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The role of parental emotional factors in toddler's amount of screen use

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ABSTRACT

In today's world, children have high exposure to near-ubiquitous digital media in their homes. However, early use has been linked with developmental and emotional delays. In this context, the aim of our research was to examine specific emotional parental factors (i.e. anxiety-depressive and stress symptoms and parental reactions to children's negative emotions) that may be associated with the amount of screen time toddlers have during weekdays and weekends. A total of 100 parents of toddlers aged 12–36 months participated in the study, completing questionnaires. The findings revealed that parents' anxiety-depressive and stress symptoms were linked to their toddlers' digital media use, particularly on weekends. Additionally, parents' reactions to their children's negative emotions were most strongly associated with weekend television usage. Overall, regardless of the type of screen or time of use, higher exposure to TV or mobile devices was associated with the greater likelihood of parents using screens as a response to their children's negative emotions and a reduced likelihood of encouraging emotional expression. Moreover, associations between parental anxiety-depressive and stress symptoms and toddler weekday and weekend screen time were mediated by using screens to help children regulate emotions. This research enhances our understanding of the factors that may influence toddlers' screen exposure. Targeted interventions addressing these factors could be developed to prevent or mitigate early and extensive screen use in young children.

All around us, in public transportation, in shops, in lines, it has become common to see young children with a smartphone in their hands protest vigorously when their parent tries to take it away from them (Elias & Sulkin, 2019; Gordon-Hacker & Gueron-Sela, 2020). Despite recommendations from the specialized national and international organizations (Audiovisual Superior Council, French Pediatric Society, National Union of Familial Organizations, Academy of Sciences, Organisation for Economic Co-operation and Development, American Academy of Pediatrics) (Commission Écran, 2024; Diter & Octobre, 2022; Gottschalk, 2019; McArthur et al., 2022) to limit screen time under 2 years of age and not to exceed 1 h per day between 2 and 3 years of age, only 12 % of French 2-year-olds are not exposed (Diter & Octobre, 2022). In addition, at 2 years of age, children use screens on average 53 min a day and that time increases with age, rising above an hour and a quarter of screen exposure at 3½ years of age (Diter & Octobre, 2022). These findings in France are also observed in other Western countries (USA, New Zealand, Australia), highlighting the importance of understanding

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toddler's digital media exposure (Brushe et al., 2024; Corkin et al., 2021; Mann et al., 2025). Recent research shows that screen time should not be viewed as a single entity; it is important to distinguish between the types of devices used and the days of the week. Indeed, research consistently shows that, for children aged 1–3 years, television is used more frequently and for longer than mobile devices. A substantially larger proportion of toddlers watch TV regularly or daily, whereas smartphone and tablet use is less common and usually of shorter duration, particularly before 2 years of age (OPEN, 2024). Mobile device use increases towards 3 years of age, but TV remains the dominant source of screen exposure in this age group (OPEN, 2024). In terms of the day of the week, toddlers use TV and mobile devices more during the weekend than during the week (OPEN, 2024). This pattern may be explained by the fact that parents spend more time with their children during weekends (Sigmundová et al., 2018), thereby increasing the influence of parental practices on children's digital media use (Tang et al., 2018). These findings highlight the need to differentiate between weekends and weekdays when studying screen time.

Whereas school-age children and teenagers have more independence around using screens, early screen use (i.e., between 0 and 3 years of age) is usually a parental decision, regardless of the young child's wishes. Thus, exploring the parental, child and environmental factors that bring parents to expose their young children (1–3-year-olds) to screens appears important to better comprehend young children's screen use and inform prevention practices. Among these factors, several parental (primarily maternal) characteristics have been studied in relation to children's digital media use.

1. Relations between maternal depressive symptoms and children's screen use

It is noteworthy that the research cited below focuses almost exclusively on mothers, with fathers being nearly absent from all studies examining depression. Thus, compared to children of mothers without depressive symptoms, young children (i.e., aged from a few months to around 5 years) of mothers who experience depressive symptoms appear to be exposed to screens for longer durations (Bank et al., 2012; Conners et al., 2007; Duch et al., 2013; Holmgren et al., 2022; Howe et al., 2017) and to more age-inappropriate content (Conners et al., 2007). Furthermore, in the Conners et al. (2007) study, the more children were exposed to such content, the more their mothers tended to reverse the parent/child roles, meaning that children were the ones being sensitive to the parent's needs and making significant decisions rather than the parents. The authors suggested that children unaccustomed to age-appropriate roles have not learned to discern suitable from unsuitable content, therefore increasing their exposure to inappropriate content (Conners et al., 2007). Additionally, compared to mothers without depressive symptoms, mothers exhibiting depressive symptoms are less likely to engage in discussions with their child about what they are watching (Bank et al., 2012), potentially intensifying the impact of inappropriate content on the child (Conners et al., 2007; Domoff et al., 2020). Mothers who experience depressive symptoms also tend to perceive television as more of an entertainment tool for their child than mothers without depressive symptoms (Bank et al., 2012), resulting in more relaxed screen time limits (Domoff et al., 2020) and, consequently, increased exposure of the child to digital media devices (Bleakley et al., 2013; Brindova et al., 2014; Eyimaya & Irmak, 2021; Tang et al., 2018).

Another study linked postpartum depression to problematic screen use in both mothers and children aged 3-year-olds (Holmgren et al., 2022) and hypothesized on the processes explaining their relation. Digital media use may act as an emotional regulation strategy for mothers and help alleviate negative emotions associated with depressive symptoms (Domoff et al., 2020; Holmgren et al., 2022) or difficult child behavior (Torres et al., 2021). This coping mechanism may gradually contribute to excessive screen use by mothers (Holmgren et al., 2022) and vicariously teach children that screens are an emotion regulation strategy (Domoff et al., 2020; Holmgren et al., 2022). Another hypothesis posits that mothers who experience depressive symptoms are more likely to leave their child alone with a screen than mothers without depressive symptoms (Holmgren et al., 2022; Munzer et al., 2018), either due to beliefs about the entertainment value of screens (Bank et al., 2012; Domoff et al., 2020) or due to their depressive symptoms (e.g., lack of energy, difficulty making decisions), prompting them to delegate certain parenting responsibilities (Conners et al., 2007; Pempek & McDaniel, 2016).

2. Relations between parental stress and children's screen use

In general, stress occurs when there is a discrepancy between the demands an individual faces and the resources they perceive they have to meet those demands (Warren & Aloia, 2019). According to Deater-Deckard (1998), parental stress emerges when the demands associated with parenting exceed the perceived available resources as a parent. Thus, parents who feel incompetent, think they lack knowledge, and lack social support in their environment are more vulnerable to the emergence of parental stress, as their perceived resources seem limited when facing the numerous demands of parenting (Deater-Deckard, 1998). Stressed parents may use screens as a coping strategy to help them in their parenting role (McDaniel & Radesky, 2020; Wang et al., 2024). Indeed, researchers have shown that the higher the parental stress, the longer children are exposed to screens (McDaniel & Radesky, 2020; Shin et al., 2021; Wang et al., 2024). This relation has also been found in studies focusing on general stress (Sahithya et al., 2020; Seguin et al., 2021). Parental stress might influence parenting practices, especially related to children's emotions and behaviors, which may in turn play a role in their children's digital media use (Wang et al., 2024).

3. Relations between stress and anxious-depressive symptoms in parents and their reactions to their child's negative emotions

Children learn emotional regulation strategies through: 1) vicarious learning (i.e., children observe and then imitate how their parents regulate their own emotional experiences), 2) parenting practices related to children's emotions (i.e., how parents react when

their children's express emotions), and 3) the family emotional climate such as parent-child attachment and family relationships (Eisenberg et al., 1998; Morris et al., 2017).

Parenting practices have been studied in relation to parental anxiety, depression, and stress. According to Sosa-Hernandez et al. (2020), parents with strong emotional regulation abilities and few anxious-depressive symptoms tend to use parenting practices that value their child's emotional expression, help them solve problems (e.g., helping the child find a lost toy), support them through unpleasant emotions (e.g., giving the child a hug when they are sad), and discuss emotions and regulation strategies (Gottman et al., 1996; Sosa-Hernandez et al., 2020). Conversely, parenting practices that minimize children's emotional experience and punish their emotional expression have been associated with more anxious-depressive symptoms and parental regulatory difficulties (Gottman et al., 1996; Sosa-Hernandez et al., 2020).

Parental stress has also been linked to maladaptive parenting practices (e.g., less sensitivity to children's needs, more authoritarianism, more neglect, less engagement in interactions) (Wang et al., 2024; Zimmer-Gembeck et al., 2022). A stressed parent is experiencing exhaustion or limited resources (Deater-Deckard, 1998). This might lead to less educational guidance and instead, more permissive or, conversely, more controlling and punitive practices because all of these parenting practices require fewer parental resources (Warren & Aloia, 2019; Wang et al., 2024). In support of this hypothesis, Wang et al. (2024) showed that parenting practices partially mediate the relation between parental stress and problematic digital media use by 3–6 year-old children such that the greater the level of stress experienced by mothers, the more they tend to adopt maladaptive parenting practices, which in turns leads to more problematic digital media use among children. Stressed parents are more likely to use maladaptive parenting practices (e.g., physical punishment, verbal aggression, use of screens), since their resources and ability to dedicate one on one time to their child are limited (Wang et al., 2024). In that context, parents may use digital media to regulate children's emotions.

4. Relations between children's use of screens as a regulation tool and their exposure to digital media devices

Gordon-Hacker and Gueron-Sela (2020) investigated whether placing a child in front of a screen to alleviate negative affect was an effective emotional regulation strategy. The results were both interesting and surprising. Exposing an 18-month-old baby to a screen to reduce negative affect predicted an increase in their emotional distress eight months later, but only if the child expressed little negative affects at 18 months. According to the researchers, mothers of babies who expressed a lot of negative affect tended to try various strategies to calm them as quickly as possible. Conversely, mothers of babies who expressed relatively little negative emotions tended to use a less diverse repertoire of strategies and relied more on screens for their immediate distraction potential. Furthermore, children might learn that crying allows them to watch screens, leading them to express more negative affect to obtain this digital media reward (Gordon-Hacker & Gueron-Sela, 2020). Consequently, using screens as an emotional regulation technique does not appear to be beneficial for children's socio-emotional development, as it might prevent the development of self-regulation abilities. Moreover, frequent use of screens in response to unpleasant emotional experiences reduces parent-child interactions, hindering the learning of internal regulation strategies (Gordon-Hacker & Gueron-Sela, 2020). The child may then struggle in future emotional situations, having a limited repertoire of emotion regulation strategies. Supporting these hypotheses, Coyne et al. (2021) found a positive relation between using a screen-related emotion regulation strategy in 2- to 3-year-olds and the presence of emerging signs of problematic digital media use in children (e.g., digital media devices becoming the child's only source of comfort). Similarly, the more digital media devices were used for emotional regulation, the more children expressed distress when parents attempted to take them away (Coyne et al., 2021).

5. Research objectives and hypotheses

In this study, we investigated the relationships between parental emotional factors (i.e., reactions to their child's negative emotions and symptoms of anxiety, depression, and stress) and toddler's screen time, in a sample including both mothers and fathers of 1–3-year-old children. As opposed to most existing studies who have assessed children's screen time globally, in this study, we differentiated between mobile device usage (e.g. tablet, laptop or smartphone) and television usage (TV channel or TV on demand), and between weekday and weekend uses. Indeed, studies have shown higher screen usage on weekends compared to weekdays (Calvo et al., 2018; Jago et al., 2014; Sigmundová et al., 2018) and highlight the relevance of not focusing solely on the total duration of screen exposure (Barr et al., 2020). Parent-toddler time is likely greater during the weekends than during the week, which could increase the influence of certain parental factors (e.g. stress and anxious-depressive symptoms) on children's screen time during this period (Barr et al., 2020; Elias & Sulkin, 2019; Sigmundová et al., 2018). Furthermore, digital media practices seem to differ depending on the type of screen (i.e., television vs mobile device); some researchers have contrasted the passive nature of television use with the active aspect of mobile device use (Pulkki-Råback et al., 2021), while conversely, handheld mobile devices may be easier to use in-the-moment to manage negative child emotionality (Radesky et al., 2016).

Based on the literature reviewed above, we hypothesized that parent-reported toddler screen time (mobile use on weekday and weekend and television exposition on weekday and weekend) would be associated with higher parental stress, anxiety and depression. Furthermore, we also hypothesized that all types of toddler screen time would relate to more unsupportive parental reactions towards their toddler's negative emotions (i.e., punitive reactions, minimization reactions, wish-granting reaction, parental distress and screen as coping) and to less supportive reactions towards their toddler's negative emotions (emotion-focused reaction, problem-focused reaction and expressive encouragement). Because parents spend more time with toddlers on weekends, we expected stronger correlations between various parental factors (psychopathological symptoms and parental reactions to their children's emotions) and weekend digital media use, particularly with weekend television time, as compared to weekday time.

Finally, we hypothesized that parents' use of screen as a regulation strategy for their child's negative emotions would, at least partially, mediate the relation between parental stress and anxious-depressive symptoms and toddler screen time, such that increased parental anxiety, stress and depressive symptoms would predict more frequent parental use of screens in reactions to their toddler's negative emotion, which would then predict higher screen time. In particular, we expected to observe greater mediation when the predicted variable concerns digital media usage at weekends, especially television watching time.

6. Method

6.1. Participants

One hundred parents residing in France (33 fathers and 67 mothers) and their toddler (53 boys and 47 girls) aged 12–36 months ($M = 25.5$ months; $SD = 7.27$) participated in this study. They were recruited between 2021 and 2023. The sample size was determined based on guidelines outlined by Daniel (2012) and supported by similar published studies, such as Rivera et al. (2022). A G*power analysis confirmed this estimate. Assuming a medium effect size ($f^2 = 0.15$; Cohen, 1988), an alpha level of .05, and a desired statistical power of .80, a sample size of 77 was required for correlational analyses involving three main variables. For the mediation analysis, simulation studies indicate that sample sizes between 70 and 100 participants are sufficient to detect indirect effects of medium magnitude when both paths of the mediation model (typically referred to as a and b) are of moderate size (Fritz & MacKinnon, 2007).

Mothers were 32.9-year-olds on average ($SD = 4.42$) and fathers were on average 35.4-year-olds ($SD = 6.03$). When the participating parent had multiple children within this age range, they were asked to complete the questionnaires for the child whose birthday was the coming up next. In order to prevent potential biases in the results, parents and children were excluded from participation if they presented a physical or mental disability, if parents were not fluent in French, or if children were very premature (i.e., born at less than 32 weeks of gestation). Based on these criteria, two participants were excluded from the analyses because their children were born at less than 32 weeks of gestation. Four more participants were excluded because children's ages were outside the inclusion criteria (i.e., three toddlers were less than 12-months-olds and one was over 36-month-olds). Finally, 11 additional participants were excluded due to extensive missing data (i.e. four did not respond to the questions on screen time, the CTNES, or the DASS-21 at all; six did not respond to the CTNES and DASS-21 questionnaires at all; one did not respond to the CTNES at all). Thus, the analytic sample included 100 parents (117 recruited but 17 excluded).

6.2. Procedure

Participants were recruited via posters and flyers posted on various social networks (e.g., Facebook) or emailed, and displayed and handed out in various locations such as day care centers. Parents were not paid for their participation. Participants signed an informed consent form to participate in the research. This study received the equivalent of the IRB approval at the University of Lille (n°2021–510-S94).

As part of the larger DATE study, two in-person visits, about 2 weeks apart, were scheduled for each participant. At the end of the first visit, parents were given questionnaires to fill in at home. During the second visit, parents handed in their filled-in questionnaires. The location of the visit was decided based on what was most convenient for the participant (e.g., home, workplace). The order of the questionnaires was counterbalanced across 2 versions to minimize bias related to the order of presentation and response to the various questionnaires. In the rare cases when only one visit was scheduled, participants could mail-in their completed questionnaires.

6.3. Measures

This research is part of a larger study (Digital media, Attachment, Technoference, and Emotions project) focusing on digital media use and children's socio-emotional development in children aged 12–36 months. In this study, we examined children's screen time, parents' self-reported anxiety, depression, and stress, and the parental reactions to their child's negative emotions.

6.3.1. Socio-demographic measures

Parents reported on their gender, their age, their child's gender and age, number and age of siblings, both parents' education level, and the household's net monthly income in euros.

6.3.2. Parental reactions to toddlers' negative emotions – CTNES

The CTNES (Coping with Toddlers' Negative Emotions) was developed by Spinrad and colleagues (Spinrad et al., 2004) to describe parents' reactions regarding their young child's negative emotions. It was adapted from the CCNES, developed by Fabes and colleagues for parents of older children (Fabes et al., 1990). A French translation and back translation were conducted for this study. The questionnaire includes 12 hypothetical scenarios that could occur daily (e.g., "My child spills something and makes a big stain on the carpet, then gets angry and cries"). For each situation, parents evaluated from 1 (very unlikely) to 7 (very likely) the likelihood with which they would respond a certain way. For each scenario, parents rated the likelihood of responding with a distress reaction (e.g., "I would feel upset"), punitive reaction (e.g., "I would send my child to their room for making a big stain"), expressive encouragement (e.g., "I would tell my child it's normal to be angry"), wish response (e.g., "I would stop what I'm doing to play with my child"), emotion-focused reaction (e.g., "I would soothe my child with a hug or kiss"), problem-focused reaction (e.g., "I would help my child think of something else to do that would be fun"), minimization (e.g., "I would tell my child they are making a big deal out of nothing"),

and screen-giving (e.g., "I would put on a video or game on my smartphone to distract them").

Scores for each subscale were obtained by averaging the scores of the items associated with the given subscale. The higher the parent's score on one of the subscales, the more they tend to react in that manner to their child's negative emotions. For this measure, three participants were excluded from the analyses because they did not respond to all or part of the items. The internal consistencies were assessed using McDonald's omegas. The choice of McDonald's omega over Cronbach's alpha is explained by the greater precision of this indicator, particularly because it takes into account the multifactorial structure inherent in certain questionnaires (Béland et al., 2017). All omegas were satisfactory: distress reaction ($\omega = .73$), punitive reaction ($\omega = .82$), expressive encouragement ($\omega = .94$), emotion-focused reaction ($\omega = .86$), problem-focused reaction ($\omega = .88$), minimization ($\omega = .85$), wish response ($\omega = .70$), screen use ($\omega = .90$).

6.3.3. Parental stress, anxiety, and depression – DASS-21

Parents filled in the 21 items of the DASS-21 (Depression Anxiety Stress Scale, Lovibond & Lovibond, 1995; Martin, 2014) from 0 ("does not apply to me at all") to 3 ("applies to me very much, or most of the time") to report on their symptoms of stress (7 items; e.g., "I found it difficult to relax"), anxiety (7 items; "I had trembling"), and depression (7 items; "I felt that I had nothing to look forward to").

The total score for each subscale was calculated by summing the participants' responses for the items belonging to each subscale and then multiplying the result by two. The final score is then interpreted in terms of severity, ranging from normal (score less than 14 for stress, less than 7 for anxiety, and less than 9 for depression) to extremely severe (34 or higher for stress, 20 or higher for anxiety, and 28 or higher for depression), with intermediate categories being mild (15–18 for stress, 8–9 for anxiety, and 10–13 for depression), moderate (19–25 for stress, 10–14 for anxiety, and 14–20 for depression), and severe (26–33 for stress, 15–19 for anxiety, and 21–27 for depression). The internal consistencies of the subscales "stress" ($\omega = .86$), "anxiety" ($\omega = .83$), and "depression" ($\omega = .86$) were satisfactory. In addition, the total score of the DASS-21 was calculated by summing the scores at the three subscales and the global internal validity of the DASS-21 is also very satisfactory ($\omega = .93$).

6.3.4. Toddler's screen time

Parents reported on their toddlers' screen time by answering four questions: "How much time do you estimate your child uses a mobile device – tablet, smartphone, laptop - on a typical weekday?", "How much time do you estimate your child uses a mobile device – tablet, smartphone, laptop - on a typical weekend day?", "How much time do you estimate your child watches television - TV channel, TV on demand - on a typical weekday?", and "How much time do you estimate your child watches television - TV channel, TV on demand - on a typical weekend day?". For each of these questions, parents responded on an eight-point Likert scale that ranged from 0 to more than 3 h in 30-min increments. The items were used individually in the analyses. Although the measure remains a parent-report of screen time, the more specific nature of the questions is likely to help parents answer more accurately.

7. Results

Descriptive analyses were conducted on all variables (see Table 1). Following these initial analyses, mean differences were examined to test the effects of parent's and children's gender and to be able to control for them, if they exist, in subsequent analyses (see Tables 2 and 3). Although this was not a primary focus of the study, it appeared important to explore these effects in preliminary analyses, as prior research has reported differences based on children's gender for certain variables investigated here (Pulkki-Råback et al., 2022). In addition, research on parents typically includes predominantly mothers rather than fathers. The composition of our sample allowed us to compare the study variables by gender, addressing this limitation noted in previous work (Tang et al., 2021; Wang et al., 2024).

Table 1
Descriptive statistics.

	<i>M</i>	<i>SD</i>	<i>Range</i>
Stress	12.8	9.26	0–42
Depression	6.16	7.06	0–42
Anxiety	5.16	6.75	0–42
Global symptoms	24.2	20.5	0–126
Punitive reaction	2.22	.863	0–7
Minimisation	3.25	1.16	0–7
Wish response	2.73	.784	0–7
Distress reaction	3.72	.877	0–7
Screen as coping	1.51	.808	0–7
Expressive encouragement	5.11	1.48	0–7
Emotion-focused reaction	5.91	.816	0–7
Problem-focused reaction	6.20	.805	0–7
Toddler's use of mobile devices on a weekday	.500	.882	0–7
Toddler's use of mobile devices on a weekend day	.850	1.39	0–7
Toddler's use of television on a weekday	1.19	1.72	0–7
Toddler's use of television on a weekend day	1.55	1.81	0–7

Note: All of these variables are expressed on a Likert scale, including digital media usage.

Table 2

Descriptive statistics and mean differences by toddler's gender.

	Gender	<i>M (SD)</i>	<i>Mann-Whitney U test</i>	<i>p</i>
Stress	Boys	13.80 (9.36)	1095	.299
	Girls	11.70 (9.11)		
Depression	Boys	6.04 (6.97)	1230	.916
	Girls	6.30 (7.25)		
Anxiety	Boys	4.91 (6.43)	1193	.714
	Girls	5.45 (7.16)		
Global symptoms	Boys	24.8 (20.2)	1174	.621
	Girls	23.5 (21.0)		
Punitive reaction	Boys	2.21 (.87)	1220	.992
	Girls	2.23 (.87)		
Minimisation	Boys	3.31 (1.19)	1146	.594
	Girls	3.19 (1.14)		
Wish response	Boys	2.79 (.76)	1124	.494
	Girls	2.67 (.82)		
Distress reaction	Boys	3.80 (.85)	1044	.212
	Girls	3.64 (.91)		
Screen as coping	Boys	1.57 (.85)	1143	.568
	Girls	1.43 (.77)		
Expressive encouragement	Boys	5.21 (1.46)	1138	.558
	Girls	5.00 (1.52)		
Emotion-focused reaction	Boys	5.91 (.92)	1108	.424
	Girls	5.90 (.69)		
Problem-focused reaction	Boys	6.14 (.91)	1157	.650
	Girls	6.26 (.68)		
Toddler's use of mobile devices on a weekday	Boys	.42 (.87)	1094	.213
	Girls	.60 (.90)		
Toddler's use of mobile devices on a weekend day	Boys	.77 (1.34)	1166	.544
	Girls	.94 (1.45)		
Toddler's use of television on a weekday	Boys	1.38 (2.01)	1204	.758
	Girls	.98 (1.31)		
Toddler's use of television on a weekend day	Boys	1.66 (1.91)	1183	.653
	Girls	1.43 (1.69)		

No significant differences were found between girls and boys (Table 2). Mothers reported less minimization reactions, but more expressive encouragement, problem-focused reaction and emotion-focused reaction as compared to fathers, when responding to their children's negative emotions. They also reported more symptoms of depression, stress and anxiety and global symptoms (Table 3). Thus, parental gender was controlled in the analyses.

In addition, correlations were carried out to investigate relations between the study's main variables, on the one hand, and toddler's age, parent's age and net monthly household income, on the other (Table 4). Toddler age was positively related to the various measures of the time they spend in front of digital media tools (i.e., mobile device and TV use during the week and weekends) and to the parental practices that consist in using screens to soothe the toddler (Table 3). Parental age was negatively associated with the parental reaction of giving a screen to their toddler to help them to regulate their emotions (Table 4). Lastly, net monthly household income was negatively associated with toddler's weekend TV viewing time, as well as with the parental practice of providing their toddler with a screen to help him or her calm down (Table 4).

Following these preliminary analyses, the main analyses were carried out to test the various research hypotheses. JAMOVI (version 2.5.6.0) was used for all analyses. We conducted correlation analyses to address the first hypothesis, controlling for parent's gender, toddler age, parent age, and/or monthly income, depending on where preliminary analyses had revealed significant relations between these factors and the variables involved in the hypotheses. Next, mediation analyses were conducted to investigate the mediation of psychopathological symptoms in the parent and each of the different measures of the child's screen time by the parental practice "screen-giving" which consists in giving a digital media tool to the toddler when he/she manifests unpleasant emotions.

7.1. Relations between toddlers' screen time, parental reactions to their toddlers' negative emotions and parental symptoms

We hypothesized that parents' reports of toddler screen time would relate to more self-reported stress, anxiety and depression. Furthermore, we also hypothesized that all parental reports of children's screen time would relate to more unsupportive reactions towards their toddler's negative emotions and to less supportive reactions towards their toddler's negative emotions. We expected stronger correlations between various parental factors (psychopathological symptoms and parental reactions to their children's emotions) and weekend digital media use, particularly with weekend television time, as compared to weekday time.

7.1.1. Weekend TV and mobile devices screen time

In the Pearson correlations (see Table 5), the more toddlers were watching TV on the weekends, the more parents reported feelings of stress, anxiety and depression. In addition, with the increase in time spent in front of the TV, parents reported using more

Table 3

Descriptive statistics and mean differences by parental role.

	Parental Role	M (SD)	Mann-Whitney U test	p
Stress	Father	9.21 (7.55)	731**	.006
	Mother	14.6 (9.54)		
Depression	Father	3.70 (4.80)	769*	.012
	Mother	7.37 (7.69)		
Anxiety	Father	2.55 (3.51)	714**	.003
	Mother	6.45 (7.57)		
Global symptoms	Father	15.5 (13.4)	690**	.002
	Mother	28.4 (22.0)		
Punitive reaction	Father	2.43 (.85)	834	.059
	Mother	2.12 (.86)		
Minimisation	Father	4.01 (.96)	457***	< .001
	Mother	2.88 (1.07)		
Wish response	Father	2.73 (.73)	1049	.766
	Mother	2.73 (.82)		
Distress reaction	Father	3.49 (.79)	863	.094
	Mother	3.84 (.90)		
Screen as coping	Father	1.41 (.70)	1033	.666
	Mother	1.55 (.86)		
Expressive encouragement	Father	4.24 (1.45)	536***	< .001
	Mother	5.55 (1.30)		
Emotion-focused reaction	Father	5.57 (.95)	721**	.006
	Mother	6.08 (.69)		
Problem-focused reaction	Father	5.83 (.95)	631***	< .001
	Mother	6.38 (.65)		
Toddler's use of mobile devices on a weekday	Father	.58 (1.15)	1091	.899
	Mother	.46 (.73)		
Toddler's use of mobile devices on a weekend day	Father	.76 (1.41)	1019	.486
	Mother	.90 (1.38)		
Toddler's use of television on a weekday	Father	1.30 (1.70)	1024	.523
	Mother	1.13 (1.74)		
Toddler's use of television on a weekend day	Father	1.48 (1.72)	1101	.973
	Mother	1.58 (1.86)		

Note: * $p < .05$; ** $p < .01$; *** $p < .001$. Significant scores in bold.**Table 4**

Correlations between control variables (age of child, age of parent and net monthly household income) and the main variables of the study.

	Toddler's age	Parent's age	Net monthly household income
Anxiety	.139	-.079	-.181
Depression	.083	.030	-.091
Stress	.092	.005	-.073
Global symptoms	.117	-.013	-.124
Distress reaction	-.048	-.158	-.009
Punitive reaction	.047	-.020	.050
Expressive encouragement	-.015	-.060	-.071
Wish response	-.053	-.050	-.164
Emotion-focused reaction	-.138	-.150	.057
Problem-focused reaction	.096	-.183	-.026
Minimisation	-.104	-.020	.020
Screen as coping	.203*	-.198*	-.219*
Toddler's use of mobile devices on a weekday	.266**	-.004	-.098
Toddler's use of mobile devices on a weekend day	.324***	-.008	-.128
Toddler's use of television on a weekday	.266**	-.152	-.161
Toddler's use of television on a weekend day	.428***	-.121	-.211*

Note: * $p < .05$; ** $p < .01$; *** $p < .001$. Significant scores in bold.

unsupportive emotional regulation strategies and fewer supportive strategies. More specifically, parents were more likely to react to their child's negative emotion by minimizing it, punishing it, granting their toddlers' wishes or by providing a screen to help regulate it as toddler's TV time increased; increased TV time was also marginally associated with higher levels of parental distress. Conversely, they were less likely to encourage their child's emotional expression and used marginally fewer emotion-focused reactions. Contrary to expectations, problem-focused-reactions were not related to weekend TV times.

Regarding the use of mobile devices during the weekend, longer times were associated with higher parental stress, anxiety and depression. Higher weekend mobile devices time was also related to more parental use of screens as a regulatory strategy for their toddler's negative emotions, less expressive encouragement, and, marginally, less emotion-focused parental reactions. The other

Table 5

Partial correlations between parental symptoms, parental reactions and toddler's screen use, controlling for parental gender and age, toddlers' age, and income.

	1. ^a	2. ^a	3. ^a	4. ^a	5. ^b	6. ^b	7. ^b	8. ^a	9. ^c	10. ^a	11. ^a	12. ^a	13. ^d	14. ^d	15. ^d
1. Anxiety – DASS-21 ^a															
2. Depression – DASS-21 ^a	.596***														
3. Stress – DASS-21 ^a	.540***	.801***													
4. Global symptoms – DASS-21 ^a	.788***	.914***	.916***												
5. Distress reaction – CTNES ^b	.164 ^t	.180*	.298**	.254**											
6. Punitive reaction – CTNES ^b	.121	.075	.093	.109	.256**										
7. Wish response – CTNES ^b	.280**	.169*	.073	.186*	.190*	.062									
8. Minimisation – CTNES ^a	.073	.149 ^t	.174*	.156 ^t	.114	.576***	.045								
9. Screen as coping – CTNES ^c	.434***	.463***	.372***	.477***	.126	.273**	.279**	.134 ^t							
10. Expressive encouragement – CTNES ^a	-.190*	-.215*	-.202*	-.231*	-.161 ^t	-.507***	-.112	-.289**	-.557***						
11. Emotion-focused reaction – CTNES ^a	-.169*	-.195*	-.224*	-.227*	.072	-.390***	.193	-.153 ^t	-.317***	.455***					
12. Problem-focused reaction – CTNES ^a	-.196*	-.337***	-.320***	-.330***	.032	-.384***	.059	-.186*	-.391***	.503***	.784***				
13. Toddler's use of mobile devices on a weekday ^d	.098	.189*	.147 ^t	.166 ^t	-.061	.034	-.103	.102	.389***	-.278**	-.241**	-.093			
14. Toddler's use of mobile devices on a weekend day ^d	.241**	.260**	.180*	.253**	-.004	-.032	.062	.023	.448***	-.245**	-.148 ^t	-.035	.860***		
15. Toddler's use of television on a weekday ^d	.056	.036	.026	.043	.085	.160 ^t	.149 ^t	.115	.548***	-.382***	-.179*	-.086	.472***	.470***	
16. Toddler's use of television on a weekend day ^e	.203*	.316***	.225*	.281**	.154 ^t	.256**	.193*	.204*	.702***	-.522***	-.166 ^t	-.110	.547***	.568***	.726***

Note: ^t $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$. Significant scores in bold.

DASS-21 assesses symptoms of stress, depression et anxiety in parents. CTNES assesses parental reactions when the child manifests negative emotions.

^a For variables “Anxiety”, “Depression”, “Stress”, “Global symptoms”, “Minimisation”, “Expressive encouragement”, “Emotion-focused reaction”, and “Problem-focused reaction”, parent's age, toddler's age and net monthly income are not controlled.^b For variables “Distress reaction”, “Punitive reaction” and “Wish response”, parent's age, toddler's age, parent's gender and net monthly income are not controlled.^c For variable “Screen as coping”, parent's gender is not controlled.^d For variables “Toddler's use of mobile devices on a weekday”, “Toddler's use of mobile devices on a weekend day”, “Toddler's use of television on a weekday”, parent's gender, parent's age and net monthly income are not controlled.^e For variable “Toddler's use of television on a weekend day”, parent's gender and parent's age are not controlled

parental practices (i.e., minimization, punitive reaction, distress reaction, responding to children's wishes, problem-focused reaction) were not significantly related to the amount of time toddlers spend using mobile devices during weekends (see Table 5).

7.1.2. Weekday TV and mobile devices screen time

Contrary to the findings with toddlers' weekend TV time, weekday TV time was not related to parental psychopathological symptoms of anxiety, stress and depression in the Pearson correlations. However, several parental reactions to their toddlers' negative emotions were associated with weekday TV time. Specifically, the longer toddlers watched TV during the week, the more likely parents were to react to their child's emotions by providing a screen to help regulate them, and, marginally, the more likely they were to use punitive reactions or grant their toddlers' wishes. Conversely, they were less likely to encourage toddlers' emotional expression and to use emotion focused strategies. Several other emotion-related parenting practices (i.e., minimization, distress reaction, problem-focused reaction) were not significantly related to children's television viewing time during the week (see Table 5).

When examining time spent on mobile devices during the week, longer times were significantly related to more self-reported depressive symptoms and marginally associated with more stress. Contrary to weekend screen time, anxiety was not related to weekday times. In addition, several emotion-related parenting reactions were associated with weekday time spent on mobile devices. Specifically, parents were more likely to react to their child's emotions by providing a screen to help regulate them. Conversely, they were less likely to encourage their child's emotional expression and to use emotion-focused strategies. Several other parental reactions to toddler's emotions (i.e., minimization, punitive reaction, distress, responding to the child's wishes, problem-focused reaction), were not significantly related to the amount of time the child used mobile devices during the week (see Table 5).

To summarize the results on weekend and weekday screen time, increased TV and mobile device use on weekends was more strongly associated with higher parental psychopathological symptoms than on weekdays. Additionally, two emotion-related parental reactions were consistently linked to screen time. Regardless of the device (TV or mobile) or timing (weekday or weekend), lower frequencies of expressive encouragement was associated with higher screen time, while greater use of screens as an emotion regulation strategy for toddlers correlated with increased screen time. It should also be noted that there are strong positive correlations between digital media use during the week and during the weekend. These correlations are even stronger in each equipment category (mobile device use during the week and during the weekend, and television use during the week and during the weekend; see Table 5).

7.1.3. Parental psychopathological symptoms and emotion-related reactions

Pearson correlations revealed a consistent negative relationship between psychopathological symptoms and supportive emotion-related parental reactions. Specifically, parents reporting higher anxiety, stress, and depressive symptoms reported less frequent use of expressive encouragement, emotion-focused responses, and problem-focused strategies when addressing their toddlers' negative emotions (see Table 5).

In contrast, correlations between psychopathological symptoms and unsupportive parental reactions were less consistent. However, parents with higher stress, anxiety, and depression were more likely to use screens to regulate their toddlers' emotions. Additionally, though less consistently, parental distress, granting toddlers' wishes, and minimizing their emotions were sometimes linked to increased parental anxiety, stress, or depression (see Table 5).

7.2. Mediation analyses

We hypothesized that parental use of screens as a way to handle toddlers' negative emotion would mediate, at least partially, the relation between parent's overall psychopathological symptoms (stress, anxiety, and depression) and the various measures of toddler's screen time (i.e., mobile use on weekday and weekend and television time on weekday and weekend).

Bootstrapping was used as the method of analysis, as the data distributions were not normal and as this method is particularly robust (Hayes, 2009). Indirect effects were calculated for each of the 1000 bootstrap samples, and the 95 % confidence interval was estimated by determining the indirect effects at the 2.5th and 97.5th percentiles. Parental gender and age, toddler's age and the net

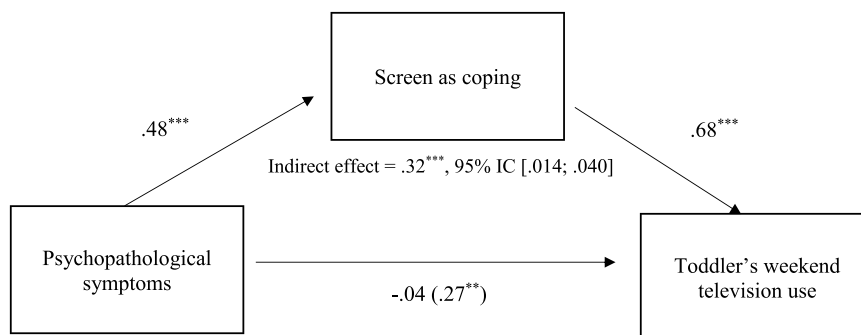


Fig. 1. Indirect effect of the parental practice of 'screen as coping' on the relation between the parent's psychopathological symptoms (anxiety, depression and stress) and the toddler's weekend television use, by bootstrap (controlling for the child's age, the household's net monthly income, the parent's age and gender). Note: ** $p < .01$; *** $p < .001$. Total effect is in parenthesis.

monthly income of the household were systematically controlled in the analyses, as these factors were related to the variables involved in the mediation hypotheses.

In the mediation analysis, parental screen-giving reactions mediated the relation between parental psychopathological symptoms and toddlers' weekend TV watching time such that more parental depression, stress and anxiety symptoms predicted a more frequent use of a screen as a way for parents to react to their toddlers' negative emotions, which predicted a higher weekend TV watching time (see Fig. 1).

This indirect effect explained 89 % of the total effect and is a full mediation. In other words, providing a screen to the child to calm him or her completely explains the relation between the parental symptoms and toddlers' use of television during the weekend.

Similarly, parental screen reactions mediated the relation between parental psychopathological symptoms and toddlers' weekend digital media devices use such that the more parents reported symptoms of anxiety, depression and stress, the more they gave a screen to deal with their toddlers' negative emotions, which in turn predicted an increase in toddler weekend digital media devices use (see Fig. 2).

This indirect effect explained 84 % of the total effect. Furthermore, this is a full mediation in which providing a screen to toddlers as a way to deal with their negative emotions completely explained the relation between the parental symptoms and the toddlers' use of mobile device during the weekend.

Similar indirect effects were found when looking at toddlers' weekday mobile devices uses and TV watching time (see Figs. 3 and 4). Specifically, the more parents reported symptoms of stress, anxiety and depression, the more frequently they used screen-giving reaction towards their toddlers' negative emotions, which in turn predicted more weekday time both on TV and using digital media devices.

8. Discussion

The aim of this study was to investigate parental factors that play a role in toddlers' exposure to screens to better understand what relational and contextual drivers shape early digital media use, and therefore need to be addressed in interventions aiming to support healthy digital media use by families. Overall, we found that parents' stress and anxious-depressive symptoms independently correlated with both toddler screen time - on weekends more than on weekdays - and also was associated with less sensitive emotional reactions to child challenges. Using screens to calm toddler negative emotions partially explained this relationship.

The first goal of the study was to examine associations between toddlers' screen time, parental reactions to their toddlers' negative emotions and parental stress, anxiety and depressive symptoms. As expected, higher weekend screen time was related to more parental anxiety, stress and depressive symptoms, however, higher weekday screen time was only related to more depressive symptoms. In addition, higher correlations were obtained with toddlers' weekend TV time. These results are generally in line with our hypothesis, although we also expected significant correlations with children's digital media exposure during the week. These results concur with those of previous studies, which have shown a relation between the presence of stress and anxious-depressive symptoms in the parent and children's screen time, with parents being more susceptible to use digital media tools as a proxy for their parenting tasks (Bank et al., 2012; Conners et al., 2007; Duch et al., 2013; Holmgren et al., 2022; Howe et al., 2017; McDaniel & Radesky, 2020; Pempek & McDaniel, 2016; Pulkki-Raback et al., 2022; Shin et al., 2021; Wang et al., 2024).

With regard to parental reactions to toddlers' negative emotions, as the duration of toddler screen time (mobile devices and television) increased during the week and weekends, parents reported using them more to help their children calm down when they expressed unpleasant emotions. This result is consistent with previous studies or models (Coyne et al., 2021; Domoff et al., 2020) and supports our hypothesis. It is worth noting that the higher correlation was observed with TV viewing time on weekends. Similarly, as the amount of time spent watching TV on weekends increased, parents tended to react to their child's emotion by minimizing it, punishing it or granting their child's wishes. Thus, most of the parental practices identified as unsupportive to children's social-emotional development (i.e., minimisation, punitive reaction, wish granting, screen use, and distress reaction) were associated solely with weekend TV time. Although we had expected higher correlations with this measure of screen time, we still expected

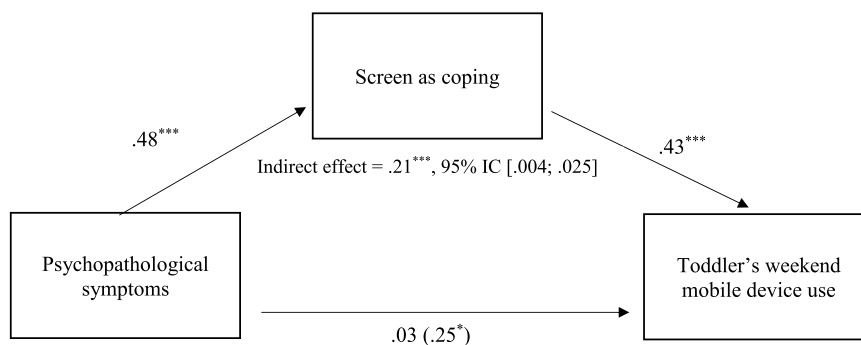


Fig. 2. Indirect effect of the parental practice of 'screen as coping' on the relation between the parent's psychopathological symptoms (anxiety, depression and stress) and the Toddler's weekend mobile device use, by bootstrap (controlling for the child's age, the household's net monthly income, the parent's age and gender). Note: * $p < .05$; *** $p < .001$. Total effect is in parenthesis.

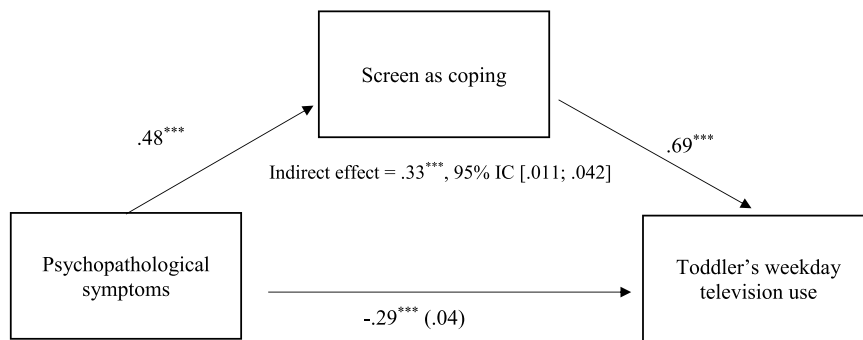


Fig. 3. Indirect effect of the parental practice of 'screen as coping' on the relation between the parent's psychopathological symptoms (anxiety, depression and stress) and the Toddler's weekday television use, by bootstrap (controlling for the child's age, the household's net monthly income, the parent's age and gender). Note: *** $p < .001$. Total effect is in parenthesis.

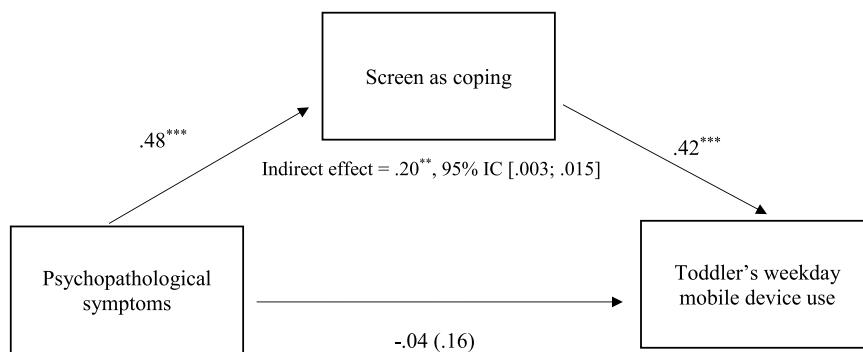


Fig. 4. Indirect effect of the parental practice of 'screen as coping' on the relation between the parent's psychopathological symptoms (anxiety, depression and stress) and the Toddler's weekday mobile device use, by bootstrap (controlling for the child's age, the household's net monthly income, the parent's age and gender). Note: ** $p < .01$; *** $p < .001$. Total effect is in parenthesis.

associations between parental practices and the other three measures of child screen time. Tang et al. (2018) had also found different relations between their variables depending on whether screen times were recorded during weekends or during the week. Researchers suspected that parents spend more time with their children on weekends (Sigmundová et al., 2018) and that this increases the influence of their practices on their children's digital media uses (Tang et al., 2018).

When looking at supportive parental reactions, the longer the child was exposed to screens (mobile devices and television), the less parents reported encouraging toddler emotional expression and adoption of emotion-focused regulation strategies. It should be noted that encouraging emotional expression was associated with weekend TV time, but not emotion-focused reactions, which were only associated with digital media use during the week. Furthermore, problem-focused parental reactions and the tendency to react with distress to children's negative emotions were never associated with measures of the toddlers' screen time. Few studies have investigated the relation between emotion socialization practices and different measures of toddler's screen time. Indeed, most studies have focused on the characteristics of the three major parenting styles (Detnakintra et al., 2020; Eyimaya & Irmak, 2021; Howe et al., 2017) and have focused solely on television viewing time, without necessarily differentiating between weekday and weekend use (Barr et al., 2020). While this is justifiable, given that television is the main digital media tool used in early childhood (Diter & Octobre, 2022; Lauricella et al., 2015), it does not take into account the great variety of digital media devices now available. The present research found negative relations between supportive emotion socialization practices and children's digital media usage times, but only with emotionally engaging parental responses (i.e., encouragement of emotional expression, emotion-focused response). These results support the hypothesis that parents who are unwelcoming and not warm on an emotional and affective level might use screens as a strategy to compensate for these difficulties (Detnakintra et al., 2020; Howe et al., 2017).

The second goal of the study was to examine the use of a screen as an emotional regulation tool for the child as a mediator of the relation between parents' stress and anxious-depressive symptoms and the child's digital media usage times. We expected these mediations to be stronger with weekend, and especially weekend TV time, as the outcome variable.

Indeed, as expected, the more self-reported parental stress, anxiety and depression, the more frequently parents used screens when faced with their toddlers' negative emotions, which in turn predicted more TV viewing time and more digital media devices use, both on the weekend and during the week. Although all four indirect effects were significant (for each of the four analyses carried out), anxiety-depressive and stress symptoms were not significant predictors of children's digital media use during the week (i.e., the total effects were not significant), highlighting the importance of examining processes such as indirect effects in order to better understand

how parental factors and children's screen use are related. In our study, providing toddlers with a screen to help soothe them was a significant mediator of the relation between the parent's anxiety-depressive and stress symptoms, on the one hand, and the toddler's television and mobile device usage times during the weekend, on the other. Toddler's digital media use during the week was not significantly predicted by the parent's anxiety and stress symptoms. As mentioned above, this could be related to the amount of time parents spend with their child, which is estimated to be greater on weekends compared to weekdays (Tang et al., 2018; Sigmundová et al., 2018), which could increase the influence of parental factors on children's digital media uses (Calvo et al., 2018). Thus, it is possible that parental current anxiety-depressive and stress symptoms do not directly lead to greater use of screens during the week, as children may spend less time with them. On the other hand, significant mediations were found for toddlers' digital media usage on weekends, suggesting that parental factors might have a greater influence on screen time on days off as they might spend more time with their children and therefore increase the influence of their parenting practices (Calvo et al., 2018; Tang et al., 2018). In addition, parents experiencing more psychological distress might need time to relax and recharge on weekends, which would make time with their children more stressful. They might find time with their toddlers less satisfying or pleasurable. Their toddlers might also exhibit more negative behaviors, especially during unstructured weekend time, due to the genetic inheritance of mood and other disorders. Overall, these results support previous findings showing a relation between stress and anxious-depressive symptoms in parents and their tendency to offer a screen to their children as a tool for regulation (Conners et al., 2007; Domoff et al., 2020; Holmgren et al., 2022; McDaniel & Radesky, 2020; Shin et al., 2021; Warren & Aloia, 2019; Wang et al., 2024). Similarly, research has shown the role played by this parental practice in the emergence of increased screen use by children (Coyne et al., 2021; Domoff et al., 2020; Elias & Sulkin, 2019), toddlers missing out on opportunities to learn a large range of regulation strategies (Domoff et al., 2020; Gordon-Hacker & Gueron-Sela, 2020).

8.1. Strengths and limitations

Strengths of this study pertain to its comprehensive methodological design, including the involvement of both mothers and fathers of toddlers in France, the measure of diverse screen-time moments, and the examination of multiple parental factors. As this study shows, there are significant differences between mothers and fathers in certain variables correlated with the child's digital media time (e.g., anxiety-depressive symptoms are higher in mothers, and these symptoms are thought to contribute to young children's exposure to screens). This highlights the relevance of including both mothers and fathers in a sample to enable generalization of the results to parents as a whole. However, regarding emotion socialization practices, Sosa-Hernandez et al. (2020) reported similar emotional socialization profiles for fathers and mothers, suggesting that they do not differ in how they respond to their children's expressed emotions.

Additionally, the sample included 12–36-month-olds. Since many studies focus on older children, our study helps fill this gap by observing the relations between specific parental factors and toddler's screen habits from a very early age.

In addition, this research was conducted in France. This geographical choice also enriches the literature on the subject, as most research is conducted in the United States or Canada. Depending on the country and the culture, parental practices and digital media uses are likely to vary, hence the interest in being able to conduct research in different countries (Duch et al., 2013; Livingstone et al., 2017).

This study is also informative in that it is likely to inform clinicians and researchers about parental factors that may influence toddler's digital media uses. By providing a better understanding, it makes it possible to design interventions that would target the factors identified as playing a role in the genesis of children's early and extensive exposure to screens. It is also likely that such interventions would improve relational health outcomes.

Finally, as mentioned above, a diversity of measures of children's screen time were taken into account, separating toddlers' use of television from their use of mobile devices, and also differentiating their use during the week from their use during the weekend. This makes this study particularly interesting, given that most research has focused on the overall duration of children's exposure to screens (Barr et al., 2020). As noted by other researchers (Calvo et al., 2018; Jago et al., 2014; Sigmundová et al., 2018) and emphasized in our study, distinguishing digital media use based on time (weekday vs. weekend) and type (television vs. mobile devices) makes it possible to reveal varying degrees of relationships with parental factors. This is valuable both from a research perspective (e.g. generating new hypotheses regarding the variety of screens) and from a clinical perspective (e.g. adjusting the focus of interventions with parents).

Despite these strengths, the present study also has several methodological limitations that should be considered when interpreting the findings. First, while both mothers and fathers participated in the study, mothers were overrepresented in our sample, making up about two-thirds of our sample. We controlled for gender in the analyses that required it, however, it is possible that the preliminary analyses were not sufficiently powerful to reveal other relations between parents' gender and the variables investigated. Another sampling limit in our study is that, the average net monthly household income was higher than the average household income in France. It is possible that the topic of the study attracted parents who were sensitive to the issue and more likely to be 1) of a higher SES background and 2) to have children who did not use screens in a problematic way leading to results underestimating screen time among toddlers. Some studies have highlighted differences according to socio-economic level (Diter & Octobre, 2022; Domoff et al., 2020; Duch et al., 2013), therefore, replicating these findings with lower SES participants would be useful to better generalize these findings. Nonetheless, variability in screen time in our sample was large enough to detect associations and indirect effects.

Second, self-reported measures were used in this study, which may have altered the reliability of parents' responses, particularly with regard to their toddler's screen time, via the social desirability bias. In addition, because parents reported on toddlers' screen time, parenting and their mental health symptoms, a limitation is potential single reporter bias. Thus, it might be relevant to develop more objective measures of children's screen time, although this may be difficult for mobile devices, as children under the age of three rarely

have a dedicated device (Radesky et al., 2020) as well as use multiple reporters in the future.

Third, several other variables should be taken into account in future studies. For example, time spent by the child with each parent during the week and weekends, as this is likely to affect the relations between certain variables investigated in the research (Sigmundová et al., 2018; Tang et al., 2018). For example, a significant amount of time spent with a parent who has anxiety-depressive symptoms or who tends to adopt unfavorable parenting practices (e.g. providing the child with a screen in the presence of unpleasant feelings) could increase the risk that the child will be exposed to screens for a fairly long time. Similarly, expanding the parental factors by including measures of their sense of parental efficacy (Domoff et al., 2020; Radesky et al., 2016), could also have been relevant, as some research has mentioned an impact of this dimension on the emergence of anxiety-depressive symptoms and on parenting practices. In future research it might be relevant to investigate the bidirectional relation between parental perception of self-efficacy and parents' tendency to provide their child with a screen to help regulate him or herself, which in turn might affect the parent's self-efficacy.

A fourth and final limitation of the present study is its cross-sectional design. While the indirect effects found in this study are important findings in helping us understand processes linking parental variables with children's screen use, investigating these relations in a longitudinal study will be important. Because all variables were measured at a single time point, the mediation analyses can only inform associations among the variables and do not allow conclusions about temporal ordering, directionality, or causality. Future longitudinal studies would allow the examination of temporal relations and potential bidirectional associations between parental and infant factors, necessary to understand developmental processes over time.

8.2. Clinical applications

In this study, we identified parental factors that could lead to toddlers being exposed to digital media devices in a significant and/or precocious way. Acting on these factors could prevent inappropriate or excessive use of screens by young children. Based on the results of this study, it appears that parents might use screens as a strategy for emotional regulation both for themselves and for their toddlers. If screens are used as a coping strategy, it may therefore be effective to train parents to use different methods of emotional regulation for themselves and their children. Programs have been developed and shown encouraging results. For example, David et al. (2017) were successful in training the reappraisal component of emotion-regulation using an online version of the Rational Positive Parenting Program (rPPP). This parental program based on cognitive-behavioural therapies, showed a reduction of parental distress and an improvement of parental self-efficacy and parental self-esteem. In addition, an improvement of the socio-emotional skills in children was observed. Parental mindfulness is another form of intervention that could improve parent-child interactions and help regulate emotions, addressing parents' emotional needs (Duncan et al., 2009; Lippold et al., 2022; Marticotte, 2020). Mindfulness, by fostering attention and acceptance, could reduce screen use, sometimes used for emotional regulation, and strengthen parent-child bonds (Lippold et al., 2022). With the increasing role of screens (Diter & Octobre, 2022; Lippold et al., 2022), their use disrupts mindfulness. Therefore, interventions to develop parental mindfulness could reduce parental stress and behaviors related to screen exposure (Duncan et al., 2009; Lippold et al., 2022). In conclusion, attenuating the factors that might contribute to children's early and prolonged exposure to digital media devices would be a good approach to both prevention and remediation, with mindfulness or cognitive reappraisal programs as some of several potential options for achieving this.

9. Conclusion

In this study, parental stress and anxious-depressive symptoms were related to higher toddler screen time on weekends more than on weekdays and less sensitive reactions to toddler's emotions. Associations between parental anxious-depressive and stress symptoms and toddler weekday and weekend screen time were mediated by parents' use of screens to help children regulate their negative emotions. Based on these findings, interventions targeted at training parents to use different emotion regulation strategies for themselves and their children might be an important component to prevent or lessen early and extensive screen use in young children.

Author statement

All authors have accepted responsibility for the entire content of this manuscript and consented to its submission to the journal, reviewed all the results and approved the final version of the manuscript.

The content of the manuscript is the authors' original work, has not been published elsewhere and is not under consideration for publication elsewhere.

CRediT authorship contribution statement

Marie Danet: Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Oana David:** Writing – review & editing, Funding acquisition. **Jenny Radesky:** Writing – review & editing, Funding acquisition. **Claire Hofer:** Writing – review & editing, Writing – original draft, Validation, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Caroline Foutry:** Writing – review & editing, Writing – original draft, Formal analysis.

Declaration of Competing Interest

There are no relevant financial or non-financial competing interests to report.

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The data that support the findings of this study are available upon request from the corresponding author, MD.

There are no relevant financial or non-financial competing interests to report.

Data availability

Data will be made available on request.

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