

Technology at the Table: Attitudes about Mobile Phone Use at Mealtimes

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ABSTRACT

Mealtimes are a cherished part of everyday life around the world. Often centered on family, friends, or special occasions, sharing meals is a practice embedded with traditions and values. However, as mobile phone adoption becomes increasingly pervasive, tensions emerge about how appropriate it is to use personal devices while sharing a meal with others. Furthermore, while personal devices have been designed to support awareness for the individual user (e.g., notifications), little is known about how to support shared awareness in acceptability in social settings such as meals. In order to understand attitudes about mobile phone use during shared mealtimes, we conducted an online survey with 1,163 English-speaking participants. We find that attitudes about mobile phone use at meals differ depending on the particular phone activity and on who at the meal is engaged in that activity, children versus adults. We also show that three major factors impact participants' attitudes: 1) their own mobile phone use; 2) their age; and 3) whether a child is present at the meal. We discuss the potential for incorporating social awareness features into mobile phone systems to ease tensions around conflicting mealtime behaviors and attitudes.

Author Keywords

Mobile phones; mealtimes; norms; attitudes; social media.

ACM Classification Keywords

H.0. General.

INTRODUCTION

Despite evolving routines among individuals, families, and organizations, mealtimes continue to be a venerated part of our daily life in the U.S. and worldwide. Families are encouraged to eat meals together devoid of distractions like television [20], desk workers are encouraged to take breaks at lunch rather than eating at the desk [61], and mealtime

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settings are a focus point for a variety of wellbeing outcomes (e.g., disordered eating) [26]. Though mealtimes in the U.S. can be rushed—eating alone “on the go” or at a desk (e.g., [36])—they remain a practice embedded with culture and values. Holidays, celebrations, or family gatherings are centered on a shared meal [6].

However, as mobile phones become inextricably integrated into everyday life, a variety of questions—and concerns—have been raised about the impact of mobile phone use on people's ability to communicate with and relate to one another. Turkle's book “Alone Together” argues that we are forgoing “real” face-to-face contact by interacting with our devices while in the presence of others [56]. Mainstream media has also perpetuated this narrative; for example, The New York Times has run a series of op-eds depicting the potentially damaging consequences of mobile phone overuse on society [18,51]. Many of these concerns center on the ways that mobile phone use is invading long-established social institutions, like family time, work hours, and mealtimes [18,51].

However, other research has suggested that these concerns are overstated, and people in fact exert control over how and when they use their devices [59]. Taken together, debates about the role of mobile phones in everyday life persist, especially as their adoption and use continues to grow [9,10,12,18,37,51,56,59]. While extensive research has explored mobile phone use in a variety of contexts such as the workplace, public spaces, and the classroom [5,9–11,22,37,59], little work has investigated their impact in the spaces between: namely, during mealtimes. Further, little HCI research has investigated design requirements for technologies that might better support attention, social presence, and shared values during meals.

In this paper, we explore attitudes about mobile phone use during mealtimes and consider the design of mobile technologies for supporting mealtime behaviors. To do so, we investigate the following two research questions:

1. What are people's attitudes about mobile phone use during mealtimes?
2. What factors contribute to people's attitudes about appropriate mobile phone use during mealtimes?

Drawing from an online survey of 1,163 participants from Anglosphere countries, we find that attitudes about mobile phone use differ depending on the particular phone activity;

activities that may be perceived as less important (e.g., using social media) and that take longer (e.g., surfing the web versus responding to a text message) are rated as less appropriate in the mealtime context. Further, attitudes about the appropriateness of phone use at meals depend on who at the meal is engaged in that activity; phone use by adults is rated as more appropriate than phone use by children. We also identify three significant factors that impact attitudes about mobile phone use at meals: participants' own mobile phone use, participants' age, and whether a child is present at the meal. We explore design recommendations for mobile phone systems that help to facilitate a shared understanding of meal-goers' phone behavior. Specifically, we propose designing technologies with greater awareness (e.g., of a users' activity) and consider game-like approaches for managing technology use when both adults and children are present.

RELATED WORK

We draw on two areas of research: attitudes about mobile phone use in public and personal contexts, and mealtime routines and their relationship to technology use.

Attitudes About Mobile Phone Use

Attitudes about phone use in public. Over the past 20 years, scholars have documented the annoyances associated with mobile phone ringing in public settings [9–11,37]. In places like restaurants, parks, busses, and gyms, the ringing and conversations enabled by mobile phones has elicited ire among many. These annoyances echoed earlier ones that came with the introduction of the landline phone [22]; however, the mobility offered by mobile phones seems to exacerbate these annoyances.

Palen et al. [45] observed that people reacted negatively to the use of mobile phones in public spaces like restaurants (a reaction that persists today for many [18]). Campbell [11] found that mobile phone use in restaurants was perceived as more appropriate than mobile phone use in theaters and classrooms, but less appropriate than use in busses, stores, and sidewalks. Lipscomb et al. [38] found that mobile phone use in church, class, libraries, and movie theaters was perceived as inappropriate, while attitudes were evenly split about use in restaurants. Most recently, Pew reported that certain public mobile phone use (i.e., while walking down the street, on public transportation, and while waiting in line) was considered generally “OK” while other public mobile phone use (i.e., at a restaurant, movie theater, or church) was considered generally “not OK” [49].

This previous research shows that attitudes about mobile phone use in public depend on the specific context. Some of those differences are due to the communal nature of attention (e.g., a movie screen) that may demand greater adherence to norms than non-communal settings (e.g., a bus) [9]. However, much of this prior research spoke primarily to the attitudes about mobile phone use in public [45]. In contrast, the present study explores attitudes about mobile phone use while engaged in a meal with friends,

family, or other acquaintances – a behavior that may have greater interpersonal or relational importance than using a phone near strangers.

Attitudes about phone use in personal contexts. Norms about the appropriateness of mobile phone use in personal contexts are not as well understood as norms about public mobile phone use. The limited prior work shows that mobile phone use in personal contexts is generally perceived as inappropriate, though it depends on the particular phone activity. For example, Pew recently reported that 88% of respondents found it generally “not OK” to use mobile phones at a family dinner [49]. However, Forgays [25] found that texting was viewed as more appropriate than talking on a mobile phone, whether done during social interactions with others or during intimate settings with a partner.

Differences in attitudes about mobile phone use. A small subset of prior work shows that certain individual differences, such as age and gender, predict attitudes about mobile phone use. Older age predicts favorable attitudes about banning public mobile phone use [42] and younger age predicts more favorable attitudes about texting in public and personal contexts [25]. Similarly, Pew reported that older adults were more likely to feel that using mobile phones in social settings hurts the conversation [49]. In addition, [57] demonstrated that gender predicted attitudes about public phone use, with males reporting higher levels of negative affect or annoyance in response to public mobile phone use than females.

In addition to age and gender, an individual's own phone use and certain context variables predict attitudes. Palen et al. [46] found that while new mobile phone users felt that public phone use should be reserved for important matters, those attitudes became more accepting with increased phone use. This is consistent with other research that showed participants were less annoyed by public phone use in contexts where the participant indicated they themselves would be comfortable making or receiving phone calls [57]. Finally, contextual factors such as group size may predict attitudes about mobile phone use. Campbell [11] argues that Japan may be less tolerant of public phone use, in comparison to Hawaii or Sweden, in part because of Japan's high population density making public phone use more of a social intrusion.

Taken as a whole, the research reviewed here has primarily focused on public phone use. Even with some recent work more focused on personal contexts and individual differences, little research has explored attitudes and the factors that predict attitudes about mobile phone use during the socially-rich context of mealtimes shared with others. The current study builds on the prior work by not only exploring additional mobile phone—and smartphone—behaviors but also by exploring how perceptions of appropriateness differ depending on who is engaged in those activities and who is present during those social

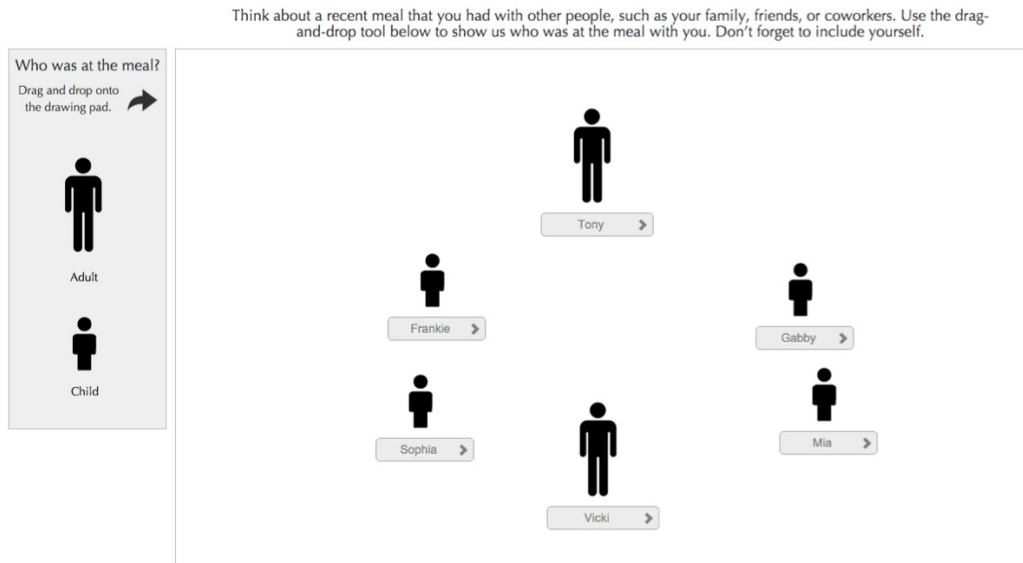


Figure 1. Participants were asked to “draw” a recent meal they had with other people through a custom interactive drag and drop interface.

interactions. The next section lays the foundation for understanding mealtime contexts.

Mealtime Routines

Mealtimes are a cultural phenomenon observed in almost every culture and society around the world. Mealtimes have been a major research focus in three disciplines primarily: anthropologists have investigated how food preparation, distribution, and consumption relate to culture and social order in society [43], health researchers and practitioners study the relationship between mealtime behaviors and health outcomes [14,61], and gender and family studies scholars have explored how mealtimes perpetuate or disrupt roles and relationships within the family [41].

Mealtimes are especially important in families as mechanisms for children’s socialization into language, customs, and social expectations both for individual families and in broader society [26,43]. Family mealtimes correlate with a number of positive outcomes for children and adolescents. For example, a study of 200 families found that positive communication during family mealtimes predicted higher child quality of life [21].

Technology at mealtimes. Prior work has also explored the influence of technology at meals, where the number of activities or distractions during a meal are thought to correlate with worse outcomes. For example, high rates of television watching during mealtimes have been associated with poorer health outcomes [14] and lower fruit intake at family meals [24]. Playing computer games at meals is also associated with poor health outcomes [8].

Research also suggests that mobile phone use might be disrupting, or at least altering, individual and social behavior at mealtimes. Humphreys [33] found that when

face-to-face conversations, such as at restaurants, were interrupted by a mobile phone call, the excluded party modified their own behavior to address feelings of vulnerability or awkwardness. Other research showed that the mere physical presence of a mobile phone during a face-to-face conversation negatively impacted relationship formation [47].

HCI mealtime research has primarily focused on systems designed to aid the food preparation experience [31,54,55], to encourage healthier meal decisions [7,13,39], and to help alleviate the loneliness of eating alone [27]. Limited HCI work has explored the social aspects of meals. Hupfeld and Rodden [34] found that technology was generally unwelcome at the dining table unless the technology was providing a shared experience. Similarly, other work found that families both intentionally utilized and avoided different technologies during meals [19]. Grimes and Harper call for more mealtime technologies that enhance “family connectedness” [28]. One such system, The 4 Photos System, displays photos of the individuals at a meal and was found to encourage shared reminiscing, more equitable participation by each member, and reinforcing of family bonds [44].

We build on this prior HCI research to understand how appropriate or inappropriate different phone behaviors are perceived (e.g., calling, texting, going online), how those activities are perceived differently depending on who is engaged in them (e.g., adults or children), how user demographics may predict those attitudes, and how these outcomes can be leveraged to design technologies that better support mealtime mobile phone use.

METHODS

Following the methods of prior work on attitudes about mobile phone use in various settings [9–11,42,57], we administered a survey with the goal of eliciting attitudes about mobile phone use during mealtimes. The survey was conducted on the online experiment platform LabintheWild.org from February through September 2015. Participants were recruited through online social networks and word-of-mouth. Participants were uncompensated but received feedback on how their mobile phone behaviors compared to other people’s behaviors.

Procedure

After agreeing to an informed consent form, participants were asked to illustrate a recent meal they had with other people using a drag-and-drop drawing tool (see Figure 1). The drawing tool was intended to aid recall of a recent meal and to minimize bias towards an ideal mealtime rather than a realistic one. For each person (adult and/or child) in the drawing, participants provided a first name (optional), age, relationship (e.g., spouse, co-worker, etc.), and gender. Once the participant was satisfied with their drawing they clicked an arrow to move to the next screen, which asked them to describe the time of day, length, and location of the meal.

Part two of the survey asked participants about their attitudes about mobile phone use at the meal they just depicted. Three separate closed-ended questions asked participants how appropriate it would be for an adult at that meal to take out their mobile phone and “send or read a text message,” “answer a mobile phone call,” or “go online or use a social media site.” All three questions used a 7-point Likert scale anchored by “very inappropriate” to “very appropriate.” For participants who included a child in their drawing, two of the above questions (regarding text messaging and going online) were repeated but were asked in reference to a child at that meal instead of an adult.

Because it is not feasible to ask about every kind of mobile phone behavior, we chose to focus the survey on mobile phone behaviors that research has shown people typically engage in, such as texting, accessing the Internet, participating in social networking, and fielding calls [17,53]. We chose not to ask about children answering mobile phone calls because research suggests they rarely engage in this activity [2,3,35]. In 2012 Pew reported that they talked on the phone far less than they texted [2]; in 2015, Pew’s report on teen smartphone use also did not report on their talking on the phone behaviors [3].

Part three of the survey asked participants if they own a phone, what year they first got a mobile phone, and whether their phone is a smartphone that can connect to the Internet. Participants were also asked, “how often do you use your mobile phone at meals with other people like family and friends” using a 6-point Likert scale anchored by “never” and “always” (participants received feedback at the end of the survey which was based on this question and required a

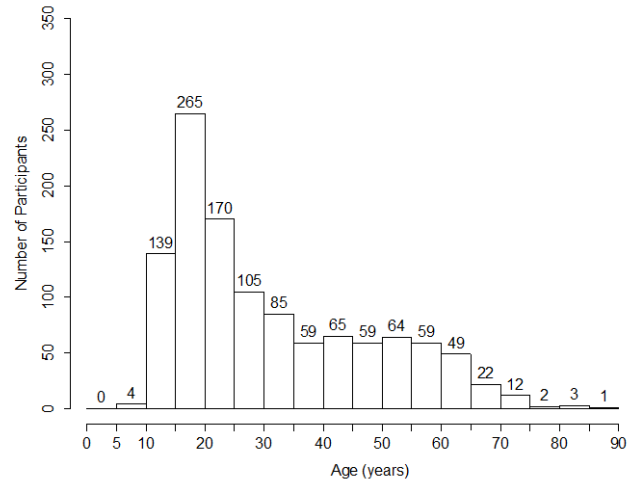


Figure 2. Age distribution of participants.

response on one side of the scale or the other, necessitating a 6-point scale for this question alone). If participants provided an affirmative answer to this question (i.e., anything other than “never”), they were asked about their typical phone activities when using their mobile phone during meals with others (checkbox options included: talking to someone, texting, using social media, emailing, playing games, online shopping, looking up information related to the conversation). Finally, participants were asked how often they use their mobile phone on a normal day and how many meals they have with other people in a typical week. Once the main portion of the survey was complete, participants provided general demographic information and reported whether they experienced technical difficulties during the study.

This study was approved by the research team’s Institutional Review Board. Participants signed an online waiver of consent form, including a parental waiver of consent for participants under the age of 18.

Data Preparation

During the 7 months that the survey was available on LabintheWild.org, 1,641 volunteers participated from 74 different countries. A total of 119 participants were excluded from analysis because they reported technical difficulties or had previously completed the survey. To focus on regions of the world with similar cultural origins and to ensure participants fully understood instructions written in English, the final data set was filtered to only include participants from Anglosphere countries (i.e., from Australia, Canada, New Zealand, United Kingdom, and United States, which are considered English-speaking nations with a number of overlaps in cultural heritage (described in detail here [58])). As a result, this paper reports on 1,163 participants from five countries around the world.

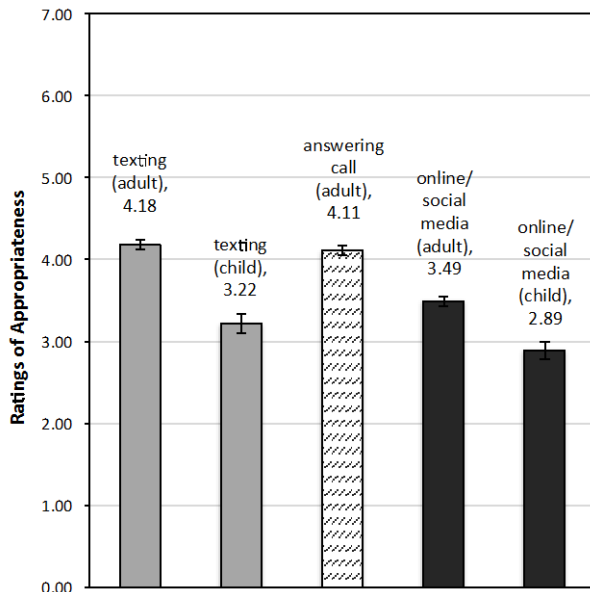


Figure 3. Mean appropriateness ratings of different mobile phone uses at meals. Error bars show one standard error from the mean.

Participants

Participants were between 8-88 years old ($M = 31.73$, $sd = 16.57$, median = 26) and 77.3% were female. Most participants were from the United States (833), followed by the United Kingdom (127), Canada (90), Australia (76), and New Zealand (37). Nearly all participants reported owning a mobile phone (93.2%), with 86.0% in total reporting that they own a smartphone that can connect to the Internet. Among all participants, the average frequency of mobile phone use on a typical day was 4.60 ($sd = 1.7$) on a seven-point Likert scale from “never” (1) to “constantly” (7). Participants indicated an average frequency of mobile phone use at meals with other people like family and friends of 2.48 ($sd = 1.39$) on a six-point Likert scale from “never” (1) to “always” (6). Finally, the majority (64%) of meals surveyed took place in the evening.

Analysis

General attitudes about mobile phone behavior at meals were analyzed using paired t-tests. All p-values were adjusted for multiple hypothesis testing using Bonferroni corrections.

To analyze factors that impact attitudes about mobile phone behavior during meals, we fitted a series of linear regression models modeling ratings of different types of uses (e.g., sending/reading text messages at a meal) as the dependent variables. We added several independent variables that we hypothesized would influence ratings of appropriateness: (a) age, (b) whether or not the respondent owns a mobile phone, (c) how long the respondent has owned a mobile phone, (d) how often the respondent uses their phone on a typical day, (e) how often the respondent

uses their phone at meals with others, (f) meal size, i.e. how many individuals were included in the mealtime drawing, (g) child presence, i.e. whether a child was included in the mealtime drawing, (h) housemates, i.e. the number of individuals that the respondent lives with, and (i) gender. We repeated the regression excluding independent variables that did not statistically improve the model fit according to Akaike’s Information Criteria (AIC). All of the five models (one for each of the five types of mobile phone uses) are statistically significant. We refer to these regression results reporting on the F-statistics from the Analysis of Variance report. The full dataset can be accessed at www.labinthewild.org/data.

RESULTS

General Attitudes about Mobile Phone Use at Mealtimes

Results show that participants find it more appropriate for adults to use a mobile phone at meals than for children (see Figure 3 for an overview of mean ratings). For example, participants rated it significantly more appropriate for an adult to send or read text messages during a meal ($M = 4.18$, $sd = 2.04$) than for a child to do so ($M = 3.22$, $sd = 2.22$, $t(371) = 8.25$, $p < .0001$). Using a mobile phone to go online or use social media while at a meal is considered less appropriate than reading or sending text messages for both adults ($t(1156) = -17.57$, $p < .0001$) and children ($t(371) = -5.99$, $p < .0001$). However, results show that this behavior (i.e., going online or using social media) is again regarded as more appropriate for adults ($M = 3.49$, $sd = 2.17$) than for children ($M = 2.89$, $sd = 2.21$, $t(371) = 3.61$, $p < .001$). When we compare attitudes about adults’ use of mobile phones at meals, a one-way repeated measures ANOVA shows a significant difference between the appropriateness of the three types of uses—sending/reading text, answering calls ($M = 4.11$, $sd = 1.95$), and going online or using social media ($F(2, 1151) = 153.89$, $p < .001$, $\eta^2 = .21$). As can be seen in Figure 3, answering a call is more appropriate than going online or using social media ($t(1152) = 10.84$, $p < .0001$) and, as described above, going online or using social media is considered less appropriate than reading or sending text messages. However, we find that the appropriateness of adults sending/reading texts is not significantly different from answering calls ($M = 4.11$, $sd = 1.95$, $t(1153) = 1.45$, n.s.).

Finally, it is noteworthy that participants rated adults texting and adults answering a call as more appropriate than inappropriate. On the other hand, children texting and both adults and children going online or using social media were rated as more inappropriate than appropriate (see Figure 3 and means reported above).

Factors that Impact Attitudes about Mobile Phone Behavior

While the findings described above show general attitudes about mobile phone usage at meals, we found that participants’ ratings were significantly affected by three main factors: (1) their own mobile phone use (i.e., the

(DV) Ratings of appropriateness for:	Term	β	SE	t-ratio	p	η^2
adult sending/ reading texts <i>R</i> ² =.27 <i>F</i> (4,1152) = 103.85, <i>p</i> < .0001	Intercept	4.26	0.20	20.84	<.0001	
	frequency of using phone at meals	0.57	0.05	12.48	<.0001	0.51
	frequency of using phone per day	-0.11	0.04	-2.88	<.01	0.03
	age	-0.04	0.00	-10.53	<.0001	0.37
	presence of child [no]	0.30	0.06	5.15	<.0001	0.09
child sending/ reading texts <i>R</i> ² =.27 <i>F</i> (4,366) = 33.84, <i>p</i> < .0001	Intercept	2.71	0.50	5.41	<.0001	
	frequency of using phone at meals	0.80	0.09	8.85	<.0001	.75
	frequency of using phone per day	-0.15	0.07	-2.26	<.05	.05
	age	-0.03	0.01	-4.60	<.0001	.20
	presence of child [no]	-0.17	0.39	-0.42	n.s.	.00
adult going online/ using social media <i>R</i> ² =.29 <i>F</i> (4,1151) = 118.71, <i>p</i> < .0001	Intercept	3.48	0.21	16.29	<.0001	
	frequency of using phone at meals	0.70	0.05	14.61	<.0001	.60
	frequency of using phone per day	-0.16	0.04	-4.09	<.0001	.05
	age	-0.04	0.00	-10.05	<.0001	.28
	presence of child [no]	0.31	0.06	5.24	<.0001	.07
child going online/ using social media <i>R</i> ² =.30 <i>F</i> (4,266) = 39.61, <i>p</i> < .0001	Intercept	1.90	0.49	3.91	<.0001	
	frequency of using phone at meals	0.85	0.09	9.73	<.0001	.82
	frequency of using phone per day	-0.11	0.07	-1.71	n.s.	.03
	age	-0.03	0.00	-4.19	<.0001	.15
	presence of child [no]	-0.25	0.38	-0.66	n.s.	.00
adult answering phone call <i>R</i> ² =.10 <i>F</i> (4,1148) = 33.56, <i>p</i> < .0001	Intercept	3.94	0.22	18.25	<.0001	
	frequency of using phone at meals	0.41	0.05	8.38	<.0001	.72
	frequency of using phone per day	-0.08	0.04	-2.05	<.05	.04
	age	-0.02	0.00	-4.55	<.0001	.21
	presence of child [no]	0.10	0.06	1.64	n.s.	.03

Table 1. Regression models for attitudes about mealtime phone behaviors, with eta-squared effect sizes.

frequency of their own use on a typical day and during a meal), (2) their age, and (3) whether they were describing a meal that included a child (see Table 1). In combination, these factors explain between 27% and 30% of the variance in people's ratings of the appropriateness of adults/children sending or reading text messages, and of adults/children going online or using social media while at a meal. However, the factors are much less predictive of participants' attitudes about adults answering a call during mealtimes with only 10% of the variance in participants' ratings explained.

Participants' gender, the number of people at the described meal, number of housemates, and how long the respondent has owned a mobile phone did not show significant main effects. In the following sections, we present detailed results that show the influence of mobile phone use, age, and child presence depending on the specific mobile phone activity and who is using the mobile phone.

Mobile Phone Use: Our results show that the reported frequency of using a mobile phone during a meal with others is the most important predictor of participants' attitudes of others' mobile phone behavior at meals. In particular, how much someone uses a phone during meals determines whether that person considers it appropriate for

an adult and child to send/read text messages ($F(1) = 155.72, p < .0001$ and $F(1) = 78.33, p < .0001$, respectively), for an adult to answer a call ($F(1) = 70.18, p < .0001$), and for an adult and child to go online or use social media ($F(1) = 213.47, p < .0001$ and $F(1) = 9.73, p < .0001$, respectively). Overall, the more often a participant uses a mobile phone at meals with others, the more appropriate they rate adults and children texting, adults and children going online or using social media, and adults answering calls.

Similarly, the frequency of using a mobile phone in general positively correlates with participants' ratings of appropriateness of using a mobile phone at meals. The reported frequency of using a mobile phone on a typical day has significant main effects on participants' ratings of the appropriateness of adults sending/reading text messages ($F(1) = 8.28, p < .01$), answering calls ($F(1) = 4.20, p < .05$), and going online or using social media ($F(1) = 16.77, p < .0001$). There are more mixed findings for participants' ratings of the appropriateness of children performing the same behaviors—frequency of using a mobile phone on a typical day has significant main effects on ratings of the appropriateness of children sending/reading text messages ($F(1) = 5.11, p < .05$) but not on the appropriateness of children going online or using social media during a meal.

Age: A person's age has significant main effects on their ratings of appropriateness of both adults and children sending/reading texts ($F(1) = 110.80, p < .0001$ and $F(1) = 21.11, p < .0001$), of adults answering calls ($F(1) = 20.71, p < .0001$), and on both adults and children going online or using social media ($F(1) = 101.02, p < .0001$ and $F(1) = 4.19, p < .0001$).

As can be seen in the Lowess curves in Figures 4a and 4b, the appropriateness ratings show an inverted U-shape with age: children and young adults consider certain behaviors as increasingly appropriate. The curve drops steeply or levels off for participants past their mid-twenties. Across all ages, teenagers (in particular, those in their mid-teens) consider it most appropriate for children to use their mobile phones during meals, while it is adults in their twenties who considered it most appropriate for adults to use their phones at meals. Figures 4a and 4b show this same pattern for the two different types of mobile phone uses (reading/ sending text messages (4a) and going online or using social media (4b)).

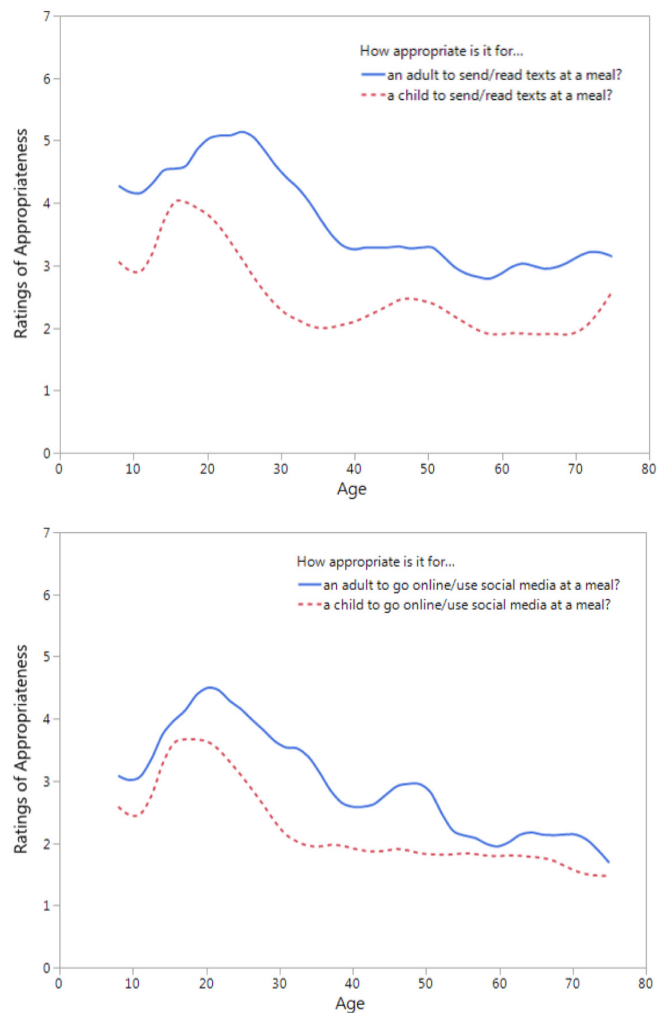
Child Presence: Participants who described a meal that included a child rated adult phone use at meals as less appropriate (adults sending/reading text: $F(1) = 26.54, p < .0001$, adults going online or using social media: $F(1) = 91.98, p < .0001$). In other words, adults texting and going online or using social media were rated as more appropriate when participants reported that no child was present at the meal. However, the presence of a child at the meal does not affect the appropriateness of adults taking phone calls during mealtimes ($F(1) = 2.69, n.s.$). The presence of a child also did not show a significant main effect on the appropriateness of children's use of mobile phones at meals (child sending/reading text: $F(1) = 0.18, n.s.$, child going online or using social media: $F(1) = 0.43, n.s.$).

DISCUSSION

Results quantify appropriateness of mobile phone use for adults and children, by demographics, and across three purposes. To summarize, we find that:

- Going online or using social media at meals is rated as less appropriate than texting or answering calls;
- Adults using a mobile phone at meals is rated as more appropriate than children doing so
- People's own mobile phone use is the strongest predictor of their beliefs about its appropriateness
- From childhood through young adulthood, perceived appropriateness increases, then declines after reaching the mid-twenties
- Having a child present at the meal decreases perceived appropriateness of adult phone use

Here we explore why differences in appropriateness exist and how theories and principles from HCI can be leveraged to support more appropriate and acceptable mealtime behaviors.



Figures 4a,b. Lowess curves showing the average ratings of appropriateness per age (lambda smoothing parameter=0.05).

Doing Work or Wasting Time: Importance of Activity as a Measure of Appropriateness

One explanation for the differences in appropriateness ratings for different phone activities is the perceived importance of each kind of use: texting and receiving a phone call are likely to be more important than going online or using social media, which are often perceived as leisure activities or activities to do out of boredom [17,53]. This explanation is consistent with prior work that found technology was generally perceived to be unwarranted at meals, unless it was providing a shared experience for all members of the meal [34]. In such cases, the importance of bonding with other members of the meal may be perceived as an important behavior that outweighs the perceived inappropriateness of having the technology present.

Like with adult behaviors, the importance of the behavior may also explain differences between appropriateness of adult and child behaviors. For adults, texting may be used as a tool for communication and coordination of everyday needs—with spouses, bosses, or children [25]. In contrast,

for children, texting is typically perceived to be a highly social activity [2,29,30] (even though parents may originally purchase cell phones for their children for parent-child communication). Teens send and receive many—sometimes 100s—of texts a day, mostly with peers, and content is social in nature [3]. Though teen texting may be important for their social development, it can be perceived as a waste of time or excessive [60], which would make it appear to be less appropriate than adult texting. The differences may also be explained by broad societal concerns about young children being exposed to too much screen time, concerns that are enhanced by organizations like the American Academy of Pediatrics who recommend minimizing screen time for children [62]. Indeed, some reports suggest that children are perceived as using their phones too much, though prior work has not directly tested the veracity of these perceptions [2,3]. There is also evidence that parents are concerned that too much mobile device use can negatively impact social skill development and behavior [60].

The length of time of each behavior is likely to take may also influence attitudes; texting can be succinct and focused on a particular message that needs to be communicated [50]. In contrast, going online or using social media can be time consuming, and users sometimes spend more time on sites than they anticipated or want to [48,52]. Because mealtime distractions can leave other meal-goers feeling excluded and vulnerable [33], perceived appropriateness might vary based on the anticipated amount of time the behavior will draw a person's attention away from the meal [34].

Designing for Activity Importance through Awareness

Mobile phones currently do a poor job of making visible what a mobile phone user is doing on her phone [1,9,10]. While this gives individual users agency and can provide a comfortable level of “interactional ambiguity” between communicators [4], it also hinders social awareness of people and surroundings—a phenomenon that is regularly observed among mobile phone users walking head down on a sidewalk, talking loudly in a restaurant, or texting while driving [9–11]. HCI and CSCW research has long-recognized the importance of *awareness* in designing systems in contexts like the workplace [16]. One early mechanism for fostering awareness was the use of social activity indicators, or tools that foster social awareness of people's activities [1]. Here, we suggest that mobile phones need to be designed to incorporate greater awareness of social activities in social contexts. This would allow a user and the people near her to understand the nature of the activity being conducted.

For example, a mobile phone might be able to detect that a user is at a meal and ask her if the activity is important to finish now or if she would like to wait until after the meal. Such a design maintains user control, but prompts more intentional uses through gentle nudges, a technique often

used in health applications [40]. Similarly, a phone might detect different kinds of activities, such as checking a work email account versus posting to Instagram, and flash a small light to indicate the nature of the use to people nearby. This may be especially helpful for phone activities that are already perceived as more appropriate than inappropriate, such as adults sending or receiving text messages during meals. Further, when a family is eating a meal together, if an activity is deemed important by the group (e.g., an adult checking a work email or a child checking a school assignment), a light could create shared knowledge of the importance of that activity which can in turn decrease conflict and increase shared acceptance of that use at that time.

These recommendations give rise to a broader tension between the goal of technologies that afford agency to the user versus technologies that seek to control user behavior (e.g., applications that cut off access to the Internet for periods of time). We propose that mealtimes highlight an emerging need for collective agency; that is, prioritizing the needs of a group or social context in addition to the needs of the individual user, the latter of which has long been a focal point in HCI research (e.g., [23]). For example, although flashing an indicator light to reveal an activity compromises some of an individual users' privacy, such an indicator may prompt behaviors that are in the shared interest of the collective group. This becomes especially important in the context of families or other social settings where mealtimes hold particular values and outcomes related to health, relationships, and wellbeing [20,26,61].

Not in Front of the Kids? How Age Relates to Attitudes about Mobile Phone Use at Mealtimes

While a variety of studies have documented the connection between age and phone use attitudes [25,42], this is the first to demonstrate a U-shaped relationship between age and perceptions about appropriateness. Specifically, age correlates with attitudes about mobile phone use at meals for texting, answering calls, and going online or using social media. Prior work has suggested that mobile phones allow teenagers to assert control over their social environments, which are often otherwise dictated by adult authorities like teachers and parents [35]. Perhaps not surprisingly, appropriateness ratings increase from childhood through young adulthood, aligned with the onset of adolescence and a general desire for autonomy, and then decline gradually as age increases.

We also find that not only is it less appropriate for children to use mobile phones at meals, the mere fact of having a child present at the meal decreases appropriateness for *adults'* mobile phone use. This holds true for texting and going online or using social media but not for answering a phone call. One explanation is that adults see themselves as role models when children are present, especially with regards to behaviors that children frequently engage in (i.e., texting, going online or using social media) versus

behaviors that children do not regularly engage in (answering the phone) [2,3]. This is consistent with research that found that parents and caregivers of children playing at a park generally try to minimize their own phone use in order to supervise, be responsive to, and act as good role models for the children [32]. Across contexts like playgrounds and mealtimes, adults may experience tensions between what they *want* to do and what they feel like they *should* do when children are around.

A Game-Like Approach for Supporting Appropriate Adult and Child Mobile Phone Use

As children access mobile phones and other technology at younger ages, it becomes increasingly important that they learn healthy habits and behaviors at these early ages. Mealtimes are an inviting context for them to do so; meals are embedded with values and are experienced by people in cultures around the world. Building on the concepts of awareness and social activity indicators above, we suggest that mobile phones could incorporate games into mealtime behaviors that allow adults and children to visualize and reflect on their own uses, and to develop shared understandings of other people's activities. Recent research has described a sensor-based game for families in which they guess who is using the Internet in the home on a given device at a given time [15]. Participants in that study—including children ages 7-13—reported that the game enabled them to discuss technology use in a fun and engaging way without feeling judged about their technology use.

Building on those ideas, we propose that mobile phone developers could create games that let users play for points based on mobile phone use in social contexts like mealtimes. Players could give feedback to other players through lively features, possibly using food as metaphors within the system (e.g., an ice cream sundae badge for not going online or using social media during a meal). This approach builds on Hupfeld and Rodden's [34] argument for technology use as a shared experience during mealtimes; by focusing on positive and playful aspects of mobile phones, we might be able to create shared technology experiences rather than one in which individuals are staring at their own devices. As observed in [15], a game-like approach might also foster reflective conversations about appropriate uses, rather than stigmatizing overuse by either the adult or the child.

Limitations and Future Work

While this research surveyed a sizable pool of participants from several Anglosphere countries, our sample only includes Internet users, who are not likely to represent the broader Anglo-Saxon population. Also, we observed a response bias to our survey leading to a sample that is relatively young and primarily female. Further, given that participants' own mobile phone use influences attitudes about appropriateness of use (and most participants in this study own a smartphone), it seems likely that non-mobile

phone users might find mobile phone use less appropriate than our sample indicated.

In addition, we only asked participants to report one example of a meal; it is possible that biases in what they chose to report would impact the overall results in some way. Also, in our survey design we chose to collapse a number of behaviors, such "go online" and "use social media," into one question. Future work could disentangle these behaviors. Finally, we did not ask participants to consider the appropriateness of mealtime mobile phone use that is related to or supports the meal conversation, a nuanced context that is likely to impact perceived appropriateness.

Future work could explore attitudes about technology use in social contexts, such as during mealtimes, from a sample of non-mobile phone users to compare results to our findings here as well as users in developing countries. Also, we note that our findings present a snapshot of attitudes of people at a particular age today rather than a longitudinal study of attitudes over time. Thus, our results only depict attitudes in the present; not attitudes in the past or future. Future work could build on our research by investigating how attitudes about mobile phone use in social contexts change over time. Finally, managing mobile phone use at mealtimes is a fundamentally sociotechnical challenge: interventions to address this challenge would need to explore both social behaviors and norms at mealtimes in addition to incorporating awareness and social indicators in designs of new systems.

CONCLUSION

Mealtimes are shared and celebrated by people around the world. At the same time, mobile phone adoption is pervasive in most countries around the world. This research takes a first step at investigating perceptions of mobile phone use at mealtimes among an Anglo-Saxon population. We make three overarching contributions. First, going online or using social media at meals is considered less appropriate than texting or answering calls. Second, mobile phone use at meals is generally perceived to be more appropriate for adults than for children. Finally, an individual's own phone habits and age predict attitudes about the appropriateness of mobile phone use at meals. Incorporating social awareness features into mobile phone systems may help people to decrease tensions around mealtime mobile phone use, while continuing to afford agency around individual behaviors.

DATASET

Our dataset can be accessed at www.labinthewild.org/data.

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