



# What did COVID-19 Change? The Impact of COVID-19 on Korean Parents' and Children's Daily Lives and Stress

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## Abstract

The COVID-19 outbreak has not only posed a threat to physical health but has also changed our daily lives. This study explored how the COVID-19 pandemic affected Korean parents' and children's daily lives and stress levels. Parents' childcare time, children's screen time, the time spent for social interactions and learning, and parents' and children's stress levels before and after the pandemic were compared. The main caregivers' childcare time increased significantly during the pandemic (4.00 h/day). For children, the time spent for screen time (1.76 h) and online interactions (0.95 h) increased significantly, whereas face-to-face interaction time (4.17 h) and time spent learning (2.16 h) decreased significantly. In addition, parents' and children's stress levels increased significantly during the pandemic. Other descriptive information is provided and discussed. Our results indicate that Korean parents and children experienced significant disruption to their daily lives and increased stress during the pandemic.

**Keywords** COVID-19 · Parenting · Children · Social distancing · Daily lives · Stress

## Introduction

In December 2019, a cluster of pneumonia cases was reported by the Wuhan Health Commission, China [1]. The novel disease causing this outbreak, coronavirus disease 2019 (COVID-19), soon became a global pandemic. Many countries implemented restrictions on population movement and social interaction to slow the spread of COVID-19. For example, Italy and China conducted lockdowns throughout the country [2], Brazil [3] and the United States (U.S.) implemented stay-at-home campaigns [4], and South Korea set five levels of social distancing rules and banned private gatherings of five or more people [5].

Although public health actions were taken globally to mitigate COVID-19 contagions, these actions also resulted in unintended consequences that impacted family life. In April 2020, in more than 167 nations, at least 1.46 billion children (83.8% of enrolled learners) were out of childcare or school, without access to group activities, social interactions, or team sports [6]. To date, parents and caregivers in

many countries continue to work from home or are unable to work, while caring for their young children, without knowing how long the pandemic will last. For parents, keeping children busy and safe at home or transitioning to home-based learning can be a daunting prospect. For children, staying home for longer hours than usual, with limited social interactions or learning online, can be a demanding task.

A growing body of research has suggested that parents in many countries have experienced and continue to deal with increased parenting stress during COVID-19 [7, 8]. In the U.S., for example, parents have reported higher levels of stress than adults without children [9]. More than 70% of parents have reported that managing their children's online education and daily routines is stressful [9]. Similarly, Japanese parents have reported increased stress levels after their children's school closure [10]. In Italy, the pandemic has led to parental emotional exhaustion [11], especially in mothers. The worsening of parents' psychological health, such as increased levels of stress or anxiety, could lead to harsher parenting and negative consequences for their children's well-being [7, 8, 12, 13].

Few studies have explored the impact of the COVID-19 pandemic on children's daily lives or psychological health [14, 15]. Children have experienced significant disruptions to their daily routines, with daycare and school closures in

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many countries. As children are confined to home during the pandemic, they may suffer with delicate physical health, loneliness, anxiety, and boredom [8, 16–18]. Research has suggested that children have much longer screen times, irregular sleep patterns, and less favorable diets during even short periods of time away from school, for example on weekends or summer vacations [19, 20], which may lead to additional vulnerabilities in children's development.

Given the novelty of the COVID-19 situation, more research is needed to investigate how the COVID-19 pandemic and related social distancing practices affect parents' and children's daily lives and their psychological health. The purpose of the present study was to capture a snapshot of the impact of the unexpected shift in the daily lives of Korean parents' and their children, as well as their associated stress levels during COVID-19. In Korea, in March 2020, all daycares, kindergartens, and schools nationwide delayed opening after winter vacation and were temporarily closed until late May [21]. Schools gradually reopened from late May starting from G12 (senior high school), but soon again shutdown with the onset of a new wave of COVID-19. The present study was conducted in May 2020, at which point many children remained at home.

A primary goal of the present study was to explore the impact of the COVID-19 pandemic on parents' and children's daily lives, focusing on the time they spent on various daily activities. Although research suggests that parenting stress increased during the pandemic [10, 22, 23], it is unclear as to how much the childcare burden (with respect to time spent in this regard) increased during this time. Therefore, we quantified the increased parenting burden during the pandemic by asking parents to recall the average hours per day they spent on childcare before and after the onset of the pandemic. We hypothesized that the time spent by parents on childcare per day significantly increased during versus before the pandemic. Regarding children, it is still unclear as to how the COVID-19 pandemic has changed their daily activities. Therefore, we measured the average time spent by children engaged in various activities (e.g., screen time, learning, and face-to-face and online social interactions) before and after the onset of the pandemic. We hypothesized that the time spent by children in face-to-face social interactions, and on learning, significantly decreased, whereas the screen time and time spent on other forms of social interactions significantly increased, after versus before the onset of the pandemic.

In addition, we explored the change in stress levels of parents and children during the pandemic. Although recent research has initiated investigations into individuals' stress during the pandemic [24, 25], few studies have addressed the changes in parents' and children's stress levels. This is because there are practical limitations in obtaining baseline data of these stress levels before the COVID-19 pandemic.

The present study sought to compare parents' and children's stress levels before and after the onset of the pandemic, although less ideal, by asking parents to recall their stress levels at the two time points. We hypothesized that parents' and children's stress levels increased after the pandemic. In addition, the present study investigated the main stressors and the activities that parents and children relied on to cope with their stress.

The objective of the present study was to explore the effects of the COVID-19 pandemic and related social-distancing practices on family life, the childcare burden on parents, and children's daily lives, with a focus on the early stage of the pandemic in South Korea. The study also evaluated the negative impact of the COVID-19 pandemic on parents and children's stress levels. We believe that the findings of the present study will provide useful information to better understand how the COVID-19 pandemic has affected parents' and children's daily lives, and how families continue to cope with the pandemic situation in their daily lives.

## Method

### Participants and Procedures

A total of 296 Korean adults completed the survey; of these, 8 (3%) were eliminated because they did not meet the criterion of being the main caregiver of at least one child aged between 1 and 12 years. The final sample included 288 parents, with at least one child aged 1–12 years who was living at home. Table 1 summarizes the characteristics of the participants (92% mothers and 8% fathers). In total, 53.9% of the participants were employed and 45.1% were unemployed, housewives or househusbands. Approximately 63.1% of the participants had incomes below the average monthly household income (\$3750) reported in the South Korean consensus (<https://kosis.kr/eng/>) of the second quarter of 2020.

If participants had multiple children, they were asked to report about their youngest child. The mean age of the participants' youngest child was 5.56 years (standard deviation [*SD*] 3.31 years; range 1–12 years). The average number of family members was 3.70 (*SD* = 0.87), and the average number of children was 1.70 (*SD* = 0.70). In terms of family structure, 91.7% of the families were nuclear families, and 7.6% of the families were extended families.

Participants were recruited through social media (i.e., a survey link with instructions posted on Instagram) and online parenting forums [i.e., Naver ([www.naver.com](http://www.naver.com)) online cafés for parents]. The online survey was conducted on the Survey Monkey platform, between May 24 and May 28, 2020. The survey took approximately 20 min to complete. Participants were compensated with a coffee coupon after

**Table 1** Participant characteristics ( $N=288$ )

	<i>N</i>	%
Participant gender		
Male	23	8.0
Female	265	92.0
Participant occupation		
Employed	155	53.9
Housewife or househusband	130	45.1
Student	3	1.0
Monthly household income (\$)		
< 1800	88	30.6
1800–3599	94	32.6
3600–5400	56	19.4
5401–7200	25	8.7
> 7200	25	8.7
Family structure		
Nuclear family (parents and children)	264	91.7
Extended family (grandparents, parents, and children)	22	7.6
Other	2	0.7
	<i>M (SD)</i>	Range
Child age	5.56 (3.31)	1–12
Number of family members in the household	3.70 (0.87)	2–8
Number of children in the household	1.70 (0.70)	1–6

completion of the survey. Each participant gave consent as they started the survey, and the protocol was approved by the Institutional Review Board of Sungshin Women's University (Seoul, South Korea).

## Measures

We developed ad-hoc questionnaires to explore the changes that parents and children encountered in their daily lives due to the COVID-19 pandemic. We designed an online questionnaire to be completed by the caregivers of children during the COVID-19 pandemic. The questionnaire was simple and easy to complete. The questionnaire consisted of two main parts: one part asking about the changes in parents' childcare burden and stress and a second part that focused on changes in children's daily activities and stress.

### Questions About Parents: Changes in Childcare Burden and Parental Stress

To explore parents' experiences during the pandemic, we first asked parents to select the biggest change in their daily lives since the pandemic began (e.g., problems in their physical health or that of a member of their family, child's school closure, governmental order for self-quarantine, changes in household income, etc.). Parents were also asked to report

the biggest concern regarding their physical health (e.g., decrease in exercise, weight gain, poorer sleep, etc.) and psychological health (e.g., nervousness, lethargy, depression, anxiety, fear of death, etc.). For the multiple-choice questions used in the survey, participants could choose only one option; however, they were also provided with the opportunity to enter a free-response option if none of the existing choices represented their situation.

Next, to quantify the increased childcare burden due to the pandemic, we asked participants to recall the average number of hours per day that they and other adult(s) of the same household spent on childcare at two time points, before and after the onset of the pandemic. Childcare time was defined as the time spent by the participants, or other adults in the same household, on childcare, i.e., on caring for and educating their children. Regarding the time spent on childcare after the onset of the pandemic, we asked the participants to report their experience during the past week. In addition, parents reported their stress level before and after the onset of the pandemic on a five-point scale. To further describe the nature of the changes in parental stress, we asked parents to select the most significant factor that they felt had affected the change in their stress level (e.g., staying at home for a much longer time than usual, keeping socially distant, childcare burden, etc.), and how they attempted to relieve their stress (e.g., engaging in indoor

or outdoor activities, social interactions, using electronic devices, etc.) before and during the pandemic.

### Questions About Children: Changes in Children's Daily Activities and Stress

For children, parents were asked to report about their youngest child. Similar to the questions about the parents themselves, we first asked parents to select the change in their child's daily life that they were currently most concerned about (e.g., longer screen time, decrease in social interactions, decrease in physical activities, changes in sleep or meal patterns, etc.). Parents also reported the most significant concern regarding their child's physical health (e.g., decrease in exercise, weight gain, difficulty with sleep, etc.) and psychological health (e.g., lethargy, depression, anxiety, fear of death, etc.).

Next, to quantify the changes in the time children spent on their daily activities, we asked participants to report the average number of hours per day on weekdays that their child stayed at home and spent their time as screen time, social interactions (face-to-face or online), and learning, before and after the onset of the pandemic. As with the parent-focused section of the questionnaire, parents were asked to report their child's stress level before and after the onset of the pandemic on a five-point scale. We also asked parents to select the most significant factor that they thought had affected the change in their child's stress level (e.g., staying at home for a much longer time than usual, keeping socially distant, challenges of online classes, etc.), and the way their child relieved stress (e.g., engaging in indoor activities, outdoor activities or social interactions, using electronic devices, etc.) before and during the pandemic. Finally, we asked parents to report on their child's positive experiences during COVID-19.

## Results

The collected data were analyzed using descriptive statistics and a paired sample *t*-test.

### Changes in Parents' Childcare Burden and Stress due to COVID-19

#### Descriptive Results

Table 2 presents the descriptive results for the biggest change in parents' own life after COVID-19, the biggest concerns about parents' own physical and psychological health, the main cause of parental stress, and the main way parents' relieved stress before and after the onset of COVID-19. Most parents (81.9%) reported the closure of their child's daycare,

kindergarten, or school as the most significant change in their daily lives after the onset of the pandemic. Regarding the concerns about parents' own physical health, they reported a decrease in physical exercise (42.4%) and weight gain (31.3%) as the biggest concerns. Regarding the concerns about parents' own psychological health, they reported nervousness (35.4%) and lethargy (24.0%) as the biggest concerns.

### Childcare Before and After the Onset of COVID-19

The average number of hours per day that parents spent on childcare increased significantly after the onset of the pandemic (before: mean [ $M$ ] = 6.43 h,  $SD$  = 3.43; after:  $M$  = 10.43,  $SD$  = 4.05),  $t(287) = 19.22$ ,  $p = 0.000$  (Fig. 1). Indeed, most parents ( $n = 264$ , 91.7%) reported an increase in the time spent on childcare after the onset of the pandemic. Similarly, 251 parents lived with other adult(s) at home, and all of them (100%) reported an increase in the childcare hours of other adult(s) in the same household. The average hours per day that other adult(s) spent on childcare also increased significantly after the onset of the pandemic (before:  $M = 3.71$ ,  $SD = 3.47$ ; after:  $M = 4.94$ ,  $SD = 4.04$ ),  $t(250) = 5.66$ ,  $p = 0.000$ . In sum, during the pandemic, primary caregivers were providing about 4.00 additional hours of childcare per day, and other household members were performing about 1.23 additional hours of childcare per day.

### Parents' Stress Before and After the Onset of COVID-19

Parents reported that their stress level after the onset of the pandemic ( $M = 4.17$ ,  $SD = 0.76$ ) was significantly higher than that before the pandemic ( $M = 3.30$ ,  $SD = 0.77$ ;  $t(287) = 17.08$ ,  $p = 0.000$ ; Fig. 2). Regarding the most significant factor that affected parents' stress, more than one third of parents reported having to stay at home for much longer times than usual (43.1%) and having to remain socially distant (37.1%) as the main causes for their stress (Table 1). Before the pandemic, parents engaged in face-to-face social interactions with their friends (31.3%) or outdoor activities (25.7%) and used electronic devices such as smartphones or computers (19.4%) to relieve their mental stress. After the pandemic, however, using electronic devices (46.9%) became the most popular way for parents to relieve their own stress, followed by online social interactions with their friends (17.4%) and indoor activities (17.4%).

### Changes in Children's Daily Life and Stress due to COVID-19

#### Descriptive Results

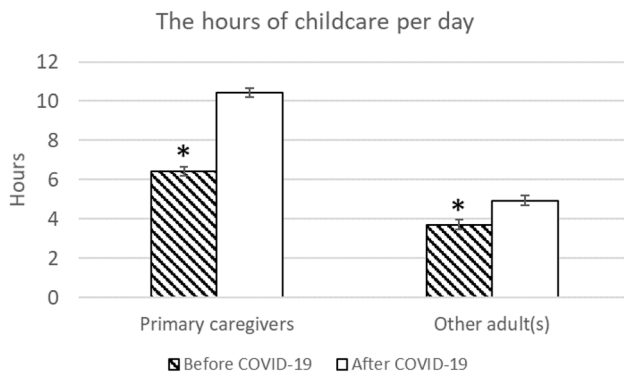
Table 3 presents the descriptive results of the change in children's daily life during COVID-19 that parents were

**Table 2** Descriptive results of the biggest change in parents' daily lives after COVID-19, the biggest concerns in parents' physical and psychological health, the main cause of parents' stress, and the main way parents relieved stress before and after COVID-19 ( $N=288$ )

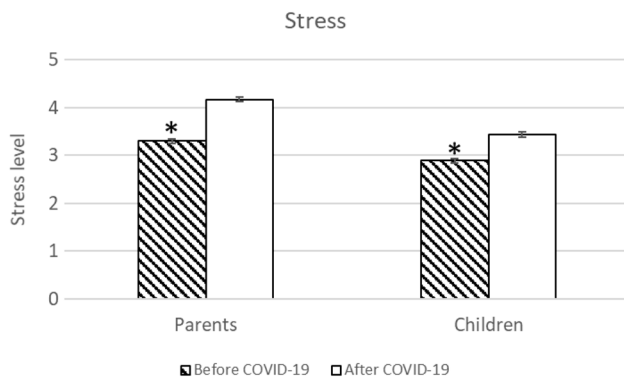
	<i>n</i>	%
The biggest change in parents' own life		
Child's school closure	236	81.9
Changes in household income	23	8.0
Problems with the physical health of themselves or their family	10	3.5
In quarantine	8	2.8
Other	11	3.8
The biggest concern regarding parents' own physical health		
Decrease in physical exercise	122	42.4
Weight gain	90	31.3
Difficulty with sleep	32	11.1
Poorer vision due to excessive use of electronic devices	17	5.9
Digestive problems	11	3.8
Other	16	5.6
The biggest concern regarding parents' own psychological health		
Nervousness	102	35.4
Lethargy	69	24.0
Loneliness due to limited social interactions	55	19.1
Anxiety	29	10.1
Depression	26	9.0
Fear of death	2	0.7
Other	5	1.7
The main cause of parents' own stress		
Staying at home for a much longer time than usual	124	43.1
Keeping socially distant	107	37.1
Extra burden of helping child with online classes	45	15.6
Other	12	4.2
Before the pandemic: the main way parents relieved their own stress		
Face-to-face interactions with friends	90	31.3
Outdoor activities	74	25.7
Using electronic devices	56	19.4
Online interactions with friends	26	9.0
Indoor activities	22	7.6
Sleep	14	4.9
Other	6	2.1
After the pandemic: the main way parents relieved their own stress		
Using electronic devices	135	46.9
Online interactions with friends	50	17.4
Indoor activities	50	17.4
Sleep	21	7.3
Outdoor activities	20	6.9
Face-to-face interactions with friends	3	1.0
Other	9	3.1

most concerned about, the biggest concerns regarding their child's physical and psychological health, the main cause of the child's stress, the main way to relieve the child's stress before and after the onset of COVID-19, and the child's positive experiences during COVID-19. More than one third of parents (34.4%) reported an increase in their child's screen time as the change that they were most concerned

about, followed by a decrease in social interactions (19.1%) and a decrease in physical activity (18.1%). Regarding concern about their child's physical health, parents reported a decrease in physical exercise (42.0%) and decrease in visual acuity due to excessive use of electronic devices (21.5%) as their biggest concerns. Regarding parents' concerns about their child's psychological health, they reported loneliness



**Fig. 1** Average hours per day primary caregiver ( $n=288$ ) and other adults ( $n=251$ ) spent on childcare before and after the onset of COVID-19. Errors bars represent standard error, and asterisks denote a significant difference between the two time points ( $p < .05$ )



**Fig. 2** Average stress level of parents and their child before and after the onset of the pandemic ( $N=288$ ). Errors bars represent standard error, and asterisks denote a significant difference between the two time points ( $p < .05$ )

due to limited social interactions (46.9%) and lethargy (18.4%) as the biggest issues. Despite challenges due to the pandemic, parents also reported that their child had positive experiences. Specifically, parents reported that their child was getting sufficient rest while staying at home (43.4%) and was spending more time with family (32.3%).

### Children's Activities Before and After the Onset of COVID-19

Parents reported that the average number of hours per day on weekdays that children stayed at home increased significantly during the pandemic (before:  $M=14.51$  h,  $SD=5.19$ ; after:  $M=20.42$ ,  $SD=5.22$ ). Regarding the time children spent on various activities, parents reported an increase in their child's screen time per day after the pandemic (before:  $M=2.20$ ,  $SD=1.84$ ; after:  $M=3.96$ ,  $SD=2.28$ ),  $t(287)=16.41$ ,  $p=0.000$  (Fig. 3). In terms of children's social interactions, the average number of hours of

children's face-to-face interactions on weekdays decreased significantly (before:  $M=5.78$ ,  $SD=2.69$ ; after:  $M=1.61$ ,  $SD=2.51$ ;  $t(287)=-21.20$ ,  $p=0.000$ ), whereas the average number of hours of online interactions increased significantly (before:  $M=1.96$ ,  $SD=2.83$ ; after:  $M=2.91$ ,  $SD=4.16$ ;  $t(287)=4.31$ ,  $p=0.000$ ). In addition, the average number of hours that children spent learning on weekdays decreased significantly after the pandemic (before:  $M=5.63$ ,  $SD=2.94$ ; after:  $M=3.47$ ,  $SD=2.41$ ;  $t(287)=-12.67$ ,  $p=0.000$ ). We conducted correlational analyses to explore further the relationships between the difference in primary caregivers' childcare time and the differences in the time that children spent on various activities. These additional analyses determined that the difference in primary caregivers' childcare time was significantly correlated with the difference in the child's screen time ( $r=0.22$ ,  $p=0.000$ ) and the difference in the time that children spent on face-to-face interactions ( $r=-0.16$ ,  $p=0.003$ ) and learning ( $r=-0.13$ ,  $p=0.03$ ). These correlation results suggest that the sudden decrease in caregiver availability during the pandemic could be related to how children allocate their time among the various activities in their daily lives.

### Children's Stress Before and After the Onset of COVID-19

Parents reported that their child's stress level increased significantly after the pandemic (before:  $M=2.89$ ,  $SD=0.78$ ; after:  $M=3.43$ ,  $SD=0.88$ ;  $t(287)=10.37$ ,  $p=0.000$ ; Fig. 2). Regarding the main cause of children's stress, parents reported staying at home for a much longer time than usual as the most significant factor (45.5%) affecting their child's stress level during the pandemic, followed by keeping socially distant (40.6%) and challenges with online classes. Before the pandemic, children engaged in outdoor activities (35.1%) or face-to-face social interactions with their friends (27.8%), and used electronic devices such as smartphones or computers (16.3%) to relieve their mental stress. After the pandemic, however, electronic devices (47.6%) became the most popular way for children to relieve their own stress, followed by indoor activities (27.8%).

### Discussion

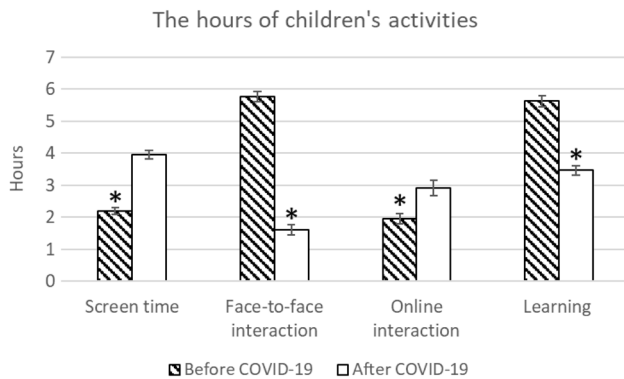
The present study investigated the changes experienced by Korean children and their parents after the onset of the COVID-19 crisis, focusing on parents' concerns about their own health and their child's health, parenting burden, child's daily activities, and parents' and children's stress. The results described parents' main concerns regarding their own physical and mental health and that of their youngest child. Regarding physical health, parents were concerned most about the decrease in physical activity for themselves

**Table 3** Descriptive results of the change in children's daily lives during COVID-19 that parents were most concerned about, the biggest concerns regarding the child's physical and psychological health, the main cause of the child's stress, the main way to relieve the child's stress before and after COVID-19, and the child's positive experiences during COVID-19 ( $N=288$ )

	<i>n</i>	%
The change in their child's daily life that parents were most concerned about		
Longer screen time	99	34.4
Decrease in social interactions	55	19.1
Decrease in physical activities	52	18.1
Changes in sleep patterns	44	15.3
Changes in meal patterns	19	6.6
Fear of COVID-19	9	3.1
Boredom	7	2.4
Other	3	1.0
The biggest concern regarding the child's physical health		
Decrease in physical exercise	121	42.0
Poorer vision due to excessive use of electronic devices	62	21.5
Weight gain	40	13.9
Difficulty with sleep	36	12.5
Digestive problems	12	4.2
Other	17	5.9
The biggest concern regarding the child's psychological health		
Loneliness due to limited social interactions	135	46.9
Lethargy	53	18.4
Nervousness	50	17.4
Difficulties with learning	37	12.8
Anxiety	6	2.1
Depression	6	2.1
Fear of death	1	0.3
The main cause of the child's stress		
Staying at home for a much longer time than usual	131	45.5
Keeping socially distant	117	40.6
Challenges with online classes	33	11.5
Other	7	2.4
Before the pandemic: the main way of relieving the child's stress		
Outdoor activities	101	35.1
Face-to-face interactions with friends	80	27.8
Using electronic devices	47	16.3
Indoor activities	37	12.8
Online interactions with friends	21	7.3
Sleep	1	0.3
Other	1	0.3
After the pandemic: the main way of relieving the child's stress		
Using electronic devices	137	47.6
Indoor activities	80	27.8
Outdoor activities	29	10.1
Online interactions with friends	19	6.6
Face-to-face interactions with friends	14	4.9
Sleep	3	1.0
Other	6	2.1
Child's positive experiences during COVID-19		
Getting enough rest	125	43.4
Spending more time with family	93	32.3
Child did not have any positive experiences	36	12.5
Development of independence	13	4.5
Development of the ability to cooperate with others	6	2.1

**Table 3** (continued)

	<i>n</i>	%
Emotional development	6	2.1
Other	9	3.1



**Fig. 3** Average hours per day children spent on screen time, face-to-face interactions, online interactions, and learning before and after the onset of COVID-19 ( $N=288$ ). Errors bars represent standard error, and asterisks denote a significant difference between the two time points ( $p < .05$ )

and their child. Parents were concerned most about nervousness and lethargy for their mental health. For their child's mental health, parents were most concerned about loneliness due to limited social interactions and lethargy. These results together describe and specify parents' concerns about the physical and mental health of their family during the COVID-19 pandemic.

The present study provides a snapshot of how families with children were adapting to COVID-19 early in the pandemic (i.e., May 2020). Notably, 81.9% of the parents in the present study said that the closure of their child's school was the biggest change in their daily lives. This unusual situation significantly increased the child care burden of parents. Parents who were the main caregivers performed 4.00 additional hours of childcare per day during the ongoing pandemic. Other adults in the household performed 1.23 additional hours of childcare per day. Future research may examine the relationships between additional childcare time during the pandemic and perceived parenting stress. This question is important because an increase in parenting stress is a key predictor of parenting behavior [26], and especially harsh parenting may lead to child maltreatment [27].

Parents in the present study reported that their child was spending 1.76 additional hours of screen time per day during the pandemic. These results confirmed prior findings that child screen time increased during the COVID-19 pandemic [28–31]. The increase in child screen time during COVID-19 may support claims that longer screen times are related to limited parental resources or access to childcare [32, 33]. In

the present study, the difference in parents' childcare time was significantly correlated with the difference in the child's screen time. Similarly, a recent study conducted in the U.S. during COVID-19 reported that the timeline of the rise in children's screen time closely followed that of the sudden decrease in caregiver availability [29]. These results together suggest that the rise in screen time during the COVID-19 pandemic may be somewhat inevitable and driven by insufficient caregiver availability.

How much of the relationship between child screen time and negative outcomes can be explained by childcare burden remains a question. Many studies have shown that increased screen time of children is related to poor sleep, asthenopia, obesity, and other negative outcomes in their physical health [34–36]. Furthermore, child screen time is inversely associated with children's psychological health [37, 38] and academic performance [39]. However, it is unclear whether child screen time causes such negative developmental outcomes because increased screen time is associated with other factors that limit parental resources or access to childcare, such as low socioeconomic status, poor parents' mental health, and low social support for parents, and these factors are associated with poor developmental outcomes [40–43]. It is possible that such factors cause both increased screen time and negative outcomes or the factors and increased screen time jointly cause negative outcomes [32, 33]. The unfortunate pandemic situation provides researchers with a unique opportunity to investigate how the sudden increase in childcare burden and child screen time are related, and how they affect child developmental outcomes [29].

The strength of the present study is that it documents how much the COVID-19 pandemic has affected children's real-world social life and learning in terms of time (hours). In the present study, children spent 4.17 fewer hours in face-to-face offline interactions. Although children used video chat or social media to interact with others for 0.95 additional hours per day during the pandemic, this does not appear to compensate for the drastic decrease in children's social interactions. The results also suggest that COVID-19 has impacted children's learning. In the present study, children spent 2.16 fewer hours learning per day during the COVID-19 pandemic. Taken together, these results provide useful information to quantify the "adverse consequences of school closure" [34] during COVID-19. Future studies should include follow-up measures to investigate in more detail the longitudinal effects of social distancing and lockdown on children's psychosocial development and educational outcomes.



Consistent with previous findings [10, 35], parents in the present study reported that their stress level had increased significantly during the COVID-19 pandemic. In addition, the present study provides novel evidence that parents' perceived level of their child's stress also increased during the pandemic. As noted in the study, COVID-19 also changed the kinds of activities that parents and children engaged in to relieve their mental stress. Before the pandemic, parents and children participated in outdoor activities or social interactions to ameliorate their stress. During the pandemic, however, both parents and children relied on electronic devices or indoor activities to relieve their stress. The focal point of future research should be in developing interventions or effective coping strategies that could be implemented under such lockdown situations.

This study had several limitations. First, all measures in this study were reported by parents; thus, all study results are the parents' perceptions. For example, we asked parents to report their child's stress level and use the measures to estimate the children's stress. We do not have data from more objective measures to verify and validate the results. Second, the present study is cross-sectional in nature. For the questions that asked about factors before and after the pandemic, parents were required to recall two time points in the past. Although we did so to measure the baselines of various factors before the pandemic, we do not know the reliability of the parents' recall. All of the study results should be interpreted with these caveats in mind. Third, the survey was relatively short because we wanted to limit the burden on the participants. In particular, certain key variables, such as childcare burden (time spent caring for children per day) and stress, were measured in a simple manner. In future studies, we plan to investigate whether the pandemic has affected the time spent on active versus passive childcare [36]. We also plan to monitor the stress levels of caregivers using validated scales completed at various time points during the pandemic. Fourth, despite our efforts to include a representative sample, there may have been a degree of selection bias; the sample only included parents who had access the internet and were willing to answer questions online. Also, because we did not collect data for certain demographic variables (such as parents' education and age), the possibility that the sample was not representative of the general population cannot be excluded. Future studies should systematically investigate the factors that affect parental stress and children's well-being during the ongoing COVID-19 pandemic. We plan to investigate these issues in a larger sample, and to collect more detailed data on parents' socioeconomic status.

Regardless, the results provide evidence that the COVID-19 pandemic significantly disrupted the daily lives of Korean parents' and their children and that parents and children are experiencing more stress in this novel situation. As the pandemic continues into 2021, these impacts

continue to accumulate and become exacerbated. There is a pressing need for longitudinal studies and to implement innovative solutions to cater to the psychosocial and mental health needs of parents and children during and after the pandemic.

## Summary

This study was one of the first to report changes in the daily lives of parents and children during the COVID-19 pandemic, specifically in the time spent engaged in various activities. The results suggest that the time spent on childcare by the main caregivers increased significantly (to 4.00 h per day) during the early stages of the pandemic (characterized by social distancing and school closures). Children's daily lives were also significantly affected by the pandemic, during which the time spent using screens (1.76 h), and engaging in online interactions (0.95 h), significantly increased. In contrast, the time spent in face-to-face interactions (4.17 h), and on learning (2.16 h), significantly decreased. Furthermore, parents' and children's stress levels significantly increased during the pandemic. Exploratory analyses suggested that spending more time than usual at home was the most significant factor in parents' and children's increased stress levels. During the pandemic, parents and children were most likely to use electronic devices and participate in indoor activities as a means of relieving stress. This study provides useful data for researchers and practitioners pertaining to changes in the lives of parents and children that occurred during the COVID-19 pandemic. The data could also provide a basis for future research.

**Author Contributions** JP<sup>1</sup>, JP<sup>2</sup>, and KJ designed the research; JP<sup>1</sup> and JP<sup>2</sup> performed the research; JP<sup>1</sup> and KJ analyzed the data; and JP<sup>1</sup>, JP<sup>2</sup>, and KJ wrote the paper.

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**Data Availability** The data are available in an online repository hosted by the Open Science Framework (<https://osf.io/axkfq/>).

**Code Availability** Not applicable.

## Declarations

**Conflict of interest** The authors declare no conflict of interest.

**Ethical Approval** All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee, as well as the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

**Consent to Participate** Informed consent was obtained from all participants involved in the study.

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