommendations for these specific groups.

In addition, we recognize the importance of distinguishing between sex and gender in research on child development (Zosuls et al., 2009), especially given their distinct and influential roles in psychosocial outcomes (Martin & Hadwin, 2022). However, due to inconsistencies in how these variables were reported across the studies included in our review, combining them into a single variable was necessary to manage this variability. This limitation underscores the need for careful consideration of sex and gender in future child-focused screen time research, particularly when looking at psychosocial outcomes. Also, as noted earlier, our study could not assess whether variables like socioeconomic status influenced the relationships between screen use and socioemotional problems. Future research could better examine how these factors influence the relationship between screen use and socioemotional problems throughout childhood.

Last, it is important to highlight that none of the studies included in this meta-analysis scored low risk on all risk of bias criteria. Most studies were not preregistered. Preregistration is generally agreed to mitigate bias and enhance transparency, enabling others to more effectively calibrate their confidence in scientific claims (Hardwicke & Wagenmakers, 2023). Preregistration has been recommended since 2012 (Kupferschmidt, 2018), but it has not been widely adopted: of papers published in our review since then, only 63% were preregistered. In addition, many studies were deemed high-risk due to a lack of clarity over their procedures. While word counts are restrictive, and standards are evolving, authors should consider both (a) using standardized reporting checklists to promote transparency about key decisions (H. Cooper & Cooper, 2020; von Elm et al., 2014) and (b) providing open data and code so that analyses can be reproduced by other researchers.

Conclusions

Screens are ubiquitous but have complex effects on children's health and development (Sanders et al., 2024). Our meta-analysis revealed that screen use leads to socioemotional problems and vice versa. Although overall effect sizes were small-to-moderate, small effects are clinically meaningful when accumulating over time (Funder & Ozer, 2019). Relationships between gaming and socioemotional problems were strong in both directions, suggesting games might be a particular area of focus for parents, researchers, and policymakers. Our findings reinforce the need for parents to monitor the time children spend on screens. If children are engaging in modest amounts of screen time, screen time is educational (Sanders et al., 2024), and protective factors such as sleep, physical activity, and social interactions are not displaced, then there may be few risks of increased socioemotional problems. If screen time is well above guidelines, or predominantly gaming, then there appears to be a substantial increase in risk, for both externalizing and internalizing problems. Our findings emphasize the importance of teaching children with alternate methods of coping with socioemotional problems rather than resorting to screens. Overall, our findings support the need for screen time guidelines, but we echo calls for guidelines to be attuned to content and context. The total amount of screen time matters, but so does the reason they are using the screen, and the environment surrounding the child.

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