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Changes in children's pattern of digital media use and parental variables during the COVID-19 pandemic

Cambios en el uso de medios digitales de los niños y variables parentales durante la pandemia de COVID-19

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Abstract

The COVID-19 pandemic has the potential to increase infants' use of media and pose specific challenges for parents. This study aimed to analyze the dynamics and associations between the perception of change in digital media's use during the pandemic, parental variables (loss of social support, symptoms of common mental disorders (CMD), perceived stress, parental self-efficacy, and satisfaction), and the child's age. Participants were 231 parents (M=33.84 years; SD=4.84; 91.80% female) of children with typical development of up to 36 months. Instruments used were: Sociodemographic Data Questionnaire; Media Use Questionnaire; Self-Reporting Questionnaire (SRQ-20); Perceived Stress Scale (PSS-4); Parenting Sense of Competence Scale (PSOC). Descriptive analyzes were conducted, as well as regularized partial correlation network analysis. The results indicate a perception of increased usage time, and the insertion of new devices into the children's routine. High rates of loss of social support, perceived stress, and CMD symptoms were found. The loss of social support and the child's age were strongly associated with changes in the pattern of use. The perception of increased usage time proved to be relevant from an intervention point of view, as well as mental health measures and loss of social support.

Keywords: digital media, early childhood, pandemic, parenting

Resumen

La pandemia de COVID-19 tiene el potencial de aumentar el uso de las tecnologías por parte de la infância temprana y plantear desafíos específicos para los padres. Este estudio tuvo como objetivo analizar la dinámica y las asociaciones entre la percepción de cambio en el uso de los medios digitales durante la pandemia, las variables parentales (pérdida de apoyo social, síntomas de trastornos mentales comunes (TMC), estrés percibido, autoeficacia parental y satisfacción) y la edad del niño. Participaron 231 padres (M=33,84 años; DE=4,84; 91.80% mujeres) de niños de hasta 36 meses. Los instrumentos utilizados fueron: Cuestionario de Datos Sociodemográficos; Cuestionario de uso de medios; Cuestionario de Autoinforme (SRQ-20); Escala de Estrés Percibido (PSS-4); Escala de sentido de competencia parental (PSOC). Se realizaron análisis descriptivos y análisis de redes de correlación parcial regularizados. Los resultados indican una percepción de mayor tiempo de uso y la inserción de nuevos dispositivos en la rutina de los niños. Se encontraron altas tasas de pérdida de apoyo social, estrés percibido y síntomas de TMC. La pérdida de apoyo social y la edad del niño estuvieron fuertemente asociadas con cambios en el patrón de uso. La percepción de un mayor tiempo de uso resultó relevante desde el punto de vista de la intervención, así como de las medidas de salud mental y la pérdida de apoyo social.

Palabras clave: medios digitales, infancia temprana, pandemia, estilo parental

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Introduction

The COVID-19 pandemic originated in China, in December 2019, and quickly became a public health emergency (World Health Organization [WHO], 2020). In Brazil, the first case of COVID-19 was confirmed in February 2020 and measures to contain the virus began in March. Since the pandemic started, studies all over the globe have demonstrated increased usage time of digital media in families with children of different age groups (Carroll et al., 2020; Mesce et al., 2022; Sá et al., 2021). Research had shown that digital media use in early childhood was frequent, even before the pandemic, contrary to the recommendations of several Pediatrics societies and WHO (Azevedo et al., 2022; McArthur et al., 2022; WHO, 2019). Still, there is a significant gap in the studies on babies and toddlers up to 36 months (Azevedo et al., 2022; Nevski & Siibak, 2016).

The pandemic seems to have negative impacts on children, such as high levels of stress (Silvério et al., 2023), difficulties in the parent-child relationship (Calvano et al., 2023), poor sleep quality (Richter et al., 2023), and emotional and behavioral symptoms (Orgilés et al., 2020). This scenario may be linked to the increased time spent using digital media (Nagata et al., 2020). Some studies have linked the excessive use of digital media to the worsening of children's sleep patterns (Shinomiya et al., 2021), the presence of adverse experiences (Jackson et al., 2020), and emotional and behavioral problems (Monteiro et al., 2021).

From a systemic view of the individual, Bronfenbrenner's Bioecological Model of development understands that human development occurs intertwined with the environment in which a person participates (Bronfenbrenner, 2002). That is, individual characteristics, together with aspects of the environment, both spatial and temporal, influence proximal processes and lasting forms of interaction in the environment (Bronfenbrenner & Evans, 2000). Therefore, the massive presence of digital media in the current culture and the routine of families interfere and suffer interference from different levels of development processes.

According to Bronfenbrenner (2011), the socio-historical context (e.g., historical events) can intervene in human development both positively and negatively. The COVID-19 pandemic can exert its interference in different systems in which the child develops, burdening parents and compromising the quality of their parental practices. This represents a risk to child development, with potential disruptive and lasting effects (Linhares & Enumo, 2020).

The increased media use during the pandemic may be related to the scarcity of tools parents have to assist them in the care of their children and the parental overload and its impacts on mental health. Changes in the pattern of digital media use could be triggered by the lack of other sources of aid (Nagata et al., 2020). Studies prior to the pandemic have already suggested that digital media can represent a helpful tool in times of low support for childcare (Mallmann & Frizzo, 2019; Rosa et al., 2020).

From the theoretical background and the understanding that parents mediate the use of technologies by babies (Brito et al., 2017), it is relevant to investigate the possible effects of the COVID-19 pandemic on parental variables, such as (a) mental health, (b) loss of social support, (c) parental self-efficacy, (d) parental satisfaction, and (e) socioeconomic level, in order to contextualize the changes in the digital media's pattern of use during the pandemic.

During the COVID-19 pandemic research reported a higher prevalence of symptoms of common mental disorders (CMD) - a group of anxiety and depression-related disorders that can lead to emotional distress and interfere with daily life - and stress among fathers and mothers (Vescovi et al., 2021). Perceived stress has been the focus of different studies with samples of fathers and mothers in the context of the pandemic (Calvano et al., 2021; Carroll et al., 2020), and it is associated with negative parenting practices (Calvano et al., 2023). Parents with higher levels of stress reported greater use of screens by their children and shorter time of physical activities and sleep (Orgilés et al., 2020). The presence of CMD symptoms among mothers of children up to three years of age was positively correlated to offering digital media to their children, both before and during the pandemic (Pedrotti et al., 2021).

Thus, fathers and mothers face specific challenges, needing to account for the demands of their children beyond their own (Vescovi et al., 2021). One of the parenting challenges during the pandemic seems to be the loss of social support sources such as schools' closure and distance from family members, friends, and/or nannies. Some studies conducted in the pandemic point to associations between the loss of support for childcare and symptoms of maternal depression (Lebel et al., 2020). It is also important to consider socio-economic aspects, such as parental education and family income the young children's digital media use necessarily depends on the parents, so the cultural and socioeconomic context has great relevance (Jordan & Prendella, 2019).

Parental self-efficacy is also a relevant variable in this context (Gambin et al., 2020; Morelli et al., 2020) and represents the parent's perception of their abilities to perform parental functions (Pardo et al., 2018). Parental self-efficacy has been pointed out as a protective factor for the well-being of children (Morelli et al., 2020) and for the quality of parent-child interactions (Gambin et al., 2020) in the context of the COVID-19 pandemic. Studies prior to the pandemic demonstrated a positive association between parental self-efficacy and screen time restriction in preschool children (Gonçalves et al., 2019) and a negative association with excessive use of digital media by children (Smith et al., 2010).

In a complementary way, parental satisfaction relates to a more emotional perspective of parenting and concerns the affection that is directed to parental requirements (Seabra-Santos et al., 2015). This construct is defined as the sense of pleasure and commitment in performing the parental function (Brown et al., 2016). Despite its associations with parental self-efficacy, parental satisfaction has not been the focus of studies involving digital media use in childhood.

In addition to parental variables, the child's age has been positively associated with screen time (Azevedo et al., 2022; Kabali et al., 2015; Lauricella et al., 2015; Nevski & Siibak, 2016). Studies investigating the relationship between age and usage time during the pandemic have shown that this association remains despite the changes caused by COVID-19 (Aguilar-Farias et al., 2020; Arufe-Giráldez et al., 2020; Cartanyà-Hueso et al., 2020; Sá et al., 2021).

The research in this area focuses mainly on screen time, a trend already presents prior to the pandemic (Barr et al., 2020). The measures around the digital media pattern of use represent a challenge in this field of study since only the usage time may not be sufficient to understand the phenomenon. Additionally, parents seem to have difficulties providing an accurate measure of the time their children spend in front of the screens (Barr et al., 2020; Radesky et al., 2020). It is plausible that parental perception of changes in the pattern of media usage during the pandemic (such as the insertion of a new type of device in the child's routine and the perception of change in the usage time after the onset of the pandemic) represent relevant variables because they bring information about how parents are evaluating their children's use of digital media.

Finally, it is important to consider that the associations between all these variables are usually investigated linearly. However, parenting, media use in early childhood, and child development are complex constructs that influence and are influenced, concomitantly, by several aspects. According to Radesky (2015), children's use of digital media involves a socio-ecological context composed of several layers, from the individual aspects of the child to the cultural relevance of the media, in line with Bronfenbrenner's theoretical model. Due to these characteristics, it becomes difficult to access the complexity of this phenomenon, which requires statistical models that consider this theoretical structure (Radesky, 2015), such as network science (Hevey, 2018).

Thus, investigating the variables mentioned above from a network perspective can contribute to understanding the effects of the pandemic on parenting and media use in this context, filling gaps in the literature. Therefore, this study aimed to analyze the dynamics and association between the perception of change in the use of digital media during the COVID-19 pandemic (insertion of a new type of device in the routine and increase in usage time), parental variables (education, income, loss of social support due to the pandemic, symptoms of CMD, perceived stress, parental self-efficacy, parental satisfaction) and the age of the child.

Method

Participants

A total of 231 parents aged 20 to 48 years participated (M = 33.84; SD = 4.84), 91.80% of which were female. They had children (55.40% female) with typical development up to 36 months of age (M = 17.02; SD = 9.88).

The following child conditions were considered exclusion criteria: (a) genetic syndromes; (b) complex congenital malformations; (c) neurological and/or cardiac diseases; and (d) delays in neuropsychomotor development diagnosed by a doctor or other professional. This information was obtained through a screening question at the beginning of the questionnaire. We chose to include only children with typical development because parenting a child with non-typical development creates a different context that could potentially influence the variables investigated in this study.

Instruments

(a) Sociodemographic data questionnaire: This questionnaire was used to access sociodemographic data of participants and their families like age, working conditions, education, and income, among others, as well as questions about the COVID-19 pandemic, such as its repercussions on the respondent's routine. To assess the loss of social support for childcare we asked: *As a result of COVID-19, have you lost any of these childcare resources? Mark all that apply: Assistance from family and/or friends; Daycare; Nanny; Did not count on any of these supports before COVID-19.* The first three items were added, indicating the total loss of support. The score could vary from 0 to 3. The higher the score, the more sources of support were lost by the family.

(b) Media usage questionnaire: A Brazilian Portuguese version of the questionnaire "Zero to Eight: children's Media Use in America 2013" (Common Sense Media, 2013) was used. For the cultural adaptation of the questionnaire to the Brazilian context, the research team and experts conducted a literature review and discussion of the items. This instrument raises questions about media used by children and parents, as well as time, mode, reasons, and needs for using the media. The research team of *Common Sense Media* approved the adaptation of the questionnaire. For this research, questions about the context of isolation caused by the COVID-19 pandemic were included.

For this study, only the following questions were used: (a) *During quarantine, do you consider that your child's use of technologies is greater, less, or equal to before quarantine?* and (b) *During quarantine, did your child start using any of the following devices that they did not use before quarantine? Mark all that apply: Television; Smartphone; Tablet; Computer; None.* Subsequently, the answers to this question were dichotomized into yes (if the participant checked at least one of the four mentioned devices) and no (if the participant checked "none").

(c) Self-Reporting Questionnaire (SRQ-20): A psychiatric screening instrument for non-psychotic mental disorders, mainly for symptoms of depression and anxiety, that is, common mental disorders (Beusenberg et al., 1994). The questionnaire consists of 20 yes/no questions. Each affirmative answer is classified as "1," and the sum of all items composes the final score. The Brazilian version was validated by Mari and Williams (1986) and reassessed by Gonçalves et al. (2008). The internal consistency of the Brazilian version is .86 (Gonçalves et al., 2008). Internal consistency for the sample in this study was satisfactory, with both Cronbach's alpha (α) and McDonald's omega (ω) equal to .84.

We used 8 as the cutoff point, which indicates positive screening for common mental disorders, as supported by the literature (Barreto do Carmo et al., 2018, Mari & Williams, 1986).

(d) Perceived Stress Scale (PSS): This instrument was developed by Cohen et al. (1983) for cognitive measurement of the presence of stress symptoms. The 4-item version was used as it was the most suitable to perform a general stress screening (Faro, 2015). In this study, Cronbach's Alpha was .80. As the investigated sample tended to have high scores, a higher cutoff of 8 points was determined, equivalent to the 75th percentile of the original validation sample.

(e) Parental educational competence assessment questionnaire (Questionário de Avaliação da Competência Educativa Parental - QACEP): This instrument evaluated the perception of competence of fathers and mothers in their parental roles (Pardo et al., 2018) and was used to obtain measures of parental satisfaction and parental self-efficacy. The scale consists of 16 items on a six-point scale, between "totally disagree" and "totally agree".

The instrument consists of two subscales: (a) parental self-efficacy and (b) parental satisfaction. In this study, we chose to use the scores of the subscales separately to access the specificities of each of them. This questionnaire was adapted to Brazilian Portuguese and presented evidence of reliability for the two subscales: α=.66 (self-efficacy) and α=.73 (satisfaction). The Brazilian version of the scale showed discriminant validity and evidence supporting the internal structure of the instrument, which confirmed the two-factor solution in the Brazilian validity study (Pardo et al., 2018). For our sample, internal consistency was satisfactory for the subscales Self-Efficacy (α = .70; ω = .70) and Satisfaction (α = .78; ω = .80).

Procedure

This is a cross-correlational study (Johnson, 2001) conducted via an online survey through the *Survey Monkey* provider, and which composes a larger project entitled "Parental mental health and use of digital media by young children: a comparative study before and during the COVID-19 pandemic". This project was approved by the first author's university ethics committee under CAAE: 30809520.9.0000.5334. The questionnaire was disseminated via social media and the researchers' contact lists. All parents consented to participate in the study. Data collection was conducted from May 27 to June 15, 2020.

Data analysis

At first, descriptive analyses (frequency, mean and standard deviation) were performed using the *Statistical Package for the Social Sciences* (SPSS) software for Windows version 18.0. These analyses aimed to characterize the sample.

Subsequently, a network analysis of regularized partial correlations was conducted using the *Jeffreys's Amazing Statistics Program* (JASP) software for Windows, version 0.14.1.0, to evaluate the association between perceived change in the use of technologies during the COVID-19 pandemic, parental variables (education, income, loss of social support due to the pandemic, symptoms of CMD, perceived stress, parental self-efficacy, parental satisfaction) and the age of the child. This analysis allows us to identify the associations between two variables controlling the effect that all the others exert on them. The following centrality indicators were reported: (a) strength, which indicates the robustness of the relationships of each variable; (b) proximity, which indicates how quickly the variable is affected by changes in any part of the network and can affect other parts of the network; and (c) expected influence, which quantifies the position, nature, and strength of the cumulative influence of a node within the network and, therefore, the role it plays in the activation and persistence of the network (Robinaugh et al., 2016).

The "Fruchterman–Reingold " algorithm was used to present the data so that the variables with stronger associations approach and those with less strong associations repel each other (Fruchterman, & Reingold, 1991). To improve the accuracy of the network, the Markov random fields model was used. The algorithm adds a penalty "L1" (regularized neighborhood regression) to decrease the variance, controlling the sparsity and facilitating the interpretation of the model. Regulation is estimated by a less complete selection and contraction operator (LASSO). The extended Bayesian information criterion (EBIC) was observed to select the Lambda of the regularization parameter. EBIC uses a hyperparameter (y) that determines how EBIC selects sparse models (Chen & Chen, 2008). In this study, the value, which can vary from 0 to 0.50, was determined at 0.25. This is an appropriate value for exploratory networks, as is the case of this study since it is more parsimonious in its penalization (Chen & Chen, 2008). Network analysis uses regularized absolute reduction and selection operator (LASSO) algorithms to obtain the precision matrix (weight matrix). When standardized, this matrix represents the associations between the variables of the network, that is, it can be interpreted as an array of correlations.

Finally, the graph representing the network was constructed so that the variables are represented by nodes and the relations by lines. The thicker and darker the line, the stronger the relationship. Moreover, the solid lines represent positive relationships, while the dashed lines represent negative ones. The *JASP* Software was also used for plotting this figure.

Results

At the time of data collection, 88.70% of the participants were in social isolation due to the COVID-19 pandemic, and 61.90% reported having work and/or study activities at home. Most (82.70%) had been in isolation for more than

two months. As for family income and parental educational level, most were middle class and highly educated (Table 1). However, 56.30% reported a decrease in income due to the pandemic.

Most of the participants lived with a partner (92.60%) and reported having only one child (74.5%) and three people depending on their family income (62.30%). Regarding the time spent with the child during social isolation, most reported spending most of the day or more with the child. The loss of social support was extensive, and all families that had any of the evaluated sources of support (80,1%) faced the loss of at least one of those due to the pandemic. A total of 66.70% of the parents stated that their child's screen time increased after the onset of the pandemic and 42.9% reported having included at least one new type of digital media device in the child's routine during the social isolation period (Table 1).

Table 1
Sociodemographic and Changes in pattern of digital media use data (N = 231)

	f[a]	%
Monthly Household Income		
Up to one MW	7	3.00
1 to 3 MW	22	9.50
3 to 6 MW	59	25.50
6 to 9 MW	48	20.80
9 to 12 MW	38	16.50
12 to 15 MW	24	10.40
More than 15 MW	33	14.30
Parental educational level		
Elementary education	2	0.80
High school	8	3.50
College education	96	41.60
Technical course	3	1.30
Post-graduation	122	52.80
Number of persons dependent on family income		
One	2	0.90
Two	14	6.10
Three	144	62.30
Four	54	23.40
Five or more	17	7.30
Number of children		
One	172	74.50
Two	47	20.30
Three	10	4.30
Four or more	2	0.90
Time spent with the child		
All day with the child	106	46.70
Most of the day with the child, sharing care with another adult	110	47.40
Some hours with the child	15	5.90
Type of support sources lost		
Daycare	114	49.40
Help from family and/or friends	109	47.20
Nanny	30	13.00
None	46	19.90
No. of support sources lost		
One	122	52.80
Two	58	25.10
Three	5	2.20
None	46	19.90
Increase in screen time during the pandemic		
Yes	154	66.70
No	77	33.30
Inclusion of a new device during the pandemic		
Yes	99	42.90
No	132	57.10

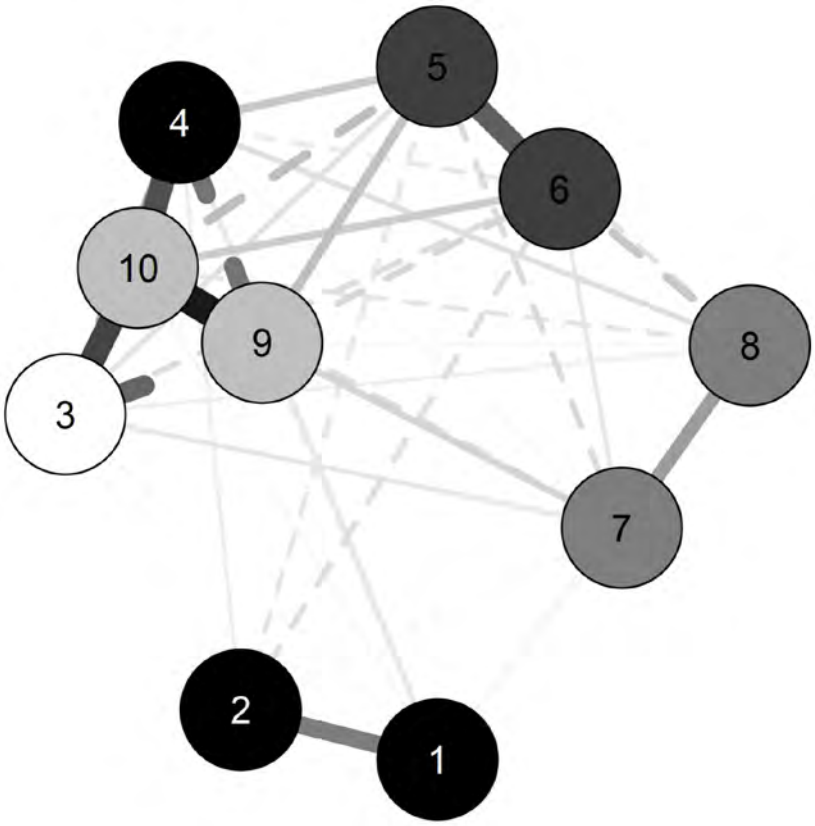
Note: MW = Minimum wage. The minimum wage was BRL 1037,00 per month in the data collection period (approximately U$ 212)

Regarding the parental variables, the SRQ-20 and the PSS scores show high rates of positive screening for CMD and perceived stress (46.30% and 92.10% respectively). Also, in the QACEP subscales, the results show high levels of parental self-efficacy and satisfaction (Table 2).

Table 2
Parental Variables Characterization (N = 231)

	Mean	SD	Sample Minimum-Maximum Score
SRQ-20	7.21	4.29	0-18
PSS-4	11.77	2.94	4-20
Parental Self-efficacy Subscale	31.42	4.52	18-42
Parental Satisfaction Subscale	40.91	6.94	22-54

Figure 1
Current network pattern



Note: Black = family context (1 = Parental educational level; 2 = Family income; 4 = Loss of social support); White = child's age (3); Dark gray = parental mental health (5 = Perceived stress; 6 = CMD symptoms); Medium gray = parental competence (7 = Parental self-efficacy; 8 = Parental satisfaction); Light gray = perception of change in the child's pattern of media use during the pandemic (9 = insertion of media device; 10 = increase in usage time). Solid lines represent positive relations, whereas dashed lines represent negative ones.

The current network pattern (Figure 1) presented a sparsity of .067, that is, of the 42 possible relations, 40 occurred. This pattern indicates a group of strong associations between increased usage time in the pandemic, device insertion in the pandemic, loss of social support, and the child's age. In addition, in the periphery of the network, it is possible to verify three pairs of variables more strongly associated: (a) income and education (0.497); (b) perceived stress and symptoms of CMD (0.61); and (c) parental self-efficacy and satisfaction (0.375) (Figure 1; Table 3). These associations occurred as expected since the variables in question comprise, respectively, the same construct: (a) socioeconomic level, (b) mental health, and (c) parental competence.

Table 3
Weight matrix

Variable	Network								
	1	2	3	4	5	6	7	8	9
1. Parental educational level	.000								
2. Family Income	.497	.000							
3. Age of the child	-.036	-.034	.000						
4. Loss of social support	.093	.061	-.330	.000					
5. Perceived Stress	.023	-.094	.112	.207	.000				
6. Symptoms of CMD	.000	-.125	-.127	-.085	.614	.000			
7. Self-efficacy	-.041	-.038	.090	.027	-.136	.085	.000		
8. Satisfaction	.034	-.022	.057	.121	-.110	-.204	.375	.000	
9. Media insertion	-.055	.000	-.591	-.534	.240	-.152	.158	.026	.000
10. Increase in usage time	.033	.000	.720	.672	-.243	.192	-.134	-.095	.883

As for the centrality indicators, the increase in the time of use (1.680) and the insertion of media devices (1.239) during the pandemic, followed by the loss of social support (0.568) and the age of the child (0.525), were the variables with the highest strength indices, that is, the variables that established stronger associations in the network. In turn, perceived stress (1.014), increase in the time of use (0.886), CMD symptoms (0.869), media insertion (0.758), and loss of social support (0.723) were the variables with the highest proximity indices, that is, the variables most quickly affected by changes in the current network pattern. Finally, the increase in time of use (2.636), perceived stress (0.305), and parental educational level (0.200) were the variables with the highest expected influence values, that is, the variables with the greatest potential to change the current pattern of the network if they are objects of intervention (Table 4).

Table 4
Centrality indicators

Variable	Strength	Proximity	Expected Influence
1. Parental educational level	-1.176	-1.517	.200
2. Family Income	-1.097	-1.458	-.300
3. Age of the child	.525	.067	-.930
4. Loss of social support	.568	.723	-.321
5. Perceived Stress	.102	1.014	.305
6. Symptoms of CMD	-.156	.869	-.375
7. Self-efficacy	-.817	-.664	-.067
8. Satisfaction	-.869	-.678	-.401
9. Insertion of media device	1.239	.758	-.746
10. Increase in usage time	1.680	.886	2.636

Discussion

This study aimed to analyze the dynamics and associations between the perception of changes in digital media use during the COVID-19 pandemic, including the introduction of new devices and increased screen time, as well as parental variables. Parental variables encompassed education, income, loss of social support due to the pandemic, symptoms of common mental disorders, perceived stress, parental self-efficacy, parental satisfaction, and the child's age. In general, our results show a scenario of relevant loss of social support for childcare, as well as high rates of perceived stress and symptoms of CMD, despite high levels of parental self-efficacy and satisfaction and the average-high socioeconomic level of the participants. In addition, the pandemic seems to have increased screen time and favored the insertion of new electronic devices. These variables have been strongly associated with the loss of social support and the child's age. Furthermore, parental perception of increased digital media usage time seems to be a relevant variable in developing interventions that seek to modify the current network pattern, considering the high expected influence of this variable in the network pattern. Also, parental mental health measures and the loss of social support represent variables quickly modified by any change in the system, distributing these changes throughout the network.

The increase in media use and the relevant loss of social support illustrate the impact of the pandemic on families' routines, denouncing the need to reorganize the care for children (Vescovi et al., 2021). Another result that draws attention is the high prevalence of symptoms of CMD (46.3%) and stress (92.1%). In contrast, high parental self-efficacy and satisfaction rates were found, which could represent a protective factor for the well-being of children (Morelli et al., 2020) and for the quality of parent-child interactions (Gambin et al., 2020) in this complex context.

In the network analysis, the variables related to the perception of change in children's use of digital media (increase in usage time and insertion of media devices) were the strongest associations in the network. This demonstrates that the changes in the pattern of digital media use are strongly connected to other variables in the current network pattern. Moreover, these variables clustered with the loss of social support and the child's age, indicating robust associations between these constructs. However, the negative direction of the association between the loss of support and the insertion of media devices was unexpected. Nevertheless, the loss of support was positively associated with an increase in screen time (as expected).

The child's age was positively associated with the increase in the usage time but negatively with the insertion of a new device. Digital media usage time increases with age (Azevedo et al., 2022; Kabali et al., 2015; Lauricella et al., 2015; Nevski & Siibak, 2016). This relationship seems to remain in the context of the pandemic, according to ours and other studies (Aguilar-Farias et al., 2020; Arufe-Giráldez et al., 2020; Cartanyà-Hueso et al., 2020; Sá et al., 2021).

However, most studies (including ours) adopted a retrospective design to access parents' perception of change in media use precipitated by the pandemic. As one of few exceptions, the comparative study by Pedrotti et al. (2021) demonstrated that the media usage time showed a significant increase only in children older than one year, remaining stable among infants. Older children use more digital media because they have skills that enable more opportunities for engagement with these devices (Aguilar-Farias et al., 2021). Older children are also more often enrolled in school and extracurricular activities online, as well as have more skills to interact with relatives and friends using video chatting tools. On the other hand, children under the age of one are more dependent on an adult offering them the media, as they cannot independently engage in such activities (Kildare & Middlemiss, 2017). Lauricella et al. (2015) argue that parents' attitudes regarding the offer of devices also change according to the child´s age and interfere with the amount of time the child spends on screens.

It is possible that specific characteristics of each age range are related to the pattern of digital media use. According to Bronfenbrenner's (2002) model, the individual aspects of the child, their abilities, and needs at each stage of development are components of the proximal processes the child is involved in. Besides the child, parental and demographic variables, as well as the context of the pandemic, interact in creating the phenomena of digital media use.

On the other hand, the insertion of a new device in the child's routine during the pandemic was negatively associated with age. According to Kabali et al. (2015), the first use of mobile devices decreases with age, being more frequent among children up to one year old. Therefore, it is plausible to consider that the insertion of new devices during the pandemic occurred more among younger children because they were less exposed to digital media in the first place. The context of social isolation, with restriction of activities and new demands for digital media use, may have contributed to the insertion of new devices among younger children.

The positive association between increased usage time and loss of social support found in this study possibly illustrates the need to use more digital media with children due to multiple demands and lack of support generated by the pandemic. According to Rosa et al. (2020), digital media may represent a source of support when caring for a baby. Other studies have described that the use of digital media is associated with the parent's need to entertain the child so that the adult can perform other activities (Azevedo et al., 2022; Kabali et al., 2015; Mallmann & Frizzo, 2019; Pedrotti et al., 2021). It is important to consider that our study only assessed the number of support sources lost but did not investigate the intensity of each loss. This may be a relevant aspect for future qualitative investigations, shedding light on how each support system favors or hinders children's digital media use.

The association between the loss of social support and the insertion of new devices presented an unexpected direction. Families that lost more sources of support reported less insertion of new devices. Despite the strong positive association between the increase in screen time and the insertion of devices, these variables presented distinct relations with the loss of support construct. This scenario reflects the need for studies to consider aspects beyond usage time. The need for other measures besides screen time has been discussed in the literature because parents seem to have difficulty in accurately assessing their children's time (Barr et al., 2020; Radesky et al., 2020). In addition, qualitative aspects of the use (when and how the media is used) are not addressed when measuring screen time alone.

The insertion of a new electronic device seems to point to an increase in the use of media in general. It inaugurates and maybe expands the child's contact with digital media, as well as with other possibilities in terms of content and contexts of use. Different devices can offer different user experiences. However, no other study evaluated the frequency of insertion of a new electronic device into the child's routine during the pandemic. The scarcity of data regarding the insertion of devices makes it difficult to discuss the results around this variable. This aspect deserves to be further investigated in future studies since it can contribute to understanding aspects of contexts of use.

The increase in usage time variable had the greatest expected influence. That is, the variable with the greatest potential to promote changes in the current network pattern if it was targeted in an intervention. This result demonstrates the need to monitor this phenomenon since it seems to promote a systemic change hitherto not observed in the literature, considering the model investigated in this study. In addition, this result contributes to discussions around the variables to be measured in studies investigating the use of digital media because the increase in usage time was more relevant in this network pattern than the insertion of a new device in the routine. Our results support the idea that researchers should consider other measures of screen use along with screen time, and not instead of it.

The loss of social support and mental health measures presented relevant values of proximity, with stress presenting the highest value. That means they will be quickly affected by changes in any part of the network, being

responsible for spreading the effects of a given intervention quickly to the other variables in the network. These results agree with the literature, which has demonstrated the effects on mental health and the loss of social support from the COVID-19 pandemic and defended the need for attention to these phenomena concerning intervention policies to protect families and children (Huebener et al., 2021).

Parental self-efficacy and satisfaction presented a more peripheral position in the network and were more strongly associated with each other than with mental health measures. This association between parental self-efficacy and satisfaction has already been reported in the literature (Matias et al., 2017; Seabra-Santos et al., 2015), and according to our result, seems unchanged in the pandemic context. Research conducted during COVID-19 found that parental self-efficacy is a mediator of parental stress on the child's emotional regulation (Morelli et al., 2020).

Parental satisfaction helps parents in directing attention to and selecting more positive information to reduce the perception of difficulties (Matias et al., 2017). We found no studies that evaluated parental satisfaction during the pandemic. As our research was conducted in the early months of the pandemic, it is possible that this construct has not yet been affected by environmental changes. Longitudinal studies would provide more insights into that matter. Another explanation is that spending more time at home with their children due to distance measures acted as a protective factor for parents, sustaining their levels of satisfaction despite other risk factors (such as depressive symptoms and loss of support). Our research, then, provides empirical data on these constructs that may be relevant when addressing the experience of parenting in this challenging environment.

The socioeconomic level (family income and educational level) was also peripheral in the network pattern. The family income was negatively associated with perceived stress and symptoms of CMD, but with weak relationships. This perhaps is related to the homogeneity of our sample, especially in terms of educational level (more than half of the participants reported having post-graduation studies). A greater sample variability regarding socioeconomic status would allow a better investigation of the phenomena. However, studies conducted during the pandemic face enormous challenges once face-to-face contact involves the risk of infection, while online survey often leads to sampling bias (Jordan & Prendella, 2019).

Finally, this set of results provides an overview of the experience of parenting in the context of the COVID-19 pandemic in Brazil and its associations with the use of digital media in early childhood, evidencing changes in the usage pattern and high rates of loss of social support, symptoms of CMD and perceived stress. Considering the relevance of the first years of life for later development, our study demonstrates that families with young children should be prioritized in preventive initiatives targeting the potentially harmful effects of the pandemic, as well as the relevance of the increase in the usage time of digital media in this context.

Final considerations

The present study contributes to research on children's media use by addressing this phenomenon in a stressful context, such as the COVID-19 pandemic. The relevance of the loss of social support and parental mental health regarding changes in the pattern of use during the pandemic provides subsidies for developing programs that promote support for parents and protect children from potentially harmful media use.

It also provides relevant information for discussions around the most appropriate measures to investigate the use of digital media by highlighting the relevance of parental perception of increased usage time in the investigated model. It includes the measure of insertion of new devices, which is an innovation. In addition, the fact that this study investigated the relationships between all these variables together, through network analysis, also represents a contribution to the area. The associations between these constructs are usually accessed separately and/or linearly.

Among the limitations of this study is the cross-sectional and retrospective design to access the perceptions of change in media use. On the other hand, different studies have accessed this variable in a similar way (Carroll et al., 2020; Sá et al., 2021). The four-item version of the PSS may have been too sensitive in screening stress in this sample. Despite its good psychometric properties, this version produces a lower variability in responses. Using the PSS-10 version could be more appropriate in establishing prevalence by cutoff point in a deeply stressful context such as a pandemic.

Our data refer to the very initial moment of the pandemic (June 2020). The prolongation of the pandemic and the social distancing measures may have impacts not addressed in this study, such as the weakening of social support resources and parental mental health deterioration. Thus, it is relevant to follow this situation longitudinally and investigate how it impacts the use of digital media by children throughout the pandemic period.

Given the centrality of the increase in media usage time and mental health measures, as well as the relevant loss of support, future studies could include these factors when outlining initiatives to support families of young children in the context of the pandemic. These could be core features in new intervention programs.

Authors' Notes

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