

## RESEARCH ARTICLE

# Infants' and toddlers' digital media use and mothers' mental health: A comparative study before and during the COVID-19 pandemic

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## Abstract

This study compared children's and mothers' digital media use and mothers' mental health in two samples: one accessed before (Group 1;  $N = 257$ ;  $M = 33.18$  years;  $SD = 4.79$ ) and the other accessed during (Group 2;  $N = 256$ ;  $M = 33.51$  years;  $SD = 4.96$ ) the COVID-19 pandemic in Brazil. Mothers of children up to 3 years old (Group 1:  $M = 17.95$  months,  $SD = 9.85$ ; Group 2:  $M = 16.48$  months,  $SD = 10.15$ ) answered an online survey. Bivariate analysis, factorial ANOVA tests, and multiple linear regression were performed. Results suggest that mothers' and children's media use duration was higher during the pandemic only among children over 12 months. Mothers' media use duration ( $\beta = .18$ ) and mothers' intention to offer media ( $\beta = .23$ ) contributed to the explanation of children's media use duration ( $F(4, 474) = 16.81$ ;  $p < .001$ ;  $R^2 = .12$ ;  $R^2$  adjusted = .117). Higher mothers' common mental disorders symptoms were also positively correlated to mothers' intention to offer media to children both before and during the pandemic. Results suggest that interventions focusing on infants and toddlers screen time reduction should target maternal aspects such as mental health, maternal screen time, and intention to offer media, taking into account the mothers' needs when planning these actions.

## KEYWORDS

COVID-19, digital media, infant development, mothers' mental health, pandemic

## 1 | INTRODUCTION

The COVID-19 pandemic is a global public health emergency with relevant mental health implications (Holmes et al., 2020). Experiencing a pandemic can lead to negative feelings such as fear of infection and death, financial losses, and social isolation, all of which seem to be asso-

ciated with higher stress levels and psychiatric symptoms (Duarte et al., 2020; Wang et al., 2020). Brazil is one of the countries most affected by the pandemic, with a high number of cases and deaths. In this country, the pandemic occurred simultaneously with a political and economic crisis (Fortunato et al., 2020) and loss of labor and social security rights (Santos et al., 2020). Deaths from COVID-19 in

Brazil are concentrated in areas of greater social vulnerability (Fortunato et al., 2020), and the pre-existing inequality tends to intensify due to economic retraction (Santos et al., 2020).

Some groups are more vulnerable to the effects of the COVID-19 crisis (Holmes et al., 2020). For example, parents of young children may be more affected than other groups (Bai et al., 2020; Del Boca et al., 2020; Marchetti et al., 2020). In fact, higher levels of depression and anxiety were found among parents and pregnant women during the COVID-19 pandemic (Lebel et al., 2020; Wu et al., 2020; Yuan et al., 2020). Parents have to manage their children's feelings and their own and also have to deal with sudden changes in routine such as working from home, homeschooling, and losing support networks due to distance measures (Vescovi et al., 2021).

According to Bronfenbrenner's Bioecological theory, human development occurs associated with the individual's environment (Bronfenbrenner, 2002). The outbreak of a pandemic changes the interrelated contexts in which the child lives, such as the family, school, neighborhood, and society, affecting their proximal processes, defined as reciprocal interactions between an active, evolving child and the persons, objects, and symbols in its immediate environment (Bronfenbrenner & Morris, 2006). These changes can have potential direct and indirect effects on infants and toddlers. Therefore, it is crucial to understand how contextual factors such as a pandemic may impact families' routines to support future interventions.

In this new scenario, digital media has been an essential resource for communication, work, and social life. There has been a significant increase in the use of technologies worldwide during the pandemic (Candela et al., 2020; Sun et al., 2020). In this sense, based on Bronfenbrenner's theory, Johnson and Puplampu (2008) propose the technosubsystem, which includes the child's interactions with communication, information and entertainment technologies in direct environments such as school and home. This concept assumes that media use is part of the child's development contexts and would also be affected by an event such as the COVID-19 pandemic.

Since digital media can represent a resource for child care in low support settings (Rosa et al., 2020), parents may be offering screens to children when facing all these new stressful demands and multiple tasks related to the coronavirus outbreak (Nagata et al., 2020). Evidence points to an increase in children's media use during the pandemic, which is not linked only to online school activities (Aguilar-Farias et al., 2021; Horiuchi et al., 2020) and can be related to a parental need to offer digital media due to excessive demands (Carroll et al., 2020). Also, mothers' increase in media use can be associated with the increase among children since caregivers' screen time is a

### KEY FINDINGS AND THEIR IMPLICATIONS FOR PRACTICE/POLICY

1. Key Finding 1: COVID-19 pandemic is most likely changing the pattern of media use in families with children. We found increased media duration among mothers and toddlers, but not infants. Children aged between 1 and 3 years appear to be a relevant group to target in screen time reduction initiatives after the COVID-19 crisis.
2. Key Finding 2: Mothers' common mental disorder symptoms were higher during the pandemic and were associated with mothers' intention to offer media in both groups (before and after the pandemic). In the pandemic group, fewer mothers reported the intention to offer media during moments of rest and play.
3. Key Finding 3: Mothers' media use duration and mothers' intention to offer media significantly explained children's media use duration. The needs of mothers should be taken into account when planning interventions to reduce children's screen time.

### STATEMENT OF RELEVANCE TO THE FIELD OF INFANT AND EARLY CHILDHOOD MENTAL HEALTH

This study is relevant for providing comparative data regarding infants and toddlers digital media use and mothers' mental health in the pandemic context. Digital media is a resource heavily used during the COVID-19 crisis that has adverse outcomes for child development. This study adds information on maternal factors that are associated with children's increased media use during the pandemic. Our results contribute to support public policies and interventions on children's screen time reduction focusing on the particularities of the pandemic period. When facing the consequences of COVID-19 to child development, it is important to consider the mother's mental health, screen time, and intention to offer media, especially those that care for children aged between 1 and 3 years old. Supporting mothers who had to cope with the direct and indirect effects of the pandemic with fewer resources than before can help promote healthy media use in early development.

well-known predictor of children's media use (Domoff et al., 2019).

In this sense, mothers' mental health appears to influence the quantity and quality of children's exposure to screens (Duch et al., 2013; Park et al., 2018). Even before the pandemic, children of depressive mothers reported more intense media use (Anand et al., 2014; Park et al., 2018). During the pandemic, parents with higher stress levels reported more digital media use by children (Orgilés et al., 2020). These data represent a concern, especially because parents have been severely affected by exhaustion (Marchetti et al., 2020; Vescovi et al., 2021), and this scenario can result in children using electronic devices more often and without parental mediation (Lau & Lee, 2020).

It is relevant to understand changes in digital media use, since the patterns of this use in early childhood influence the patterns of use in adolescence and adulthood (McArthur et al., 2020). Children's age seems to influence digital media use duration, with an increase in time as the child ages (Duch et al., 2013; Lauricella et al., 2015). During the pandemic, a positive association between media use duration and child's age was also found (Arufe-Giráldez et al., 2020; Cartanyà-Hueso et al., 2021). Thus, it is plausible that the developmental characteristics of each age group influence the use of digital media, but these relations need to be further elucidated considering that infants are the least inquired group in studies about children technology use (Miller et al., 2017).

Children's screen exposure is associated with developmental delays, worse health outcomes, and poor psychological well-being (Twenge & Campbell, 2018; Zimmerman et al., 2007), especially when this exposure systematically happens during mealtime and bedtime (Carter et al., 2016; Willis et al., 2016). According to Arufe-Giráldez et al. (2020), the period of home confinement made it challenging to comply with World Health Organization recommendations regarding physical activity, sleep hours, and screen time in children under 5 years of age. This situation may represent a risk to children's health and development. It is relevant to investigate the use of media that emerged with the pandemic to develop public policies and interventions to support parents during this atypical context.

Some studies have investigated media usage in families with children in this period. These studies focused on infant sleeping problems (Kahn et al., 2021), general infant behavior (Shinomiya et al., 2021), adverse childhood experiences (Jackson et al., 2021), and behavioral and emotional problems of children under seven (Monteiro et al., 2021). However, the COVID-19 crisis is a key risk factor for anxiety and depression symptoms among mothers (Davenport et al., 2020; Hessami et al., 2020). At the same time, there is evidence of a high use of screens by children in this period (Aguilar-Farias et al., 2020). The pandemic scenario

and its direct and indirect effects may potentially increase the symptoms of common mental disorders, while favoring the use of digital media to work, learn, and connect with others. There is still a gap in the literature regarding maternal mental health and its association with media use in infants and toddlers during the COVID-19 crisis, especially comparing data from different contexts. Thus, we address a hypothesis about associations between maternal mental health and digital media use during the pandemic and whether these associations differ from the pre-crisis period.

With a comparative design, our study provides important data to discuss screen time in infancy and toddlerhood, maternal mental health, and associated factors for infants' and toddlers' digital media exposure. Thereby, this study aimed to compare the use of digital media by young children and mothers and mothers' mental health in two samples: one accessed before (Group 1) and the other accessed during the COVID-19 pandemic (Group 2).

We expect that (a) Mothers of Group 2 would have worse levels of mental health (Lebel et al., 2020; Wu et al., 2020; Yuan et al., 2020) and increased media use duration (Candela et al., 2020; Sun et al., 2020) when compared to mothers of Group 1; (b) children's digital media use would be higher in Group 2 (Arufe-Giráldez et al., 2020) and lower in younger children in both groups (Arufe-Giráldez et al., 2020; Cartanyà-Hueso et al., 2021); (c) maternal mental health would be associated with maternal media use duration and children's media use duration in both groups; and (d) Group, mothers' media use duration, maternal mental health and mothers' intention to offer media (which refers to moments of the day mothers feel the need and intent to, but not necessarily, offer digital media to their children), would explain children's media use duration.

## 2 | METHODS

### 2.1 | Study design and data collection

From November 2018 to March 2019, we conducted a cross-sectional study to identify factors associated with children's media use, and this sample is considered Group 1: Before the pandemic. From May to June 2020, we collected new data to compare the use of digital media by children and mothers and mothers' mental health during the COVID-19 pandemic, and this is considered Group 2: During the pandemic. It is important to realize that the first cases of COVID-19 in Brazil started by the end of February, and by the end of March, severe confinement started in most regions of Brazil. Therefore, G2's families were still adapting to the changes brought about by the pandemic. Also, at the time of G2 data collection, there were 476.450

**TABLE 1** Group characteristics

	Group 1 <sup>a</sup> (n = 257)	Group 2 <sup>a</sup> (n = 256)	p-value
Mothers' age (mean)	33.18 years (SD = 4.79)	33.51 years (SD = 4.96)	.445
Children's age (mean)	17.95 months (SD = 9.85)	16.48 months (SD = 10.15)	.095
Children's gender			.565
Female	50.2%	52.7%	
Male	49.8%	47.3%	
Mothers' education			.616
Primary school or less	3.1%	1.56%	
High school	17.9%	17.18%	
College	31.1%	29.70%	
Specialization course or graduate school	47.9%	51.56%	
Annual family income <sup>b</sup>			.016
≤6 minimum wages (U\$13.75000)	32.7%	40.2%	
7–12 minimum wages (U\$16.041,66–U\$27.50000)	34.2%	37.9%	
≥13 minimum wages (U\$29.79166)	33.1%	21.9%	

<sup>a</sup>Group 1: before the COVID-19 pandemic. Group 2: during the COVID-19 pandemic.

<sup>b</sup>Income based on dollar value on March 30, 2021 (BRL5,76).

COVID-19 cases and 18,361 deaths in Brazil. This study is part of two broader research projects entitled “Infants, families, and technology use: a multi-method study for child development” (Frizzo et al., 2017) and “Parental mental health and use of digital media by young children: a comparative study before and during the COVID-19 pandemic” (Frizzo et al., 2020). The projects were approved by the Ethics Committee of Universidade Federal do Rio Grande do Sul (CAAE: 69947117.6.0000.5334) and by the National Research Ethics Commission (CAAE: 30809520.9.0000.5334). Informed consent was obtained from all participants. Besides, to access the survey, respondents agreed with the statement, “I am over 18 years old and accept to participate in the survey”.

## 2.2 | Participants

Two hundred and fifty-seven mothers ( $M = 33.18$  years,  $SD = 4.79$ ) of children up to 3 years old were accessed from November 2018 to March 2019 (Group 1), and 256 mothers ( $M = 33.51$  years,  $SD = 4.96$ ) were accessed from May to June 2020 (Group 2). The distribution of sociodemographic characteristics was similar between the two groups (Table 1).

## 2.3 | Assessment criteria

The inclusion criteria were Brazilian mothers of children up to 3 years old that were over 18 years old. The exclusion criteria were the following child conditions: (a) genetic

syndromes; (b) complex congenital malformations; (c) neurological and/or heart disease; and (d) delays in neurodevelopment diagnosed by a doctor or other health professional. This information was obtained through a screening question answered by the participants before the questionnaire.

## 2.4 | Instruments

*Sociodemographic Data Questionnaire* (NUFABE, 2020a): This instrument was used to survey sociodemographic data of the participants and their families, such as age, working conditions, income, among others. This instrument suffered minor modifications to adapt to the COVID-19 context, such as changes in income and work due to the pandemic, loss of support network in childcare, close contacts being suspected cases, or diagnosed with COVID-19.

*Media Use Questionnaire* (NUFABE, 2020b): This is a Brazilian-Portuguese version of the questionnaire used in the survey “Zero to Eight: Children’s Media Use in America 2013” (Common Sense Media, 2013). It consists of questions about the types and duration of media used by children and their mothers. This instrument suffered minor modifications to adapt to the COVID-19 context, such as the inclusion of questions regarding devices children started to use during the pandemic, use of digital media to check on the news about the pandemic, and increase or decrease in mother’s and children’s media use duration during the pandemic. From this questionnaire, we derived the following variables: (a) media use duration;

(b) mothers' intention to offer media; and (c) contexts of child media use.

1. *Media use duration* was defined as the sum of the weekly duration of media use, performing activities such as listening to music, watching videos, playing on the smartphone or video game, and using applications on digital media devices. The response options ranged from up to 15 min to more than 4 h.
2. *Mothers' intention to offer media* includes responses to a multiple-option question that covers moments of the day mothers feel the need and intent to offer digital media to their children (but not necessarily do), like while playing with children, while working at home, studying, resting, bathing, or doing domestic activities (such as cooking and cleaning). Each affirmative answer is scored 1, and the total sum gives the final score.
3. *Contexts of child media use* refers to the total number of routine moments a child uses the media in a typical day. It is calculated by the sum of a multiple-option question that includes moments of the child's routine such as mealtime, bedtime, bath time, breastfeeding, diaper-changing, cloth-changing, bathroom use, and medication. Mothers should check all the moments that children usually use the media when they offer and when children use it by their own choice. Each affirmative answer is also scored 1, and the total sum gives the final score.

To cross-culturally adapt the questionnaire to the Brazilian context, we conducted literature reviews as well as several discussions of the items between our research team and experts to guarantee the psychometric rigor. The Common Sense Media research team approved this adaptation. For the present study, a new adaptation was made to cover the COVID-19 context as mentioned above.

*Self-Reporting Questionnaire (SRQ-20)* (Beusenberg et al., 1994): This is a psychiatric screening instrument for non-psychotic mental disorders, mainly for symptoms of depression and anxiety ( $\alpha_{\text{group1}} = .85$ ;  $\alpha_{\text{group2}} = .84$ ). It's used to collect information about participants' emotional characteristics in the last 30 days. The questionnaire consists of 20 yes/no questions, four of which are about physical symptoms and 16 about psycho-emotional disorders. Each affirmative answer is scored 1, and the total sum gives the final score. The cut-off point is 8 for the clinical group (Barreto do Carmo et al., 2018), defining a positive screening for participant's common mental disorders (Mari & Williams, 1986). The Brazilian version of SRQ-20 was validated by Mari and Williams (1986) and reassessed by Gonçalves et al. (2008). Brazilian version's internal consistency was .86 (Gonçalves et al., 2008). This

questionnaire was used to obtain a simple measure of mental health.

## 2.5 | Data analysis

Initially, we performed descriptive analysis for sample characterization. Skewness (.689–.860) and kurtosis (.097–.643) of ordinal and interval variables ranged between  $-1$  and  $+1$ , except for contexts of child media use. For this variable, a non-parametric analysis was performed. Student's *t*-tests were run to verify differences between groups regarding mothers' and children's media use duration, mothers' common mental disorder symptoms, and mothers' intention to offer media. Mann-Whitney test was performed to check for differences in the number of contexts of child media use.

Relationships between variables were also verified using Pearson's and Spearman's correlations. A factorial ANOVA was performed to investigate the effect of a possible interaction between groups and children's age (categorized as 12 months or less and more than 12 months) on children's media use duration. We used the chi-squared test to verify associations between moments of the day mothers intended to offer media to their children (e.g., moments of rest and play) and the group. Additionally, we tested a model of the child media use duration as an outcome through multiple linear regression using the enter method. All analyzes were conducted with IBM SPSS v. 26, and the criterion for significance was  $p \leq .05$ .

## 3 | RESULTS

Mothers' ( $t = -7.767$ ,  $df = 459.534$ ,  $p < .001$ , Cohen's  $d = .71$ ) and children's ( $t = -3.561$ ,  $df = 464.823.119$ ,  $p < .001$ , Cohen's  $d = .32$ ) media use duration and mothers' common mental disorder (CMD) symptoms ( $t = -5.312$ ,  $df = 477$ ,  $p < .001$ , Cohen's  $d = .49$ ) were higher during the pandemic (Table 2). Nevertheless, there were no differences in the number of contexts of child media use between groups (before and during the pandemic) ( $U = 29595.000$ ,  $p = .208$ ). We found a positive correlation between mothers' CMD symptoms and children's media use duration before the pandemic ( $r = .14$ ;  $p = .027$ ), but only marginally significant during the pandemic ( $r = .12$ ;  $p = .07$ ). Mothers' media use duration was positively correlated with children's media use duration before the pandemic ( $r = .30$ ;  $p < .001$ ), but the relationship was not significant during the pandemic ( $r = .10$ ;  $p = .13$ ).

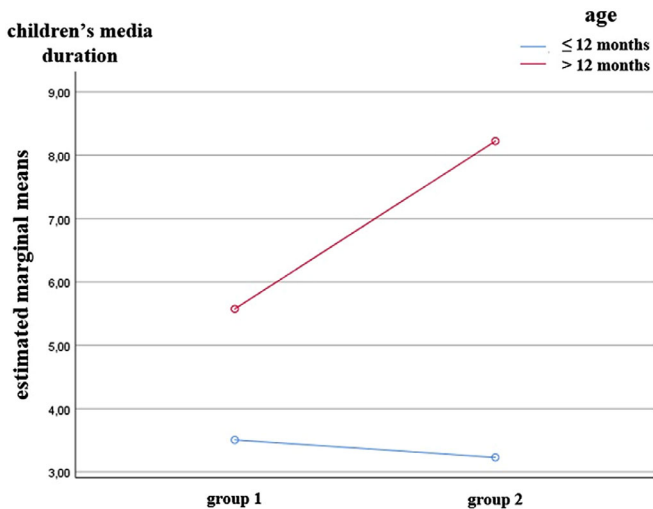
We tested the interaction between groups (before and during the pandemic), children's age (Group 1:  $n = 83$  under and  $n = 174$  above 12 months; Group 2:  $n = 104$

**TABLE 2** Differences in means between groups for mothers' CMD symptoms and variables related to media use

	Group 1 mean (SD) <sup>a</sup>	Group 2 mean (SD) <sup>b</sup>	<i>t</i>	df	<i>p</i> -value	Cohen's <i>d</i>
Mothers' CMD symptoms	5.35 (4.18)	7.41 (4.27)	-5.312	477	<.001	.49
Mothers' media use duration	7.49 (3.34)	10.01 (3.78)	-7.767	459.534	<.001	.71
Children's media use duration	4.91 (3.32)	6.05 (4.22)	-3.467	504.119	.001	.32
Mothers' intention to offer media	1.37 (1.26)	1.38 (0.78)	-.136	432.004	.892	-

<sup>a</sup>Group 1: before the COVID-19 pandemic.

<sup>b</sup>Group 2: during the COVID-19 pandemic.

**FIGURE 1** Effect of age and group on children's media use duration

under and  $n = 143$  above 12 months), and children's media use duration. Both groups ( $F(1, 504) = 14.770, p < .001, \eta^2 = .029$ ), and age ( $F(1, 504) = 130.712, p < .001, \eta^2 = .21$ ), in isolation, have an effect on children's media use duration. There was also an interaction between the variables ( $F(1, 504) = 22.415, p < .001, \eta^2 = .043$ ): children's media use duration only increased in children over 12 months, remaining stable for those who were 12 months or less (Figure 1).

Mothers' CMD symptoms were positively correlated to mothers' intention to offer media both before and during the pandemic ( $r_{\text{group1}} = .21; p = .001; r_{\text{group2}} = .16; p = .017$ ) and to the contexts of child media use only before the pandemic ( $r_S = .18; p = .005$ ). In turn, mothers' intention to offer media was positively correlated to contexts of child media use during the pandemic ( $r_S = .15; p = .023$ ), but not before it. During the pandemic, fewer mothers reported the intention to offer media during moments of rest ( $\Phi = .40, p < .001$ ) and play ( $\Phi = .23, p < .001$ ).

A multiple linear regression analysis was performed to explain changes in children's media use duration based on group, mothers' media use duration, mothers' CMD

symptoms, and mothers' intention to offer media (Table 3). Without dividing by group, the three continuous variables correlated positively ( $p < .001$ ) with child media use duration ( $r = .23, r = .16$ , and  $r = .26$ , respectively). In regression, only mothers' media use duration ( $\beta = .18$ ) and mothers' intention to offer media ( $\beta = .23$ ) were considered significant independent variables ( $F(4, 474) = 16.81; p < .001; R^2 = .12; R^2_{\text{adjusted}} = .117$ ), explaining 11.7% of children's media use duration variance.

## 4 | DISCUSSION

This study aimed to compare the use of digital media by children and mothers and mothers' mental health in two samples: one accessed before (G1) and the other accessed during (G2) the COVID-19 pandemic in Brazil. According to our initial hypothesis, mothers' and children's media use duration was higher in G2. In these challenging times, digital media has been the recommended safe way to keep in touch with family and friends, work and study, get updated information about the disease, and do other activities such as buying supplies. Some children are also receiving preschool activities online. Thus, increased media use duration seems an inevitable effect of the pandemic (Nagata et al., 2020).

Interestingly, this increase differed according to the child's age. During the pandemic, children's media use duration only increased in children over 12 months, remaining stable for those who were 12 months or less. This finding builds upon one recent research that found that older children's screen time is more affected by COVID-19 than younger children's media use (Aguilar-Farias et al., 2021). Nevertheless, since that study had a retrospective design, our result provides more consistent evidence of the differential impacts of the pandemic in children's media use according to their age.

Older children tend to use more media (Cartanyà-Hueso et al., 2021), mainly because they have more access, opportunities, and skills to engage with digital media (Aguilar-Farias et al., 2021; Lauricella et al., 2015). Besides, the older

TABLE 3 Regression analysis summary for child media use duration

Independent variables	<i>B</i>	Std. error	95% CI	Beta	<i>t</i>	<i>p</i> -value	<i>R</i> <sup>2</sup>	$\Delta R^2$
(Constant)	1.551	.587	[.40, 2.70]	–	2.643	.008	–	–
Group <sup>a</sup>	.545	.351	[–.15, 1.24]	.072	1.552	.121	.023	.021
Mothers' media use duration	.181	.046	[.09, .27]	.182	3.976	<.001	.061	.038
Mothers' CMD symptoms	.066	.039	[–.01, .14]	.076	1.676	.094	.074	.013
Mothers' intention to offer media	.805	.155	[.50, 1.09]	.228	5.205	<.001	.124	.050

<sup>a</sup>Group 1: before the COVID-19 pandemic. Group 2: during the COVID-19 pandemic.

the children, the more they can request caregivers to use digital media. The observed increase in media duration among older children may be explained by them being more affected by daycare centers and playground closures during the pandemic. This age group is characterized by environment exploration and the proximal processes they are involved with are enlarging to include not only the parents, but peers and other relatives. Previously to the pandemic, working parents were more likely to allow screen time to children (Hu et al., 2018). It is plausible that the social distance measures added to overloaded parents may have restricted even more this age group to the techno-subsystem (Johnson & Puplampu, 2008).

Another important issue in this matter is that social distancing decreases parental social support. Studies have shown that children's screen time is more related to the child care resources parents have than to the information about screens they possess (Hartshorne et al., 2021). During quarantine, mothers of children over 12 months in the absence of social support, may have turned to digital media more often. Thus, technological devices may have even more frequently occupied the role of babysitting found in several studies prior to the pandemic (Minges et al., 2015).

Nevertheless, media use in early stages such as infancy and toddlerhood is not recommended by Pediatric Societies' guidelines around the world (American Academy of Pediatrics, 2016; Brazilian Society of Pediatrics, 2019; Canadian Paediatric Society, 2017). Our study shows that, during the pandemic, toddlers (but not infants) are at risk of excessive media use, and this aspect should be addressed in interventions.

In the regression analysis, only mothers' media use duration ( $\beta = .18$ ) and mothers' intention to offer media ( $\beta = .23$ ) explained changes in children's media use duration. Parents' screen time is a relevant predictor of children's media use duration (Domoff et al., 2019). This is in line with the significant correlation between mothers' and children's media use duration in the group accessed before the pandemic. Surprisingly, this correlation was not significant in the group accessed during the pandemic. It is plausible that other contextual factors precipitated by COVID-19 (such as preschools' online activities) change

the predictors of children's media exposure and are also relevant to explain this phenomenon. This scenario points to changes in families' media use due to the pandemic.

As expected, in the current study, mothers' CMD symptoms were higher in the pandemic group. This is consistent with previous studies regarding the possible effects of the COVID-19 pandemic on mental health that found higher levels of depressive, stress, and anxiety symptoms in parents and pregnant women after the pandemic started both in Brazil (Machado et al., 2021) and worldwide (American Psychological Association, 2020; Lebel et al., 2020; Vescovi et al., 2021; Wu et al., 2020; Yuan et al., 2020). Besides COVID-related worries, the observed increase in mothers' CMD symptoms could be attributed to challenges faced by them, such as household and parenting demands added to health and economic concerns.

In this regard, mothers' CMD symptoms were associated with (a) children's digital media use duration and (b) contexts of child media use only in the group inquired before the pandemic. Several studies have shown that parents' mental health is a predictor of children's screen time (Duch et al., 2013; Park et al., 2018). This relation was not observed in G2, perhaps because new contextual factors related to COVID-19 changed this relationship, as mentioned before. On the other hand, mothers' CMD symptoms were positively correlated to mothers' intention to offer media both before and during the pandemic. This result suggests that mental health is closely related to mothers' intention to offer media to their children and is consistent with previous studies on depressed parents that tend to offer their children more digital media (Park et al., 2018) and at earlier ages (Anand et al., 2014) than non-depressed ones. Poor maternal mental health possibly makes it more difficult to find resources for parenting other than digital media.

Furthermore, during the pandemic, mothers' intention to offer media was positively associated with contexts of child media use, suggesting that mothers' intention to offer media is strongly related to infants' and toddlers' broader media use throughout the day. This is in line with the literature, which shows that parents offer infants and toddlers digital media according to their own needs (Kabali et al., 2015; Mallmann & Frizzo, 2019; Radesky et al., 2016).

Our finding raises concerns since media use during routine moments, especially mealtimes and bedtime, is related to adverse outcomes in children such as obesity (AAP, 2016; Willis et al., 2016) and decreased sleep duration and quality (Carter et al., 2016). Also, a broader use throughout the day may indicate that digital media is replacing face-to-face interaction with caregivers.

Moreover, our results suggest differences between the two groups in the moments mothers intend to offer media. During the pandemic, fewer mothers felt the need to offer digital media at moments of rest and play. This result is different from studies conducted before the pandemic, which found that parents commonly offer media to children during moments of rest (Bentley et al., 2016) and play (AAP, 2016; Brown & Smolenaers, 2016). It is possible that, since media use has been central to adults in this pandemic period, they may want to keep away from screens when they can and thus offer less media to their children when resting or playing. Another possible explanation might be that those moments of rest and play decreased during the pandemic since overloaded parents could play and rest less frequently. Considering all these results, the mother's intention to offer media seems to be a critical factor in understanding and intervening in children's media use. Still, the impact of the pandemic in this variable needs to be further elucidated.

Overall, our study suggests that the COVID-19 pandemic may be changing the pattern of media use in families with infants and toddlers, at least in Brazil. Our results showed an increased media duration in mothers and toddlers, but not infants. We also found changes in the moments mothers intend to offer media to their children. Even though screen time is increasing in different age groups since COVID-19 started (Candela et al., 2020; Sun et al., 2020), our study suggests that toddlers (but not infants) are at risk of higher exposure during the pandemic. To our knowledge, this is one of the first studies to adopt a developmental perspective of digital media use in the context of the pandemic.

Therefore, children aged between 1 and 3 years appear to be a relevant group to target in screen time reduction initiatives to detain COVID-19's impact. Since child media use increases with age, and toddlers commonly have more autonomy and skills to use digital media than infants, it is in this developmental stage that children establish their media habits. Additionally, even before the pandemic, interventions were already focusing on media use patterns and content of exposure rather than screen time alone (Barr, 2019). Taking our results into account, supporting mothers' mental health, and helping them identify their need to offer media and find alternatives to screens may be relevant factors to consider when addressing the impacts of the COVID-19 crisis in child media use.

#### 4.1 | Strengths, limitations, and future directions

This study assessed data before and during the pandemic in two similar groups. By comparing these groups, it was possible to estimate changes in contextual factors that may affect the duration of children's digital media use. Future studies adopting a qualitative and longitudinal design could investigate more deeply the changes in the pattern of child media use observed in this study, especially in the mother's intention to offer media. Why do fewer mothers intend to offer media to their children at playtime and rest time during the pandemic? Are they more available to play with their children? Are they so overwhelmed that they cannot even find time to rest? Is it possible that mothers, aware of their children's higher exposure to screens during the pandemic, offer alternatives to digital media at playtime? Are these changes observed in other cultural groups? Those questions could be assessed in future investigations, quantitative and qualitatively.

The COVID-19 health crisis may also be affecting children's mental health, an aspect we did not investigate in this study. During COVID-19, the literature indicates that children are displaying symptoms of anxiety, depression, and behavior problems in sleeping and eating (Jiao et al., 2020). Highly stressed parents may be using more media to handle overwhelmed children, and this higher technology use may by itself influence externalizing and withdrawal behaviors in children (McDaniel & Radesky, 2018). New studies could focus on these issues.

One limitation worth mentioning is the use of self-report to assess mothers' and children's media use duration. There is evidence that parental self-report about media use duration has low accuracy. Radesky et al. (2020) found differences between child media use reported by parents and measured objectively through apps and screenshots of the battery feature, with parents either underestimating (35.7%) or overestimating (34.8%) child media use duration. Thus, the use of objective measures is strongly advised in future investigations. Simultaneously, self-report is still the most common way to measure screen time in studies on the topic. Even though we initially tried to reach fathers, their response rate was incredibly low. New studies could focus on fathers' perceptions about child media use, perhaps with an innovative or more specific strategy for data collection.

Online data collection also has potential limitations, such as sampling bias, by accessing participants with higher income and educational levels who are familiar with the use of technology (Hunter, 2012). This may be true, especially during the pandemic when access to the internet may become a luxury as unemployment and economic difficulties increase (Lourenco & Tasimi, 2020).



At the same time, online data collection is an essential resource during the pandemic, facilitating access to research participants (Lourenco & Tasimi, 2020). In this sense, there is no intention to generalize our results to the entire Brazilian population. This would require a representative sample with a wider socioeconomic and ethnic diversity, also including particularly vulnerable groups.

## 4.2 | Practical implications

This study has some relevant practical implications. The increased family media use duration during the pandemic indicates the importance of interventions focusing on screen use reduction. Thus, parents should be oriented to ensure that screens do not replace physical and emotional care and quality interactions. This is important because healthy development occurs when children establish mutual and stable emotional attachment with people in their environment (Bronfenbrenner, 1973, 1979; Rosa & Tudge, 2013).

Digital media use for interaction purposes, with age-appropriate content, preserving sleep, physical activities, and mealtimes are essential guidelines for parents. Furthermore, according to Bronfenbrenner, child development is promoted when the environment favors observation and engagement in challenging activities with the assistance of more experienced ones (Bronfenbrenner, 1973, 1979; Rosa & Tudge, 2013). Therefore, infants and toddlers learn a lot about the world and their culture by interacting with caregivers in daily activities. The techno-subsystem (Johnson & Pupilampu, 2008) may have increased in importance after the pandemic, and should be considered as a relevant subsystem in which the child is embodied. Nevertheless, to promote a healthy early development the relationships occurring within the techno-subsystem should always be mediated by an adult (Padilla-Walker et al., 2012). In that regard, our study also points to the importance of health policies targeting the adults who care for children. When facing the consequences of the COVID-19 pandemic, it is essential to support parents, especially mothers. Taking care of those who care for babies and young children is a way of ensuring infant mental health in this challenging time.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## DATA AVAILABILITY STATEMENT

The dataset for this article is not currently available as it is part of an on-going project. It will be made available in the future from the corresponding author on reasonable request.

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