Youth Screen Time and Behavioral Health Problems: The Role of Sleep Duration and Disturbances

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ABSTRACT: ***Objective:*** **The purpose of this study was to examine the indirect effect of youth screen time (e.g., television, computers, smartphones, video games, and tablets) on behavioral health problems (i.e., internalizing, externalizing, and peer problems) through sleep duration and disturbances.** ***Methods:*** **The authors assessed a community sample of parents with a child in one of the following three developmental stages: young childhood (3–7 yrs; N = 209), middle childhood (8–12 yrs; N = 202), and adolescence (13–17 yrs; N = 210). Path analysis was used to test the hypothesized indirect effect model.** ***Results:*** **Findings indicated that, regardless of the developmental stage of the youth, higher levels of youth screen time were associated with more sleep disturbances, which, in turn, were linked to higher levels of youth behavioral health problems.** ***Conclusion:*** **Children who have increased screen time are more likely to have poor sleep quality and problem behaviors.**

*(J Dev Behav Pediatr 0:*1–8, 2016) **Index terms:** screen time, sleep disturbances, sleep duration, behavioral health problems.

The explosion of digital technology ownership in the last 5 years[1,2] has created a dramatic shift in how youth and families use technology.[3,4] Furthermore, the increased access to new digital media (e.g., smartphones and tablets) devices has contributed to a rapid rise in average screen time exposure for children.[4,5] Total daily screen time across devices in children 8 to 18 years old has risen from 5 to approximately 8 hours since 1999,[6] far exceeding the American Academy of Pediatrics' recommendation of 2 hours or less.[7]

Excessive screen time in childhood is associated with behavioral health problems.[8–10] However, the process by which screen time increases these problems has not been elucidated. One potential mechanism of this association is youth sleep quality: there are established individual associations between youth screen time and compromised sleep duration and quality[11–13] as well as between sleep and a variety of childhood behavioral health outcomes (e.g., internalizing, externalizing, and peer problems).[14–16] The mechanisms by which higher levels of screen time cause sleep disturbances have been attributed to environmental, psychosocial, and biological causes.[11–13] One of these environmental sources is the use of screen-based activities, which often delays bedtime or truncates total sleep time.[11]One psychosocial source may be arousal due to the content of the media, interfering with the ability to fall and stay asleep.[17]And finally, 1 potential biological mechanism is the effect of screen light on both circadian rhythm and alertness.

Although initial support is promising, only 2 studies have examined sleep as a link between screen time and youth behavioral health with both finding some support for sleep duration serving in this role.[18,19] Each study had limitations that dampen the generalizability of results and implications for modern families. These include failure to examine sleep quality, which may be a more important marker of sleep than is duration[14,20–23]; limited assessment of screen time (e.g., during the school day); absence of modern media devices (e.g., tablets, smartphones); limited assessment of behavioral health problems; and narrow age ranges (e.g., middle school children), precluding the examination of differences over the course of child development.[14]

The purpose of this study was to address the limitations noted above and provide updated information and recommendations to families. We (1) examine both sleep duration and sleep disturbances, a proxy for sleep quality[24,25]; (2) assess screen time after school for all the primary types of devices children use today (e.g., smartphones, tablets, video games, and laptops); (3) assess internalizing, externalizing, and peer relationship problems; and (4) use a sample of families with a child in one of the following 3 developmental stages: young childhood (3–7 yrs), middle childhood (8–12 yrs), and adolescence (13–17 yrs). These age groups were chosen a priori based on typical age

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J. Parent has full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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divisions of prevention and intervention programs that involve parenting as a primary component (e.g., young children[26]; middle childhood[27]; adolescence[28]) to more directly inform the development of programs to help parents manage their children's screen time at different developmental stages. Of importance, research has long indicated that children have different cognitive skill development and play different roles in the family during these stages of development.[29] We hypothesized that higher levels of screen time would be indirectly related to higher levels of youth behavioral health problems (i.e., internalizing, externalizing, and peer problems) through lower sleep duration and higher levels of sleep disturbance. We hypothesize that these indirect effects would be significant across the three developmental stages.

METHODS

Participants and Recruitment

Parents of 3 to 7 (N = 209), 8 to 12 (N = 202), and 13 to 17 (N = 210) year old children were recruited online through Amazon's Mechanical Turk (MTurk), the dominant crowdsourcing application in the social sciences. On MTurk, workers browse Human Intelligence Tasks (HITs) by title, key word, reward, availability, and so on and complete HITs of interest. Participants are compensated by requesters on successful completion of tasks (for an introduction to using MTurk[30]). Participation requirements were being a US resident and having at least a 95% task approval rate on MTurk.

Online data collection about screen time has been used successfully, previously.[31] Furthermore, there are several advantages for the use of crowdsourcing methods in clinical and developmental research. First, relatively large sample sizes can be collected quickly[32] for a minimal cost allowing researchers to address unanswered questions, particularly about mechanisms that statistically require large sample sizes. Second, a diverse range of participants (e.g., race, socioeconomic status, household composition) can be recruited from across the United States.[32–34] Third, previous research has convincingly demonstrated that data obtained via crowdsourcing methods are as reliable as those obtained via more traditional data collection methods.[32,33] Fourth, previous work has also shown that participation and data quality are unaffected by compensation rate or task length.[35] Fifth, as demonstrated by this study, crowdsourcing methods afford an opportunity to recruit mothers and fathers, the latter being long underrepresented in clinical research.[36,37] Sixth, crowdsourcing methods use identification numbers, which protects respondent anonymity and prevents any individual worker from participating in a single HIT more than once.

Procedure

All study procedures were approved by the University of Vermont Institutional Review Board. Parents were initially consented online and, after completing surveys, compensated US $4.00. For families with multiple children in the target age range, 1 child was randomly selected through a computer algorithm. Ten attention-check items, placed throughout the survey, asked participants to enter a specific response that changed throughout the survey and appeared randomly. To ensure that responses were not random or automated, participants (N = 2) were excluded from the study if they had more than 1 incorrect response.

Measures

Youth Weekly Screen Time

Parents were asked 2 questions regarding their child's screen time: "Now thinking about (target child)'s typical activities, on a typical *weekday* ("*weekend*" in second question) how much time does (target child) spend doing each of the following at home?" Parents responded with the number of hours and/or minutes their child engaged in each of the following activities: (1) watching TV or DVDs; (2) using the computer; (3) playing video games on a console game player (such as: Xbox, Playstation, Wii); (4) playing on a handheld game console, such as a Gameboy, PSP, or DS; (5) using a tablet computer (such as iPad); and (6) using a smartphone for playing games, watching videos, or surfing the Internet (not including time spent talking on the phone). A daily use (averaged across the weekend and weekday) was calculated by device and then summed across all devices. Because of outliers' 2 standard deviations above the mean that were beyond possible daily totals, such values were winsorized and assigned the highest value at 2 standard deviations. The method used in this study to measure child screen time was similar to those used by major industry reports and peer-reviewed research.[38,39]

Sleep Disturbances and Duration

An abbreviated version of the Children's Sleep Habit Questionnaire (CSHQ) was used to measure youth sleep disturbances and duration. The CSHQ is a widely used parent-report questionnaire to screen for childhood sleep problems and has been shown to be highly correlated with objective measures sleep functioning such as actigraphy. Parents rated the frequency of sleep behavior for the most recent "typical" week on a 4-point Likert scale, with the response options *usually* (5–7 times per week), *sometimes* (2–4 times per wk), *rarely* (0–1 time per wk), and *never* (less than once a week). A higher score indicates more sleep disturbances. Seven items were chosen to measure sleep disturbances across several domains: daytime sleepiness ("falls asleep while involved in activities"), daytime fatigue ("seems tired during the day"), sleep efficiency ("wakes up during the night"), continuity of sleep ("is restless and moves a lot during sleep"), consistency of sleep ("sleeps about the same amount each day" and "goes to bed at the same time at night"), and sleep latency ("falls asleep within 20 minutes after going to bed"). Items were scored such that higher scores represented more sleep disturbances (current α = .72). To measure sleep duration, parents

reported what time their child typically goes to sleep on weeknights and weekend nights separately, and what time they typically wake up on weekdays and weekend days. From these, the amount of sleep was calculated by multiplying the weekday totals by 5 (days), adding it to the weekend totals multiplied by 2, and dividing the total by 7 to indicate average daily sleep duration.

Youth Internalizing and Externalizing Problems

The parent form of the 19-item Brief Problem Monitor (BPM)[40] measured 2 indices of youth behavioral health problems: internalizing and externalizing problems. BPM items were selected from the Child Behavior Checklist and Youth Self-Report[41] using item response theory and factor analysis.[42] The internal consistency, test–retest reliability, and validity of the BPM are excellent.[40,42] Each item is rated on a 0 to 2 scale (0 = not true, 1 = somewhat true, or 2 = very true). Higher scores indicate more internalizing (current α = .72) or externalizing (current α = .72) problems.

Peer Problems

For the third indicator of behavioral health problems, the peer problem subscale of the Strengths and Difficulties Questionnaire[43] was used. Responses to each of the 5 peer problem items (e.g., playing alone; being bullied and generally not liked by other children) were rated on a 3-point Likert scale (0 = not true, 1 = somewhat true, or 2 = certainly true). Psychometric properties are well established.[44–46] Higher scores indicate more peer problems (current α = .72).

Data Analytic Plan

Evaluation of the Structural Model

Path analysis to test the hypothesized structural model was conducted with Mplus 6.0 software.[47] Because previous research recommends examining sleep duration and problems separately,[20,23] models were run individually with sleep disturbances and then with sleep duration as the link between screen time and behavioral health problems. The following fit statistics were used to evaluate model fit: Chi-square (χ^2: $p > .05$ excellent), comparative fit index (>.90 acceptable, >.95 excellent), root mean square error of approximation (<.08 acceptable, <.05 excellent), and the standardized root mean square residual (<.08 acceptable, <.05 excellent).[48,49] As missing data were less than 1% overall for all core variables, full information maximum likelihood estimation techniques were used for inclusion of all available data. The Model Indirect command in Mplus was used to calculate a standardized indirect effect parameter and biased-corrected bootstrap confidence intervals. Additionally, the ratio of the indirect effect to the total effect (ab/c)[50] for each significant indirect effect test was calculated.

Covariates

Although not included in the proposed conceptual model, the effects of youth gender, parent marital status (1-parent family vs 2-parent), and family income on the model were examined by running a multiple-indicator/multiple-cause[51] model in which all major constructs of the final model were regressed on the covariates separately. If paths in the structural model remained significant with the inclusion of these covariates, it was concluded that the control variables did not influence the relations among variables in the model.

Secondary Analyses

To facilitate recommendations for families on how many hours of youth screen time is disruptive for sleep (i.e., disturbances and duration), 1-way analysis of variance with 6 levels of screen time (0–2 hrs as recommended by American Academy of Pediatrics; 2.1–4 hrs; 4.1–6 hrs; 6.1–8 hrs; 8.1–10 hrs; and 10.1 hrs or more) was conducted with sleep disturbances and duration as the dependent variables.

RESULTS

Primary Analyses

Sample demographics by developmental stage (young childhood, middle childhood, and adolescent samples) are presented in Table 1.

The multiple-group function in Mplus was used to determine model fit across all 3 developmental stages, but paths in the model were freely estimated by youth developmental stage. When sleep disturbances were included in the model, direct paths from youth screen time to behavioral health problems were nonsignificant across all developmental stages and thus these paths were dropped to determine model fit. This final model demonstrated excellent fit, χ^2 (9, N = 613) = 10.73, $p > .15$, root mean square error of approximation (RMSEA) = .03, 95% confidence interval (CI), 0.00–0.088, comparative fit index (CFI) = 1.0, standardized root mean square residual (SRMR) = 0.03, and is displayed by each child developmental stage in Figure 1. The standardized estimates of direct and indirect effects are presented in Table 2 along with bias-corrected bootstrap CIs for all effects for each of the 3 developmental stages.

The statistically significant standardized estimates of pathways in the sleep disturbances model (Fig. 1) were consistent across all 3 developmental stages: as predicted, higher levels of youth screen time were associated with higher levels of sleep disturbances, which, in turn, were related to higher levels of internalizing, externalizing, and peer problems. Furthermore, the indirect effect of youth screen time on youth internalizing, externalizing, and peer problems through sleep disturbances was significant across all developmental stages (Table 2). The ratio of the indirect effect to the total effect for youth screen time on problem behaviors for the young, middle, and adolescent children ranged from 33% to 50% for internalizing problems, from 33% to 89% for externalizing problems, and from 44% to 98% for peer problems.

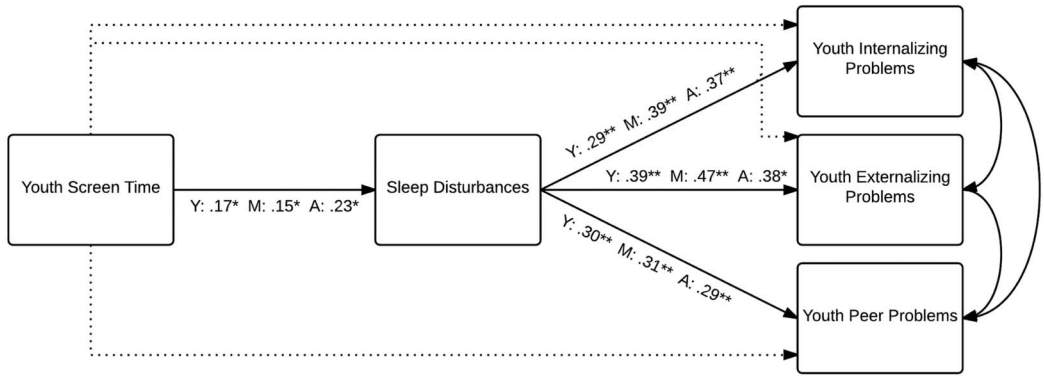
Multiple-indicator/multiple-cause (MIMIC) models tested the demographic effects of youth gender, parent marital status, and family income on the associations in the model for each age group. All the major constructs of

Table 1. Sample Demographic Characteristics by Developmental Stage

	Mean (SD) or Percentage		
	Young Childhood, n = 209	**Middle Childhood, n = 202**	**Adolescence, n = 210**
Parent age	31.61 (6.57)	35.39 (6.45)	41.78 (7.66)
Parent (% mothers)	59.8	58.4	62.4
Parent race, %			
White	76.0	77.2	78.8
Black	10.6	10.4	11.1
Latino/a	5.8	6.9	5.8
Asian	6.7	4.0	3.4
Other	0.9	1.5	0.9
Parent marital status, %			
Single	18.4	15.4	18.8
Married	58.7	68.2	66.3
Cohabitating	22.8	16.4	14.9
Parent education, %			
Did not complete H.S.	1.0	0.0	0.0
H.S. or GED	12.5	12.9	11.9
Some college	30.6	25.2	35.2
College degree	42.5	41.1	39.5
> College degree	13.4	20.8	13.3
Family income, %			
Under US $30,000	20.5	19.8	24.8
US $30,000–$49,999	32.6	29.2	26.2
US $50,000–$69,999	20.1	16.8	20.0
US $70,000–$99,999	14.8	18.8	16.6
US $100,000 or more	12.0	15.4	12.4
Family neighborhood, %			
Urban	27.8	26.2	25.7
Suburban	51.7	52.0	51.0
Rural	20.6	21.8	23.3
Number of children	1.67 (0.85)	2.05 (1.36)	1.72 (0.93)
Youth age	4.47 (1.34)	9.46 (1.38)	14.70 (1.40)
Youth gender (% Girls)	44.0	46.0	44.8
Youth screen time (hrs), %	4.95 (4.1)	5.50 (4.3)	8.80 (5.1)
0–2	16.8	8.0	0
2.1–4	37.0	34.0	9.3
4.1–6	21.6	25.5	25.0
6.1–8	12.0	15.0	24.5
8.1–10	5.9	8.0	14.2
>10	6.7	9.5	27.0

the model were regressed on the control variables separately. All paths in the structural model across all three samples were largely unaffected (i.e., remained significant without large reductions in effect size) by the inclusion of these control variables; thus, it was concluded that the control variables did not influence the original relations among variables in the model.

Next, the model was run with sleep duration in the model instead of disturbances. This model demonstrated excellent fit, χ^2 (9, N = 613) = 13.89, $p > .10$, RMSEA = 0.05, 95% CI, 0.00–0.10, CFI = 0.98, SRMR = 0.04 (Table 2 presents standardized estimates and 95% CIs). Youth screen time was related to sleep duration for young and middle childhood, but not for adolescence.



Note: Y = Young Childhood; M = Middle Childhood; A = Adolescence; * = $p < .05$; ** = $p < .01$; non-significant paths indicated by dashed line.

Figure 1. The indirect effect of youth screen time on behavioral health problems through sleep disturbances.

Sleep duration was only related to youth externalizing problems in middle childhood; all other paths from sleep duration to behavioral health outcomes were not significant. This model was not considered further (e.g., MIMIC models were not tested).

Secondary Analyses

The bottom of Table 1 shows overall mean screen time and percentage of sample in each category. To examine how many hours of screen time is disruptive for sleep, sleep disturbances initially and then duration served as a dependent variable and 6 levels of youth screen time served as the independent variable in an analysis of variance. A significant effect emerged for young childhood (F [5, 203] = 2.43, $p < .05$) and adolescence (F [4, 199] = 3.74, $p < .01$), but not for middle childhood (F [5, 194] = .60, $p > .10$); however, the pattern of mean values for middle childhood is consistent with that for the adolescent sample. Contrasts were performed to examine the significant differences

Table 2. Standardized Estimates for the Final Structural Model by Youth Developmental Stage

	Standardized Estimate (95% CI)		
Paths in the Model	**Young**	**Middle**	**Adolescence**
Sleep disturbances			
Screen time—sleep disturbances	0.17 (0.04 to 0.30)	0.15 (0.02 to 0.29)	0.23 (0.10 to 0.36)
Sleep disturbances—internalizing problems	0.29 (0.16 to 0.41)	0.39 (0.28 to 0.51)	0.37 (0.25 to 0.49)
Sleep disturbances—externalizing problems	0.39 (0.27 to 0.50)	0.47 (0.37 to 0.58)	0.38 (0.26 to 0.50)
Sleep disturbances—peer problems	0.30 (0.17 to 0.42)	0.31 (0.19 to 0.44)	0.29 (0.17 to 0.42)
Screen time IND internalizing problems	0.05 (0.004 to 0.09)	0.06 (0.004 to 0.12)	0.08 (0.03 to 0.14)
Screen time IND externalizing problems	0.07 (0.01 to 0.12)	0.07 (0.01 to 0.14)	0.09 (0.03 to 0.15)
Screen time IND peer problems	0.05 (0.01 to 0.09)	0.05 (0.001 to 0.10)	0.07 (0.02 to 0.12)
Internalizing WITH externalizing	0.25 (0.12 to 0.38)	0.45 (0.34 to 0.56)	0.21 (0.08 to 0.35)
Internalizing WITH peer problems	0.23 (0.10 to 0.35)	0.34 (0.22 to 0.47)	0.45 (0.34 to 0.56)
Externalizing WITH peer problems	0.03 (−0.11 to 0.16)	0.29 (0.16 to 0.41)	0.24 (0.12 to 0.37)
Sleep duration			
Screen time—sleep duration	−0.29 (−0.48 to −0.10)	−0.53 (−0.71 to −0.36)	0.14 (−0.01 to 0.29)
Sleep duration—internalizing problems	−0.05 (−0.20 to 0.11)	−0.06 (−0.21 to 0.08)	−0.01 (−0.16 to 0.14)
Sleep duration—externalizing problems	−0.10 (−0.24 to 0.04)	−0.22 (−0.38 to −0.06)	−0.09 (−0.23 to 0.05)
Sleep duration—peer problems	−0.06 (−0.18 to 0.06)	−0.05 (−0.21 to 0.11)	0.15 (−0.01 to 0.31)
Internalizing WITH externalizing	0.33 (0.17 to 0.48)	0.55 (0.43 to 0.68)	0.32 (0.18 to 0.47)
Internalizing WITH peer problems	0.29 (0.15 to 0.43)	0.42 (0.29 to 0.55)	0.51 (0.39 to 0.64)
Externalizing WITH peer problems	0.13 (−0.04 to 0.30)	0.39 (0.24 to 0.53)	0.35 (0.22 to 0.47)

CIs that do not contain zero can be considered statistically significant. CI, confidence interval; IND, indirect effect.

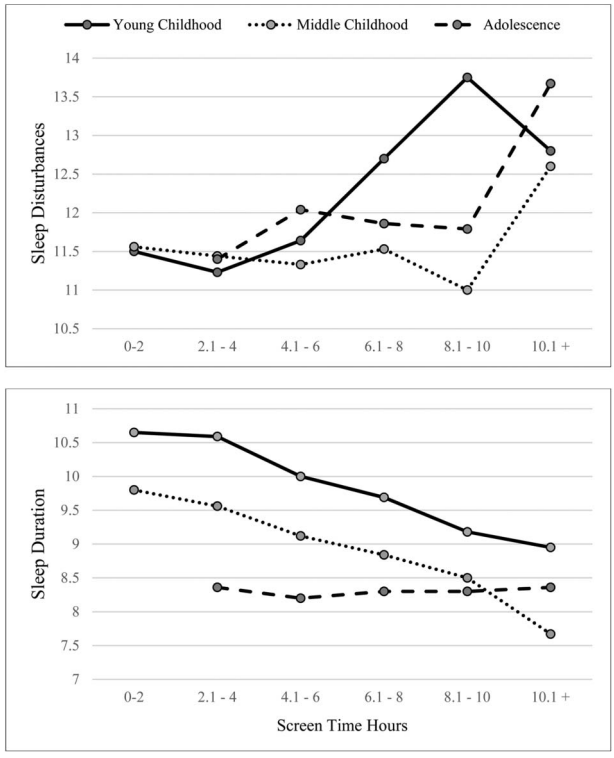


Figure 2. Estimated mean values for sleep disturbances and duration by youth screen time.

between screen time categories (Fig. 2 presents estimated sleep disturbance mean values by screen time category). For middle childhood and adolescence, although only significant in adolescence ($p < .01$), 10+ hours of screen time is associated with higher levels of sleep disturbances than all other levels of screen time. In contrast, for young childhood age, a steep increase in sleep disturbances begins after 6 hours of screen time ($p < .05$) and increases again after 8 hours ($p < .01$).

When sleep duration served as the dependent variable, a significant effect emerged for young childhood ($F [5, 202] = 2.8$, $p < .05$) and middle childhood ($F [5, 194] = 12.05$, $p < .001$), but not for adolescence ($F [4, 199] = .19$, $p > .10$) (Fig. 2 presents estimated sleep duration mean values by screen time category). For the middle childhood sample, sleep duration was not different for 0 to 2 and 2.1 to 4 hours of screen time ($p > .15$), whereas, after 4 hours of screen time, sleep duration decreased significantly with each 2-hour increase in screen time (all $p < .05$). A similar pattern of effects emerged for the young childhood sample; sleep duration was not different for 0 to 2, 2.1 to 4, and 4.1 to 6 (all $p > .05$) but decreased for each 2-hour increase in screen time afterward (all $p < .05$).

DISCUSSION

This study examined the indirect effect of youth screen time on behavioral health problems through sleep duration and disturbances. Findings indicated that, regardless of the developmental stage of the youth, higher levels of youth screen time were associated with more sleep disturbances, which, in turn, were linked to higher levels of youth internalizing, externalizing, and peer problems. Contrary to expectation, sleep duration only served to link screen time to behavioral health problems for externalizing problems in middle childhood.

The consistency of findings for sleep disturbances across developmental stages ranging in age from 3 to 17 years provides substantial support for the roles of youth screen time and sleep disturbances in youth behavioral health problems. Beyond the significant links in the model, the effect size of the indirect effect from youth screen time to all 3 types of behavioral health problems through sleep disturbances was substantial at each developmental stage. As most research has focused on young children,[15] the findings for older children and adolescents are particularly important.

Secondary analyses provided additional data to facilitate recommendations for families on how many hours of youth screen time is disruptive for sleep. At all three developmental stages, average screen time is substantially above that recommended by American Academy of Pediatrics[7] but comparable with major industry reports.[6] For young children, sleep disturbances seem to emerge after 6 hours of daily screen time, whereas, for middle childhood and adolescence, these disturbances increase only at high levels of daily screen time use (10 hrs or more). Sleep duration seems to decrease progressively after 4 or 6 hours of daily screen time for preadolescents. Because both duration and quality of sleep are important for children and adolescents,[25] the findings suggest that for preadolescents screen time above 4 to 6 hours daily is disruptive and for adolescents screen time above 10 hours daily is disruptive. Of importance, the findings are limited to sleep; higher levels of screen time may disrupt functioning in other areas (e.g., academic performance).

Because sleep hygiene is important in the treatment of behavioral health difficulties,[52] the present findings suggest that practitioners should assess for youth screen time and, if appropriate, include recommendations to reduce children's screen time. Because the adoption of mobile media devices continues to grow, it will be particularly important to provide parents with effective strategies for managing their child's screen time (e.g., technology-specific parenting strategies).

There are several limitations of this study. First, the data are cross-sectional, raising questions about the direction of effects and temporal precedence that are better addressed by longitudinal designs. Second, because of the crowdsourcing methodology, all variables in the model were from a single reporter. Because this is a potential issue of shared method variance and parent's reports of adolescent sleep and internalizing may be biased,[53] the use of multiple reporters and methods (e.g., actigraphy) on constructs of interest could strengthen confidence of findings in future work. Third, we did not separate out weekend from weekday screen time and sleep. These are important topics for families; however, research has not yet addressed weekday versus weekend

measurement of these constructs. Research designs using daily-diary or ecological momentary assessment methodologies will be well suited to examine the roles weekday versus weekend assessment plays. Fourth, our assessment of youth screen time did not account for overlapping use of multiple devices. Although our average screen time hours were in line with major industry reports,[6] future research should take into account potential device overlap and examine if simultaneous use of multiple devices further increases risk for behavioral health problems. Furthermore, screen time outside the home (e.g., friend's home) was not considered in our assessment. Fifth, this study did not include self-reported medical or behavioral health issues (e.g., attention-deficit hyperactivity disorder). This is an important potential confounder and future research should include this information as potential covariates. Additionally, our assessment of sleep disturbances and youth problem behavior used measures not yet validated for children younger than 6 years.

Sixth, the online nature of participant recruitment in this study precludes the examination of parents who may not use the Internet, possibly as a result of their perceptions of technology. Given that approximately 15% of adults in the United States do not use the Internet,[54] it will be important in future research to include these families. Seventh, this study's focus on negative effects of screen time precluded the examination of potential positive effects of screen time. For example, the importance of technology for a child's academic success provides a source of unique tension for parents as they attempt to balance the positive and negative effects of screen time. Future research should incorporate positive effects of screen time, such as academic success, as an additional potential outcome associated with child screen time. Eighth, our measure of sleep disturbances was an abbreviated version of the full Children's Sleep Habit Questionnaire. Although most items and subscales from this measure were not of interest to the current investigation, further research on the validity of the brief version is needed. Ninth, future research will benefit from using objective methods of assessing sleep duration and quality.[25]

An additional limitation of the current investigation is the simplification of the process by which high levels of screen time influence sleep and problem behaviors. Although necessary for initial stages of inquiry into this growing topic of research, future research should seek to examine the mechanisms involved for each pathway in the current model and do so with the child's developmental stage as a central context. For example, it is plausible that the mechanisms by which high levels of screen time are related to sleep disturbance, which in turn is related to behavioral health, would differ depending on the child's developmental stage. For example, adolescents may engage in screen time rather than sleeping, whereas young children may be overstimulated by the games and, therefore, have a more difficult time settling in when it is time to sleep. Furthermore, a developmentally informed approach to identifying mechanisms of influence will greatly enhance both breadth and confidence in findings as well as the broad scale generalizability of findings to families and children.

CONCLUSION

The use of mobile media devices continues to increase in childhood. The current findings suggest that excessive screen time is associated with reduced sleep duration in the preadolescent years and sleep disturbances in 3 age groups ranging from 3 to 17 years. In turn, sleep disturbances, and to a lesser extent duration, are associated with behavioral health problems. Effective interventions to decrease screen time need to be developed and tested for their effects on these negative outcomes. Once mechanisms have been identified within and across children at different developmental stages, interventions targeting these mechanisms can be designed and implemented. Potential targets for intervention may include psychoeducation for both the parent and child regarding the consequences of excessive screen time, as well as targeting screen time indirectly through interventions aimed at improving parental efficacy when managing this behavior.

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