Patterns of Mobile Device Use by Caregivers and Children During Meals in Fast Food Restaurants

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Dr Radesky conceptualized and designed the study, supervised the study, collected data, analyzed and interpreted data, and drafted the initial manuscript; Dr Kistin supervised the study, contributed to study design, analyzed and interpreted the data, and critically reviewed the manuscript; Drs Silverstein and Augustyn contributed to study design, analyzed and interpreted the data, and critically reviewed the manuscript; Ms Nitzberg and Ms Gross contributed to study design, collected data, analyzed and interpreted the data, and critically reviewed the manuscript; Drs Kaplan-Sanoff and Zuckerman contributed to study design, trained research assistants, analyzed and interpreted the data, and critically reviewed the manuscript; and all authors approved the final manuscript as submitted.

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WHAT'S KNOWN ON THIS SUBJECT: Mobile devices are ubiquitous in children's lives, but how caregivers and children use them in everyday situations, and how use of devices affects caregiver–child interactions, has not been studied.

WHAT THIS STUDY ADDS: In naturalistic mealtime observations, we documented the behavior of many caregivers whose attention was highly absorbed in their mobile devices, with varying child reactions to this absorption. This study raises several hypotheses about mobile device use and caregiver-child interaction.

abstract

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BACKGROUND AND OBJECTIVES: Mobile devices are a ubiquitous part of American life, yet how families use this technology has not been studied. We aimed to describe naturalistic patterns of mobile device use by caregivers and children to generate hypotheses about its effects on caregiver–child interaction.

METHODS: Using nonparticipant observational methods, we observed 55 caregivers eating with 1 or more young children in fast food restaurants in a single metropolitan area. Observers wrote detailed field notes, continuously describing all aspects of mobile device use and child and caregiver behavior during the meal. Field notes were then subjected to qualitative analysis using grounded theory methods to identify common themes of device use.

RESULTS: Forty caregivers used devices during their meal. The dominant theme salient to mobile device use and caregiver–child interaction was the degree of absorption in devices caregivers exhibited. Absorption was conceptualized as the extent to which primary engagement was with the device, rather than the child, and was determined by frequency, duration, and modality of device use; child response to caregiver use, which ranged from entertaining themselves to escalating bids for attention, and how caregivers managed this behavior; and separate versus shared use of devices. Highly absorbed caregivers often responded harshly to child misbehavior.

CONCLUSIONS: We documented a range of patterns of mobile device use, characterized by varying degrees of absorption. These themes may be used as a foundation for coding schemes in quantitative studies exploring device use and child outcomes. *Pediatrics* 2014;133:e843–e849

Mobile devices such as smartphones and tablets are ubiquitous in children's lives.[1–3] Parental use of mobile devices in playgrounds, restaurants, or other public venues with children has received criticism in the lay press,[4,5] with concern that parental distraction by these devices may affect child safety or emotional well-being. Studies have demonstrated unsafe driving[6] and pedestrian behavior[7] while people are distracted by mobile devices, but the ways in which devices are being used around children, and the parenting behaviors associated with such use, have not been investigated.

Depending on how they are used, mobile devices could have both positive and negative impacts on family interactions.[3] Devices can be used for family entertainment, social support, or access to educational materials for children. However, mobile devices can also distract parents from face-to-face interactions with their children, which are crucial for cognitive, language, and emotional development.[8–10] In addition, devices provide instant access to videos and games, increasing the likelihood that screen time will replace other enriching child activities or be used as a "pacifier" to control child behavior. The complexity of mobile device use and its potential positive and negative effects on parent–child interaction remain unexplored.

Measurement of device use is more complicated than that of traditional media such as television because of the multitude of ways devices can be used and because of their constant accessibility. Most previous epidemiologic studies of mobile device use have used methods such as retrospective self-report or review of cell phone records to assess frequency of use.[11–15] However, simply measuring the frequency of device use fails to capture modes of use that are most relevant to parent–child interactions and thus may be insufficient to describe the true impact of this technology on child health and development. A relevant categorization framework is necessary to begin to study how mobile device use affects caregiver–child interaction.

We sought to observe caregiver and child use of mobile devices during a daily encounter when families would typically talk and interact: while they are eating together in a fast food restaurant. We chose a method of naturalistic, anonymous observation, because this would allow description of real-life use of devices around children, a crucial step in elucidating this complicated behavior.[16] Through qualitative analysis and identification of themes from detailed observations of public behavior, we aimed to describe patterns of how caregivers and children use mobile devices around each other, with the ultimate purpose of developing a categorization scheme of mobile device use for future quantitative study.

METHODS

Study Design: Naturalistic, Anonymous Observation

We conducted 55 public, anonymous nonparticipant observations of caregivers and children eating in fast food restaurants in the Boston area during July and August 2013. This method of direct, nonparticipant observation is common in the field of anthropology, and it involves the researcher blending in with the observational setting so as to not affect the publicly observable behavior of others while taking detailed notes about observed behaviors, their sequence, and consequences. The purpose of this approach is to identify cultural patterns and generate hypotheses for additional investigation.[17] Field note data are particularly useful when investigators hope to approach novel cultural phenomena without applying preconceived hypotheses, to help develop classification systems, and to avoid social desirability bias.

This study was considered exempt from review by the Boston University Medical Center Institutional Review Board.

Observation Sites and Participants

We chose to observe caregivers and children during meals because this is a daily routine in which face-to-face caregiver–child interactions are considered beneficial.[18] It has been estimated that 40% of American meals are eaten outside the home,[19] so fast food outings probably represent a substantial proportion of family meals. In playgrounds or other public venues where adults use devices, children are often occupied with their own pursuits, so fewer face-to-face interactions with caregivers are expected to occur.

We performed observations in different fast food restaurants in 15 neighborhoods in the metropolitan Boston area. These neighborhoods were selected for their range of income, geographic location, and urbanicity. This sampling was not intended to be representative of the general population; rather, it provided an opportunity to observe the behavior of a diverse group of caregivers and children.

We observed any group in which an adult accompanied 1 or more children who appeared to be 0 to 10 years old (ie, infancy to elementary school age). Child age was estimated based on height, general appearance, and developmental status. There was no upper limit of children or caregivers present and no exclusions based on language spoken. We did not study caregivers eating with an adolescent, because adolescents are likely to have different patterns of mobile device use themselves.

Observational Methods

Researchers (J.S.R., K.N., J.G.) individually visited restaurants between lunch

and dinnertime, purchased food, and sat as close as possible to the easiest caregiver–child group to observe. If no children were in the restaurant, researchers waited for a group to sit down at a nearby table. Observations contributed to the data set if the recorded portion of the meal lasted at least 10 minutes, all individuals were visible (visible from behind or profile was acceptable), and the observer was close enough to record facial expressions and tones of voice of most members. The content of conversation was not considered a prerequisite because most device use and mealtime behaviors are nonverbal; however, spoken language was recorded when audible. In order to capture a variety of styles of device use, we initiated record-taking regardless of whether a device was visible at the start of the meal. Researchers took paper notes or typed on laptops with security screens to preserve anonymity. Researchers received training on how to respond if questioned about their observations; however, at no time were the researchers questioned by others in the restaurant.

Researchers performing these observations had background training in either child development (J.S.R., K.N.) or anthropology (J.G.). Additional training applicable to our field observations included review of materials on specific anthropological methods,[17] practice sessions in restaurants, and guidance from a medical anthropologist on field note taking.

Consistent with nonparticipant observational methods,[17] researchers recorded detailed notes about what they witnessed, the sequence of events, child and caregiver characteristics (eg, number, gender, estimated age range), specific child and caregiver behaviors, and other unanticipated events. Observers also recorded their own interpretations of behavior and reactions. When making interpretations, observers indicated what behaviors led to this interpretation (eg, woman appears bored; has flat expression, stares into space).

Analysis

Direct observations permitted investigators to explore findings without imposing researcher-derived constructs or preconceived hypotheses. Field notes were reviewed in detail with child behavior specialists (B.Z., M.K.-S.), and through an iterative process, we used a grounded theory approach to develop themes related to mobile device patterns and caregiver and child behavior. The grounded theory approach involves systematic review of qualitative data to allow novel ideas and theories to emerge from the observations rather than imposing existing theory or conceptual models to arrive at, or interpret, results.

Investigators (J.S.R., K.N., C.J.K.) reviewed each field note independently and discussed the salient themes of each. Investigators then agreed on a set of codes to capture the presence or absence of these themes, which were applied to each field note by using Dedoose software (SocioCultural Research Consultants, Manhattan Beach, CA).[20] After 55 observations, thematic saturation was reached.

We used accepted techniques to ensure the validity of our data[21,22]: investigator triangulation, whereby the investigators who coded the data were from different disciplines and read the transcripts independently before meeting to ensure consensus of all codes applied; and expert triangulation, whereby the study's methods, coding scheme, and results were presented separately to a group of health services researchers, to parents of young children, and to child development experts.

RESULTS

Population

We conducted 55 observations in 15 neighborhoods in the Boston area, with median incomes ranging from $45 604 to $108 686. The majority of caregiver–child groups observed had 1 caregiver present (58.2%), and the number of children ranged from 1 to 3 (Table 1). Most children appeared to be of school age (Table 1). Length of meal observations ranged from 10 to ∼40 minutes. Of the 55 caregiver–child groups observed, 40 used a mobile device.

Dominant Theme: Absorption With the Mobile Device

Although many ways to categorize device use were identified and discussed, the concept of absorption, defined as the extent to which the primary focus of the caregiver's attention and engagement was with the device rather than the child, consistently arose as most salient to the caregiver–child relationship. Three independent but overlapping characteristics of mobile device

TABLE 1 Observation and Family Characteristics

	n (%)
Day of the week	
Weekday	36 (65.5)
Weekend	19 (34.5)
Mealtime	
Lunch (11:30 AM–2:00 PM)	26 (47.3)
Midafternoon (2:00–4:00 PM)	4 (7.3)
Dinner (4:00–7:00 PM)	25 (45.5)
Number of caregivers	
1	32 (58.2)
2	23 (41.8)
Number of children	
1	27 (49.1)
2	20 (36.4)
3	8 (14.5)
Estimated caregiver ages	
20s	12 (21.8)
30s	24 (43.6)
40–60	17 (30.9)
60+	2 (3.6)
Estimated child ages	
Infant	6 (6.7)
Toddler	16 (17.8)
Preschooler	14 (15.6)
School age	54 (60.0)

use contributed to the degree of absorption. These included the frequency, duration, and modality of use, child bids for attention and caregiver responses during use, and whether devices were viewed separately or coviewed.

Frequency, Duration, and Modality of Use

Caregiver degree of absorption depended largely on how frequently the device was used, for what duration, and what apparent modality was in use (eg, phone calls versus typing or finger swiping). Naturally, not bringing a device out (n = 15) or having the device only on the table (n = 3) was consistent with no apparent absorption. In contrast, many caregivers (n = 16) used the device almost continuously throughout the meal, eating and talking while looking at the device or only putting it down briefly to engage in other activities (Table 2, excerpt 1). This pattern of use occurred both with sole caregivers and those who had another adult present, of all age groups and both genders. The highest degree of absorption occurred when this nearly continuous use consisted of typing or making swiping finger motions, rather than with phone calls, because the caregiver's gaze was directed primarily at the device (Table 2, excerpt 3).

Absorption was not necessarily related to continuous use; it could occur intermittently or at the end of meals, when many caregivers took out their device while the children were still eating or the caregiver appeared bored (n = 8). Phone calls could be absorbing, but caregivers usually maintained some eye contact with children during these calls, which did not last through entire meals as texting or swiping could.

A lesser degree of absorption was exhibited when caregivers used their device for brief, intermittent periods, such as quickly checking their device, typing or texting for a brief time, or responding to phone calls but then putting the device away (n = 9). These caregivers appeared to balance their attention between device and child by using it quickly when children were otherwise engaged, and then returning to conversation. A few caregivers held their smartphones in their hands while doing other things (n = 3), suggesting to observers that their attention may have been partially on the device during other interactions.

TABLE 2 Observation Field Note Excerpts Illustrating Caregiver Absorption With Mobile Devices

Subtheme	Excerpt
Decreased responsiveness to child	(1) Female caregiver pulls out her phone from her purse and looks at it. Girl [school age] is talking to her caregiver, caregiver is looking at the phone, nodding a little while the child talks but not looking back at her or responding with words. Caregiver doesn't appear to be listening but says a few words in response every once in a while. Girl asks caregiver about her manicure. Keeps asking her questions but does not appear upset (cheerful facial expression, happy tone of voice) with the few words that caregiver says in response. Caregiver looks around the restaurant. Stares back at her phone. Child sways in her chair and keeps eating fries and asking caregiver questions. Caregiver looks up occasionally to grab a French fry or quickly say something to the girl and then continues to do something on her phone.
	(2) Female caregiver is holding the baby in her lap and is staring at her cell phone. Both boys [preschool and school age] are sitting in their chairs staring around. They appear to be almost finished eating. Caregiver is finished. Caregiver looks up and asks the middle boy if he can please finish in a frustrated tone of voice. Oldest boy is wiggling around in his chair. She says "sit down" without looking up from her phone. Oldest boy is looking at his shoes, the ground, his chair, but not getting out of his chair. She says, "Just sit. Please listen," and then looks at the middle boy and says, "Just 2 more minutes. Please eat." Middle boy starts whining and picks up his juicebox. Caregiver looks up from her phone, and the boy complains that his straw has fallen inside the juicebox. Caregiver takes it from him and says that he pushed it in and he can't have it anymore. Child seems unbothered. She asks him if he is finished eating, and he says he isn't finished, then he gets up and wanders around the table. Caregiver gets up, holding the baby, and picks up his plate and throws it out.
Decreased conversation with child; child passive	(3) Female caregiver brings food over and sits down across from girl, they distribute the food and as [school aged] girl starts eating caregiver brings out her smartphone. There is no conversation. Caregiver appears to be typing into phone, holding it about 10 inches away from her face, looking into it for long stretches during which she does not look up. She stops typing and is staring at the screen, touching it at points, holding it with her right hand while she leans her chin on her left hand, her facial expression flat. She has been looking at it for about 2 min without any change of gaze, while the girl eats and looks around the room. Caregiver then puts phone down on the table and takes a drink from her smoothie. She then looks at the girl for about 1–2 s and then down at her phone on the table. The girl keeps eating, then gets up to cross the room to get more ketchup. Caregiver is not watching her do this; she is looking down at the phone. The girl quickly returns and sits and eats, looking around the room while caregiver continues to hold the phone with her right hand and look at it, sipping her drink without moving her gaze. She eats some fries slowly and continues to look at the phone with a flat expression. Still no conversation. This continues through most of the meal. Now girl's head appears to be looking right at caregiver, and caregiver looks up but not at the girl, scans the restaurant with a flat expression and then eats some fries and puts the phone down on the table.

TABLE 2 Continued

Subtheme	Excerpt
Child escalation/ caregiver raising voice during absorption	(4) Dad [was called Dad by one of the boys] sits down with 3 boys and brings out a smartphone and starts swiping. Boys are talking to each other, excited, eating, talking, seeming to goof around. The dad looks up at them intermittently when they exclaim something or raise their voices, but otherwise he looks at his phone, which he is holding in front of him. …I can see that dad is scrolling through small text; looks like a web site, not e-mail. Again dad looks up at them when one of them exclaims something [inaudible] but then goes back to surfing web. At this point he puts the phone down from in front of his face, still holding it in hand, and points to youngest, instructing him on something. Then back to scrolling. …Oldest boy starts singing "jingle bells, Batman smells," and the others try to join in but don't know the words. Dad not responding. They're making up their own words to the song now. Dad calls the little one's name and speaks in a mildly stern voice, and they stop singing. Little one laughs. Dad continues to hold phone up in front of face, looks over to boys, then back to phone. …The boys start singing "jingle bells, Batman smells" again, and dad looks up and tells them to stop in a firm voice. Then he looks back to phone. … [end of meal] Again in stern voice, seeming exasperated, dad says, "HURRY UP!" and the boys are being silly, licking each other's cones, climbing on each other and on the divider between booths; dad keeps giving instructions in same tone of voice, says something about not getting this again. (5) Girl [young school aged] comes back to the table, is scratching her head with the fork, looking at her parents [she called them Mom/Dad]. They are looking at their phones. She has a cookie now that her brother gave her. Dad reaches over the table and starts eating the daughter's food. She frowns and says that it is her food. He responds saying, "You aren't eating it, and I bought it, so I'm going to eat it." She shrugs it off and keeps eating her cookie. Dad is scolding boy about something. Both girl and boy look at each other and are smiling. Boy gets up to throw his trash away. He's standing up. Mom is still looking only at her phone, dad is eating, and daughter is drinking from her soda cup. Girl is playing with her noodles with her finger. Dad yells at her to stop. He takes her food away from her and is cleaning up the table. Girl is talking, mostly to the boy. Mom is still looking at her phone. Dad talks to the children to scold them, then goes back to looking around the food court. Mom is still looking at her phone. Dad is looking at her phone with her now. Daughter takes her fork and starts stabbing a container on the table. Mom looks at her and scolds her. Dad keeps telling her to stop, but she continues with a big smile on her face. Mom finally looks up and scolds her. The girl continues what she is doing. The fork snaps, and both parents look up and tell her, "STOP." She laughs, and the boy laughs. …[later in meal] Mom is showing something to all of them on her phone. Boy is reaching his arm out, and the girl is hitting it, while the girl screams. Dad tells them to stop. Mom is still looking at her phone. Girl gets off of her chair and starts swinging the boy's chair around. Dad tells her to get back in her chair in stern voice. Mom doesn't look up from her phone.

Bids and Responses

A second axis on which to categorize device use related to how children responded when caregivers began to use a device and how caregivers managed this behavior. Some school-aged children were already engaged in eating, talking to another child, or playing with a toy and did not seem to change their behavior based on caregiver mobile device use, especially if the use was brief. When caregivers were continuously absorbed in the device, some children did not make bids for attention or conversation with the adult (Table 2, excerpt 3).

Many children started to exhibit limit-testing or provocative behaviors during adult device absorption (Table 2, excerpts 4 and 5). The highest degree of caregiver absorption was evidenced by responses such as gaze being directed primarily at the device, keeping the gaze on the device while answering questions or giving instructions to others, having a longer latency to respond to bids, or not responding to bids from others. In addition, caregivers absorbed in devices frequently ignored the child's behavior for a while and then reacted with a scolding tone of voice, gave repeated instructions in a somewhat robotic manner (eg, without looking at the child or relevant to child behavior), seemed insensitive to the child's expressed needs (Table 2, excerpt 2), or used physical responses (eg, one female adult kicked a child's foot under the table; another female caregiver pushed a young boy's hands away when he was trying to repeatedly lift her face up from looking at a tablet screen).

Using Devices Separately Versus Coviewing

Separate use of devices included caregiver use as described earlier but also occurred when caregivers gave a device to a child for entertainment purposes or to seemingly control the child's behavior ($n = 3$). Smartphones and tablets were provided to some toddlers to apparently entertain the child during or after the meal when the child's behavior became more active, such as crawling under the table. Some caregivers showed absorption in their own device while their toddler engaged with a separate one (Table 3, excerpt 1). Even when the device was not offered to the child, many children were fascinated by adults' devices and made attempts to grab or use them when

they were on the table or peered over their caregiver's shoulder to see what they were doing.

Shared device use was also observed (n = 4). On several occasions the caregiver offered the device to the children to pay joint attention to a video or photos or to apparently look things up during conversation (Table 3, excerpt 2). These caregivers were deemed less absorbed in the device because their primary focus of concern appeared to be the shared experience with the child.

TABLE 3 Observation Field Note Excerpts Illustrating Separate Versus Shared Use of Devices

Subtheme	Excerpt
Separate	(1) Child [toddler age girl] wiggles and looks around the room while she chews on the corner of the bread, reaching her hand out and touching female caregiver's upper arm. Caregiver is typing on the tablet and has not looked up to child. Child then puts her hand into caregiver's hair and turns her bun (looks painful) while caregiver is looking at tablet; caregiver looks up to child, says something to her, and puts the tablet on the table in front of the child and brings up a Disney app. The child puts the bread down and leans over the table, standing on the seat, and starts tapping on the tablet with face about 8–10 inches away from it, continues to wiggle. She doesn't seem able to make it work, so she starts to make whining vocalizations … a minute later caregiver notices the child is having difficulty and leans over with her to help, and sets up a video. While the video runs the child keeps babbling and jargoning in a fussy way. Caregiver is now eating and looking at her smartphone. Child wriggles, standing on seat, not appearing to pay full attention to video. Caregiver brings over her smartphone and puts it down in front of the child, who now has both devices in front of her and is looking at one or the other for brief periods.
Shared	(2) The family sat talking and eating. Another man came to the restaurant with his dog and left it tied outside while he went inside to order. While inside, his dog started howling for attention. Many people stopped to watch the dog, and the male caregiver got his cell phone out and gave it to the older boy to take a picture or video of the dog. They joked that the dog would be famous on YouTube. …The caregiver finished his meal and got his phone out from his pocket. He talked to the boys and appeared to be looking up things on his phone that they were talking about. After doing that for a few minutes he put his phone away. The family spent the rest of their meal talking and eating and making jokes.

DISCUSSION

Through detailed observations of caregivers and children eating together in fast food restaurants, we characterized how mobile devices are used by caregivers and children in natural settings, with the most dominant theme being absorption in the device. Degree of caregiver absorption was determined by frequency, duration, and modality of device use, how the child reacted to the caregiver's device use and resulting child bids and caregiver responses, and whether the device was shared.

Caregivers who used devices ranged from having the device on the table to almost constant absorption with the device throughout the meal. Although detailed analysis of interpersonal interactions was beyond the scope of this study, we did find it striking that during caregiver absorption with devices, some children appeared to accept the lack of engagement and entertained themselves, whereas others showed increasing bids for attention that were often answered with negative parent responses. Child use of devices was less common (most children were engaged in eating, playing with other children, or playing with "kid's meal" toys) but appeared to be for the purposes of entertainment or behavior control. Children were almost always curious about what adults were doing on devices, and sharing information or media on devices appeared to be a source of joint enjoyment for adults and children. These findings warrant additional study but are an important first step in the study of how device technology affects the daily interactions that are so important to child development.

This study raises several hypotheses that might be explored in future qualitative or quantitative work. For example, what content or reasons for mobile device use (eg, work, entertainment) are associated with the highest levels of caregiver absorption? It will also be important to explore how caregivers conceptualize their own mobile device use and whether they have any rules about use during family times. Caregivers have always had to multitask or toggle their attention between care of children and other activities, but is mobile technology particularly absorbing or pervasively available, so that it is more difficult to stay present during interactions with children? Do children react to this by making more bids for attention during caregiver device use? What are the longer-term effects of frequent exposure to others' "present absence,"[23] during which a companion is physically present but his or her thoughts are elsewhere? In addition, it will be important to know more about patterns of child use and modes of shared use that harness joint attention between caregivers and children. In a future separate study, we plan to use laboratory-based videotaped mealtime encounters to further refine and operationalize our coding scheme using the themes presented in this study and begin to quantitatively examine these

hypotheses regarding family interactions.

Because no previous studies have examined this topic, our goal was to perform a small, hypothesis-generating study that helps to understand how adults balance attention and engagement between a ubiquitous technology and the children in their care. Several limitations to our study must be mentioned. We should not draw conclusions about relationships between mobile device use and caregiver–child interaction from our results. This was a descriptive study using anthropological observational methods; we did not code device use or frequency of behaviors quantitatively, so could not statistically test associations. Although diverse sites were sampled and clear patterns of device use noted, it is possible that we did not describe the entire range of how devices are used, particularly with regard to child device use, which was uncommon in the groups we observed.

CONCLUSIONS

This study documents a range of patterns of mobile device use, including a large proportion of caregivers who were highly absorbed with their handheld devices. These themes can be used to characterize device use for future studies examining associations between mobile device use and child or caregiver outcomes. We hope our findings will help generate additional research and discussion about the use of this technology around children.

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