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A Naturalistic Study of Child and Family Screen Media and Mobile Device Use

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Abstract

Parental mediation of screen media (e.g., television, video games) is associated with better outcomes for children. Although much research has examined parental mediation of television (TV), there is a dearth of research examining communication about mobile media (e.g., Smartphones, tablets) in the digital age. This study seeks to identify themes of family communication around media and mobile devices using naturalistic observational methodology. The sample consisted of 21 toddlers (ages 12–24-months old), 31 preschool-age children (3–5 years old), and 23 school-age (10–13 years old) children and their families. Children wore Language ENvironment Analysis (LENA) audio recording devices, which recorded vocalizations and other sounds proximal to the child wearing the device in the home environment, as well as audible screen media use. ATLAS.ti was used to transcribe dialogue from the audio recordings that pertained to screen media. Experts from the fields of communication, clinical child psychology, and developmental-behavioral pediatrics independently analyzed the transcripts to identify common themes. Five main themes emerged. First, parental mediation of screen media was primarily restrictive, reactive, and focused on technology functionality. Second, active mediation was child-driven. Third, siblings played a more dominant role in mediation than parents. Fourth, parents and children negotiated screen time limits. Finally, parallel family media use was common. Multiple family members engaged with their own mobile devices while simultaneously being exposed to background screen media (i.e., media multitasking). Assessing media use in the naturalistic home environment elucidated current patterns of family media use and communication about media in the digital age.

Keywords Media · Mobile devices · Parental mediation · Media multitasking · Naturalistic · Parenting

Mobile media (e.g., Smartphones and tablets) have proliferated in the digital age, providing youth and their parents with opportunities to use screen media at any time and any place. Increased access to, and ownership of, mobile technology by children of all ages characterizes this new digital age. The number of children 0 to 8 years who have access to mobile devices has increased from 52% in 2011 to 75% in 2013 (Rideout 2013). Further, well over half of households with youth ages 8–12 years have smartphones (79%) and tablets (80%) (Rideout 2015). Younger children are gaining access to mobile technology, with personal ownership of mobile media devices occurring earlier in childhood. For example, Kabali et al. (2015) found that three-fourths of children had their own mobile media device by age 4 years.

Due to the potential negative effects of screen media, there has been concern about the impact of newer media on children's development and what parents can do to manage children's mobile media use. Research on children's television (TV) use over the past two decades has found that parents' mediation, or the way in which parents engage (or not) with their children around screen media, may mitigate negative effects and enhance positive effects of children's media use (see Collier et al. 2016 for a meta-analysis).

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Three types of parental mediation are active mediation, restrictive mediation, and social co-viewing (Valkenburg et al. 1999). Active mediation consists of parents' communication with their children about media content, including characters' actions and motivations. Active mediation of TV has been found to mitigate the risks of exposure to violent media (e.g., aggression; Nathanson and Cantor 2000), and enhance positive effects of prosocial media (e.g., *Daniel Tiger's Neighborhood*; Rasmussen et al. 2016). Restrictive mediation, or setting limits or rules about the content and duration of media use, has also been linked to better outcomes for children and reduced screen time (e.g., Gentile et al. 2014). Social coviewing consists of parent and child viewing media programming together, but without active dialogue about content (Valkenburg et al. 1999). Social coviewing may have positive or negative effects on children depending on the content of the program viewed (e.g., Nathanson 1999). Taken together, parental mediation plays an important role in managing children's media use and potentially influencing media effects.

Although parental mediation is beneficial for optimizing media's effects, parents may find it difficult to manage their children's media use, especially for young children. Although technology has the ability to support the learning of young children (e.g., Plowman et al. 2008; Plowman and Stephen 2007), there has been an emphasis by parents to support their children's operational skills (i.e., independent use of mobile devices), which may interfere with joint use and active mediation of content on these devices (Plowman et al. 2010). Additionally, mediation strategies pose challenges for parents such as causing in-home conflict and making childcare more time-intensive. Limiting media use also requires parents to present alternative entertainment sources to their children, which requires resources that may be unavailable to some families (Evans et al. 2011). Parents may also have insufficient knowledge for effectively managing their children's media usage, such as being unfamiliar with the technology and lacking information about media use guidelines (Nevski and Siibak 2016; Nikken and de Haan 2015). Additionally, the presence of multiple siblings in the household may further complicate mediation efforts. Although older siblings may expose the younger child to age-inappropriate content (Nikken and de Haan 2015), older siblings may also serve as guides for the younger siblings' media use, demonstrating to the younger sibling how to use smart devices and choosing the content which the younger sibling engages in (Nevski and Siibak 2016).

Most research on parental mediation has focused on TV, and to a lesser extent video games and the Internet. Parents utilize restrictive mediation, active mediation, and co-use with video games and internet as well, similar to strategies that parents use to mediate TV (Nikken and Jansz 2006;

Nikken and Jansz 2014). Other types of mediation strategies have emerged with managing adolescents' use of the Internet. For example, Nikken and Jansz (2014) revealed that parents might incorporate supervision strategies to regulate young children's internet usage, which requires a nearby parent to monitor the child engaging in internet use. Livingstone and Helsper (2008) also identified software-based techniques, such as filtering and monitoring, that were being used by parents to mediate adolescents' internet use. Despite this research on parental mediation of video games and the Internet, we still know very little about how parents and children communicate about mobile media and *how* families use screen media (old and new) in digitally saturated home environments.

Naturalistic observational methods are crucial to identifying phenomena not yet characterized in the literature, and are uniquely well-suited to the study of family mobile media use. Just as observational research in the 1980s and 1990s provided deep inspection of family's television use (e.g., Gunter et al. 1995; Krendl et al. 1993; Lull 1980), similar naturalistic studies are needed in our current digital age. Compelling ethnographic research utilizing interviews with adolescents and adults has provided a deeper understanding of mobile technology use and potential effects (Katz 2014; Turkle 2011, 2015) and qualitative research utilizing interviews with parents and adolescents have yielded important insights that extend parental mediation theory (Jiow et al. 2016). However, to our knowledge, no naturalistic observations of children in their *homes* have documented how parents, children, and siblings *talk* about media. Recently, mobile recording devices have been used to capture the home media environment in young children in 2010–2011 (Waters et al. 2016), just as tablets were being introduced by Apple and Samsung. This technology, known as the Language ENvironment Analysis (LENA; LENA Research Foundation, Boulder, CO) has the capacity to move with the child (an essential feature in order to study similarly mobile media) and identify electronic media signals in the child's environment. Although prior research has utilized LENA to quantify duration of media use and its association with parent and child vocalizations (e.g., Christakis et al. 2009; Zimmerman et al. 2009), no studies, to our knowledge, have transcribed the communication that occurs during media exposure in the families' homes. Given its capacity to document the home media environment, LENA was used in the current study in a sample of families with children across developmental periods (toddlers to school-age children). The aim of this study was to facilitate a deeper understanding of how families talk about media in the digital age in order to build novel frameworks for future study of mobile media in the home, as well as inform clinical recommendations.

Method

Participants

The current study is part of a larger longitudinal study that occurred in 2014–15 examining predictors of children's healthy growth and development; it was approved by the University of Michigan Institutional Review Board. Recruitment flyers were posted in pediatric primary care clinics and other health and child agencies within a one-hour radius of the authors' institution. Interested families contacted study staff and were screened for eligibility. Inclusion criteria were: (1) child between the ages of 12.0 to 24.0 months ("toddlers"), 3.00 to 5.99 years ("preschool-age children"), or 10.00 to 12.99 years ("school-age children"); (2) at least one legal guardian lives in the home with the child; (3) child lives in only one home at least five of seven days a week; (4) child has no major medical or developmental concerns; (5) family speaks English at home most of the time and is able to speak only English on days of recording; (6) child was born at gestational age ≥36 weeks; (7) child is without significant dietary restrictions; and (8) participating parent and child have no barriers to physical movement.

Forty toddlers, 40 preschool-age children, and 52 school-age children and their families participated ($N = 132$ parent-child dyads). Of the total sample, 89 families (67.4%) submitted audio recordings for analysis; 75 (84.3%) of whom had audible electronic media use during the recordings. There were no significant differences in demographic characteristics (e.g., child age, child gender, child race/ethnicity, mother age, mother education level, single-parent households, and income-to-needs ratio) between families who did versus families who did not have recordings (p's > .10). The final sample of children was 54.7% male and the majority non-Hispanic White. The sample consisted primarily of families whose primary caregiver had higher education (i.e., 82.7% had taken college courses or had a college degree or higher; see Table 1 for full descriptive statistics).

Procedure

Participants were informed that the audio recordings of family interactions would be analyzed, and written informed consent from the legal guardian for all children as well as assent from the school-age children was obtained prior to enrollment in the study. Research assistants visited families' homes to collect data and provided LENA audio recording technology and instructions for use. The LENA device audiorecords language and other audible sounds in proximity to the child. Families were instructed to have children wear the LENA device either around their neck or in the front pocket of a shirt in order to record parent-child conversations and other audible content in their

Table 1 Sample demographic characteristics

Child characteristics	Mean (SD) or n (%)
Child sex	
Male	41 (54.7%)
n Children per age group	
Toddlers (12–24 months)	21 (28.0%)
Preschool-age children (3–5 years)	31 (41.3%)
School-age (10–13 years)	23 (30.7%)
Child race/ethnicity	
White, non-hispanic	49 (65.3%)
Black, non-hispanic	13 (17.3%)
Other, non-hispanic	8 (10.7%)
Hispanic, any race	5 (6.7%)
Maternal characteristics	
Maternal age (years)	33.25 (6.60)
Highest level of education completed	
Did not complete high school	5 (6.7%)
Graduated from high school	7 (9.3%)
Completed a GED	1 (1.3%)
Completed some college	20 (26.7%)
Completed a 2-year college degree	13 (17.3%)
Completed a 4-year college degree	29 (38.7%)
Household (income-to-needs ratio)	
Not reported	4 (5.3%)
<1.0	27 (36.0%)
>=1.0, <2.0	21 (28.0%)
>=2.0, <3.0	13 (17.3%)
3.0 or higher	10 (13.3%)
Single-parent household	
Yes	14 (18.7%)
No	61 (81.3%)

Note. N = 75

environment. Children were instructed to wear the device from approximately 4–8 pm for three days. This time frame was chosen to ensure that all participants would be home at the time of the recording (i.e., the older children would be wearing the audio recording device at school if recording began before the end of the school day).

The LENA device software analyzes the audio data and calculates minutes of electronic media sounds and indicates when, during the recording, electronic media was audible. This output was utilized to identify which hours of LENA recording to select for transcription, similar to prior research observing home media use utilizing LENA (Waters et al. 2016). Specifically, the Audio Environment Report for each child was examined and the first hour (e.g., 4–5 pm, 5–6 pm, etc.) in which any amount of electronic media was detected (i.e., at least approximately 3 min in the hour) was selected for analysis. Because of the resource-intensive

nature of LENA transcription, only 1 h from each participant was transcribed. The majority of hours selected for transcription occurred on weekdays ($n = 67$; 89.3%) and during the hours of 5 pm–8 pm ($n = 43$; 57.3%). Twenty percent of the hours occurred between the hours of 2 pm–5 pm ($n = 15$) and 22.7% of the hours occurred after 8 pm ($n = 17$).

Modeled after a prior protocol developed for characterizing media exposure using LENA technology (Waters et al. 2016), research assistants were trained to transcribe all instances of "media talk." Media talk was defined as words spoken by the child or other family members regarding any aspect of media use, including rules or regulations about use (e.g., restrictive mediation) and discussion of the media content being viewed (e.g., active mediation).

Using ATLAS.ti (Version 7.5.9; ATLAS.ti Scientific Software Development GmbH, 2015), research assistants synced each utterance of media talk to the audio recording. Research assistants detailed other contextual information about the recording (e.g., types of media used) in notation format, giving the transcripts for analysis an anthropologic field note quality.

Data Analyses

To investigate and characterize the communication about media (i.e., the content of "media talk"), we conducted a thematic analysis of the media talk, using the constant comparative method (Glaser and Strauss 1967). This method consists of using a grounded theory (i.e., inductive approach) in order to identify novel themes relevant to the lived experiences of families (akin to methods outlined by Nowell et al. 2017). In other words, a priori codes were not used when identifying themes. That is, in thematic analysis, themes are generated inductively from the data until saturation is reached, unlike content analysis where frequency of a priori themes is documented (see Vaismoradi et al. 2013 for an overview of the differences between thematic and content analyses). Three experts from the disciplines of communications, child clinical psychology, and developmental-behavioral pediatrics independently listened to the synced audio recordings and read the transcripts of media talk concurrently. In accordance with accepted methods in qualitative research (e.g., Perrin 2005), these readers independently identified themes of family media use and communication about media within each cohort of children in the study, met to discuss themes, iteratively refined those that recurred, and applied these thematic concepts while analyzing subsequent audiofiles. This occurred until theme saturation was achieved. Supporting quotes reflecting the themes and descriptions of the media environment observed were shared by the readers to aid in thematic analysis. The readers came to a consensus that

although over-arching themes of family media use and communication about media that were identified occurred across all age groups, nuances of the themes emerged among specific child age groups. Thus, supporting quotes and examples are also presented from each age group in order to illustrate some of the similarities and nuanced differences in family media use and communication across developmental stages.

Results

Five over-arching themes emerged in the analysis: (1) Parental mediation is primarily restrictive, reactive and "tech-focused;" (2) Active mediation is child-driven; (3) Siblings play a primary role in mediation; (4) Parent-child negotiations about media use are common; and (5) High degree of parallel family media use. We illustrate how each theme presented within the context of three different age ranges: toddlers, preschool-age children, and school-age children when nuanced differences emerged (notably for Themes 1, 2, and 4).

Parental Mediation was Primarily Restrictive, Reactive and "Tech-Focused"

Across ages, parental mediation of screen media was primarily focused on restricting child access, reacting to child demands, and consisted of *comments or directives about managing the technical aspects of devices* ("tech-focused"). In the toddler cohort, there was very little parental active mediation of content (but there was communication about technology use). Restrictive mediation dominated the parent-child interactions around media. In this young cohort, restrictive mediation consisted primarily of commands about how to use (or not use) media and mobile devices.

> Mother: "You can't touch that TV, you are too close." "Hit the top and turn him back on."

> Mother: "That's not how you turn on the TV. Put my control down little boy, put my control down."

> Mother: "It's going to play by itself, baby" [referring to DVD player when toddler makes a sound].

The nature of the tech-focused talk among the preschool and school-age children focused on instructing how to use mobile devices. Parents instructed children in their use of mobile technology and other functions. For example, parents explained how to use a phone app, how to charge a phone, and their rationale behind their use of mobile device

functions (e.g., social networking). Consistent with the younger cohorts, rarely did parents of school-aged children discuss content restrictions or actively mediate the content of programming.

> Mother: "Alright, the computer is still waking up so give it a second."
> Child: "Hey, mom wonder what it's doing?"
> Mother: "It's trying to turn on a couple programs."

> Mother: "Okay, someone needs to plug the phone in."
> Child: "It is plugged in!"
> Mother: "You have to just jiggle it a little. If it vibrates that means it's plugged in."

> Child: "But why did you put us on Facebook?"
> Mother: "Because I thought it was really funny that you guys made up this huge huge challenge so I wrote that I didn't know if we should be more excited about your huge challenge or more embarrassed…"

Active Mediation was Child-Driven

Rather than parents proactively mediating their child's media content, we observed that there was more child-driven active mediation, with preschool-aged children in particular seeking parental attention and facilitation of content processing. Given the limited verbal capacity of the toddlers, we heard less child-driven active mediation in that cohort. We heard preschool-age children bid for help with processing by asking questions about content, TV characters, and expressing their feelings about characters. Thus, when we heard parents processing media content, it was often in reaction to a child's bid for active mediation.

> Child: "What happened?" [in response to a scene in James and the Giant Peach]
> Mother: "He tripped and they all fell out."

> Child: "What are they? What are they?"
> Child: "Now who's walking on the TV in the camera?"
> Mother: "I don't know."
> Child: "Who's talking in the camera?"

> Child: "I can't watch this one."
> Mother: "Is it scary?"
> Child: "Uh huh."

> Mother: "Oh."
> Child: "I don't like the villain."
> Mother: "Ok, well turn it. You turn it off and we'll turn it back on for Wild Kratts."

Siblings Played a More Dominant Role in Mediation than Parents

Across age groups, siblings were more active in engaging with media than parents. When active mediation or processing of media content did occur, it was primarily driven by siblings. For example, older siblings in the home would initiate such talk from parents by asking a question. Thus, younger children who have older siblings may benefit from such explanations, despite their own more limited verbal skills, which could restrict their capacity to express confusion about media content or request more information.

> Mother: "Oh no, they died because they drowned from the water." [in response to older sibling of toddler asking why a parent died in a movie]

Among the school-age children, sibling bonding occurred around joint media use. Media communication among siblings was lengthier compared to media talk between adults and children. The content of this communication also reflected scaffolding of use, such as teaching a sibling how to use a video game controller, as well as joint media use.

> Child: "They changed the texture of the blocks." [talking about different game features]
> Child: "You use this to steer, you use A to go forward, you use B to go backwards…"
> [child helping sibling learn to play video game]

> Child: "This is what (name of peer at school) looks like." [child showing sibling photo of peer on Facebook]

Parent-Child Negotiations about Media Use were Common

Interactions around getting more screen time involved bargaining and negotiating from both the parent and child, and such discussions were most apparent among preschool-aged children and school-age children (due to more limited verbal abilities in the youngest cohort). Such negotiations also appeared to arise in part due to the multiple options open to the child (e.g., different devices, ease of internet access). For example, one mother and preschool-aged child

were watching streaming video, and spent several minutes going through the viewing options, with the child refusing most of them. Negotiations also revolved around the particular devices available to the child:

> Mother: "You also get 5 min of TV, It's too late already today."
> Child: "I want to watch TV for 10 min."
> Mother: "No."
> Child: "What about 9 min?"
> Mother: "No."
> Child: "5?"
> Child: "Can I watch, can I play on my iPad?"
> Mother: "Yes you may play on the iPad."
> Child: "Yay! Get the iPad."

> Child: "Mom can I see your phone?"
> Mother: "Why would you do that?"
> Child: "Because I know we get 30 min of electronics today."
> Mother: "Nope, you don't."
> Child: "Well how about I get 20 min?"

Parallel Family Media Use: Multiple Family Members Used Own Devices Simultaneously and with Other Background Media Exposure

We observed children being exposed to multiple screen media in the home, with devices being used at the same time by different family members, across all age groups. Examples of this "parallel family media use" included: a mother watching the news as her child played games on her mobile phone; children playing on the iPad while mother was on her mobile device; and father playing music on iTunes with one child, while other sibling watched television. Similarly, children were exposed to other family members using their own devices while they independently viewed media. For example, in one family, we heard three siblings using separate devices at one time (computer, mother's smart phone, and Wii). Often, the TV was on in the background while children and parents were using iPads, computers, and other mobile devices. In other words, media multitasking by family members at the same time was observed. Another example of parallel family media use occurred when siblings played separate video games in the same room. However, joint use of media was also observed when siblings were present. For example, in one family, siblings were heard playing Minecraft together, with TV on in the background (i.e., media multitasking).

Discussion

Utilizing methods that allowed us to assess naturalistic interaction in the home, our study identified five key features of family media and mobile device use: (1) active mediation of content was rare and "tech-focused talk" was more common; (2) active mediation was child-driven; (3) siblings played a more dominant role in mediation than parents; (4) parent-child negotiations about media use were common; and (5) parallel family media use and media multitasking by family members were common for households with mobile technology. Our findings have implications for the study of family and parent-child interactions around mobile media use, as well as barriers that researchers may encounter in quantifying media use with traditional (self-report) methods. This study found that, in the context of multiple media options, parental active mediation of content was limited, across all ages of children. Parents more commonly expressed rules or regulations about children's media use than actively processed the content of media. Statements about restriction or regulation of use were often in reaction to a child's request for assistance or the parent observing the child's inappropriate use of media or mobile technology. We used the term "tech-focused talk" to reflect communication about media focused on how to use various technologies or devices (i.e., the mechanics or nuances of accessing or viewing media). In sum, we found that instead of mediation of content, parents engaged in tech-focused talk. The level of detail provided by parents during tech-focused talk varied by child age, with the youngest cohort hearing brief commands on how to use non-mobile media and more elaborate descriptions of features and functions of technology in the older cohorts. Flynn and Richert (2015) have reported on similar tech-focused talk in their laboratory research on parents' scaffolding of young children's use of a novel interactive device (i.e., Leapfrog). Flynn and Richert (2015) identified that parents use a range of scaffolding strategies to facilitate their preschool-age children's use of the device. In their study, Flynn and Richert found that more than half of the parents focused more on providing device-related support strategies (e.g., directives such as "push the key" and instructions about device use) than content-specific strategies. In addition to directives around mobile device use, we also observed tech-focused talk (what Flynn and Richert refer to as device-related) with other novel functions in non-mobile media, including how to access streaming content on TV and play movies. In older children, the tech-focused talk was more complex (e.g., explanations for why the computer was going slow or benefits to a newer operating system). This is an important finding in light of the fact that early digital literacy is thought to comprise understanding how to

learn from technology and use it to create and access new information, rather than the mechanics of touching and clicking (Rogow 2015).

We observed evidence that mediation efforts were often child-driven, across the preschool and school-age children in the study (likely due to their verbal capacity). In other words, children elicited parental active mediation of media by initiating dialogue or clarification about the content of media. Parents reacted to children's bids for content clarification or elaboration but rarely initiated active mediation of content on their own. To our knowledge, prior research has not yet examined who typically initiates active mediation (i.e., the parent or the child or other family member). It is possible that certain active mediation practices (e.g., explaining what is happening on TV or helping the child understand what he/she is seeing on TV; Valkenburg et al. 1999) may be more likely to occur after a child indicates confusion or requests assistance with processing the content. On the other hand, there is an assumption in media research that parents are the active socializers around media use (children are the passive recipients), and, as such, less attention has been paid to child-driven or bidirectional effects (Van den Bulck et al. 2016). As Van den Bulck et al. (2016) argue, future research should consider the effects that children have on parents' media use and family media rules. Given the findings in our study that children initiated active mediation, we likewise propose that such research also considers child factors that yield greater active mediation on behalf of the parent. It is also important to note that, as mobile device use continues to grow in toddlers and preschool-age children, one could envision that parents may experience challenges in active mediation unless there is joint use (co-viewing content). That is, with mobile technology, children can play or use devices independently, and the content on the smaller screens may not be readily observable or audible to parents (contrary to more traditional media such as TVs or movies). Future research should examine whether active mediation is more challenging or less common regarding content viewed on mobile devices.

Another key finding was that siblings played a significant part in co-using media and mediating content, across age groups. Older siblings facilitated parental mediation by asking for clarification on media content that younger siblings were viewing. Although prior research has examined the association between sibling presence or birth order and amount of TV viewed (Hardy et al. 2006), content of TV viewed (Pinon et al. 1989), and perceived susceptibility to media effects (Davies and Gentile 2012), none to our knowledge have examined how siblings mediate media. Yet, as others have reported, there has been limited research on sibling-to-sibling mediation of media (Austin and Kistler 2016). Understanding the role of siblings in mediating

media in the digital age may be especially important because older siblings may be more adept than their parents at understanding newer media (as suggested by Austin and Kistler 2016) and the mobile device preferences of their younger siblings. It may also be that with co-use, there are more opportunities for siblings to mediate the media being viewed. As others have found, children more commonly co-use media with their siblings than their parents (Roberts et al. 1999) and there is evidence that co-playing video games may be associated with positive (e.g., affection) and negative (e.g., hostility) outcomes in the sibling relationship (Coyne et al. 2016). It may also be that having older siblings could significantly influence content of media that younger siblings desire to watch. As such, surveying sibling dyads and observing sibling dyads using media are particularly recommended to inform our understanding of family mediation in the digital age.

Given the ubiquity of media and mobile technology in households today (e.g., Kabali et al. 2015), our finding about the frequency of parent-child negotiations around media use may not be surprising. Both parents and children bargained about amount of use and type of media use (e.g., TV vs. tablet). The endless possibilities of streaming TV programs to watch that are not restricted by a certain time slot or format (i.e., standard TV set) may increase the opportunities for parents and children to access their preferred choice of media at any time and any place. In recent research, parents have expressed the challenges they experience with decision making around children's mobile media use. Radesky et al. (2016) interviewed parents of children 0–8 years old about their beliefs regarding their child's mobile technology use and identified several tensions that parents wrestle with in the digital age. Consistent with our finding about bargaining and negotiating about use, parents in Radesky et al.'s (2016) study reported feeling powerless in the face of child demands for mobile technology use and the appeal of such technology to reduce conflict and disruption in the home. As such, following through with restrictive mediation and other rules about the duration and timing of technology use may become ever more challenging for parents, particularly when children and other family members have their "own" readily available devices. It is not yet known how prevalent parent-child conflict around mobile technology is and if general parenting style or parental efficacy associates with such conflict. Similarly, parents' own dependence on mobile phones may also influence decision-making around children's mobile device use (Hwang et al. 2017). Future research should seek to fill those gaps and, importantly, identify guidelines or best practices to support parents in order to prevent or reduce the frequency of child demands and negotiating for mobile technology. For example, with growing options available to parents for digital monitoring

and management of children's mobile devices, future studies could examine parents' perceived utility of such products and whether they facilitate more consistent mediation.

The first four themes that emerged largely reflected *communication* about media in the home; our final theme detailed patterns of use observed among family members of all ages. We observed "parallel family media use," or instances of family members independently using different media simultaneously. This often occurred when a parent used a mobile device (often a phone) and the child/children were viewing media on other devices or platforms, such as watching a TV program or playing video games. Other instances of parallel family media use were observed between siblings, such as when siblings used separate devices or viewed other media simultaneously. Parallel family media use sometimes coincided with media multitasking, wherein children were exposed to/were using two or more types of media at the same time. Examples of this included children using mobile devices with TV or video games audible in the background. It is not known how prevalent parallel family media use is, but a recent study on media use by parents in US households indicates that this pattern of family media use warrants further investigation. Common Sense Media recently conducted a study on parents' media use and found that parents have high amounts of screen media use, with most of their screen time (over 7 h/day on average) used for personal (i.e., non-work related) reasons (Lauricella et al. 2016). Although it is not known exactly how much of this screen time occurred in the home, it seems likely that a proportion of these hours occurred outside of work. Another finding in their study was that large proportions of children (ages 8–18 years) owned multiple devices (Lauricella et al. 2016). For example, Lauricella et al. (2016) found that 63% of youth owned their own cell phone, 51% owned their own tablet, and 45% owned their own video game system. Pairing the amount of personal screen media use endorsed by parents and the plethora of devices owned by children and teenagers, the parallel family media use observed in our study may be a phenomenon common to many homes in the US. Future research should thus investigate the prevalence of parallel family media use further and examine the association between parallel family media use on family relationships and parent-child interactions, across children of all ages.

In addition to the implications of findings for future research on communication about media and family media use in media-saturated households, our observations have yielded factors about current media use practices in naturalistic home contexts that researchers may wish to consider when measuring children's media use and parental mediation of media. Our findings regarding parallel family media use and media multitasking in households present a

challenge to researchers seeking to quantify amount of children's time with screens based on retrospective parent report. With multiple family members using different media simultaneously, it is likely challenging (if not impossible) to accurately report on which family member was using which media and for how long. Furthermore, with concurrent media use by parents (i.e., parallel family media use), it is possible that distraction or preoccupation with their own personal media use may interfere with attending to their child's media. Given the ubiquity of media that is mobile and immersive, it is recommended that researchers use a variety of methods to assess screen media use, including mobile passive sensing, observational methods (recording technology that facilitates mobile recording; e.g., LENA), and time use diaries delivered via ecological momentary assessments. It is also recommended that researchers assess media multitasking (we refer readers to the recent research conducted by Common Sense Media that has measured media multitasking: e.g., Lauricella et al. 2016; Rideout 2015). Regarding parental mediation of media, future research may seek to continue to assess children's perceptions of parental mediation (as others have suggested—e.g., Gentile, Nathanson, Rasmussen, Reimer and Walsh, 2012) and the role of children in engaging in dialogue about media content.

Limitations and Future Research

Although observational methodology allowed us to examine naturalistic family media use and communication about media use, there are limitations to this study design that should be acknowledged. First, despite having a relatively large sample for an observational study, the sample size, high educational attainment by the mothers, and relative homogeneity of the participants limits our ability to generalize our findings to other populations. Research on demographic differences in parents' co-use of media with their children indicate that while few education level differences emerge (Connell et al. 2015), racial/ethnic differences in co-use do occur (which are consistent with our findings with a predominantly White sample). Specifically, Connell et al. (2015) found that White parents were less likely than non-Hispanic racial minority parents to co-use computers and smartphones with their young children. Similarly, White parents were also less likely to co-use tablets with their young children, compared to Hispanic parents (Connell et al. 2015). Thus, it is possible that if our sample was more racially/ethnically diverse, different patterns of parent co-use may have emerged. Second, although informative, our transcription procedures were time-intensive and thus we were unable to review all recorded hours in order to identify themes. Thus, it is not known

whether parent-child communication about media occurred in hours during which a media signal was not present or during other instances of media use. Another limitation is that recordings were limited to the late afternoon and early evening hours (approximately 4–8 pm). As one may expect, how parents mediate TV may differ depending on the time of day. For example, parents may engage in more restrictive mediation if the child is getting ready for school in the morning or preparing for bedtime at night. Similarly, for the youngest age group, older siblings may not be able to mediate media when they are at school. Future research should examine whether the themes that emerged in this study exist during other times of the day. This is especially recommended for the youngest cohort, toddlers, for whom little research has considered media parenting practices. For that age group, utilizing video recording equipment in the home may be best to observe media parenting of toddlers in future research. Finally, with audio-recordings, we could not determine if children were viewing media with headphones on (thus, without sound to the recording device) or if children or parents were using mobile devices to text or engage in other mobile phone activities without sound. Although the contextual cues informed us that this was not likely in the younger cohorts (12–24 month and 3–5 year olds), this could not be ruled out with the oldest cohort (10–13 year olds), which could mean an underestimation of types of media, particularly mobile phones, used. Future research should include passive sensing on mobile devices to redress the concern about non-audible media or mobile device use with audio and video recording technology.

Compliance with Ethical Standards

Conflict of Interest S.D., K.H., H.R., J.L. & A.M. declare that they have no conflict of interest. Dr. Radesky is paid to write for PBS Parents.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the University of Michigan Institutional Review Board and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from participants in the study (see Methods section for complete parent consent and participant assent details).

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