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Children's excessive digital media use, mental health problems and the protective role of parenting during COVID-19[☆]

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ABSTRACT

COVID-19's outbreak in March 2020 and the social distancing measures that followed it changed the lives of children worldwide. Studies assessing the pandemic's implications for children have reported an alarming increase in the use of digital media (DM) and warned of its adverse impacts on children's functioning and development. The current study aimed to assess the relationship between excessive and problematic DM use and emotional, behavioral, and academic functioning among Israeli adolescents during COVID-19 and to identify adolescents at elevated risk of developing problematic DM use. Three hundred forty-seven Israeli parent-child dyads (M age = 11.81, SD = 1.41) separately completed measures assessing children's DM use (time and addiction), functioning (academic, social, emotional, and behavioral), behavioral dysregulation, and the parents' parenting practices. The results showed that DM addiction, but not DM use, was related to children's emotional, behavioral, and academic difficulties. Moreover, the results indicated that negative parenting and behavioral dysregulation increased the risk of DM addiction, which in turn increased emotional, behavioral, and academic difficulties. The results underscored parents' role in preventing problematic DM use and highlighted the need to treat DM use and problematic DM use as distinct constructs.

COVID-19's spread has led to the declaration of a global health emergency. Governments ordered their citizens to remain indoors to control the virus's spread and protect public health. Subsequently, public areas, including schools, were closed. Many children and adolescents began to spend entire days at home without the educational and social outlets that are a significant part of the day-to-day routines of school-age children. During the social distancing and lockdown, there was a substantial increase in daily digital media (DM) use among children and youth worldwide (Eales et al., 2021; Eyimaya & Irmak, 2021; Moore et al., 2020; Nagata et al., 2020). To a large extent, the increase in children's DM use was inevitable because DM became the primary way for children and adolescents to connect with their peers, occupy themselves in the absence of outdoor activities, and engage with remote learning. Nevertheless, as previous studies have repeatedly indicated, excessive DM use can increase children's risk of developing DM addiction and negatively impact their social, emotional, and academic functioning (Lissak, 2018). The present study's goals were to assess whether the increase in youth's DM use during COVID-19 was associated with elevated social, emotional, and academic difficulties and to identify risk

factors that may increase children's vulnerability to problematic DM use and the negative emotional or academic consequences associated with it.

1. Theoretical background and hypotheses development

1.1. Negative developmental consequences related to DM use

The American Academy of Pediatrics (AAP, 2016) generally recommends a daily maximum of 2 h of DM time for school-age children, alongside consistent and family-specific limits for DM time use, to ensure that DM use does not interfere with children's sleep, social lives, or academic lives. The studies cited by the AAP suggested that excessive and improper DM use may increase the risk of health and developmental harm. These risks include, for example, language delays (Anderson & Subrahmanyam, 2017) and sleep problems (Carter et al., 2016; Garrison et al., 2011). A large body of research has linked excessive DM use to impaired executive functions, including weakened inhibitory control and working memory (Ioannidis et al., 2019; Lillard et al., 2015), in

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addition to impairments in emotional processing; dysfunctional decision-making, and compulsive-repetitive behaviors (Lin et al., 2012). Some studies have suggested a bidirectional relationship between DM use, attention, and impulsivity problems. Children diagnosed with ADD/ADHD were found at elevated risk compared to controls for excessive DM use and internet addiction (Evren et al., 2018; Gentile et al., 2012; Weiss et al., 2011; Werling et al., 2022).

From the social-emotional perspective, studies have linked DM usage time to depression and suicidal behavior in adolescents (Maras et al., 2015; Woods & Scott, 2016). For example, Liu et al. (2016) found an association between depressive symptoms and DM usage time in children ages 5–18 who used DM for more than 2 h per day. Oshima et al.'s (2012) study showed that negative mood, suicidal tendencies, and self-harm correlate with mobile phone dependency, frequent texting, and constant fear of not receiving messages. Internet addiction was associated with feelings of anxiety and helplessness (LaRose et al., 2003), negative thinking (Yen et al., 2007), and impaired psychological and social functioning (Liu et al., 2016; Yen et al., 2009). Moreover, screen-addicted adolescents had less social support and lower affinity with family members and peers (Pea et al., 2012; Richards et al., 2010; Wu et al., 2016). Concomitantly, studies have indicated a decrease in the frequency and quality of parent-child interaction in the context of excessive DM use (Ko et al., 2015; van Den Eijnden et al., 2010).

1.2. DM usage time and problematic DM use

As seen in the studies described above, the negative consequences of DM use were assessed in relation to DM usage time and dependency. Whereas many studies (e.g., Liu et al., 2016) have focused on DM use duration (i.e., amount of time spent on DM) as the primary indicator for problematic use, other studies have focused on the behavioral aspects related to DM use and particularly on children's addiction level (e.g., Oshima et al., 2012). Domoff et al. (2020) argued that the developmental problems associated with DM use are related to children's ability to balance the positive and negative aspects of DM and to regulate their DM use with their parents' help. According to Domoff's conceptualization, the evaluation of DM consequences should consider the quality of children's usage and thus evaluate aspects related to usage duration alongside aspects related to children's ability to balance, regulate and control their DM use (Domoff et al., 2019). Following Domoff's conceptualization, in the current study, we assess DM use as composed of both usage time and difficulties in regulating DM. We define difficulties in regulating DM use by the presence of addictive behaviors, including preoccupation, tolerance, challenges in controlling use, and the loss of interest in other activities. We assumed, following Domoff et al. (2019) that each component of DM use will have a unique contribution to children's functioning.

1.3. DM use during COVID-19

Studies conducted worldwide during COVID-19 on children and youths have indicated a consistent elevation in DM usage time (Eales et al., 2021; Eyimaya & Irmak, 2021; Pombo et al., 2020). Consistent with studies conducted before COVID-19, those conducted during COVID-19 have demonstrated an association between excessive DM use and negative emotions. Problematic internet use was associated with depression, anxiety, PTSD symptoms (Xie et al., 2021), and anxiety about COVID-19 (Elhai et al., 2020). Furthermore, problematic smartphone and social media use were linked to a higher level of psychological distress, including stress, anxiety, and depression (Chen et al., 2022). A study conducted with children diagnosed with ADHD showed that the engagement in problematic DM use during the pandemic was associated with a worsening in core ADHD symptoms and a significant increase in emotional, behavioral, and academic problems (Shuai et al., 2021).

Several studies that took a normative approach to youth's DM use

suggested that the increase in DM use was an attempt to alleviate the negative emotions experienced during the pandemic. For example, children used DM to reduce loneliness during the imposed social distancing and isolation (Magis-Weinberg et al., 2021). Another study indicated that lonelier adolescents were more likely to experience increased escape motivation, indirectly resulting in problematic mobile phone use (Li et al., 2021). From a family perspective, Al Gharaibeh and Gibson (2021) described that it was easy for parents to ignore excessive DM use during the pandemic as children's engagement with DM helped reduce siblings' quarrels and prevent children from leaving the house or from engaging in risk-taking behaviors.

Taken together, it is possible that for some children, the increased DM use that took place following the pandemic's onset had harmful consequences for their mental health and functioning. However, in other cases, increased DM use has helped children and their parents adapt to the challenging situation of enforced social isolation. Thus, DM use may have a differential effect on children and may have even protected some children from the pandemic's negative consequences. Identifying the mechanisms that underlie children's DM use may enable a better understanding of which children are at high risk of suffering the adverse effects of excessive DM use.

1.4. Risk factors associated with Children's DM use

1.4.1. Parenting

One major factor previously identified as influencing increased DM use and internet addiction is the parent-child relationship. Studies have found that high levels of parental involvement and warmth are related to lower DM use and addiction levels. High levels of parent-child conflict, parental psychological control, and parental *phubbing* (i.e., being distracted by a mobile phone while in the presence of others) correlate with youths' elevated levels of DM use and addiction (Hong et al., 2019; Ko et al., 2015; Lee & Kim, 2018; Li & Hao, 2019; Shek et al., 2018; Xie et al., 2019). Concomitantly, studies have shown that authoritarian and permissive parenting styles are associated with high DM usage time (Langer et al., 2014) and internet addiction (Cheung et al., 2015; Ghaderi Rammazi et al., 2015). A recent review by Beyens et al. (2022) on adolescents' social media use and parenting highlighted the critical role of parents in limiting the frequency of social media use and reducing adverse consequences of social media use (i.e., cyberbullying, anxiety and depression).

Several studies have suggested a bidirectional process according to which children's increased DM use may hamper the quality of the parent-child relationship by reducing opportunities for positive interactions and increasing parent-child conflict regarding DM use. For example, Ko et al. (2015) used a longitudinal design to assess the relationship between family characteristics (i.e., inter-parental conflict and adolescents' satisfaction with family relationships) and adolescents' internet addiction. The results indicated that children from families with higher inter-parental conflict were at increased risk for developing internet addiction. Notwithstanding, adolescents' internet addiction predicted worsening in family relationships. In another study, van Den Eijnden and her colleagues (2010) showed that while the good quality of parent-child communication about internet use contributed to lower problematic internet use, problematic internet use reduced parental communication with children about internet usage. Concomitantly, Padilla-Walker and Coyne (2011) demonstrated that adolescents' high DM use contributed to a reduction in parental involvement and monitoring of DM use, possibly to avoid parent-child conflict.

From the studies described above, it appears likely that the developmental impairment caused by increased DM use is associated with ongoing impairment in family relationships. Negative relationships between children and their parents may increase children's risk of problematic DM. Increased use of DM may reduce parental involvement in children's lives, increase family conflicts around the frequency and nature of DM use, and impair children's interpersonal opportunities for

receiving support.

1.4.2. Behavior dysregulation

An additional risk factor for excessive or problematic DM use is related to children's characteristics, particularly children's difficulties modulating and controlling their behavioral responses. The capacity to regulate behavioral responses (described in the literature in relation to terms like behavioral regulation or self-control) is considered part of the larger self-regulation theoretical construct (Nigg, 2017). While the broader self-regulation construct refers to the dynamic and continuous process of internal and external modulation, self-control or behavioral regulation focuses on the behavioral outcome of the regulatory process, and in particular, the ability to modulate inner experiences (e.g., impulses, attention, and emotions) to meet external demands or longer-term goals (Robson et al., 2020; Sektnan et al., 2010).

Several cognitive mechanisms were consistently described in the literature as central to the capacity to regulate behavioral responses, including the ability to inhibit immediate urges to modulate emotional responses, shift flexibly between activities, and regulate attention (Bednarz et al., 2020; Gioia et al., 2000; Sektnan et al., 2010). It has been suggested that for individuals with deficits in behavioral regulation, there is a disruption in the balance between the impulsive and reflexive processes that curtail their ability to maintain long-term goals in the face of local and enticing stimulation (Wiers et al., 2010). Difficulties with behavioral dysregulation/impulse control were found to contribute to academic and social difficulties, risk-taking behaviors, and addiction (Brandt et al., 2019; Robson et al., 2020).

In the context of DM use, it has been suggested that deficits in the mechanisms involved in the capacity to regulate behavioral response increase children's difficulty in balancing the rewarding aspects of DM use with other academic, social, and family goals, thus making them more prone to developing problematic use compared to children without regulatory deficits (Kardefelt-Winther, 2014; Tokunaga & Rains, 2010). Several studies have supported this suggestion, demonstrating the salient role of attention regulation and inhibitory control in regulating DM use and addiction (Fischer-Grote et al., 2019; Hormes et al., 2014; Van Deursen et al., 2015). Children with difficulties with attention regulation may struggle to switch their attention and focus on less rewarding activities, inhibit the urge to engage with social media, or switch to a different academic or social activity in the middle of an exciting online game. Likewise, children who struggle to modulate emotional responses may develop a higher dependency on DM to regulate negative and positive affect (Kim et al., 2018).

In the COVID-19 pandemic context, the capacity for behavioral regulation can be linked to children's ability to motivate themselves and engage in academic and social activities despite the pull to use DM and the absence of external academic structure and routine. Likewise, involved and supporting parenting can provide an external structure for the child's daily activities and increase the emotional reward for activities outside the DM sphere. Thus, it is possible that while many children used DM more than recommended by the AAP (2016) and WHO (2019), problematic DM use (as indicated by addictive-like behaviors) was more apparent in children with low parental support and difficulties related to behavioral regulation.

1.5. The present study

The COVID-19 pandemic changed the living conditions of many children worldwide, leading to increased social isolation and reliance on DM for social, leisure, and academic activities. The unique circumstances created by the pandemic enable assessment of the differential implications of increased DM use on children's functioning as related to parenting and children's characteristics. Moreover, the high prevalence of excessive DM usage during the pandemic reported by other studies allows for investigating DM frequency and problematic DM use as two related but distinct aspects of DM use.

The present study was conducted in April 2021, during the third government-imposed lockdown in Israel. The study involved a sample of Israeli students in Grades 5–9. We chose this population because it was the only student group that had continuously experienced remote learning since March 2020. Consequently, this age group was considered at elevated risk for social, emotional, and academic difficulties and problematic DM use. Using the unique circumstances created by the pandemic, we tested a path model based on previous studies assessing the contribution of children's behavior dysregulation and parenting to DM usage time and addiction, and the contribution of DM usage time and addiction to children's functioning. We hypothesized that negative parenting practices and children's behavioral dysregulation would be associated with increased usage time and higher rates of addictive behaviors. In turn, increased usage time and higher level of addictive behaviors were hypothesized to contribute separately to children's academic, social, and behavioral difficulties.

2. Materials and methods

2.1. Participants

Participants were children in Grades 5–9 who study in the Israeli Jewish public school system and one of their parents. Six hundred sixty-seven parents (46% mothers) and 516 children enrolled in the study, of which parent–child pairs were selected following filtration (described below), and 347 parent–child dyads with completed measures were obtained (49.3% mothers; 49.3% boys).

Most parents (84%) were married or cohabiting with their partners, and most (86%) had more than 12 years of education. All families identified as Jewish Israelis. Most parents (65%) identified as secular. A measure of crowdedness in the house (persons per room) yielded an average of one person per room in participants' homes and was consistent with previous studies on the Jewish population in Israel (Israeli Central Bureau of Statistics, 2015; $M = 1.35$ people, $SD = 0.79$). The ages of the children who participated in the study ranged from 10 to 15 years ($M = 11.81$ years, $SD = 1.41$), with 69% of the children being under 13 years old. All participants received shopping vouchers as compensation for their participation in the study. We decided to recruit only families whose children study in the Jewish public education system due to the large variance in media usage patterns among the different ethnic and religious groups in Israel before and during COVID-19, which affected children's access to DM and the availability of remote learning (Addi-Raccah & Seeberger Tamir, 2022; Mesch & Talmud, 2011).

2.2. Procedure

Parents were invited to participate in a study through an online survey panel. After signing an informed consent form, parents received online links to the research questionnaires. Parents who completed the surveys and passed a quality assurance check received second online links with research questionnaires to be completed by their children. Parents were instructed to allow their children to complete the questionnaires privately and preferably on their children's own media devices. To avoid biased answers, we emphasized to the children that their answers are confidential, and the parents will not have access to viewing them once the questionnaire is completed.

2.3. Measures

2.3.1. Demographic questionnaire

This questionnaire includes background information: child's gender and age, family composition, parents' ages, parents' religion, level of religiosity, parents' years of education, family income, and family financial changes during COVID-19.

2.3.2. DM addiction

To assess the degree of children's DM addiction, we created a questionnaire comprising questions from the SCREENS-Q questionnaire (Klakk et al., 2020) and the Smartphone Addiction Scale – Short Version (SAS-SV) questionnaire (Andrade et al., 2020). The current questionnaire consisted of nine statements concerning the level of the child's DM addiction (e.g., "My child/I wouldn't be able to stand not using a screen-based device" and "The use of screen-based devices often helps my child/me calm down.") rated on a Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Both parents and children were asked to answer the questionnaire based on the past month. We summarized the participants' responses, and higher scores indicated more addiction symptoms. The questionnaire demonstrated good reliability for both parents' and children's responses (Cronbach $\alpha = 0.85$ and 0.83 , respectively).

2.3.3. DM usage time

To estimate the amount of time children spent on DM for various needs, we used six questions from the SCREENS-Q questionnaire (Klakk et al., 2020). Both parents and children were asked to estimate how much time the child spent on DM on an average week using a 7-point scale (*not at all*, *less than half an hour*, *half an hour to 1 h*, *2 h*, *3 h*, *or 4 h or more*, with an additional option of answering *do not know*). Both parents and children were asked to answer the questionnaire in relation to the past month. The questionnaire includes two questions about using DM for leisure purposes (i.e., watching videos and playing games), one question about using DM for academic purposes, two questions about using DM for social purposes (i.e., social media and video calls), and one question about using DM for other purposes (e.g., editing photos). To estimate the usage times, the answers were recorded in the following fashion: *not at all* = 0, *less than half an hour* = 0.5, *half an hour to 1 h* = 1, *2 h* = 2, *3 h* = 3, *4 h or more* = 4, and *do not know* = missing value. For our analyses, we used only the index of DM usage times for leisure and social purposes.

2.3.4. Child behavioral dysregulation

We used three subscales from the Hebrew version of the Behavior Rating Inventory of Executive Function (BRIEF; Gioia et al., 2000): Inhibit, shift, and emotional control, which together construct the BRIEF's Behavioral Regulation Index (which appears in our analysis as "behavioral dysregulation"). A higher score on this index's subscales indicates more behavioral dysregulation. The Behavioral Regulation Index contains 34 items rated on a 3-point scale: 0 (*never*), 1 (*sometimes*), and 2 (*often*). We asked parents to complete the questionnaire in relation to the child's regular functioning. The questionnaire showed excellent internal reliability (Cronbach's $\alpha = 0.95$).

2.3.5. Child emotional and behavioral difficulties

We used the Hebrew version of the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) to evaluate children's emotional and behavioral functioning (appears in the analysis as "emotional and behavioral difficulties"). The SDQ consists of 25 items describing positive and negative attributes. The questions form five subscales: emotional symptoms, conduct problems, hyperactivity-inattention, peer problems, and prosocial behavior. Each subscale contains five items, which are rated on a 3-point scale: 0 (*not true*), 1 (*somewhat true*), and 2 (*certainly true*). Higher scores on the prosocial behavior subscale reflect strengths, whereas higher scores on the other four subscales reflect difficulties. In the current study we asked parents to complete the questionnaire in relation to the child's functioning in the past month. We calculated a total difficulty score by summing all subscales but the prosocial behavior subscale.

2.3.6. Parenting

We used the Hebrew version of the Multidimensional Assessment of Parenting Scale (MAPS; Parent & Forehand, 2017) to assess positive and

negative parenting practices. The MAPS contains 34 items and broadly assesses positive and negative parenting. The 16-item positive parenting subscale includes items representing proactive parenting, positive reinforcement, warmth, and supportiveness (e.g., "I express affection by hugging, kissing, and holding my child."). The 18-item negative parenting subscale includes items representing hostility, lax control, and physical control (e.g., "I use threats of punishment with little or no justification"). Parents responded to each item using a 5-point Likert scale ranging from 1 (*never*) to 5 (*always*). In the current study, both positive and negative parenting subscales showed good to excellent reliability (Cronbach's $\alpha = 0.88$ and 0.79 , respectively).

2.3.7. Academic functioning

To assess children's academic functioning during COVID-19, we created a scale based on five items taken from the Homework Performance Questionnaire (Power et al., 2015) and two questions from the Motivation and Engagement Questionnaire (Lee & Reeve, 2012). All questions were adapted to the online learning context. Both parents and children were asked to answer the questions using a Likert scale ranging from 1 (*never/seldom*) to 4 (*always/almost always*). The revised questionnaire showed good reliability for both parents' and children's responses (Cronbach's $\alpha = 0.87$ and 0.83 , respectively).

2.4. Consistency index

To monitor the quality of participants' responses across questionnaires, we created a variable measuring inconsistent response patterns. We selected two pairs from each questionnaire that should be answered similarly and calculated the absolute gap between the items in each pair. A consistency score was created by summing up the absolute gap scores of all pairs.

2.5. Data cleaning

To ensure high response quality by both parents and children, we excluded the following cases: (1) participants who did not study in the Israeli public education system (77 parents whose children were studying in the ultra-Orthodox education system); (2) participants whose survey response time was shorter than 2 *SD* from the expected response time (43 parents and 42 children); (3) participants who incorrectly answered the survey's attentiveness questions (23 parents and 25 children); (4) participants who answered the questionnaire twice (6 parents and 15 children); (5) participants who did not complete the questionnaires (17 parents and 42 children); (6) participants who reported unrealistic children's DM use (higher than 2 *SD* from the average; 11 parents and 11 children); and (7) participants who scored above the 90th percentile on the consistency index (8 parents and 14 children).

2.6. Data analysis

First, we conducted reliability analysis for all study measures. Second, we performed correlation analyses to assess the measures' construct validity and identify possible covariates. Finally, we conducted path analysis using Amos 21 to assess the contributions of parenting practices and children's behavioral dysregulation to DM use and addiction and the effects of DM use and addiction on children's academic, behavioral, and emotional functioning.

3. Results

3.1. Preliminary analyses

Table 1 shows the distributions of the children's DM use as reported by the children and divided gender. As can be seen, children reported an average of 7.2 h of DM use for leisure and social purposes (*SD* = 3.7 h) and an average of 2.7 h of DM use for educational tasks excluding online

Table 1
Descriptive statistics of Children’s report on digital media usage time.

Digital Media Category	Girls	Boys	Total
Watching	<i>M</i> (<i>SD</i>) 2.0 (1.3)	<i>M</i> (<i>SD</i>) 1.9 (1.1)	<i>M</i> (<i>SD</i>) 2.0 (1.2)
Gaming	1.4 (1.2)	2.3 (1.3)	1.8 (1.4)
School-Related Tasks	2.9 (1.2)	2.6 (1.3)	2.7 (1.3)
Video Calls	1.5 (1.2)	1.0 (1.1)	1.3 (1.2)
Social Networks	2.0 (1.3)	1.2 (1.1)	1.6 (1.3)
Other	0.9 (1.0)	0.6 (0.9)	0.7 (1.0)
Digital Media Usage Time for Leisure and Social Purposes	7.5 (3.4)	7.0 (3.7)	7.2 (3.4)
Total Digital Media Usage Time	10.2 (4.0)	9.5 (3.9)	9.9 (3.9)

Note. “Watching” refers to watching videos, movies, or t/v series; “Gaming” refers to playing games via smartphone, tablet, game console, or PC. “Social Networks” refers to all means of social communication; “Other” refers to uses of screen-based devices for other functions.

classes (*SD* = 1.3 h). There was a significant difference between boys and girls in the type of media used for leisure, with higher levels of game playing reported by boys ($t = 6.74, p < .01$) and higher level of social media use reported by girls ($t = -5.60, p < .01$).

Table 2 presents the distributions of the parents’ responses regarding their children’s emotional and behavioral functioning. As shown, the average total difficulties score reported by the parents ($M = 10.2, SD = 6.11$) was higher than the normal range or 0–9 reported in a study conducted in Israel before COVID-19 (Mansbach-Kleinfeld et al., 2010). Moreover, parents reported statistically significant higher levels of externalization symptoms in boys ($t = 2.1, p < .05$), and marginally statistically significant higher internalization symptoms for girls ($t = -1.7, p = .08$).

Table 3 presents Pearson’s correlation coefficients among the main study variables. Upon examining the correlations, we found that all correlations between parents’ and children’s reports indicated moderate-to-strong positive relationships (Correlations between children’s and parent’s reports are provided in the Supplemental). Additionally, *t*-test analyses showed a significant gap in parents’ and children’s responses regarding DM use ($t = -7.24, p < .01$), with a medium effect size, and regarding DM addiction ($t = 4.58, p < .01$), with a small effect size; relative to their parents, children reported more DM addiction symptoms and less DM use. Because of the significant correlation between parents’ and children’s reports on DM addiction ($r = 0.59, p < .01$), DM use ($r = 0.45, p < .01$), and academic performance ($r = 0.72, p < .01$), we decided to use the children’s reports in the hypothesis analysis described below. We added the results of the parents’ analyses to the Supplemental.

In relation to the demographic variables, we found a small correlation between children’s ages and their DM use ($r = 0.20, p < .01$), behavioral dysregulation ($r = -0.21, p < .01$), and emotional and behavioral difficulties ($r = -0.11, p < .05$), suggesting that older

Table 2
Descriptive statistics for Children’s emotional and behavioral difficulties.

	General	Emotional Symptoms	Conduct Problems	Hyperactivity	Peer Problems	Prosocial Behavior
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)
Total	10.2 (6.1)	2.7 (2.2)	2.0 (1.8)	3.3 (2.3)	2.1 (1.8)	7.1 (2.2)
Boys	10.3 (6.0)	2.4 (2.1)	2.0 (1.9)	3.7 (2.3)	2.1 (1.9)	6.8 (2.3)
Girls	10.1 (6.2)	3.0 (2.3)	1.9 (1.7)	3.0 (2.3)	2.1 (1.8)	7.3 (2.1)
Norm*	0–9	0–2	0–2	0–3	0–2	8–10

Note. Children’s emotional and behavioral difficulties were measured using the strengths and difficulties questionnaire (SDQ; Goodman, 1997); Norms are based on Mansbach-Kleinfeld et al. (2010).

children reported more DM use, less behavioral dysregulation, and less emotional and behavioral difficulties. The children’s families’ income had a small negative correlation with the children’s levels of emotional and behavioral difficulties ($r = -0.16, p < .01$). Additionally, and consistent with theory, the correlation analysis indicated moderate negative correlations between academic performance and behavioral dysregulation ($r = -0.28, p < .01$) and between academic performance and DM addiction ($r = -0.31, p < .01$), and a moderate positive correlation between behavioral dysregulation and DM addiction ($r = 0.37, p < .01$).

3.2. Hypothesis testing

We conducted a structural equation model analysis using Amos 21 to assess the contribution of parenting practices and children’s behavioral dysregulation to children’s DM use and addiction and the effects of DM use and addiction on the children’s academic, behavioral, and emotional functioning. We assessed this model while controlling for children’s age and family income. This model’s fit was insufficient: $\chi^2(11) = 25.15, p < .001$; normed fit index (*NFI*) = 0.58; comparative fit index (*CFI*) = 0.57; Tucker–Lewis index (*TLI*) = -0.41; root mean square error of approximation (*RMSEA*) = 0.26. The modification indices suggested the existence of both direct and indirect effects of parenting practices and children’s behavioral dysregulation on children’s emotional, behavioral, and academic functioning. We created a revised model to account for both direct and indirect effects (see Fig. 1). The model’s fit to the data was adequate: $\chi^2(6) = 1.65, p = .129$, goodness-of-fit index (*GFI*) = 0.99, adjusted goodness-of-fit index (*AGFI*) = 0.95, *CFI* = 0.99, *RMSEA* = 0.043.

Table 4 summarizes the results of the path analysis. As can be seen in the table, negative parenting practices ($\beta = 0.22, p < .001$) and children’s behavioral dysregulation ($\beta = 0.21, p < .001$) were significant predictors of DM addiction. Furthermore, DM addiction was an important predictor of behavioral and emotional symptoms ($\beta = 0.10, p < .001$) and academic functioning ($\beta = -0.02, p < .01$). The paths described above suggest that negative parenting practices and children’s behavioral dysregulation contribute to children’s emotional, behavioral, and academic difficulties partially through DM addiction. No significant paths were indicated in relation to digital media usage time.

In addition to the indirect effects described above, direct effects were indicated for positive parenting practices ($\beta = -0.11, p < .001$), negative parenting practices ($\beta = 0.10, p < .01$), and children’s behavioral dysregulation ($\beta = 0.36, p < .001$) on children’s behavioral and emotional difficulties. Direct effects were indicated also for positive parenting practices ($\beta = 0.01, p < .01$) and children’s behavioral dysregulation ($\beta = -0.01, p < .001$) on children’s academic functioning. Finally, regarding our demographic variables, we found a path between age and DM use ($\beta = 0.43, p < .001$) and one between family income and children’s behavioral and emotional difficulties ($\beta = -0.57, p < .05$).

The results of the modeling conducted using the parents’ responses were consistent with those of the modeling conducted using the children’s responses with one exception: In the parent’s report, a direct path was observed between negative parenting practices and DM use, suggesting that negative parenting contributed to increased DM use (see

Table 3
Pearson correlation coefficients of the main study variables.

	1	2	3	4	5	6	7	8	9
1. Child Age	–	.06	–.21**	.11*–	–.10	–.05	.00	.20**	–.04
2. Family Income		–	–.09	–.16**	.07	–.06	–.09	.08–	.05
3. Behavioral Dysregulation			–	.75**	–.02	.40**	.37**	–.01	–.28**
4. Emotional and Behavioral Difficulties				–	–.18**	.43**	.42**	.90	–.33**
5. Positive Parental Practices					–	–.17**	.00	.04	.14**
6. Negative Parental Practices						–	.30**	.06	–.12*
7. Digital Media Addiction							–	.38**	–.31**
8. Digital Media Use								–	–.09
9. Academic Function									–
M (SD)	11.81 (1.41)		44.61 (11.08)	10.19 (6.11)	61.71 (8.60)	36.68 (6.65)	31.57 (7.80)	7.25 (3.41)	2.80 (0.60)

Note. ** $p < .01$, * $p < .05$.

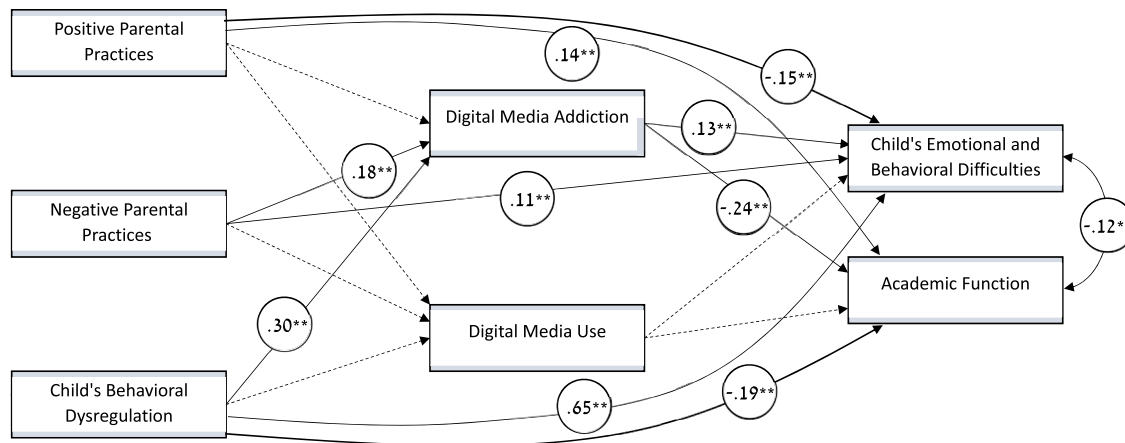


Fig. 1. Path analysis modeling the relationship between parental practices, Children’s behavioral dysregulation, DM use, DM addiction, and Child’s functioning.

Table 4
Path analysis summary based on Children’s report.

Simple Paths	Effect	p
Age → Digital Media Use	.18	<.001
Family Income → Emotional and Behavioral Difficulties	–.07	.043
Positive Parental Practices → Emotional and Behavioral Difficulties	–.15	<.001
Positive Parental Practices → Academic Function	.14	.004
Negative Parental Practices → Emotional and Behavioral Difficulties	.11	.003
Behavioral Dysregulation → Emotional and Behavioral Difficulties	.65	<.001
Behavioral Dysregulation → Academic Function	–.19	<.001
Digital Media Addiction → Emotional and Behavioral Difficulties	.13	.001
Digital Media Addiction → Academic Function	–.24	<.001
Indirect Paths	Effect	p
Negative Parental Practices → Digital Media Addiction → Emotional and Behavioral Difficulties	.02	.010
Negative Parental Practices → Digital Media Addiction → Academic Function	–.04	.008
Behavioral Dysregulation → Digital Media Addiction → Emotional and Behavioral Difficulties	.04	.017
Behavioral Dysregulation → Digital Media Addiction → Academic Function	–.07	.006

Note. Path analysis based on parents’ report is provided in the supplemental.

Supplemental material). Taken together, the modeling’s results suggested both direct and indirect effects of parenting practices and children’s behavioral dysregulation on children’s emotional, behavioral, and academic difficulties. Moreover, the results suggest that these effects were mediated by DM addiction but not by DM use.

4. Discussion

4.1. Summary of findings

The current study aimed to assess the contribution of DM use during the COVID-19 pandemic to adolescents’ emotional, behavioral, and academic difficulties. In particular, the study sought to expand previous research on the implications of DM use by assessing the contribution of DM usage time and problematic DM use to adolescents’ functioning separately and by examining the contribution of DM to children’s functioning in the context of the parent–child relationship and children’s behavioral dysregulation. Thus, the current study aimed to assess a comprehensive model of the effects of DM on children’s functioning that considers usage characteristics (i.e., time and dependency level), context (i.e., the pandemic), and the child and parenting characteristics. This is the first study we are aware of that assessed the contribution of DM use to children’s functioning while simultaneously considering the role of parenting and child characteristics as contributors to DM usage patterns and children’s functioning. Moreover, the unique circumstances of the COVID-19 pandemic provided a naturalistic opportunity to test DM usage time and DM addiction as two related but separated constructs and, thus, to better identify usage characteristics contributing to children’s difficulties.

The results of the current study indicated relatively high DM use among the study participants compared to previous research conducted before and during COVID-19 (Eyimaya & Irmak, 2021; Hutzler et al., 2021; Moore et al., 2020). Additionally, the results indicated high emotional and behavioral difficulty rates compared to age-based norms. Consistent with the research hypothesis, DM frequency use and DM addiction had differential effects on the children’s functioning. DM addiction, but not the frequency of DM use, was linked to elevated rates of emotional, behavioral, and academic difficulties. Negative parenting

practices and children's behavioral dysregulation contributed to increased DM addiction and had both direct and indirect effects on children's functioning through DM addiction. Moreover, positive parenting directly affected children's emotional, behavioral, and academic functioning, regardless of DM use.

4.2. COVID-19-related patterns of DM use

The increased use of DM reported by both parents and children in the current study is consistent with findings from other studies conducted around the world during COVID-19 (For example, [Paterson et al., 2021](#); [Runacres et al., 2021](#); [Schmidt et al., 2020](#); [Ten Velde et al., 2021](#); [Xiang et al., 2020](#)). Alarming, compared to studies conducted during the pandemic, the DM usage time reported by this study's participants (parents and children) was relatively high. One explanation for the higher usage rates reported in the current study can be related to the measure used. We used six questions from the SCREENS-Q questionnaire ([Klakk et al., 2020](#)), asking parents and children to estimate DM usage times for each usage category. Although there was a high correlation between the parents' and children's reports (which strengthened the measure's reliability), it is possible that the categorized assessment of usage time failed to account for usage overlaps (i.e., using two or more modes simultaneously) and thus contributed to an overestimation of the total usage time. Further research applying objective measures of usage time is needed to evaluate whether usage time is higher among Israeli youth.

4.3. DM Use's effects on Children's functioning

In addition to the elevation indicated in DM usage time, this study's results showed an elevation in social, emotional, and behavioral difficulties among the studied youths. This elevation aligns with other studies conducted worldwide, indicating a significant worsening in children's and youths' well-being since the COVID-19 outbreak. The increase in social, emotional, and behavioral difficulties may be an outcome of profound changes in family, social, and educational conditions due to the crisis, as well as the global atmosphere of anxiety children were facing during the pandemic ([Nearchou et al., 2020](#); [Prime et al., 2020](#)). A recent review of 102 studies examining the psychological effects of COVID-19 on children and adolescents described an increase in anxiety and depression among the study populations ([Chawla et al., 2021](#)). Moreover, the review indicated a consistent link between reduced physical activity, increased DM usage time, prolonged sitting times, and elevated anxiety and depression.

Although the current study's results support the link between DM use and children's functioning, this relationship was indicated only in relation to indicators of problematic DM use (i.e., markers for addictive use). This finding suggests that not every child who uses DM excessively will develop emotional and behavioral difficulties. The child's experience of DM usage, particularly the child's experience of emotional and behavioral dependency on DM, may account for the development of emotional and behavioral difficulties. Considering the unique context of COVID-19 (i.e., the enforced social isolation), it is possible that the observed increase in DM use for some children was an adaptive response to the new reality of limited outdoor opportunities and social interactions. In line with the compensatory internet use theory ([Kardfelt-Winther, 2014](#)), DM use may have enabled children to escape the negative feelings related to the challenging external situation.

The differential contributions of DM use and DM addiction found in the current study highlight the importance of assessing the motivational and contextual aspects of DM use (e.g., whether alternative modes of entertainment or communication are available to the child) to understand its adaptive and non-adaptive aspects.

4.4. DM addiction and behavioral dysregulation

The high correlation between children's emotional, behavioral, and academic functioning and their behavioral dysregulation found in the current study underscores the centrality of ongoing difficulties related to behavioral dysregulation (measured in relation to impulse inhibition, emotional control, and shifting) for children's functioning in different domains and during stressful times, such as COVID-19. It is possible that the higher stress level, the social isolation, and the reduced structure that characterized COVID-19 placed higher demands for emotional and behavioral regulation on children while providing them with less external regulatory support. For children with prior regulatory deficits, these new conditions further reduced their ability to balance internal and external demands and increased their propensity for experiencing mental health and academic problems. Several studies conducted during the pandemic provided support to this assumption indicating the central role of self-control as a buffer against the negative implications of COVID-19 on mental health ([Schnell & Krampe, 2020](#)), and the adherence to remote learning ([Martarelli et al., 2021](#)).

In the context of children's DM use, the current study's results revealed a significant relationship between children's behavior dysregulation and their reported DM addiction. This finding is consistent with previous studies highlighting the higher risk of developing elevated DM use and DM addiction among children with impulse control or behavioral dysregulation difficulties ([Fischer-Grote et al., 2019](#); [Hormes et al., 2014](#); [Van Deursen et al., 2015](#)). Moreover, it is possible that during COVID-19, DM became an accessible and central means for self-regulation, enabling children to increase positive affect in the absence of in-person interactions and to reduce negative feelings related to the loneliness and stress that characterized the new condition. Consistent with [Tokunaga and Rains' \(2010\)](#) deficient self-regulation model, it is possible that children with behavior dysregulation experienced difficulties inhibiting the urge to use DM for regulation or to shift to other activities that may have improved their emotional experience in the longer term.

A study conducted during COVID-19 provided some support for this direction, showing that escape motivation among adolescents with high impulsivity and low self-control predicted problematic use of mobile phones more than among adolescents with high self-control ([Li et al., 2021](#)). That is, adolescents with high levels of self-control were able to overcome the escape motivation caused by loneliness (e.g., through conversations with family or cooking; [Killgore et al., 2020](#)), thus avoiding problematic use of mobile phones, unlike adolescents with low self-control, who could not resist the temptation to use mobile phones to regulate their negative affect.

4.5. DM addiction and parenting

Beyond the central role of children's behavioral dysregulation, the results of the present study highlighted the significant role of parents. Among children whose parents reported high levels of negative parenting (manifested as low involvement, elevated hostility, increased control, and physical punishment), higher levels of DM addiction were reported, as well as elevated emotional and behavioral difficulties. These results are consistent with a recent study from Brazil conducted during COVID-19 that indicated the contribution of authoritarian parenting style to children's behavioral problems and gaming addiction ([Oliveira et al., 2022](#)), and with [Aral & Usta \(2022\)](#) findings suggesting that greater parental supervision may protect the development of internet addiction among children diagnosed with ADHD.

The current study's correlational nature does not allow for an examination of the relationship's directionality (i.e., the effect of children's DM addiction on parenting). Nevertheless, based on previous studies, there is a possibility that negative parenting creates a cycle of disengagement between parents and their children, resulting in children's increased reliance on digital media for regulation of positive and

negative affect (Hong et al., 2019; Ko et al., 2015; Lee & Kim, 2018; Li & Hao, 2019; Shek et al., 2018; Xie et al., 2019). Children's higher dependency on DM may further contribute to children's disengagement from parents and increase the parent-child conflict around DM use (Boniel-Nissim et al., 2015; Kildare & Middlemiss, 2017; Ko et al., 2015; Liu et al., 2020, p. 111; McDaniel & Radesky, 2018).

Another interesting finding relates to positive parenting (reflected by parental support, warmth, and positive reinforcement). The present study found that positive parenting contributes uniquely to children's emotional, behavioral, and academic functioning. Specifically, children of parents who expressed higher levels of warmth and support showed low levels of emotional and behavioral difficulties beyond DM use and DM addiction. This finding is consistent with existing literature and reinforces the critical role of available and supportive parenting as a resilience source even in times of crisis (Prime et al., 2020). Consistent with our work, research conducted during COVID-19 on children in Spain demonstrated that supportive parenting was a protective factor against children's emotional and behavioral difficulties (Romero et al., 2020).

It is possible that COVID-19's unique characteristics, especially the increased DM use that characterized a large proportion of youth, reduced positive parenting's impact on DM use and addiction so that children of supportive and involved parents also showed higher reliance on DM. Further research is needed to investigate the different implications of positive and negative parenting on DM use.

4.6. Theoretical implications

The implications of DM use on children's development are a major area of scientific and public interest and concern. Although there is growing evidence of excessive DM use's potential harm to children's cognitive, social, and emotional development, little is known about the implications of excessive DM use under different circumstances and in relation to children's characteristics and the parenting environment. Part of the challenge of assessing potential moderators to the negative implications of excessive DM use is related to DM use's bidirectional effect on children's developing capacities and the resulting difficulty of deciphering excessive DM use's impact and children's characteristics. The COVID-19 context (i.e., the mandated social isolation and school closure) provided a unique opportunity to test the effect of excessive DM use on children's functioning while assessing this effect in relation to personal and interpersonal characteristics. The current study's results suggested that children's usage experience, particularly their ability to regulate their use, is more closely linked to behavioral, emotional, and academic implications than their usage time. Moreover, children's excessive DM use was unrelated to social, emotional, and academic functioning in the context of benign parent-child relationships and age-typical capacity for behavioral regulation.

The current study's findings highlight the differential implications of DM use on children's functioning. It supports the need to develop a more precise conceptualization of problematic versus normative DM use. An improved conceptualization should consider behavioral and emotional aspects of DM use and the circumstances related to the use, such as whether alternative modes of entertainment or communication are available for the child. A more precise conceptualization of problematic DM use entails developing an improved understanding of normative or benign DM use. For example, by evaluating DM use in relation to social, recreational, and academic activities that are typical to the age group, thus focusing on what children use DM for and how their DM use serves normative developmental motivations such as socialization and play.

The need to develop a more balanced and evidence-based approach to children's DM use was highlighted by other researchers. For example, Cernikova et al. (2018) showed that children's experience of mental health problems related to DM use was less severe than their awareness of their potential harm. The results of Cernikova et al.'s study suggested that the public information on DM implications might emphasize severe

cases and portray more extreme consequences to children's DM use that is different from children's actual experience. A more precise conceptualization of problematic and normative DM use can reduce some public fear of DM use and improve the identification of children at risk for developing problematic DM use.

4.7. Limitations

Along with their importance, the current study's results should be considered in light of several limitations. First, the study was based on self-report measures. Despite the steps taken to monitor the responses' quality, there is a risk that the parents' and children's responses were influenced by social desirability and the level of attention participants dedicated to completing the questionnaires. In particular, in spite of the measures taken to ensure children's confidential response, there is a chance that children's report was biased if parents did not enable them to complete the survey privately. Additionally, it is possible that the self-report measure used to assess DM usage time provided an inaccurate estimation of the actual time spent using DM. Second, the data was collected entirely during COVID-19, and there is no available data on any of the measures before the pandemic. Thus, it is difficult to conclude whether the results are unique to the COVID-19 context and whether there was an elevation in DM addiction and use following the pandemic's onset. Concomitantly, it is necessary to apply careful considerations in generalizing the findings to DM use during routine times. Finally, while our results indicated relationships between the constructs, collecting the data at a one-time point, with no comparison to pre or post-COVID reporting, precludes our ability to identify the directionality of the effects or conclude that the patterns observed are specific to the context of COVID-19. Additional data collection waves are needed to determine the direction of the relationship between DM use and parenting and to identify whether the patterns identified continue to exist in post-pandemic times. Moreover, collecting qualitative information from parents and children is required to identify and understand children's perceptions regarding DM use, as well as to identify effective parenting practices protecting from the development of problematic DM use.

5. Conclusions

Excessive DM use among children is associated with social, academic, and mental health difficulties. Nonetheless, as children's use of DM increases globally and includes social, recreational, and academic activities, there is a need to identify more precisely the conditions and usage patterns that cause a risk to children's functioning and development. The global increase in children's DM use during COVID-19 provided a unique situation to assess usage time and usage patterns as two separated constructs and to identify children for whom excessive DM use poses a higher risk for the development of emotional, behavioral, and academic difficulties. The results of our study that was conducted with Israeli youth in April 2021 showed that while many children used DM excessively, only children whose use was characterized by high behavioral and emotional dependency showed related emotional, behavioral, and academic difficulties. Moreover, the risk for experiencing DM addiction, mental health, and academic difficulties was higher among youth whose parents reported hostile and controlling parenting and for children with chronic behavior dysregulation. The study results underscore the need to focus on addictive behavior rather than usage time as an important marker for risky DM use and highlight the parent-child relationship and children's capacity for behavioral regulation as critical factors to consider when attempting to improve children's mental health and academic functioning and to reduce harm related to children's DM use.

6. Recommendations for practice

The current study's results have several implications for practice:

- Parents and educators should pay attention to signs of problematic DM use when assessing the risk involved in DM use. A focus on dependency signs instead of on usage time can improve the early identification of children at elevated risk for negative consequences related to DM use and can reduce some of the public anxiety related to DM use.
- In the context of problematic DM use, special consideration should be paid to children with preexisting neurodevelopmental problems and deficits in behavioral-regulation/self control. These children may be at elevated risk for problematic DM use, and their use may need to be supervised and regulated more closely.
- Parents should be aware of their role in reducing problematic DM use and the association between the quality of their relationships with their children and their children's susceptibility to problematic use. Programs intending to reduce DM addiction should hence focus on the quality of the parent-child relationship as an important avenue to reducing problematic use.

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Declaration of interest statement

The authors declare that they have no conflict of interest.

Ethics statement

All procedures performed in this study were in accordance with the ethical standards of the 1964 Helsinki declaration and its later amendments or comparable ethical standards, and were approved by the ethics committee of the School of Education at the Hebrew University # 2021Y1903.

Authors credit

Bar Shutzman: Conceptualization, Methodology, Investigation, Formal analysis, Writing - Original Draft, **Naama Gershly Tsahor:** Conceptualization, Methodology, Formal analysis, Writing - Original Draft, Supervision, Funding acquisition.

Note. * $p < .05$, ** $p < .01$.

Note. Standardized beta coefficients of significant paths are provided in the circles. Significant pathways are shown in the black lines. Non-significant pathways are shown in the dashed lines. ** $p < .01$.

Data availability

The data that has been used is confidential.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.chb.2022.107559>.

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