# Optional ERIC Coversheet — Only for Use with U.S. Department of Education Grantee Submissions

This coversheet should be completed by grantees and added to the PDF of your submission if the information required in this form **is not included on the PDF to be submitted**.

**INSTRUCTIONS**

- Before beginning submission process, download this PDF coversheet if you will need to provide information not on the PDF.
- Fill in all fields—information in this form **must match** the information on the submitted PDF and add missing information.
- Attach completed coversheet to the PDF you will upload to ERIC [use Adobe Acrobat or other program to combine PDF files]—do not upload the coversheet as a separate document.
- Begin completing submission form at https://eric.ed.gov/submit/ and upload the full-text PDF with attached coversheet when indicated. Your full-text PDF will display in ERIC after the 12-month embargo period.

## GRANTEE SUBMISSION REQUIRED FIELDS

**Title of article, paper, or other content**

Does Home Media Use Predict Preschoolers' Skill Gains?A Time Diary Study

**All author name(s) and affiliations on PDF. If more than 6 names, ERIC will complete the list from the submitted PDF.**

| Last Name, First Name | Academic/Organizational Affiliation | ORCID ID |
|---|---|---|
| Rebecca Dore | The Ohio State University | 0000-0001-7778-389X |
| Nan Xiao | The Ohio State University | 0000-0001-5287-1762 |
| Robin Sayers | The Ohio State University | 0000-0002-4924-6787 |
| Kelly Purtell | The Ohio State University | 0000-0002-7744-7543 |
| Laura Justice | The Ohio State University | 0000-0002-0580-0280 |
| | | |

**Publication/Completion Date—**(if *In Press,* enter year accepted or completed) 2023

**Check type of content being submitted and complete one of the following in the box below:**

- ☐ If article: Name of journal, volume, and issue number if available
- ☐ If paper: Name of conference, date of conference, and place of conference
- ☐ If book chapter: Title of book, page range, publisher name and location
- ☐ If book: Publisher name and location
- ☐ If dissertation: Name of institution, type of degree, and department granting degree

Translational Issues in Psychological Science

**DOI or URL to published work** (if available) https://doi.org/10.1037/tps0000365

**Acknowledgement of Funding**— Grantees should check with their grant officer for the preferred wording to acknowledge funding. If the grant officer does not have a preference, grantees can use this suggested wording (adjust wording if multiple grants are to be acknowledged). Fill in Department of Education funding office, grant number, and name of grant recipient institution or organization.

"This work was supported by U.S. Department of Education **[Office name]** Institute of Ed. Sciences through **[Grant number]** R305A1800 to **Institution]** The Ohio State. The opinions expressed are those of the authors and do not represent views of the **[Office name]** Institute of Ed. Sciences or the U.S. Department of Education.

AMERICAN PSYCHOLOGICAL ASSOCIATION

Translational Issues in Psychological Science


ISSN: 2332-2136

2023, Vol. 9, No. 3, 263–276
https://doi.org/10.1037/tps0000365

# Does Home Media Use Predict Preschoolers' Skill Gains? A Time Diary Study

Rebecca Dore, Nan Xiao, Robin Sayers, Kelly Purtell, and Laura Justice
Crane Center for Early Childhood Research and Policy, The Ohio State University

We examined whether media use measured using time diaries is related to preschoolers' academic and social/behavioral skills. Children ($N = 179$) completed direct assessments of academic skills in the fall and spring, and teachers reported on social and behavioral skills. Parents/caregivers completed a 24-hr time diary in the spring, from which children's total media use, nighttime media use, educational media use, and joint media engagement were obtained. Results showed that children who had high levels of media use tended to have smaller social skill gains than children with low or moderate levels of media use. A similar effect was found for nighttime use on assertiveness. Overall, children who used more educational media tended to have larger gains in task orientation and assertiveness, whereas children who used more educational media specifically focusing on social-emotional content tended to have larger gains in task orientation and behavioral control. Children who used more entertainment media tended to have smaller gains in assertiveness, social skills, and task orientation, but these effects mostly emerged at high rather than moderate levels of use. Children who had more joint media engagement with peers tended to have smaller gains in vocabulary skills, whereas no such effect was seen for joint media engagement with adults. These findings suggest that there may be some important links between media use and children's social and behavioral skills, but that in general media use may not be overwhelmingly and uniformly harmful to young children's development.

***What is the significance of this article for the general public?***
This study shows that media use may not be overwhelmingly and uniformly related to negative outcomes for child development, in contrast to pervasive societal concern that media use is harmful to children. We used time diaries to assess links between media use and children's skill gains over an academic year in a sample of children from low-socioeconomic status (SES) backgrounds. Results showed that children who used very high levels of media and high levels of nighttime media tended to have smaller gains in some social and behavioral skills, but the quantity of media use was not related to children's gains in language, literacy, or math skills, suggesting that efforts aiming to minimize media use among young children from low-SES homes may be better directed toward more evidence-based efforts for improving resources and reducing systematic barriers facing families living in poverty.

*Keywords:* media, time diary, educational media, joint media engagement



This article was published Online First June 1, 2023.
Rebecca Dore https://orcid.org/0000-0001-7778-389X
The research was supported by U.S. Department of Education, Institute of Education Sciences Grant R305A180004 (Justice). The content is solely the responsibility of the authors and does not necessarily represent the official views of the Institute of Education Sciences or U.S. Department of Education.
Correspondence concerning this article should be addressed to Rebecca Dore, The Ohio State University, 175 East, 7th Avenue, Columbus, OH 43201, United States. Email: dore.13@osu.edu

In 2020, preschoolers used 2.5 hr of screen media per day and children from low-income backgrounds used more media than their higher-income peers (Rideout & Robb, 2020). Media use further increased due to COVID-19 lockdowns and closures (Dore et al., 2021; Hartshorne et al., 2021) and there has been substantial popular press hype about potential impacts on child development. In the psychological literature, the most prominent theoretical explanation for such effects is the

displacement hypothesis, or the idea that the time spent using media is displacing time that children would otherwise spend doing developmentally beneficial activities like reading or interacting with parents or peers (Khan et al., 2017). Indeed, some previous research has reported that children who have higher levels of media use also tend to have lower levels of skills, in areas including language, literacy, math, externalizing behavior, social competence, and executive function (Hutton et al., 2020; Hygen et al., 2020; McNeill et al., 2019; Nathanson et al., 2014; Pagani et al., 2013). However, media use is not monolithic and different types of media experiences may differ in the extent to which they are detrimental to development. Thus, studies correlating overall media quantity with outcomes likely miss meaningful relations and draw inaccurate conclusions. Here, we examine three notable characteristics that may influence the effect of media use on development.

First, media use prior to bedtime or overnight may be detrimental to development by disrupting sleep, both by displacement (i.e., later bedtimes) and by altering circadian rhythms due to exposure to the blue light emitted by screens (Garrison et al., 2011). In turn, substantial evidence demonstrates that adequate, high-quality sleep is vital for brain development and learning (Gómez & Edgin, 2015; Touchette et al., 2007). Thus, when children use media in the evening and overnight, it may be more disruptive to development than when media occurs during daytime hours.

Another characteristic that may influence media's effects on development is joint media engagement, or when children use media with others. Because responsive talk supports language learning (Tamis-LeMonda et al., 2001), media use may only negatively influence child outcomes to the extent that it inhibits caregiver–child interaction. Thus, when parent–child joint media engagement is frequent, any effects may be diminished because media does not replace contingent caregiver–child interaction and instead extends it to a new context. Indeed, studies have found that higher levels of joint media engagement buffer the negative effects of media use on language and literacy outcomes (e.g., Dore et al, 2020; Mendelsohn et al., 2010).

Thirdly, extensive evidence demonstrates the effectiveness of educational media in improving children's skills across domains, going back to seminal research on learning from Sesame Street in the early 1970s (Bogatz & Ball, 1971). Positive effects have been documented for math, language and literacy, and social-emotional skills (e.g., Berkowitz et al., 2015; Hurwitz, 2019; Madigan et al., 2020; Mares & Woodard, 2005). Thus, the extent to which children use educational media rather than media intended solely for entertainment may influence effects (Anderson & Subrahmanyam, 2017). Here, we define educational content as media for which the creator has an intended learning goal, whereas noneducational or entertainment media is created primarily for entertainment purposes.

The current study builds on existing research in several ways. First, unlike prior studies using a single timepoint or an earlier measure of media use and a later measure of child outcomes (e.g., Clarke & Kurtz-Costes, 1997; Pagani et al., 2013), we obtain outcome measures at two timepoints to examine the unique relationship between media use and change in development over time (Dore et al., 2020). Further, we use a time diary methodology, in which caregivers are guided to recall the child's day, including details about media use. This methodology has the advantage of being less prone to social desirability and memory errors than the more simplistic measures commonly used in existing research, such as reporting total use on a typical day or composite measures made up of multiple aspects of media use (e.g., Hutton et al., 2020; Rosenqvist et al., 2016).

In sum, the timing, context, and content of children's media use are likely to influence its potential effects on development. The simplistic methodologies (e.g., single timepoint correlational designs, parent report of total media use) used in prior research limit the conclusions that can be drawn from the existing literature. The current study aims to fill these gaps and better elucidate the role of media use in child development.

Finally, we focus here specifically on media effects among children from low-income and racially minoritized backgrounds, who spend twice as much time using media as their White and higher-income peers (Rideout & Robb, 2020). Popular press hype about the potential negative effects of media is centered on the concerns of White and upper-socioeconomic status (SES) families who are likely to have more resources, whereas lower-SES and racially minoritized families may use media as a parenting tool (Elias & Sulkin, 2019) to help manage obstacles associated with living in poverty and

dealing with systemic racism (Jackson et al., 2021; Nagata et al., 2022).

### The Present Study

This study examines the association between home media use and low-SES preschoolers' skill gains in multiple domains, including academic skills (language, literacy, and math) and social/behavioral skills (task orientation, behavior control, assertiveness, and social skills). Both linear and quadratic associations are explored, given prior findings (e.g., Dore et al., 2020). In addition to the quantity of media use, we examine associations between four aspects of media use (i.e., nighttime use, educational content, entertainment content, and joint media engagement) and skill gains, controlling for the quantity of media use. Results will have crucial implications for messaging used by pediatricians and advocacy groups around media use and for informing the creation of educational content.

## Method

### Research Design and Procedure

This study uses data collected in 2018–2019 from a larger study evaluating the effects of a 15-month kindergarten transition intervention for children in low-income homes. Parents reported on children's media use in the spring of the prekindergarten year to understand the home-learning environment. Children's skills in multiple domains were captured in the fall and spring of the prekindergarten year. Given that children were randomly assigned to one of two intervention conditions in the larger study, the assigned condition was used as a covariate in the present study. The institution's Institutional Review Board approved the research protocol.

### Participants

Participants were recruited through schools from two sizeable urban public school districts, a tri-county Head Start network, and a private childcare center in Ohio. Caregivers of children in classrooms with teacher consent received information about the project and a consent form. Subsequently, those with informed consent who were at least 4 years old by August 1st and were anticipated to enter kindergarten the following year were included in the larger study ($N = 391$ in 52 classrooms).

For the current analyses, all children with valid time diary data were included ($n = 179$; 100 boys; $M_{age} = 55.0$ months, $SD = 3.93$ months). A total of 41%, 41%, and 17% of the children were identified as White, Black, and multiracial, respectively. See Table 1 for family characteristics. Some families were not able to be contacted to provide time diary data, given that this was a hard-to-reach sample. The research team attempted to contact families at least 3 times using at least two different formats (e.g., phone call, text, email, in-person).

### Measures

#### *Demographic Variables*

In the fall, caregivers reported their child's age, sex, and race/ethnicity, as well as family sociodemographic information such as household income and maternal education.

#### *Media Use*

Trained research assistants contacted families by phone or in person and filled in a 24-hr time

**Table 1**
*Sample Demographics and Intervention Grouping*

| Variable | Frequency | % |
|---|---|---|
| Child characteristics | | |
| Ethnicity (not mutually exclusive) | $n = 174$ | |
| White | 71 | 41 |
| Black | 71 | 41 |
| Others | 32 | 18 |
| Family characteristics | | |
| Annual household income in 2019 | $n = 172$ | |
| $10,000 or less | 50 | 29 |
| $10,001–$20,000 | 34 | 20 |
| $20,001–$30,000 | 26 | 15 |
| $30,001–$40,000 | 13 | 8 |
| $40,001–$50,000 | 13 | 8 |
| $50,001–$60,000 | 10 | 6 |
| $60,001–$70,000 | 1 | 1 |
| $70,001–$80,000 | 8 | 5 |
| $80,001–$90,000 | 2 | 1 |
| $90,001–$100,000 | 4 | 2 |
| $100,001 or more | 11 | 5 |
| Mother's highest level of education completed | $n = 176$ | |
| Less than high school diploma | 23 | 13 |
| High school education with diploma or equivalent | 97 | 55 |
| Two-year associate degree | 20 | 11 |
| Bachelor's degree | 22 | 13 |
| Master's degree or doctoral degree | 14 | 8 |
| Invention grouping | $n = 179$ | |
| Intervention (basic or extensive) | 93 | 51 |
| Intervention (extensive only) | 62 | 34 |
| Control | 86 | 49 |

diary log following a detailed protocol adapted from the American Time Use Survey (United States, 2003). All child activities on the previous weekday (the previous day in 87.2% of cases) were reported starting at 5 a.m., including when (i.e., starting and ending timepoints), what, where, and with whom activities were carried out. Additional information was enquired about activities involving media use, that is, "what was the name of the (program/video/game/book) child was (watching/playing/reading)?," "what was the device used to access it?" and "what was the platform used to access it?" For each primary activity reported, caregivers were asked to report any secondary activity happening concurrently, if any (e.g., the child watched television while having a snack). Media use activities were identified if the primary and/or secondary activity involved media, including watching videos, using apps, and video chatting.

**Quantity of Use.** The duration of each activity was calculated and summed for each child. If both primary and secondary activity involved media use, the duration was not double counted.

**Nighttime Use.** The subset of total usage from 6 p.m. to 6 a.m. was used as *Nighttime Use*.

**Joint Media Use.** The duration of media use during which others using media with the child was summed. Variables were created for *Joint Adult Media Use* and *Joint Peer Media Use* as using media with an adult might be more likely to support learning and high-quality interactions compared to a sibling or peer. These categories were not mutually exclusive.

**Educational Use and Entertainment Use.** Each media title was coded for educational content. Educational media included media for which the creator has an intended learning goal, including academic content, general world knowledge, or prosocial/moral lessons. Noneducational, or entertainment media includes content that has a primary goal of entertaining, such as *SpongeBob*, even if children could incidentally learn it. Activities that were categorized as media use but for which caregivers could not recall the content were coded as N/A and not included as either educational or entertainment use. Total minutes were summed to create a *Total Educational Use* variable and a *Total Entertainment Use* variable.

Each educational title also received binary codes for math, language/literacy, and socio-emotional. A title may be coded as multiple domains (e.g., *Sesame Street* includes content in all domains; *PEG + Cat* includes only math). Sums were then calculated for each domain. See Table 2 for examples of media content that was coded into each category.

### *Academic Skills*

Children's language, literacy, and math skills were assessed using three subtests from the *Woodcock-Johnson III Test of Achievement*: Picture Vocabulary, Letter-Word Identification, and Applied Problems (Woodcock et al., 2001). These one-on-one assessments were conducted by trained research assistants at children's schools. As suggested by Woodcock et al., the

**Table 2**
*Educational Media Codes, Operationalizations, and Examples*

| Domain | Operationalization | Examples |
|---|---|---|
| Entertainment | Media that has a primary goal of entertaining, even if children could incidentally learn it | *Baby Shark*; *Paw Patrol*; *Boss Baby* |
| Educational | Media for which the creator has an intended learning goal, including academic content, general world knowledge, or prosocial/moral lessons | [See below] |
| Math | Explicitly teaches one or more math-related topics, including topics such as addition, subtraction, or measurement | *Team Umizoomie; Odd Squad* |
| Language/literacy | Explicitly teaches vocabulary words or literacy concepts like rhyming, letter recognition, or spelling | *Super Why; Word Girl* |
| Social-emotional | Explicitly teaches social-emotional or moral lessons as a main focus of the content, not as a "moral of the story" in a narrative entertainment show | *Daniel Tiger*; *Arthur* |

median reliability coefficients of the subtests were .81 for the Picture Vocabulary subtest, .94 for the Letter-Word Identification subtest, and .93 for the Applied Problems subtest.

**Language Skills.** Language skills were assessed using the Picture Vocabulary subtest. Children were required to point to a picture for a named word (e.g., "Put your finger on the picture of a dog"), then name pictures without prompts, mainly examining expressive vocabulary at the single-word level.

**Literacy Skills.** Children's literacy skills were assessed using the *Letter-Word Identification* subtest, which requires children to read and name first letters and then words (e.g., "Find the letter T").

**Math Skills.** Children's math skills were assessed using the *Applied Problems* subtest, during which students were expected to form appropriate calculations and solve orally presented math problems (e.g., How many circles are there?).

### *Social and Behavioral Skills*

Children's social and behavioral skills were assessed in the fall and spring of prekindergarten year using the four subscales of the Teacher–Child Rating Scale (Hightower et al., 1986). This 32-item scale measures teachers' perceptions of children's social and behavioral skills across four 8-item subscales. Teachers were required to rate each item on a 5-point Likert Scale from 0 (*strongly disagree*) to 4 (*strongly agree*) according to the behaviors of the target child.

**Task Orientation.** The *Task Orientation* subscale measured children's ability to begin, stay on, and focus on a given task for an extended period, for example, *this child functions well even with distractions.* The reliability scores of the subscale in the analytical sample were .94 and .95 for the fall and the spring, respectively.

**Behavior Control.** The *Behavior Control* subscale evaluated a child's ability to refrain from disruptive behaviors and tolerate frustration, for example, *this child accepts imposed limits.* The reliability scores of the subscale in the analytical sample were .93 and .94 for the fall and the spring, respectively.

**Assertiveness.** The *Assertiveness* subscale examined a child's ability to speak up and defend one's own beliefs, for example, *this child expresses ideas willingly.* The reliability scores of the subscale in the analytical sample were .91 and .92 for the fall and the spring, respectively.

**Social Skills.** The *Social Skills* subscale captured children's general ability to behave appropriately in social interaction, for example, *this child makes friends easily.* The reliability scores of the subscale in the analytical sample were .96 and .97 for the fall and the spring, respectively.

## Data Analysis

To examine the association between the quantity of media use and children's skill gains over the prekindergarten year, multivariate multiple regression analyses were conducted using Mplus7. Scores for children's skills (Model 1: academic skills, Model 2: social and behavior skills) in spring were regressed on the quantity of media use, baseline skill scores in fall, and control variables (child age, sex, race, annual household income, mother's highest level of education completed, intervention grouping dummies variable [basic intervention vs. control, extensive intervention vs. others]). The intervention had three conditions, so two dummy variables were used. To explore the association between media use characteristics (nighttime use, educational use, entertainment use, and joint use), individual predictors were added to Models 1 and 2 on top of the quantity of use. Nonlinear effects for total media use, nighttime use, and entertainment use were also examined, given findings in prior literature linking media use quantity and child outcomes quadratically (e.g., Dore et al., 2020). Associations between domains of educational use and corresponding developmental outcomes were examined: math skills regressed on the use of math media; literacy and language skills regressed on the use of language/literacy media; social and behavioral skills regressed on the use of socioemotional media. For all the models, analysis was first conducted with only baseline skill level controlled. Then, other control variables were added to test the robustness of any significant associations identified between predictors and outcomes.

There were 4% missing codes for all media use variables at the activity level due to the inability to recall or errors in the data collection procedure. Considering the small amount of missing and a lack of reliable basis to estimate unreported activities, missing values were ignored when activity-level durations were summarized at the child level. Any missing values at the child level were estimated using full information maximum likelihood (FIML) estimation with nonnormal robust standard errors (MLR). Model fit indexes used were the ratio of the chi-square test to degrees of freedom ($\chi^2/df$), the root-mean-square error of approximation (RMSEA), the Tucker–Lewis Index (TLI), the comparative fitting index (CFI), and the Standardized Root Mean Square Residual (SRMR). Cutoff criteria were $\chi^2/df < 3$, CFI/TLI $> 0.95$ and RMSEA/SRMR $< 0.08$ (Hu & Bentler, 1999).

## Results

The subsample included in final analyses did not significantly differ from the subsample that did not complete a time diary in child age, sex, and intervention grouping, but was significantly higher in the mother's education, $t(330) = 2.68$, $p = .008$ and annual household income, $t(304) = 2.305$, $p = .019$, and was more likely to be White, $\chi^2(1, N = 381) = 4.04$, $p = .044$. The larger sample ($N = 391$) was of very low SES: median annual household income was between $20,000 and $30,000, with 31% earning less than $10,000 and 21% earning more than $40,000. For this subsample, the median annual household income is similar, with 29% earning less than $10,000 and 29% earning more than $40,000. This difference in the demographic background indicates that, although the sample contains low-income families in general, the conclusions of the current study might be biased toward those families with slightly higher SES among those low-income families.

The descriptive statistics of the variables are presented in Table 3. Average media use was 119.70 min per day, of which 55.35 min (46%) was nighttime use. On average, children used 14.99 min of educational media (13% of media use) and 74.23 min of entertainment media (62% of media use) daily. (Approximately 25% of children's media use could not be categorized as either educational or entertainment content.) Joint engagement with adults and peers was 34.40 and 57.77 min per day (29% and 48% of media use),

**Table 3**
*Descriptive Statistics of the Variables*

| Variable | *M* | *SD* | Skewness | Kurtosis |
|---|---|---|---|---|
| 1. Media use (minutes) | 119.70 | 88.80 | 0.83 | 0.40 |
| 2. Nighttime media use (minutes) | 55.35 | 56.35 | 1.03 | 0.66 |
| 3. Educational media use (minutes) | 14.99 | 34.92 | 2.48 | 5.29 |
| Math domain | 6.06 | 23.77 | 4.51 | 20.83 |
| Language/literacy domain | 9.64 | 26.14 | 3.07 | 9.92 |
| Socioemotional domain | 5.82 | 23.59 | 4.68 | 22.39 |
| 4. Entertainment media use (min) | 74.23 | 80.66 | 1.33 | 1.57 |
| 5. Joint media use with adults (min) | 34.40 | 48.49 | 1.98 | 4.95 |
| 6. Joint media use with peers (min) | 57.77 | 69.50 | 1.34 | 1.86 |
| 7. Task orientation (fall) | 2.26 | 0.98 | −0.18 | −0.83 |
| 8. Task orientation (spring) | 2.30 | 0.98 | −0.33 | −0.74 |
| 9. Behavior control (fall) | 2.30 | 0.93 | −0.46 | −0.66 |
| 10. Behavior control (spring) | 2.26 | 0.98 | −0.48 | −0.69 |
| 11. Assertiveness (fall) | 2.58 | 0.71 | −0.54 | 0.08 |
| 12. Assertiveness (spring) | 2.57 | 0.79 | −0.37 | −0.36 |
| 13. Peer social skills (fall) | 2.76 | 0.82 | −0.60 | −0.07 |
| 14. Peer social skills (spring) | 2.73 | 0.90 | −0.78 | 0.34 |
| 15. Language skills (fall) | 460.10 | 15.28 | −2.75 | 12.82 |
| 16. Language skills (spring) | 466.62 | 9.99 | −0.07 | 0.44 |
| 17. Literacy skills (fall) | 322.12 | 29.21 | 0.87 | 2.03 |
| 18. Literacy skills (spring) | 339.14 | 28.95 | 0.66 | 2.73 |
| 19. Math skills (fall) | 395.21 | 22.52 | −0.38 | 0.39 |
| 20. Math skills (spring) | 408.15 | 20.46 | −0.44 | 0.44 |

*Note*. *N*s = 136–179.

respectively, which were not mutually exclusive (i.e., children sometimes used media with both one or more adults and one or more peers).

## Quantity of Media Use and Skill Gains

Multivariate multiple regression models were used to address our primary research questions (see Data Analysis). See Tables 4 and 5 for regression results and model fit indices. Media use was not significantly related to academic or social skills in the initial model ($ps > .051$) or in the model with control variables ($ps > .08$). Model fits for the academic skills model (Model 1.1) were not ideal. Based on modification indices, two paths (T1 math to T2 vocabulary, T1 Literacy to T2 Math) were added to achieve acceptable model fits. These paths were supported by literature (Purpura et al., 2011, 2017) and were retained for all analyses of academic skills. The revised academic skills model (Model 1.1) had good model fit except for one indicator. The social skills model (Model 2.1) had acceptable model fits.

The quadratic term of media use was then added to Models 1.1 and 2.1 and negatively predicted peer social skills ($\beta = -0.46$, $p = .027$): children who used more media tended to have smaller peer social skill gains, but not smaller gains on other outcomes ($ps > .104$; Model 2.2). Results remained robust after adding control variables ($\beta = -0.46$, $p = .024$; Model 2.3); see Figure 1. The full model explained 53% of the variation in peer social skills.

## Characteristics of Media Use and Skill Gains Controlling for Quantity of Use

Although nighttime use did not linearly predict academic or social and behavior skills ($ps > .142$; Models 1.4 and 2.4), children who used high levels of nighttime media tended to have smaller gains in peer social skills ($\beta = -0.51$, $p = .001$) and assertiveness ($\beta = -0.36$, $p = .050$) than children who used moderate or low levels. No quadratic relationship between nighttime use emerged for other outcomes ($ps > .076$; Models 1.5 and 2.5). Results remained robust after adding control variables for peer social skills ($\beta = -0.54$, $p < .001$) and assertiveness ($\beta = -0.35$, $p = .038$), see Figure 2 (Model 2.6). The full model explained 55% and 43% of the variation in peer social skills and assertiveness, respectively.

Total educational use did not significantly predict academic skills ($ps > .417$; Model 1.7). For social and behavior skills, children who used more educational media tended to have higher task orientation ($\beta = 0.13$, $p = .013$) and assertiveness ($\beta = 0.16$, $p = .057$; Model 2.7). The results remained robust after adding control variables: ($\beta = 0.12$, $p = .025$ and $\beta = 0.17$, $p = .038$, respectively; Model 2.8). The full model explained 60% and 44% of variations in task orientation and assertiveness according to $R^2$ measures, respectively. For the three domains of educational use, children who used more socioemotional content tended to have higher task orientation, $\beta = 0.10$, $p = .033$, and behavioral control, $\beta = 0.13$, $p = .018$ (Model 2.7.1), but neither math nor language/literacy domain use predicted developmental outcomes in the corresponding domains, $ps > .590$ (Models 1.7.2 and 1.7.3). The results remained robust after adding control variables for behavioral control ($\beta = 0.13, p = .008$), but for task orientation, it became trending ($\beta = 0.07$, $p = .092$; Model 2.7.2).

Total entertainment use did not significantly predict academic skills in either the linear ($ps > .316$; Model 1.9) or the quadratic model ($ps > .054$; Model 1.11). For social and behavior skills, children who used more entertainment media tended to have lower task orientation ($\beta = -0.20$, $p = .044$) and assertiveness ($\beta = -0.24$, $p = .030$; Model 2.9). The results remained robust after adding control variables: ($\beta = -0.19$, $p = .037$ and $\beta = -0.23$, $p = .030$, respectively; Model 2.10). The full model explained 60% and 43% of variations in task orientation and assertiveness according to $R^2$ measures, respectively. The quadratic term of entertainment use was then added to Model 2.9. Results showed that children who used high levels of entertainment media tended to have smaller gains in task orientation ($\beta = -0.42$, $p = .006$) and peer social skills ($\beta = -0.42$, $p = .043$) than children who used moderate or low levels, but not smaller gains on other outcomes ($ps > .100$; Model 2.11). Results remained robust after adding control variables ($\beta = -0.44, p = .003$ and $\beta = -0.43$, $p = .039$, respectively; Model 2.12) (see Figure 3). The full model explained 63% and 54% and of the variation in task orientation and peer social skills, respectively.

**Table 4**
*The Multivariate Multiple Regression Models of Home Media Use With Control Variables*

| | Language (spring) | | Literacy (spring) | | Math (spring) | |
|---|---|---|---|---|---|---|
| Model 1.2: Academic | Coef. (*SE*) | Stand. (*SE*) | Coef. (*SE*) | Stand. (*SE*) | Coef. (*SE*) | Stand. (*SE*) |
| Home media use | 0.20 (1.10) | 0.03 (0.16) | −0.46 (2.62) | −0.02 (0.14) | −0.98 (2.05) | −0.07 (0.15) |
| Home media use (quadratic) | 0.04 (0.21) | 0.03 (0.17) | −0.12 (0.52) | −0.04 (0.15) | −0.03 (0.32) | −0.01 (0.13) |
| Child age (in months) | 0.00 (0.16) | 0.00 (0.06) | 0.23 (0.35) | 0.03 (0.05) | −0.05 (0.27) | −0.01 (0.05) |
| Race (White/Non-White) | 3.47* (1.49) | 0.17* (0.07) | −1.73 (3.00) | −0.03 (0.05) | 2.73 (2.28) | 0.07 (0.06) |
| Maternal education Level | 0.38 (0.69) | 0.04 (0.08) | −1.5 (1.35) | −0.06 (0.06) | 0.70 (1.02) | 0.04 (0.06) |
| Family annual income | 0.12 (0.19) | 0.05 (0.07) | 0.52 (0.56) | 0.07 (0.08) | 0.35 (0.26) | 0.07 (0.05) |
| Child gender | −0.24 (1.16) | −0.01 (0.06) | −6.65* (2.78) | −0.12* (0.05) | 1.23 (2.05) | 0.03 (0.05) |
| Intervention/control | −0.15 (1.86) | −0.01 (0.09) | −1.25 (4.36) | −0.02 (0.08) | 0.97 (3.13) | 0.02 (0.08) |
| Extensive intervention/others | 1.79 (2.02) | 0.08 (0.09) | −0.83 (4.48) | −0.01 (0.08) | −0.64 (3.04) | −0.02 (0.07) |
| Baseline performance (fall) | 0.41** (0.12) | 0.61*** (0.12) | 0.75*** (0.06) | 0.78*** (0.05) | 0.59*** (0.06) | 0.65*** (0.06) |

| | Task orientation (spring) | | Behavior control (spring) | | Assertiveness (spring) | | Peer social skills (spring) | |
|---|---|---|---|---|---|---|---|---|
| Model 2.2: Social and behavioral | Coef. (*SE*) | Stand. (*SE*) | Coef. (*SE*) | Stand. (*SE*) | Coef. (*SE*) | Stand. (*SE*) | Coef. (*SE*) | Stand. (*SE*) |
| Home media use | 0.21 (0.12) | 0.32 (0.18) | 0.05 (0.12) | 0.07 (0.19) | 0.11 (0.12) | 0.20 (0.22) | 0.24* (0.12) | 0.41* (0.19) |
| Home media use (quadratic) | −0.04 (0.02) | −0.33 (0.19) | −0.02 (0.02) | −0.15 (0.18) | −0.03 (0.02) | −0.35 (0.22) | −0.05* (0.02) | −0.46* (0.20) |
| Child age (in months) | −0.01 (0.01) | −0.04 (0.06) | 0.00 (0.02) | 0.01 (0.06) | 0.01 (0.02) | 0.04 (0.07) | 0.01 (0.01) | 0.03 (0.06) |
| Race (White/Non-White) | 0.01 (0.12) | 0.01 (0.06) | −0.07 (0.14) | −0.04 (0.07) | −0.08 (0.12) | −0.05 (0.08) | 0.02 (0.12) | 0.01 (0.07) |
| Maternal education level | −0.02 (0.06) | −0.03 (0.07) | 0.08 (0.08) | 0.09 (0.10) | −0.04 (0.07) | −0.06 (0.10) | −0.03 (0.08) | −0.04 (0.10) |
| Family annual income | 0.02 (0.02) | 0.06 (0.08) | 0.00 (0.02) | −0.01 (0.08) | 0.02 (0.02) | 0.08 (0.11) | 0.01 (0.02) | 0.06 (0.07) |
| Child gender | −0.06 (0.11) | −0.03 (0.05) | 0.07 (0.12) | 0.04 (0.06) | 0.04 (0.10) | 0.03 (0.07) | 0.04 (0.10) | 0.02 (0.06) |
| Intervention/control | 0.42** (0.14) | 0.21** (0.07) | 0.02 (0.16) | 0.01 (0.09) | 0.16 (0.17) | 0.10 (0.10) | 0.09 (0.15) | 0.05 (0.08) |
| Extensive intervention/others | −0.19 (0.15) | −0.09 (0.08) | 0.24 (0.18) | 0.12 (0.09) | −0.11 (0.17) | −0.07 (0.10) | −0.06 (0.16) | −0.03 (0.09) |
| Baseline performance (fall) | 0.75*** (0.04) | 0.76*** (0.03) | 0.68*** (0.05) | 0.69*** (0.05) | 0.71*** (0.07) | 0.63*** (0.05) | 0.76*** (0.06) | 0.70*** (0.04) |

*Note.* $N = 179$. Coef. = unstandardized coefficients; Stand. = standardized coefficients; *SE* = standardized error. The intervention had three conditions, so two dummy variables were used.
* $p < .05$. ** $p < .01$. *** $p < .001$, two-tailed.

**Table 5**
*Model Fit Indexes*

| Model | Variables | $\chi^2/df$ | CFI | TLI | RMSEA | SRMR |
|---|---|---|---|---|---|---|
| Model 1.1 | Media use predicting academic skills AS | 1.77 | 0.99 | 0.96 | 0.07 | 0.20 |
| Model 2.1 | Media use predicting SBS | 1.48 | 0.99 | 0.97 | 0.05 | 0.03 |
| Model 1.2 | Media use (quadratic) predicting AS | 1.81 | 0.99 | 0.95 | 0.07 | 0.18 |
| Model 2.2 | Media use (quadratic) predicting SBS | 1.47 | 0.99 | 0.97 | 0.05 | 0.03 |
| Model 2.3 | Model 2.2 with control variables | 1.46 | 0.99 | 0.95 | 0.05 | 0.02 |
| Model 1.4 | Nighttime use of predicting AS | 1.80 | 0.99 | 0.96 | 0.07 | 0.07 |
| Model 2.4 | Nighttime use predicting SBS | 1.43 | 0.99 | 0.97 | 0.05 | 0.03 |
| Model 1.5 | Nighttime use (quadratic) predicting AS | 2.02 | 0.99 | 0.95 | 0.08 | 0.07 |
| Model 2.5 | Nighttime use (quadratic) predicting SBS | 1.40 | 0.99 | 0.97 | 0.05 | 0.03 |
| Model 2.6 | Model 2.5 with control variables | 1.41 | 0.99 | 0.95 | 0.05 | 0.02 |
| Model 1.7 | Total education use predicting AS | 1.87 | 0.99 | 0.94 | 0.07 | 0.18 |
| Model 2.7 | Total education use predicting SBS | 1.52 | 0.99 | 0.97 | 0.05 | 0.03 |
| Model 2.7.1 | Socioemotional use predicting SBS | 1.49 | 0.99 | 0.97 | 0.05 | 0.03 |
| Model 2.7.2 | Model 2.7.1 with control variables | 1.49 | 0.99 | 0.95 | 0.00 | 0.02 |
| Model 1.7.2 | Math use predicting AS | 2.01 | 0.98 | 0.93 | 0.08 | 0.17 |
| Model 1.7.3 | Language/literacy use predicting AS | 2.12 | 0.98 | 0.92 | 0.08 | 0.18 |
| Model 2.8 | Model 2.7 with control variables | 1.52 | 0.99 | 0.94 | 0.05 | 0.02 |
| Model 1.9 | Total entertainment use predicting AS | 2.04 | 0.99 | 0.95 | 0.08 | 0.07 |
| Model 2.9 | Total entertainment use predicting SBS | 1.46 | 0.99 | 0.97 | 0.05 | 0.03 |
| Model 2.10 | Model 2.9 with control variables | 1.46 | 0.99 | 0.95 | 0.05 | 0.02 |
| Model 1.11 | Media use (quadratic) predicting AS | 1.87 | 0.99 | 0.96 | 0.07 | 0.06 |
| Model 2.11 | Media use (quadratic) predicting SBS | 1.51 | 0.99 | 0.96 | 0.05 | 0.03 |
| Model 2.12 | Model 2.11 with control variables | 1.52 | 0.99 | 0.94 | 0.05 | 0.02 |
| Model 1.13 | Joint use with adults predicting AS | 1.81 | 0.99 | 0.95 | 0.07 | 0.17 |
| Model 2.13 | Joint use with adults predicting SBS | 1.45 | 0.99 | 0.97 | 0.05 | 0.03 |
| Model 1.14 | Joint use with peers predicting AS | 1.92 | 0.99 | 0.94 | 0.07 | 0.19 |
| Model 2.14 | Joint use with peers predicting SBS | 1.56 | 0.99 | 0.96 | 0.06 | 0.03 |
| Model 1.15 | Model 1.14 with control variables | 2.23 | 0.99 | 0.86 | 0.08 | 0.11 |

*Note.* RMSEA = root-mean-square error of approximation; TLI = Tucker–Lewis Index; CFI = comparative fitting index; SRMR = standardized root mean square residual; AS = academic skills; SBS = social and behavioral skills.

Joint media use with adults did not significantly predict any outcomes ($ps > .190$; Models 1.13 and 2.13), but children who used more media with peers tended to have the lower vocabulary ($\beta = -0.15$, $p = .034$; Model 1.14) but no other outcome variables (Model 2.14). The association remained robust after adding control variables ($\beta = -0.14$, $p = .042$; Model 1.15). The full model explained 48% of the variation in vocabulary.

## Discussion

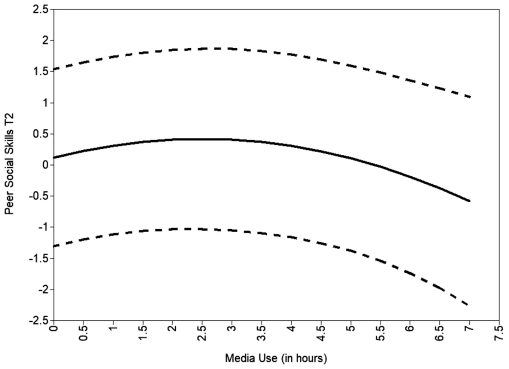
The present study used time diaries to put children's media use in context and enable examination of potential effects on child outcomes with more nuance than prior studies. Counter to pervasive societal concern around the negative effects of media use on child development and to some prior research, there were few demonstrable effects on academic skills. However, both the total quantity of children's media use and two characteristics of use (nighttime use and educational content) were predictive of children's social and behavioral skills, demonstrating that, at least in early childhood, these skills may be more susceptible to effects of media use than are academic skills.

### Associations Between Media Use and Child Outcomes

Gains in peer social skills showed a negative quadratic link with media use. That children with high levels of media use tended to have smaller gains in peer social skills may reflect the hypothesized displacement mechanism (Khan et al., 2017) in line with some prior studies (e.g., Hygen et al., 2020). However, this effect was not linear and only appeared for children who used more than 2 hr of media per day, well over the American Academy of Pediatrics (AAP) recommended guidelines for preschoolers (less than 1 hr; Council on Communications and

**Figure 1**

*Quadratic Relationship Between Media Use and Peer Social Skills*




Media, 2016). This finding does not provide evidence to support this specific hourly recommendation, which researchers have previously argued may be unrealistic for families and cause undue stress for parents (Dore et al., 2021; Elson et al., 2019). Instead, more moderate amounts of media use may be relatively benign, whereas when media is used in greater quantities, it may be more likely to displace interactions with others, and thus lead to smaller gains in social skills. A time diary approach may be more likely to capture this kind of effect, as caregivers may be hesitant to endorse more extreme amounts of media use on "typical day" reports.

Children who used higher levels of media at nighttime also tended to have poorer peer social skills than children who used low or moderate levels of nighttime media. This effect may be due to less or poorer quality sleep, which disrupts children's ability to use constructive ways of interacting with peers during the day (Vaughn et al., 2015). A similar effect emerged for assertiveness, suggesting that disrupted sleep may also impact children's ability to communicate their thoughts and needs. As with overall use, these associations were only apparent when at more extreme amounts of media, in this case, approximately an hour or more prior to bedtime or overnight, suggesting that moderate use may not be disruptive, whereas higher levels of nighttime use have more negative impacts on sleep and thus on these skills. Prior research using reports of media use on a typical day is not able to capture the potential effects of nighttime media use

**Figure 2**

*Quadratic Relationship Between Nighttime Media Use and Peer Social Skills(A)/Assertiveness(B)*

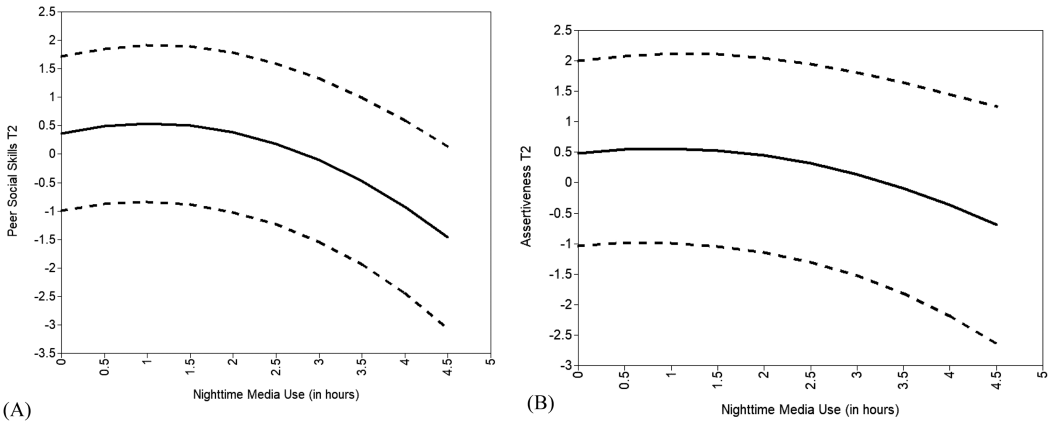
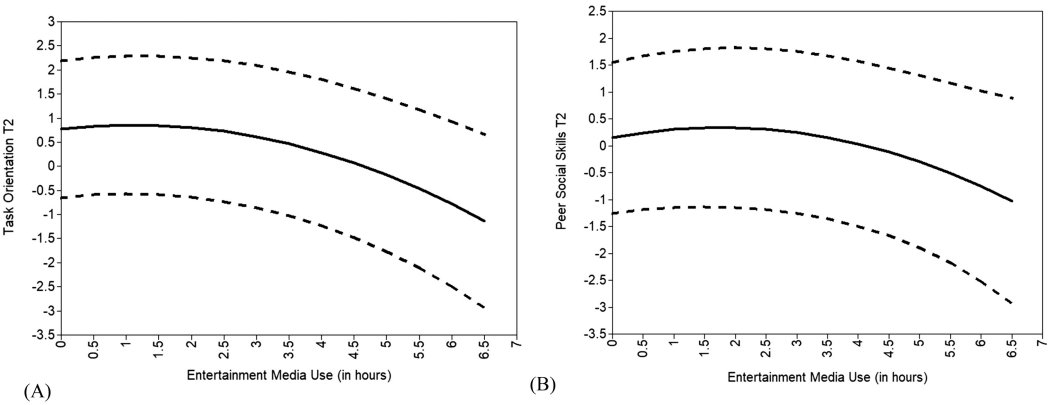


**Figure 3**

*Quadratic Relationship Between Entertainment Media Use and Task Orientation (A)/Peer Social Skills (B)*




and studies focusing on nighttime media use have not investigated associations with social skills. Thus, this finding contributes to the literature both methodologically and conceptually. In line with our findings, AAP guidelines recommend no screens in the hour before bedtime, although current results suggest that limited exposure may not be as detrimental as more prolonged use.

Additionally, we found that children who used more educational media tended to have larger gains in task orientation and assertiveness. The effect of task orientation was mirrored in results for social-emotional educational content, suggesting that media with this focus may support the development of executive function skills. Using more social-emotional media was also related to larger gains in behavioral control, aligning with this explanation. Most prior studies on educational media have focused on academic skills and have not examined executive function. Further, studies examining executive function primarily show negative links with overall media exposure (Nathanson et al., 2014). However, research suggests that children can learn prosocial skills from media (Mares & Woodard, 2005) and adopt the traits of characters (Dore et al., 2017), suggesting that children may pick up these behaviors from educational media that model them. Relatedly, the finding that overall educational media use, but not social-emotional content, predicted gains in assertiveness was unexpected, but we speculate that perhaps educational media, in general, provides modeling of children using assertive behavior, as child characters tend to express their beliefs or ideas in the process of learning new information. We found somewhat parallel results for entertainment media, such that high levels of entertainment media use were related to smaller gains in task orientation, assertiveness, and social skills, suggesting that when media without educational content takes up a substantial portion of children's time, it may disrupt the development of these skills by displacing activities like social interactions that are likely to promote these skills.

The only link we found between media use and children's academic skills was that children who had more joint media engagement with siblings or peers tended to have lower vocabulary gains. One possible explanation for this finding is that joint media engagement is confounded with educational content, such that children use less educational content with peers. However, educational media use is actually more common with peers (7.79% of peer joint media engagement) than with adults (4.36% of adult joint media engagement). An alternative explanation may be that when children use more media with other children, it is likely displacing other play and social interactions that would engender more language use, which is lacking during shared child media use. On the other hand, a negative association with vocabulary gains was not found for joint media engagement with adults. Although adult–child joint media engagement was also not associated with larger skill gains, this finding suggests that, in contrast to media use shared between two or more children, when

media is used with an adult, it may involve more verbal interactions rather than simply replacing the interactions that would otherwise be taking place (Mendelsohn et al., 2010). Previous studies have not typically included measures of children's joint media engagement with other children and this finding suggests that it may be an important contextual feature of media use to consider. Future research should also consider the age of the peers involved in joint media use, which could impact verbal interactions.

### Lack of Widespread Associations Between Media and Child Outcomes

Outside of these significant links, our results suggest that there may not be widespread associations between children's media use and skills during preschool. Overall media use was not associated with any academic skills gains, even in this sample that used a relatively high and variable amount of media and counter to some prior research using one-timepoint correlational approaches and reports of typical daily media use (e.g., Pagani et al., 2013). Nighttime use, educational content use, and joint media engagement with adults also showed no links with children's academic skills.

Notably, this study used a sample of children from low-SES families, who, on average, spend more time using media than children from higher-SES homes (Rideout & Robb, 2020). The null findings reported here across most skill domains are thus especially important, as these families may use media in instrumental ways (Elias & Sulkin, 2019), which could have benefits for caregiver stress and overall family functioning (Nagata et al., 2022).

### Societal and Policy Implications

For prevention, our results suggest that it will be vital for those creating messaging targeting families to refrain from demonizing media use. It is not clear how the AAP used existing research to determine the specific 1-hr recommendation for preschoolers, which may not feel realistic for families (Dore et al., 2021; Elson, et al., 2019). Instead, it could be prudent for practitioners to focus on discouraging very high levels of media use and nighttime use, as well as encouraging educational content. AAP guidelines do recommend no screens in the hour before bedtime and using high-quality programming, which could both be bolstered in lieu of time-based recommendations. Notably, the AAP also recommends joint use with adults, which was not related to outcomes here. The efficacy of joint use may depend on the quality of engagement rather than simply being present during child media use (Strouse et al., 2013).

Our findings also further highlight the need for industry and practitioner partnerships to reduce nighttime use. For example, partnerships with industry, such as streaming platforms, could pilot features to discourage nighttime use of children's content, such as including public service announcements about media use and child sleep before children's content is used during overnight hours, or the ability to set sleep times or time-based child locks for children's content.

For creators, these results highlight the importance of educational content promoting social and behavioral skills, as well as academic content. These findings also suggest that it could be valuable to model positive behaviors across both educational and noneducational content, as children may adopt the traits of characters they see in media (Dore et al., 2017). Finally, our findings related to peer joint media engagement imply that content creators would do well to focus on creating content that is more conducive to co-use with a peer, such as including opportunities for discussion during videos or creating apps that encourage social co-use.

This study also has broad application across fields related to the use of the time diary methodology to assess child experiences. In the domain of media, this methodology allows researchers to obtain rich data that is likely to have higher accuracy than asking parents to report on characteristics such as educational content or joint media engagement, which may have strong social desirability effects. Time diaries have been used to capture parents' time spent with children (e.g., Negraia et al., 2018) but could also be used to obtain high-quality measurements of other constructs, such as experience with peers and time spent in free play behaviors.

### Limitations and Future Directions

One limitation of this study is that results may not generalize to families from higher-SES backgrounds; future research should use similar methods in a more representative sample. The link between media use and developmental outcomes

may differ for children from higher-SES backgrounds due to differences in family contexts, resources, and the availability of alternatives to media use.

For example, research conducted with high-SES populations may find negative effects of media use because alternative activities tend to be educational and enriching. However, a lack of resources and caregiver time may lead to less enriching alternatives for children from low-SES backgrounds and consequently, studies focusing on this population may be less likely to find negative effects of media use. Future research should explore time use across SES and what activities media use might be displacing for children from varying backgrounds.

## Conclusions

This study contributes to a growing literature suggesting that media use may not be overwhelmingly and uniformly harmful to child development. Our findings suggest that efforts aimed to encourage minimizing or eliminating media use among young children from low-SES homes may be better directed toward more evidence-based efforts for improving resources for families with young children and reducing systematic barriers to optimal family functioning.

## References


Anderson, D. R., & Subrahmanyam, K. (2017). Digital screen media and cognitive development. *Pediatrics*, *140*(Supplement_2), S57–S61. https://doi.org/10.1542/peds.2016-1758C

Berkowitz, T., Schaeffer, M. W., Maloney, E. A., Peterson, L., Gregor, C., Levine, S. C., & Beilock, S. L. (2015). Math at home adds up to achievement in school. *Science*, *350*(6257), 196–198. https://doi.org/10.1126/science.aac7427

Bogatz, G. A., & Ball, S. (1971). *The second year of sesame street: A continuing evaluation* (Vol. 1). Educational Testing Service.

Clarke, A. T., & Kurtz-Costes, B. (1997). Television viewing, educational quality of the home environment, and school readiness. *Journal of Educational Research*, *90*(5), 279–285. https://doi.org/10.1080/00220671.1997.10544584

Council on Communications and Media. (2016). Media and young minds. *Pediatrics*. *138*(5). https://doi.org/10.1542/peds.2016-2591

Dore, R. A., Logan, J., Lin, T. J., Purtell, K. M., & Justice, L. M. (2020). Associations between children's media use and language and literacy skills. *Frontiers in Psychology*, *11*, Article 1734. https://doi.org/10.3389/fpsyg.2020.01734

Dore, R. A., Purtell, K. M., & Justice, L. M. (2021). Media use among kindergarteners from low-income households during the COVID-19 shutdown. *Journal of Developmental & Behavioral Pediatrics*, *42*(8), 672–676. https://doi.org/10.1097/DBP.0000000000000955

Dore, R. A., Smith, E. D., & Lillard, A. S. (2017). Children adopt the traits of characters in a narrative. *Child Development Research*, *2017*, Article 6838079. https://doi.org/10.1155/2017/6838079

Elias, N., & Sulkin, I. (2019). Screen-assisted parenting: The relationship between toddlers' screen time and parents' use of media as a parenting tool. *Journal of Family Issues*, *40*(18), 2801–2822. https://doi.org/10.1177/0192513X19864983

Elson, M., Ferguson, C. J., Gregerson, M., Hogg, J. L., Ivory, J., Klisanin, D., Markey, P. M., Nichols, D., Siddiqui, S., & Wilson, J. (2019). Do policy statements on media effects faithfully represent the science? *Advances in Methods and Practices in Psychological Science*, *2*(1), 12–25. https://doi.org/10.1177/2515245918811301

Garrison, M. M., Liekweg, K., & Christakis, D. A. (2011). Media use and child sleep: The impact of content, timing, and environment. *Pediatrics*, *128*(1), 29–35. https://doi.org/10.1542/peds.2010-3304

Gómez, R. L., & Edgin, J. O. (2015). Sleep as a window into early neural development: Shifts in sleep-dependent learning effects across early childhood. *Child Development Perspectives*, *9*(3), 183–189. https://doi.org/10.1111/cdep.12130

Hartshorne, J. K., Huang, Y. T., Paredes, P. M. L., Oppenheimer, K., Robbins, P. T., & Velasco, M. D. (2021). Screen time as an index of family distress. *Current Research in Behavioral Sciences*, *2*, Article 100023. https://doi.org/10.1016/j.crbeha.2021.100023

Hightower, A. D., Work, W. C., Cowen, E. L., Lotyczewski, B. S., Spinell, A. P., Guare, J. C., & Rohrbeck, C. A. (1986). The teacher-child rating scale: A brief objective measure of elementary children's school problem behaviors and competencies. *School Psychology Review*, *15*(3), 393–409. https://doi.org/10.1080/02796015.1986.12085242

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Hurwitz, L. B. (2019). Getting a read on ready to learn media: A meta-analytic review of effects on literacy. *Child Development*, *90*(5), 1754–1771. https://doi.org/10.1111/cdev.13043

Hutton, J. S., Huang, G., Sahay, R. D., DeWitt, T., & Ittenbach, R. F. (2020). A novel, composite measure

of screen-based media use in young children (ScreenQ) and associations with parenting practices and cognitive abilities. *Pediatric Research*, *87*(7), 1211–1218. https://doi.org/10.1038/s41390-020-0765-1

Hygen, B. W., Belsky, J., Stenseng, F., Skalicka, V., Kvande, M. N., Zahl-Thanem, T., & Wichstrøm, L. (2020). Time spent gaming and social competence in children: Reciprocal effects across childhood. *Child Development*, *91*(3), 861–875. https://doi.org/10.1111/cdev.13243

Jackson, D. B., Testa, A., & Fox, B. (2021). Adverse childhood experiences and digital media use among US children. *American Journal of Preventive Medicine*, *60*(4), 462–470. https://doi.org/10.1016/j.amepre.2020.09.018

Khan, K. S., Purtell, K. M., Logan, J., Ansari, A., & Justice, L. M. (2017). Association between television and parent-child reading in the early home environment. *Journal of Developmental & Behavioral Pediatrics*, *38*(7), 521–527. https://doi.org/10.1097/DBP.0000000000000465

Madigan, S., McArthur, B. A., Anhorn, C., Eirich, R., & Christakis, D. A. (2020). Associations between screen use and child language skills: A systematic review and meta-analysis. *JAMA Pediatrics*, *174*(7), 665–675. https://doi.org/10.1001/jamapediatrics.2020.0327

Mares, M. L., & Woodard, E. (2005). Positive effects of television on children's social interactions: A meta-analysis. *Media Psychology*, *7*(3), 301–322. https://doi.org/10.1207/S1532785XMEP0703_4

McNeill, J., Howard, S. J., Vella, S. A., & Cliff, D. P. (2019). Longitudinal associations of electronic application use and media program viewing with cognitive and psychosocial development in preschoolers. *Academic Pediatrics*, *19*(5), 520–528. https://doi.org/10.1016/j.acap.2019.02.010

Mendelsohn, A. L., Brockmeyer, C. A., Dreyer, B. P., Fierman, A. H., Berkule-Silberman, S. B., & Tomopoulos, S. (2010). Do verbal interactions with infants during electronic media exposure mitigate adverse impacts on their language development as toddlers?*Infant and Child Development*, *19*(6), 577–593. https://doi.org/10.1002/icd.v19:6

Nagata, J. M., Ganson, K. T., Iyer, P., Chu, J., Baker, F. C., Gabriel, K. P., Garber, A. K., Murray, S. B., & Bibbins-Domingo, K. (2022). Sociodemographic correlates of contemporary screen time use among 9-and 10-year-old children. *The Journal of Pediatrics*, *240*, 213–220.e2. https://doi.org/10.1016/j.jpeds.2021.08.077

Nathanson, A. I., Aladé, F., Sharp, M. L., Rasmussen, E. E., & Christy, K. (2014). The relation between television exposure and executive function among preschoolers. *Developmental Psychology*, *50*(5), 1497–1506. https://doi.org/10.1037/a0035714

Negraia, D. V., Augustine, J. M., & Prickett, K. C. (2018). Gender disparities in parenting time across activities, child ages, and educational groups. *Journal of Family Issues*, *39*(11), 3006–3028. https://doi.org/10.1177/0192513X18770232

Pagani, L. S., Fitzpatrick, C., & Barnett, T. A. (2013). Early childhood television viewing and kindergarten entry readiness. *Pediatric Research*, *74*(3), 350–355. https://doi.org/10.1038/pr.2013.105

Purpura, D. J., Hume, L. E., Sims, D. M., & Lonigan, C. J. (2011). Early literacy and early numeracy: The value of including early literacy skills in the prediction of numeracy development. *Journal of Experimental Child Psychology*, *110*(4), 647–658. https://doi.org/10.1016/j.jecp.2011.07.004

Purpura, D. J., Logan, J. A., Hassinger-Das, B., & Napoli, A. R. (2017). Why do early mathematics skills predict later reading? The role of mathematical language. *Developmental Psychology*, *53*(9), 1633–1642. https://doi.org/10.1037/dev0000375

Rideout, V., & Robb, M. B. (2020). *The Common Sense census: Media use by kids age zero to eight, 2020*. Common Sense Media.

Rosenqvist, J., Lahti-Nuuttila, P., Holdnack, J., Kemp, S. L., & Laasonen, M. (2016). Relationship of TV watching, computer use, and reading to children's neurocognitive functions. *Journal of Applied Developmental Psychology*, *46*, 11–21. https://doi.org/10.1016/j.appdev.2016.04.006

Strouse, G. A., O'Doherty, K., & Troseth, G. L. (2013). Effective coviewing: Preschoolers' learning from video after a dialogic questioning intervention. *Developmental Psychology*, *49*(12), 2368–2382. https://doi.org/10.1037/a0032463

Tamis-LeMonda, C. S., Bornstein, M. H., & Baumwell, L. (2001). Maternal responsiveness and children's achievement of language milestones. *Child Development*, *72*(3), 748–767. https://doi.org/10.1111/1467-8624.00313

Touchette, É., Petit, D., Séguin, J. R., Boivin, M., Tremblay, R. E., & Montplaisir, J. Y. (2007). Associations between sleep duration patterns and behavioral/cognitive functioning at school entry. *Sleep*, *30*(9), 1213–1219. https://doi.org/10.1093/sleep/30.9.1213

United States. (2003). *American Time use survey*. U.S. Bureau of Labor Statistics.

Vaughn, B. E., Elmore-Staton, L., Shin, N., & El-Sheikh, M. (2015). Sleep as a support for social competence, peer relations, and cognitive functioning in preschool children. *Behavioral Sleep Medicine*, *13*(2), 92–106. https://doi.org/10.1080/15402002.2013.845778

Woodcock, R. W., McGrew, K. S., & Mather, N. (2001). *Woodcock-Johnson III tests of achievement*. Riverside Publishing.

Received July 27, 2022
Revision received April 13, 2023
Accepted April 19, 2023 ■