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Screen Time in the Coronavirus 2019 Era: International Trends of Increasing Use Among 3- to 7-Year-Old Children

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Objective To evaluate changes in electronic screen-based media use in 3- to 7-year-old children across 6 countries as a result of the coronavirus disease 2019 (COVID-19) pandemic.

Study design Between April and July 2020, parents of 2516 children completed online survey measures reporting current ("now") and retrospective ("before the pandemic") screen-based media use for the purposes of entertainment, educational app use, and socializing with family and friends. Parents also reported family socioeconomic characteristics and impacts of the pandemic to their physical wellbeing (eg, whether a family member or friend had been diagnosed with COVID-19) and social disruption (eg, whether family experienced a loss of income or employment due to the pandemic).

Results On average, children engaged with screens more than 50 minutes more during the pandemic than before. This was largely driven by increases in screen use for entertainment purposes (nearly 40 minutes) and for use of educational apps (over 20 minutes). There was no overall change in screen use for socializing with family and friends. Children from lower socioeconomic status households increased screen use both for entertainment and educational app use more so than did children from higher socioeconomic status households.

Conclusions The global pandemic caused by COVID-19 has increased overall electronic screen-based media use. As lives become increasingly digital by necessity, further research is needed to better understand positive and negative consequences of electronic screen-based media use. *(J Pediatr 2021;239:59-66)*.

The coronavirus disease 2019 (COVID-19) pandemic has ushered in substantial changes in home life, which may have led to greater engagement with electronic screen-based media. Our goal was to document changes in the patterns of children's screen use within and between countries in the context of the COVID-19 pandemic. Messages surrounding the potential risks of extended screen use and the importance of limiting screen use have been shared widely and are incorporated into many country's pediatric recommendations[1-6]; however, changing routines due to the COVID-19 pandemic affect the ways children use electronic screen-based media. As children's screen time during the weekend exceeds time spent using screens during the week or school days,[7,8] and children have been spending time increasingly indoors as a result of COVID-19, we might expect media use patterns more closely mirror weekend patterns of screen use. In addition, children in households of lower socioeconomic status (SES) may spend more time using screens than their peers from higher-income homes[9] as low-SES families have been more substantially affected by economic hardships than families of greater SES backgrounds.[10,11] Finally, stress due the COVID-19 pandemic has heightened[12]—especially for those who have experienced loss of employment and other financial and social stressors[13]—which may relate to increased child screen time.[14]

We leveraged a large dataset comprising data from parents of children aged 3-7 years in 6 countries collected between April and July 2020 to understand patterns of change in young children's screen use. We also explored correlates of change in children's media use behavior and tested whether differences in proximity to the pandemic (eg, household member, family, or friend illness from, hospitalization due to, or death from COVID-19) or social disruption due to the pandemic (eg, income or occupation change, financial strain, worry about family or friends as a result of COVID-19) were associated with changes in media use. We hypothesized that children in households that have experienced greater disruption as a result of the COVID-19 pandemic have also seen a greater increase in electronic screen-based media use. We also hypothesized that children from lower-income families may be more likely to rely more on screen-based media.

COVID-19	Coronavirus disease 2019
ICC	Intraclass correlations
SES	Socioeconomic status

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Methods

During the COVID-19 pandemic, 2516 parents and/or caregivers with 1 or more children between the ages of 3.00 and 7.99 years (mean = 5.77 years; SD = 1.10; 50.6% male, 47.9% female, 1.5% no response) were administered an online questionnaire on child development in the context of the pandemic. All surveys were completed between April 29 and July 7, 2020. Participants completed a Qualtrics survey, which asked them to report activities, attitudes, beliefs, and stress in different domains before the beginning of, as well as during the pandemic. Participants were recruited in 6 countries: Australia, China, Italy, Sweden, the United Kingdom, and the US. Recruitment was carried out by a collaborative group of researchers, many of whom had worked together and employed similar recruitment methods previously, who used the social media accounts of their respective universities and/or research groups to distribute information to prospective participants. In addition, study information was sent via email to several established cohorts from longitudinal studies carried out by investigators on the team. The study advertisement asked parents of children aged 3-8 years old to participate in a 20- to 25-minute survey on the effect of COVID-19 on family life.

Surveys were originally written in English and were adapted to be appropriate to local languages and dialects by investigators in those countries. In total, 6.4% of respondents were in Australia (n = 161), 13.4% were in China (n = 336), 9.7% were in Italy (n = 244), 31.6% were in Sweden (n = 795), 28.1% were in the United Kingdom (n = 706), and 10.9% were in the US (n = 274). Respondents were typically female caregivers (81.5% female and 8% male, 10.5% prefer not to say), aged between 21 and 65 years old (mean age = 37.34, SD = 5.39 years), and highly educated (63.1% bachelor's degree). Of respondents asked about ethnicity, 50.5% were White, 29.2% Asian, 17.7% multiple ethnic groups, 1.7% Black or other, and 0.9% preferred not to say. Respondents in Australia and Sweden were not asked about ethnicity. Given the multicultural nature of the Australian population and the ambiguity of self-identifying oneself as Australian, ethnically White, etc, it was not asked for in this sample. Conversely, given the homogenous ethnic backgrounds typical of the Swedish population, investigators at the site felt that participants would identify as 'Swedish' rather than "White," "Black," "Asian," etc, and therefore opted to omit the question.

Measures

Amount of Media Use. Respondents completed 10 items related to children's electronic screen-based media use in response to the prompt "On a typical day, how much time does your child spend in front of a screen?" The first 5 questions asked the respondent to retrospectively report the amount of media use "before the pandemic"; the latter 5 asked the respondent to report the amount of media use "since the pandemic." For both time periods (ie, before the pandemic and since the pandemic), respondents were asked to report an estimate of time used to watch TV/film, play games, use learning apps, engage in social contact with family, and engage in social contact with friends. For all 10 questions, respondents used the same 6-point scale with options for "0 minutes/N/A," "15 minutes," "15-30 minutes," "30-60 minutes," "1-2 hours," or ">2 hours." These answers were transformed to the numerical value in the middle of the range in minutes (ie, corresponding to the aforementioned options, transformed values were 0, 7.5, 22.5, 45, 90, 120 minutes). Three aggregates were developed to create theoretically meaningful categories: one aggregate combined TV/film and games ("entertainment"), one consisted of only learning apps ("apps"), and one combined social contact with family and friends ("social").

COVID-19 Exposure. A composite was generated from 4 indicator variables to develop a proxy for an individual family's direct exposure to COVID-19. The first question was whether anyone in the respondent's household had experienced symptoms of COVID-19 (0 = "no," 1 = "yes"). The second question was whether any of the target child or respondent's family members or friends had been hospitalized for COVID-19 (0 = "no," 1 = "yes"). The third question was whether any of the target child or respondent's family members or friends had been admitted to an intensive care unit (0 = "no," 1 = "yes"). The fourth was whether any of the target child or respondent's family members or friends had passed away as a result of COVID-19 (0 = "no," 1 = "yes"). The resulting composite ranged from 0 to 4; however, to correct for a non-normal distribution, values greater than 0 were collapsed such that 49.0% (n = 1234) reported no direct COVID-19 exposure and 22.9% (n = 575) reported at least some direct COVID-19 exposure. The remainder of the sample (28.1%) did not provide any information on these questions.

COVID-19 Social Disruption. A composite was generated from 5 items to develop a proxy for an individual family's social disruption due to COVID-19. The first item asked whether the respondent had experienced financial strain as a result of the pandemic, with response options "not at all," "very little," "moderate," and "very much." Respondents who indicated "not at all" received a 0; respondents who indicated "very little," "moderate," or "very much" received a 1. The second item asked whether the respondent had experienced work- or family-related conflict as a result of the pandemic with the same response options; again, respondents who indicated "not at all" received a 0 and all others received a 1. The third asked whether the respondent had experienced worry about loved ones as a result of the pandemic; this was coded as the items above. The fourth asked whether one or more of the target child's primary caregiver(s) had experienced a loss in income as a result of the pandemic (0 = "no," 1 = "yes"). The fifth asked whether one or more of the target child's primary caregiver(s) had experienced a loss in employment as a result of the COVID-19 pandemic (0 = "no," 1 = "yes"). The resulting composite ranged from 0 to 5.

Family SES. An SES composite was developed as a mean of z scores from either 4 or 6 items, depending on whether the respondent identified a second adult in the home. The first items were drawn from respondents' report of their educational attainment and the educational attainment of the other adult in the home (if applicable) on a scale relevant to their own country, which was recoded to its closest equivalent in the British system (general certificate of secondary education, A level/equivalent, tertiary degree, higher degree). The next items were drawn from respondents' report of their own occupation and the occupation of the second adult in the household (if applicable), which was coded according to the UK Standard Occupation Classification system.[15] Occupations with codes beginning with 5 or above were coded as 1 (low-level; eg, process, plant, and machine operatives; customer service occupations); occupations beginning with codes 3 or 4 were coded 2 (mid-level occupation; eg, secretarial occupations; culture, media, and sports occupations); occupations with codes beginning with 1 or 2 were coded 3 (high-level occupation; eg, corporate managers, health professionals). The last items were drawn from each respondent's reports of household size: Respondents reported the number of bedrooms in their home and whether their home was "small and cramped," "small but adequate," "quite spacious," or "very spacious." The resulting mean of z scores had adequate internal consistency ($\alpha = .67$).

Covariates. A series of covariates was included in all analyses. Parent-reported child age and sex were included as covariates, as previous studies have suggested systematic increases in media use as children age and differences by sex as girls tend to engage with screens more than do boys in middle childhood and early adolescence[16] (although not in very early childhood[17]). We also controlled for number of devices in the home. Survey respondents were asked to report whether they had fewer than 5, between 5 and 10, between 10 and 20, or more than 20 screens and devices in the home; responses were recoded to indicate whether families reported having fewer than 5 screens ("1") or more than 5 screens in the house ("0").

In addition, we were also interested in changes in patterns of media use that were not for the explicit purposes of education. A composite was created to serve as a proxy for within-person screen-based media use for explicitly educational purposes. Survey respondents completed 6 questions about how often the target child engaged with the following activities using a screen each before and after the transition to COVID-related lockdowns: picture book/reading, literacy play, numeracy play, creative play, singing/rhymes, and physical activity. Each item was rated on a 5-point scale (ie, "did not occur," "a few times a month," "about once a week," "a few times a week," and "almost daily"); a mean composite was generated for each time point from variables representing picture book/reading, literacy play, and numeracy play, and a difference score was created by subtracting the composite at time 1 from the composite at time 2. Finally, to address whether any significant predictors of change in screen use were specific to screens, respondents were also asked about the frequencies before and after the transition to lockdowns for the same six activities but "in real life" instead of on the screen.

Analysis Plan

To explore changes in young children's screen use as they transitioned toward spending more time at home due to the COVID-19 pandemic, we first examined differences in parent report of child media use from pre-pandemic to during the pandemic using paired-sample t tests. These analyses were carried out in SPSS 26.0 (IBM Corp); cases with missing data were subject to pairwise deletion.

To understand correlates of change in children's media use behavior within and between countries we tested whether differential exposure to COVID-19 and social disruption as a result of the COVID-19 pandemic was related to patterns of change in media use. We also tested whether family SES related to changes in media use behavior. We computed multilevel models with respondents nested within time (1 = retrospective report of media use; 2 = current report of media use) and nested within country. We first estimated unconditional means models of each to compute country-level intraclass correlations (ICCs). We then ran conditional models to first test predictors of change in overall screen-based media use, then in the 3 subcategories of screen-based media use. As subcategories of media use are likely correlated, we allowed estimates of change in media use to correlate in a single multilevel model. Analyses were carried out in MPlus 8 (Muthén & Muthén); missing data were subject to full information maximum likelihood estimation.[18]

Results

Descriptive statistics and correlations among study variables are displayed in **Table I**. Screen use largely increased as a result of the COVID-19 pandemic (**Figure 1**). On average, parents reported a nearly 1-hour increase in screen time from before the pandemic to during the pandemic, $t\ (1453) = 22.24$, $P < .001$. This change was largely driven by changes in screen use for entertainment purposes, in which parents reported an increase of nearly 40 minutes from before to during the pandemic, $t\ (1453) = 31.12$, $P < .001$. There was also an increase of more than 20 minutes of the use of apps for educational purposes from before to during the pandemic, $t\ (1445) = 24.59$, $P < .001$. In contrast, there was a decrease in the use of screens for socializing with family and friends from before to during the pandemic, $t\ (1452) = -4.15$, $P < .001$. However, despite these mean differences, there was also substantial within-child stability in screen use. Paired-sample correlations revealed strong correlations such that children who engaged in more screen use before the pandemic also engaged in more screen use during the pandemic (r values = 0.51-0.73, P values < .001). A bivariate correlation revealed no association between SES and change in "real life" play activities, ie, change in reading, literacy play, numeracy play, creative play, singing/rhymes, and physical activity without a screen (r = .042, $P = .094$).

Table I. Descriptive statistics and correlations among study variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 T1 Total SC	–														
2 T1 Entertainment SC	.61*	–													
3 T1 App SC	.53*	.40*	–												
4 T1 Social interaction SC	.86*	.16*	.22*	–											
5 T2 Total SC	.70*	.51*	.45*	.54*	–										
6 T2 Entertainment SC	.43*	.67*	.30*	.12*	.72*	–									
7 T2 App SC	.24*	.17*	.51*	.09*	.57*	.35*	–								
8 T2 Social interaction SC	.65*	.15*	.20*	.73*	.69*	.10*	.08†	–							
9 Target child age	.07†	.16*	.06‡	-.02	.16*	.17*	.19*	.01	–						
10 Target child female	-.08†	-.10*	-.04	-.05	-.08†	-.12*	-.03	<.01	.01	–					
11 SES composite	-.15*	-.15*	-.16*	-.07*	-.15*	-.17*	-.10*	-.04	<.01	-.01	–				
12 COVID-19 social disruption	-.01	-.02	.08†	-.02	.11*	.13*	.18*	-.03	0.01	<.01	-.04*	–			
13 Direct COVID-19 exposure	.03	.08†	.01	-.01	-.01	.04	-.08†	-.01	0.03	-.01	-.02	.06†	–		
14 Change SC education	-.18*	-.14*	-.13*	-.14*	.03	.03	.25*	-.10*	.06‡	.01	.07†	.10*	-.04	–	
15 Change RL education	-.05‡	-.04	-.07‡	-.03	-.01	−0.03	.06‡	-.01	<.0	.02	.04	.03	.03	.21*	–
N	1456	1456	1451	1456	1454	1454	1451	1453	2516	2479	2489	2516	2516	1436	1562
Mean (SD)	167.78 (124.98)	77.69 (52.02)	17.82 (24.83)	72.33 (93.58)	222.10 (117.39)	117.57 (64.49)	39.47 (38.29)	65.19 (71.22)	5.77 (1.10)	–	−0.02 (0.72)	2.38 (1.42)	0.30 (0.46)	0.66 (1.13)	.21 (0.80)
Range	0-600	0-240	0-120	0-240	0-600	0-240	0-120	0-240	3.01-7.99	1-2	−1.91 to 18.50	0-5	0-1	−3.67 to 4.00	−3.67 to 4.00

RL, real life; *SC*, screen time.
*$P < .001$.
†$P < .01$.
‡$P < .05$.

Between-Country Differences in Changes in Screen-Based Media Use

We next tested whether patterns of change in media use were consistent across each country included in the present sample using paired-sample t tests for each country independently. Results are depicted graphically in Figure 2. Parent report of child total screen time increased across Australia, Italy, Sweden, the United Kingdom, and the US ($5.32 < t < 18.97$; P values $< .001$); screen time did not change in China, t (154) = 1.61, $P = .111$. Screen time for entertainment use and educational app use increased across all countries, $9.50 < t < 2.51$, $P < .001$; $5.21 < t < 22.40$, $P < .001$, respectively. Screen time for the purposes of socializing only changed in China, where it decreased by more than 50 minutes, t (154) = −9.05, $P = .001$; changes in screen time for socializing in other countries were nonsignificant, $-1.85 < t < 0.54$, P values $> .06$.

Predictors of Change in Screen-Based Media Use

Multilevel models were computed with individual's data from prior to and during the pandemic nested within individual nested within country to account for systematic differences of country-level effects. We first estimated a model of change in overall screen use. Results of the unconditional means model reveals a small effect of country (ICC = 0.03, SE = 0.02) and, as expected, a large effect of individual (ICC = 0.63, SE = 0.02).

Consistent with the aforementioned findings, we found a within-person effect of time such that total screen time increased, on average, approximately 54 minutes for a given child. Neither the index of direct COVID-19 exposure nor of family social disruption as a result of COVID-19 was associated with change in overall media use. Family SES was negatively associated with change in media use such that children from higher-SES families experienced less of an increase in media than did children in lower-SES households (Table II).

We next estimated a model of change in each subcategory of screen use; change in the three subcategories was allowed to correlate. As with overall screen use, results of the unconditional means model reveal a small effect of country on screen use for entertainment (ICC = 0.04, SE = 0.03) and a moderate effect of individual (ICC = 0.49, SE = 0.02). There was a larger—although still small—effect of country on educational app use (ICC = 0.06, SE = 0.04) and a moderate effect of individual (ICC = 0.31, SE = 0.04). Screen use for the purposes of socializing with family and friends showed a still stronger effect of country (ICC = 0.13, SE = 0.07) and of individual (ICC = 0.72, SE = 0.03).

Analysis of within-subjects effects showed change in media use for entertainment was positively correlated with change in media use for educational app use, $r = 0.36$, $P < .001$; change in entertainment media was uncorrelated with change in media use for socializing, $r = -0.01$, $P = .826$, and changes in media use for socializing and educational app use were also uncorrelated, $r = 0.03$, $P = .474$. Consistent with the aforementioned findings, we saw increases in screen use for entertainment of nearly 40 minutes, and for education app use of

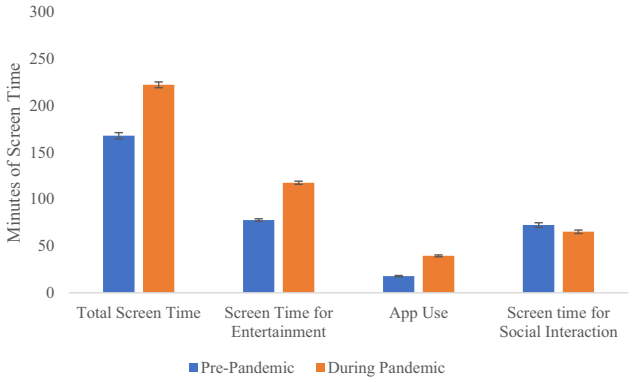

Figure 1. Comparison of screen use and its subcategories before and during the pandemic.

nearly 22 minutes. When adjusting for country-level differences, the negative change in screen use for purposes of socializing with family and friends that was suggested in paired-sample *t* tests was attenuated.

Analysis of between-subjects effects found that overall levels of subcategories of screen use were correlated within individuals. Screen use for entertainment purposes was correlated with both use of educational apps, $r = 0.33$, $P < .001$, and use of media for socializing with family and friends $r = 0.18$, $P = .001$; screen use for the purposes of educational apps and socializing were also correlated, $r = 0.23$, $P = .007$. Direct exposure to COVID-19 was unrelated to any subcategories of media use; however, social disruption due to COVID-19 was related to screen use of educational apps. More social disruption was associated with more educational app use, and marginally with screen use for the purpose of socializing with family and friends. Family SES was again negatively associated with change in screen use for entertainment and educational app use; there were no SES-related differences in media use for socializing. Results are presented in columns 2-4 of **Table II**.

Discussion

Our hypothesis that children across countries would see an overall increase in screen time as a result of the COVID-19 pandemic was in large part supported. Across countries, parents reported, on average, an increase of nearly an hour of screen time per day. This was driven largely by an increase in screen use for the purposes of entertainment and—to a lesser extent—education app use, these estimates may in fact be downwardly biased: As respondents reported children's screen use using a categorical scale whose uppermost option was ">2 hours," some children may be engaging with screens in a given category more than 2 hours on a given

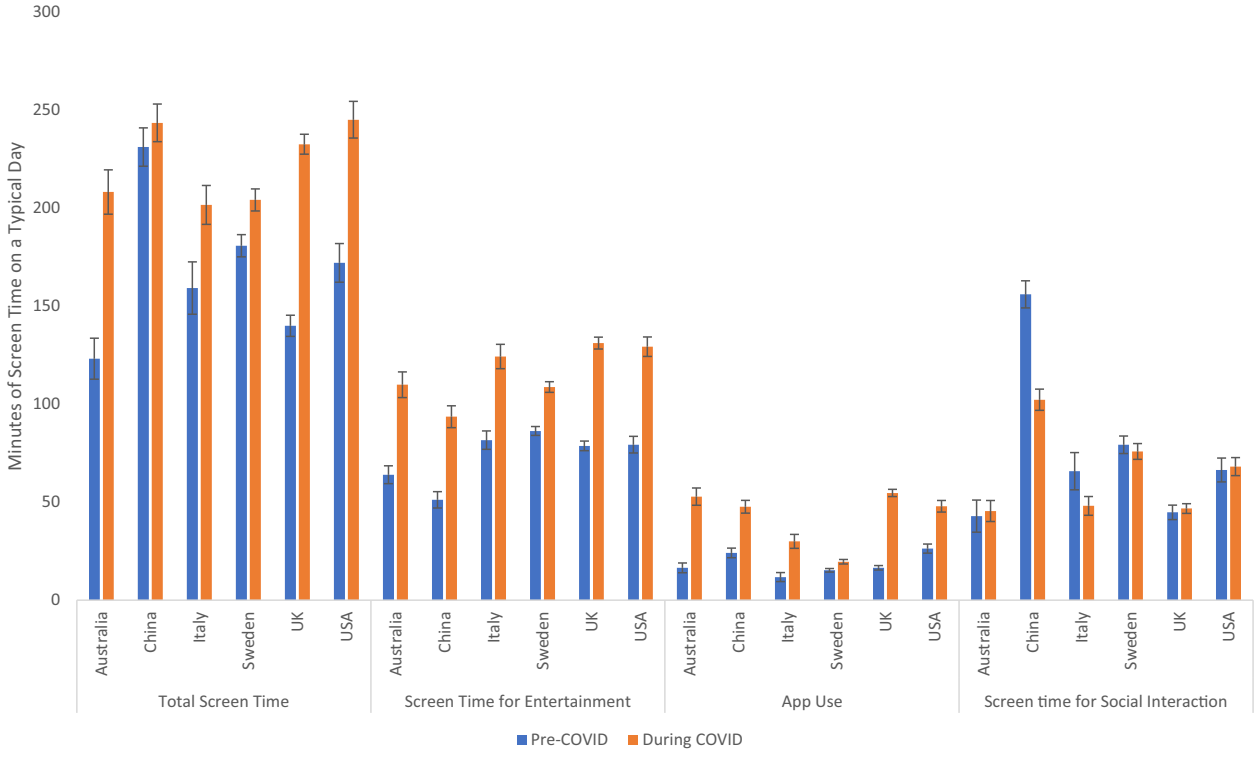

Figure 2. Comparison of screen use and its subcategories before and during the pandemic by country.

Table II. Results of multilevel models

Variables	Total screen use			Screen use for entertainment			Screen use for socializing			Screen use for educational apps		
	β	SE	*P* value	β	SE	*P* value	β	SE	*P* value	β	SE	*P* value
Within-person												
Time	54.20	17.80	.002	39.80	7.73	<.001	−6.98	6.50	.283	21.60	8.30	.009
Between-person												
Child female	−18.02	3.88	<.001	−12.19	2.32	<.001	−4.34	2.98	.146	−1.61	1.29	.211
Child age	12.31	4.10	.003	8.52	1.54	<.001	−0.03	3.88	.994	3.88	0.77	<.001
<5 media devices in home	−27.96	4.95	<.001	−16.02	2.48	<.001	−5.88	4.91	.231	−6.00	0.73	<.001
Family SES	−30.88	8.05	<.001	−16.42	3.21	<.001	−7.80	6.19	.208	−6.68	1.26	<.001
Direct COVID-19 exposure	0.81	11.80	.945	6.09	5.33	.253	−2.41	11.77	.834	−2.77	3.18	.384
COVID-19 social disruption	3.54	2.72	.193	2.06	1.49	.168	−1.59	0.86	.066	3.16	1.27	.013
Change in screen time for education	−8.20	3.73	.028	−2.29	1.45	.113	−8.54	2.12	<.001	2.61	1.21	.031

day. This is illustrated by the fact that, before the pandemic, 3.8% of respondents (n = 96) reported children viewed more than 2 hours of television/film, whereas during the pandemic, 16.7% of respondents (n = 421) reported more than 2 hours. The same general trend existed for use of video games (1.5% vs 7.0%) and app use for educational purposes (1.0% vs 4.9%). This general finding that children used screens more during the pandemic is consistent with extant findings that young children use more screens when they are not physically in school (ie, weekends) than when they are (ie, weekdays).[7,8]

We also found several correlates of change in children's media use behavior. Our metric of exposure was unrelated to changes in children's use of screens; however, social disruption due to COVID-19—events such as job loss, income reduction, and feelings of financial strain as well as worry about loved ones and increases in work- or family-related conflict—corresponded with increases in screen use for the purpose of educational apps (though not with overall screen time). It is possible that parents who reported social disruption due to COVID-19 experienced heightened levels of stress, which has previously been shown to relate to children's screen use.[14] In contrast, it may be that parents who were working fewer hours were more involved with children's screen use as a result and encouraged more app use for education purposes than for general entertainment purposes.

Across countries, children in lower-SES homes were more likely to increase screen use than their peers in higher-SES homes. This effect might exacerbate SES disparities in screen use that were present prior to the pandemic.[9] In addition, SES-related differences in changes of screen use held even when controlling for the number of devices present in the home (which, on its own, also related to changes in screen use wherein children in households with 5 or more screens were more likely to see an increase in screen use). This might be due to differences in material resources and structural differences in the home as access to out-of-home options diminish. Before the pandemic, research suggested that greater SES families are afforded more physical space and play materials than are lower SES families.[19] Thus, during the pandemic children in greater-SES households may have had more opportunities for entertainment aside from screens. However, we did not find a significant association between SES and change in "real-life" play activities, ie, change in reading, literacy play, numeracy play, creative play, singing/rhymes, and physical activity without a screen. Nevertheless, we only covered a very limited number of possible activities and it is still possible that higher SES children may have had access to other nonscreen activities. Second, parents in lower-SES households were more likely to be characterized as essential workers and continue in-person work, whereas parents from higher-SES households were more likely to be able to continue normal work from home.[20] As such, children in lower-SES households might have had less oversight if parents were spending less time in the home and may have instead relied upon screens to keep themselves occupied. Third, families with low incomes generally experience greater social disruption compared with higher income families because of more unstable work conditions and incomes.[21,22] Associations between social disruption and lower SES were only heightened during the pandemic as there were disproportionately larger job losses in sectors where low-income people work such as restaurants, manufacturing, and general blue collar work across countries in our sample.[23-25] As a result of the impacts of social disruption by SES, it has also been shown that these experiences of job loss and income instability, which are now heightened for low-income families, contribute to feelings of stress.[26] Thus, our findings related to social disruption and SES as it relates to children's screen time seem to be interconnected as families with lower SES would likely tend to also experience more social disruption during the pandemic.

We found very small—albeit statistically significant—country-level differences that suggested that patterns in media use were responsible for, at most, 13% of the variance in changes in screen use. In contrast to this, within-individual effects were large: Between 30% and 72% of the variance in children's patterns of media use were attributable to the individual. This suggests that, despite overall changes in patterns of media use as families were impacted by the COVID-19

pandemic, much of the variance in the extent to which children used screens during the pandemic could be predicted by screen use before the pandemic.

It is important to note several limitations. First, due to it being part of a more comprehensive survey, there were a limited number of questions pertaining to screen use. Second, the dichotomous coding scheme in the study did not allow for exploration of the different levels of social disruption or exposure to COVID-19. For example, we were not able to determine whether greater levels of social disruption were associated with more child screen time. Third, there are several methodologic limitations: data were collected via parent report on an online survey which involved retrospective reflection.[27] Beyond concerns about parent-report data collection broadly, online data collection yields a unique set of concerns, including the potential for false and/or non-human responses (ie, bots).[28] However, we feel this was the safest approach to data collection and as we have surveyed a very large sample across countries, we hope that screening protocols eliminated the risk of non-"real" responses and that any error introduced as a result of data collection methods is systematic and thus affects trends in a consistent direction. Further, recent studies have suggested that retrospective pre–post designs that model within-person changes over time yield reliable and valid estimates.[29] In addition, it is possible that characteristics not explored here—including changes in parent and child mental and physical wellbeing, family size, and neighborhood and school characteristics—might affect amounts of children's screen use. Finally, our estimates of children's screen use may underestimate the actual time some children spent using screens, as ">2 hours" was the largest response option. This investigation explores only a snapshot of time in an ongoing and unprecedented sociohistorical time. Materials were designed and data were collected at a particular point in the pandemic, during a point at which many people—this study team included—thought the most serious effects of the pandemic on children's schooling and activities would have been mitigated by the start of the 2020-2021 school year. As families have been exposed to multiple lockdowns (or lack thereof), inconsistent school openings and closings, and warnings regarding interaction with people outside the household, patterns of screen use have undoubtedly changed.

Ongoing research has and will likely continue to capture these patterns at other times over the course of the pandemic as well as the impacts of screen-based media for educational vs entertainment purposes. Further, increased screen time as a result of the pandemic was mainly driven by pre-pandemic screen time, indicating perhaps that increases in screen time during the pandemic may exacerbate, but not be the root source of any future negative health or academic outcomes. This may have implications for a postpandemic world as children return to school and for future research. The data collected for the present investigation captured a static estimate of screen use, whereas we know children's schedules and screen use is dynamic. Further research is needed to better understand day-to-day patterns using more nuanced methodologies[30] and to ascertain the extent to which any described effects are lasting or whether average screen use will return to pre-pandemic levels in the future.

The finding that increases in screen time due to COVID-19 are seemingly ubiquitous may minimize concerns of parents who worry about their children using screens more frequently. We reiterate recommendations that the content and context of screen use may be a more important consideration than the sheer amount of screen use[1,31,32] and encourage clinicians to remind parents, especially those of lower-SES backgrounds, to monitor screen use to ensure children's media consumption is intentional, age-appropriate, and engaging. Although we cannot be sure of the lasting implications of the COVID-19 pandemic on children's screen use, it is seemingly doubtless that screen use will only increase at a societal level over time.

Understanding the impacts of increased screen time as a result of the pandemic on children's academic and health outcomes is imperative. Future investigation of this generation of young children as it relates to screen time and academic and health outcomes might consider learning preferences (eg, screen-based or not) and preferred modes of communication. In addition, examining the impact of using screens for educational purposes for these children's academic outcomes may be useful, as some evidence suggests that educational apps may be less beneficial than previously thought.[33] Further research should be undertaken to understand whether changes in screen use due to COVID-19 are attenuated as effects of the virus are mitigated, whether a return to pre-pandemic levels varies by child, or whether we now adjust to a "new normal" of increased screen use. ■

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Appendix

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