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Phubbing behavior in conversations and its relation to perceived conversation intimacy and distraction: An exploratory observation study

Mariek M.P. Vanden Abeele[a,*], Andrew T. Hendrickson[a], Monique M.H. Pollmann[a], Rich Ling[b]

[a] Tilburg University, the Netherlands
[b] Nanyang Technological University, Singapore

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ABSTRACT

This study examines the occurrence, frequency and duration of co-present phone use, also known as 'phubbing' behavior, during a dyadic conversation and its association with perceived conversation intimacy and distraction. Phubbing was measured by covertly observing students having a 10-min dyadic conversation (N = 100 dyads). Afterwards, participants were approached and asked to complete measures of how intimate they perceived the last 10 min of their conversation, and how distracted they perceived themselves and their conversation partners. Results reveal that phubbing occurred in 62 of the 100 observed conversations. In 30% of these 62 conversations, the phone screen was shared. When phone use occurred, the average frequency was 3.16 times per dyad (SD = 2.5), for a median duration of 99 seconds (SD = 225.2). Relatively few participants could correctly recall the occurrence of phone use during the past 10 min of their conversation. Inconsistent findings were found for the association between phubbing behavior and perceived distraction. The partner's phone use (but not one's own phone use), however, was associated with lower conversation intimacy.

1. Introduction

Phubbing' is a portmanteau derived from the words 'phone' and 'snubbing' that is commonly used to refer to the practice of using one's phone during a co-present social interaction. Over the past five years, there has been a marked increase in studies devoted to the relational implications of phubbing (e.g. Chotpitayasunondh & Douglas, 2016, 2018; Forgays, Hyman, & Schreiber, 2014; Hall, Baym, & Miltner, 2014; Miller-Ott & Kelly, 2015a, 2017; Misra, Cheng, Genevie, & Yuan, 2014; Rainie & Zickuhr, 2015; Roberts & David, 2016; Vanden Abeele, Antheunis, & Schouten, 2016). This interest is sparked by concerns in the public domain over the harmful effect of using one's phone during social interactions.

Concerns about the harmful impact of phubbing are rooted in the observation that phubbing interferes with interactional processes, thus causing a 'technoference' in the relationship (McDaniel & Coyne, 2016; McDaniel & Drouin, 2019). We know from decades of research on non-verbal behavior that affiliation and intimacy in interactions is enhanced when conversation partners display attentiveness for each other (Greene, Derlega, & Mathews, 2006). When conversation partners are distracted by their phone, however, this hinders in expressing those behaviors that contribute to the development of affiliation and intimacy (Misra et al., 2014; Przybylski & Weinstein, 2012; Vanden Abeele & Postma-Nilsenova, 2018). As such, conversation partners may interpret the phubbing behavior as impolite behavior that violates how they expect their partner to behave (Kelly, Miller-Ott, & Duran, 2017; Miller-Ott & Kelly, 2015a, 2017), and may experience the phubbing behavior as a form of ostracism that hurts their needs by signaling that they are not 'worthy' of the phubber's full attention (Chotpitayasunondh & Douglas, 2018; David & Roberts, 2017; Gonzales & Wu, 2016; Hales, Dvir, Wesselmann, Kruger, & Finkenauer, 2018). While the relationships between phubbing and negative relational outcomes are complex (Miller-Ott & Kelly, 2015a; Vanden Abeele, 2019), studies show that the former mechanisms explain why phubbing can potentially lead to greater conflict and jealousy in relationships (Halpern & Katz, 2017; Krasnova, Abramova, Notter, & Baumann, 2016), hamper impression formation processes (Miller-Ott & Kelly, 2017; Vanden Abeele et al., 2016) and decrease conversation quality and relationship satisfaction (Chotpitayasunondh & Douglas, 2018; David & Roberts, 2017; Miller-Ott & Kelly, 2015b; Przybylski & Weinstein, 2012; Roberts & David, 2016).

Extant studies on phubbing have focused extensively on examining attitudes towards, antecedents of, and outcomes of the behavior (see Al-Saggaf & O'Donnell, 2019; Vanden Abeele, 2019 for recent overviews). Interestingly, however, relatively few studies have systematically observed the actual incidence of phone use when people are engaged in a

* Corresponding author. Department of Cognition and Communication University of Tilburg, 90153, Warandelaan 2 5000 LE Tilburg, the Netherlands.
E-mail address: mariekvandenabeele@gmail.com (M.M.P. Vanden Abeele).

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real-life conversation. Humphreys (2005) observed co-present phone use in a fully naturalistic setting. Her study was ethnographic in nature, however, and performed before the widespread advent of smartphones. Systematic, naturalistic observations of phone behavior can be found in a number of recent studies conducted by Kruger and colleagues (Finkel & Kruger, 2012; Kruger et al., 2017; Kruger, Falbo, et al., 2018; Kruger et al., 2018), with two of these studies shedding some light on the phubbing phenomenon. To date, however, a fine grained, quantitative analysis of systematically observed phubbing behavior appears to be lacking. Hence, the first aim of this study is to shed light on the occurrence, frequency, and duration of phubbing behavior in a naturalistic setting. To that end, we conduct a covert, naturalistic observation study that explores the phubbing behavior of two hundred university students during a dyadic conversation (N = 100 dyads).

Are people aware of their own and their conversation partner's phubbing behavior? Studies show that it is extremely difficult for individuals to accurately recall their own phone behavior (e.g. Deng et al., 2019; Vanden Abeele, Beullens, & Roe, 2013). Recall of phone behavior should improve, however, when the retrospective recall interval is shorter as Naab, Karnowski and Schlütz' (2018) comparison of survey and experience sampling measures suggests. We will therefore assess the accuracy of recalled phone use when the retrospective interval is very short. Our second goal is to assess both the recall of one's own behavior and the recall of the conversation partner's phone behavior.

Extant research points towards various mechanisms that explain the negative relationship between phubbing and relational outcomes. Two mechanisms that are mentioned in the extant literature are that phubbing behavior distracts interaction partners from the conversation (e.g. Miller-Ott & Kelly, 2015b, 2017; Vanden Abeele, 2019) and lowers the intimacy of the conversation (e.g. Kelly et al., 2017; Przybylski & Weinstein, 2012; Vanden Abeele et al., 2016). A third and final aim of the current study is to examine whether patterns in the observed phubbing behavior predict perceived distraction from the conversation and perceived conversation intimacy.

2. Theoretical framework

2.1. The nature of phubbing behavior

In less than a decade, smartphones have become the dominant technology used for communication and for accessing and sharing information in the lives of people in both developing and developed nations (ITU Statistics, 2017). Recent smartphone usage reports reveal that people on average spend about 2.5 h per day on their phone, usually dispersed over several dozens of relatively short usage sessions per day (Winnick & Zolna, 2016; Deng et al., 2019; Nielsen, 2018; Oulasvirta, Rattenbury, Ma, & Raita, 2011). Social networking takes up a substantial part of the total smartphone usage time (Deng et al., 2019; Nielsen, 2018). A consequence of the dispersed nature of smartphone use is that people are found to use their phone during face-to-face interactions. These instances of co-present phone use are known under the term 'phubbing'.

Recent research suggests that phubbing has become a common practice: Self-report measures indicate that 44% of people report phubbing and 55% report being phubbed multiple times per day (Chotpitayasunondh & Douglas, 2016). Over the past decade, a field of research has developed in which the antecedents, correlates and outcomes of phubbing are being explored. Factual information about the fine grained nature of phubbing behavior during social interactions, however, is still scant, as there are few naturalistic observation studies on phubbing. There is a large-scale, naturalistic observation study of phone use in waiting situations, performed by Kruger et al. (2017). In this study, 62% of 2013 persons were observed using their phone while waiting. Among those who were involved in a face-to-face interaction (N = 544), this percentage was lower, but with 43% still substantial. Moreover, persons involved in a face-to-face interaction did not wait any longer than those who were observed alone to initiate phone use. While informative, this study still reveals several unanswered questions regarding the nature of phubbing behavior, for example with respect to the frequency and duration of the phubbing behavior. Hence, in order to address the first aim of the current study, which is to shed greater light on the nature of phubbing behavior, our first research question concerns the occurrence, frequency and duration of phubbing behavior during dyadic conversations. We address this research aim drawing from covert, naturalistic observations of university students in the natural setting of a student restaurant.

RQ 1. What is the occurrence, frequency, and duration of co-present phone use during a face-to-face dyadic conversation?

Phone use can be initiated because of internal cues, such as boredom, but is often also initiated by external cues, such as the notifications built into mobile applications (Bayer, Campbell, & Ling, 2016; Oulasvirta et al., 2011). Finkel and Kruger (2012) found that one particular kind of external trigger is seeing someone else use their phone: the likelihood of initiating phone use is significantly greater when one's interaction partner is already using their phone. In other words, phubbing during a social interaction appears contagious. Further support for 'mirrored' phone use can be found in a survey study by Krasnova et al. (2016), in which 6.9% of the participants reported reacting to their partner's phone use by becoming involved with their own smartphone. A second research question that we ask in order to thoroughly describe the nature of phubbing behavior is therefore:

RQ 2. What is the occurrence of mirrored ('contagious') phone use?

While phones are generally considered to be personal devices – they are oftentimes shared during or built into the social interaction. Previous ethnographic work on mobile phone use among teenagers, for example, found that practices range from minimal sharing, such as reading a text message aloud, to borrowing another person's phone for a lengthier period of time, such as to make calls (Weilenmann & Larsson, 2002). Similarly, Kelly et al.'s (2017) study on phubbing behavior in romantic relationships found that sharing the phone screen to look at contents such as memes or funny videos is not only common, but also relationally valuable, as it sets a mood of intimacy and sociability. Thus, it is important to differentiate this form of 'shared' co-present phone use from co-present phone use in which the phone user keeps the device and its contents to him- or herself, as the relational implications of these two forms of co-present phone use may not only differ, but may even oppose. Hence, a third research question concerns the occurrence of shared phone use, whereby we operationalize phone use in the observation study as sharing the device screen:

RQ 3. What is the occurrence of shared screen use?

2.2. Recalling phubbing behavior

Self-report measures of phone behavior are known to suffer from low reliability as people find it difficult to recall their phone use accurately. A reason why phone use is considered to be so difficult to accurately recall, is that it is automatized, habitual behavior (Oulasvirta et al., 2011). Habitual phone behavior requires very little cognitive effort (Bayer et al., 2016). High frequency and irregular habitual behavior – thus, phone behavior - is known to be notoriously difficult to accurately retrieve from memory (Schwarz & Oyserman, 2001). Recent research by Aagaard (2019) reveals that automaticity plays an important role in phubbing behavior: The individuals in this interview study indicate that they phub without intending to, out of habit. If phubbing is indeed automatized behavior, we may deduce that recall of one's own phubbing behavior may be poor. But will recall of the

conversation partner's phubbing behavior also be poor? Studies that focus on especially young populations suggest that in some settings, phubbing behavior is no longer considered impolite but has become fairly normative (Miller-Ott & Kelly, 2017), with younger persons attaching less importance to nonverbal behaviors such as eye gaze and posture as signals of attention and politeness (Kadylak et al., 2018). In the current study, where we focus on a student population, this may lead to a poor recall of not only one's own but also the conversation partner's phubbing behavior. We explore these assumptions with our fourth research question:

RQ 4. How accurately can people recall the phubbing behavior of themselves and their conversation partners?

2.3. Phubbing as a predictor of perceived distraction and conversation intimacy

Over the past five years, support for the notion that phubbing is harmful to the quality of conversations has grown substantially. For example, the studies from Vanden Abeele et al. (2016), Hales et al. (2018), Gonzales and Wu (2016), and Chotpitayasunondh and Douglas (2018) provide experimental support for a negative effect of phubbing on various relational outcomes, such as perceived conversation quality and relationship quality. Longitudinal and cross-sectional survey studies show similar associations. For example, Halpern and Katz (2017) found that when people perceive their romantic partner as phubbing them more frequently, they also perceive greater conflict and lower intimacy in the relationship. Roberts and David (2016) found a negative association between perceived partner phubbing and relationship satisfaction. A few studies found that even the mere presence of a phone during a social interaction is enough to hamper conversation quality (e.g., Misra et al., 2014; Przybylski & Weinstein, 2012).

Distraction, both real and perceived, is suggested as one mechanism explaining these negative effects (Halpern & Katz, 2017; Miller-Ott & Kelly, 2015b; Misra et al., 2014; Nakamura, 2015; Przybylski & Weinstein, 2012; Vanden Abeele, 2019; Vanden Abeele et al., 2016). Phubbing is essentially a form of multi-tasking whereby the phone user divides his/her attention over two concurrent tasks: the real-life interaction and the virtual interaction. The phubber enters a state of 'absent presence' (Gergen, 2002), in which s/he is physically present, but mentally absent. It is a well-established fact in the multi-tasking literature that dividing one's attention over multiple tasks is cognitively demanding, therefore leading to poorer performance on either task (Salvucci & Taatgen, 2008). In the context of co-present phone use during a conversation, the cognitive efforts that the phubber puts into managing a state of 'absent presence' likely hamper a variety of cues that signal focused attention in conversations, such as regular turn taking (cf. Sacks, Schegloff, & Jefferson, 1974), keeping eye gaze (cf. Argyle & Cook, 1976; Burgoon, 1994) or mimicking facial expressions (cf. Guéguen, Martin, Meineri, & Simon, 2013). These cues are important to facilitate mutual intimate self-disclosure in a relationship (Lynn, 1978). Hence, the distraction caused by phubbing may keep conversation partners from intimately self-disclosing to one another. Given that mutual self-disclosure is essential to the development of trusting, intimate relationships with others (cf. Social Penetration Theory, Altman and Taylor (1973)), the effect of phubbing on the level of intimacy of conversations may ultimately not only lead to shallower conversations, but also relationships. Moreover, when persons perceive that their conversation is distracted by their phone use, they may interpret this behavior as a violation of their conversational expectations (Miller-Ott & Kelly, 2017), which may lead them to make negative appraisals of not only the conversation partner, but also the conversation itself (Vanden Abeele et al., 2016). The third aim of this study is to examine whether we find support for an association between the occurrence, frequency, and duration of phubbing behavior during a conversation and the level of conversational distraction and intimacy that conversation partners experience.

RQ 5. Is the occurrence, frequency, and duration of phubbing behavior negatively associated with the level of perceived distraction and perceived conversation intimacy that interaction partners experience during a conversation?x`

Finally, we explore whether shared phone use is associated differently with these outcomes than individualized phone use. As mentioned above, screen sharing can be considered a resource that sustains rather than hinders the conversation. When interaction partners bring a phone or phone content into the interaction, it may become a shared focal point of attention. Moreover, disclosing content on your phone may be conceived of as an act of self-disclosure, which contributes to perceived conversation intimacy. Hence, in addition to the former research question, we ask:

RQ 6. Is phone screen sharing positively associated with the level of perceived distraction and perceived conversation intimacy that interaction partners experience during a conversation?

3. Method

3.1. Research design, ethical clearance and data collection

We used a mixed-method research design to examine the above research questions. The design consisted of (1) naturalistic observations to gather data about co-present phone use and (2) a paper-and-pencil survey to gather data about recalled phone use, perceived distraction, and perceived conversation intimacy. Ethical approval for the study was granted by the university's IRB.

Data collection for the study took place during three weeks in March–April 2016 in a large student restaurant of the university, and was performed by three research assistants. Two researchers unobtrusively observed the dyads. The third researcher approached the dyads with the one-page survey after the observation of the dyad ended.

There were no specific criteria for participants to be included in the study, other than that they had to fall in the typical student age range upon visual inspection, had to be involved in a dyadic conversation, and the conversation had to last longer than 10 min. If an observed dyad ended the conversation before 10 min were passed or other persons joined the dyad, the observation was broken off.

The two researchers who observed the dyads worked as follows: When a dyad was chosen to observe, the researchers agreed upon which participant would be coded as participant A, respectively B. This was an arbitrary decision. Next, one researcher did the actual observations, which consisted of mentioning out loud the starting and stop times of phone use of participant A and B (e.g. "B starts phone use," "B stops phone use"), and whether a phone screen was shared with the conversation partner (e.g. "A starts sharing," "A stops sharing"). An event was registered as phone use as soon as visual attention was paid to the phone screen. The other researcher checked the time of these occurrences and made visual notes of them on two 10-min timelines (one for participant A, one for participant B). See Appendix A for the observation sheet.

The researcher who approached the participants after the observation asked the participants whether they would be willing to take part in a short, one-page survey on how people experience day-to-day conversations. The researcher asked the participants to turn away from each other when filling out the survey. All participants that were approached agreed.

3.2. Participants

Data collection was ended when the 100-dyad target was reached. Of the 200 observed participants, a majority was female (N = 153,

76.5%), which is likely due to the restaurant being located near university schools in which the student population was predominantly female at the time of data collection for our study. The average age of participants was 20.49 years (SD = 2.17), with 197 of the participants having an age between 17 and 25, and three participants between 25 and 30. Eighty-four per cent of the participants described the relationship to their conversation partner as being friends, 7.5% as romantic partners, 3% as family, 3% as colleagues, and 2.5% as acquaintances. With respect to gender composition, more than half of the dyads (64%) were female-female, 25% female-male, and 11% male-male.

3.3. Survey and observation-based measures

Given the study's mixed-method approach, the variables used to perform our analyses originate both from the observations and the paper-and-pencil survey. With respect to the observations, the following person- and dyad-level variables were created based on the coded information on the observation sheet.

3.3.1. Person-level variables

- Person-level occurrence: whether the participant at any point during the conversation phubbed his/her conversation partner (yes/no).
- Person-level frequency: How frequently the participant initiated phubbing behavior during the conversation.
- Person-level duration: How long the participant phubbed his/her conversation partners, expressed in seconds.
- Person-level initiated screen-sharing: Whether the participant shared his/her screen with the other participant.

3.3.2. Dyad-level variables

- Dyad-level occurrence: Whether at any point in the conversation a phone had been used by one or both conversation partners (yes/no).
- Dyad-level frequency: How frequently phones were used during the conversation.
- Dyad-level duration: The total duration of phone use during the conversation, expressed in seconds.
- Dyad-level mirrored ('contagious') use: Whether at any point in the conversation participants mirrored their partner's phone use, operationalized as taking one's phone immediately after noticing the conversation partner's phone use (yes/no).
- Dyad-level phone screen sharing: Whether at any point in the conversation the phone-screen was shared with the conversation partner (yes/no).

The survey that was administered to the participants after the observation asked the participants to fill out their gender, age, and the nature of the relationship with the conversation partner. Next, the survey measured perceived conversation intimacy and perceived distraction of themselves and the conversation partner. The survey ended asking the participants whether they recalled themselves and their conversation partner using a phone during the past 10 min.

3.3.3. Perceived conversation intimacy

We measured perceived intimacy of the conversation by asking the participants to think back to the last 10 min of their conversation, and to evaluate their experience by indicating their agreement with six items that were rated on a seven-point Likert scale (1 = totally disagree, 7 = totally agree). The items and their sources were: "I felt comfortable enough to share positive and negative experiences with my conversation partner," "I sometimes did not feel comfortable listening to my conversation partner's problems," "I could share my inner most thoughts with my conversation partner", from the *Fear of Intimacy Scale* (Descutner & Thelen, 1991), "I confided personal information to my conversation partner," "I felt as if my conversation partner understood my emotions," from the *Miller Social Intimacy Scale* (Miller & Lefcourt, 1982). An additional item: "I discussed a topic that I don't discuss very often", from the *Emotional Intimacy Scale* (Williams, 1985) was excluded due to low consistency with other measures. The remaining items formed an internally consistent scale (α = .78).

3.3.4. Perceived distraction of self and other

We adapted six items from the *Attentional Allocation Scale* (Harms & Biocca, 2004) to measure to what extent the participants perceived themselves and their conversation partners as distracted during the past 10 min of the conversation. The self-directed items were: "During the conversation, I was easily distracted from my conversation partner," "I remained focused on my conversation partner throughout our interaction," "During the conversation, my partner did not receive my full attention". These items formed an internally consistent scale (α = .77). The other-directed items were: "My conversation partner remained focused on me throughout our interaction", "During the conversation, my conversation partner was easily distracted from me," "During the conversation, I did not receive my partner's full attention." These items also formed an internally consistent scale (α = .73). The scale variables were computed as such that higher scores indicate perceptions of greater distraction.

3.3.5. Recalled phone use

Finally, we asked the participants via two yes/no questions, whether they and their partner had used their phone during the last 10 min of their conversation or not. One of the 200 participants answered only one conversation intimacy item. This participant was excluded from person-level analyses involving this dependent measure.

3.4. Analyses

The methods of analysis differ for the different research questions depending on their nature. The first research question utilizes descriptive statistics and visualization to characterize the distribution of phubbing behavior at multiple levels. For research questions 2, 3, 4, and 6 that involve statistical inference, we compare a null hypothesis to an alternative hypothesis using Bayesian statistics. Bayesian inference has a number of advantages over null-hypothesis testing (Wagenmakers, Wetzels, Borsboom, & Van Der Maas, 2011), and in this case we are particularly interested in quantifying the degree to which our data actually supports the null hypothesis when it favored. The Bayes Factor, specifically the ratio of the likelihood of the data given the null hypothesis or an alternative hypothesis, naturally captures this measure. For example, a Bayes Factor of 5 : 1 in favor of the null hypothesis suggests the data is five times more likely given the null hypothesis model than the alternative model. Throughout this paper we follow the suggestions from Jeffreys (1961) on how to interpret Bayes Factors: a ratio less than 3 : 1 is considered anecdotal evidence that carries little to no weight, a ratio less than 10 : 1 is moderately strong evidence in favor of a hypothesis, a ration higher than 10 : 1 is strong evidence for a hypothesis.

Finally, the fifth research question focused on predicting perceived distraction and intimacy based on phubbing behavior relies on evaluating predictive models. In this case we utilize linear regression models and evaluate them based on how much variance in the outcome variables they explain as well as the significance of the weights assigned to individual features.

4. Results

4.1. RQ 1: exploring the occurrence, frequency and duration of phubbing behavior

To answer our first research question, which concerns the

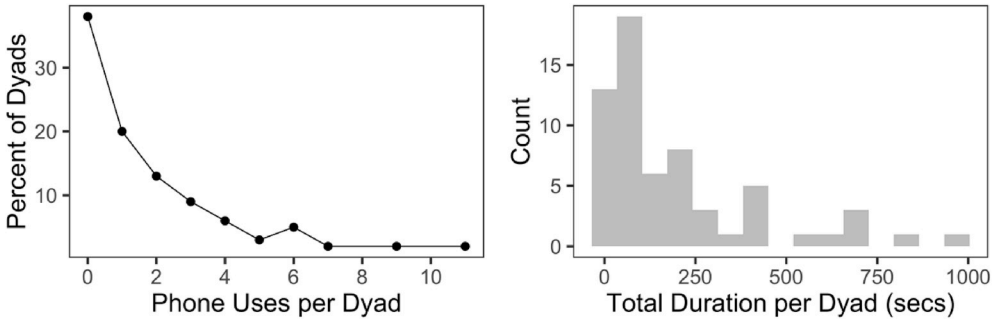


Fig. 1. Phone use *per dyad* within a 10 min conversation. Left: The distribution of the number of phubbing events per dyad. Right: The distribution of total phubbing duration across all uses by both partners (total 1200 s). Though the modal number of phubbing events per dyad was 0, most dyads did show at least one phone usage (62%) and both distributions show a highly skewed distribution with a number of people using their phone often and for a long time. See Appendix B for the tables of these figures.

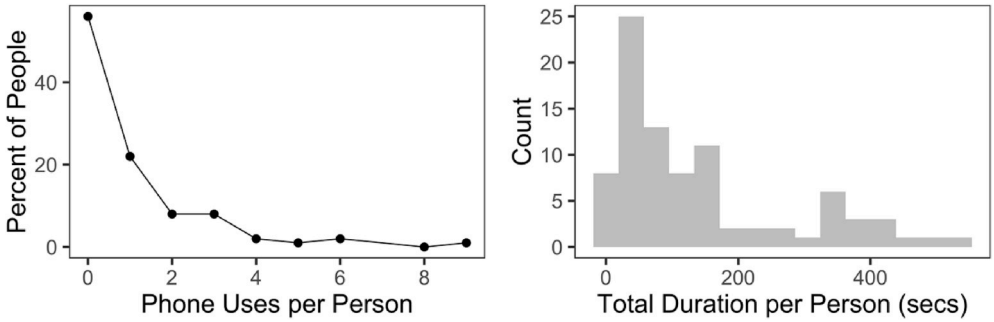


Fig. 2. Phone use *per person* within a 10 min conversation. Left: The distribution of the number of phubbing events per person. Right: The distribution of the total amount of phubbing duration by people who used their phone at least once (total 600 s). See Appendix B for the tables of these figures.

occurrence, frequency and duration of phubbing behavior, we analyze the observed data first at the dyad level, then the person level, and finally at the level of an individual phubbing event (either as instances of one participant, either instances of both people phubbing simultaneously).

Phubbing behavior was observed in 62 of the 100 dyads. In these 62 conversations, phubbing occurred on average 3.16 times during the 10 min conversation (*SD* = 2.5; *Median* = 2; *Mode* = 1; *Max* = 11), but with a highly skewed distribution (see left panel of Fig. 1). The duration of phubbing within these dyads also display a highly skewed distribution with a median duration of 99 s (*SD* = 225.2; Mean = 195.5; *Mode* = 10) across two people within the 10-min timeframe (right panel of Fig. 2).[1] Finally, the gender composition of the dyad did not seem to have an influence on phubbing behavior: A Bayesian contingency table test between the gender composition of the dyad and phubbing occurrence found moderate evidence in favor of the null hypothesis of no relationship (BF_{01} = 3.6), suggesting that the observed data is 3.6 times more likely when assuming that there is no effect of dyad gender composition on phubbing behavior.[2]

At the person-level, 87 (43.5%) of people phubbed their partner at least once during the conversation (which also resulted in 87 persons being the victim of phubbing). Among the 87 persons who phubbed at some point, the average occurrence of phubbing was 2.3 times (*SD* = 1.8; *Median* = 2; *Mode* = 1; *Min* = 1; *Max* = 9). For these people, the average total duration per person was 140.0 s, but there was substantial variability between phubbers with respect to the total duration of their phubbing behavior (*SD* = 136.6; *Median* = 90.0; *Mode* = 10; *Min* = 6; *Max* = 540).

Finally, we explored individual phubbing events. In general, these events were relatively long, lasting on average over a minute with high variability (*Mean* = 62.00 s; *SD* = 76.4; *Median* = 33; *Mode* = 10).[1]

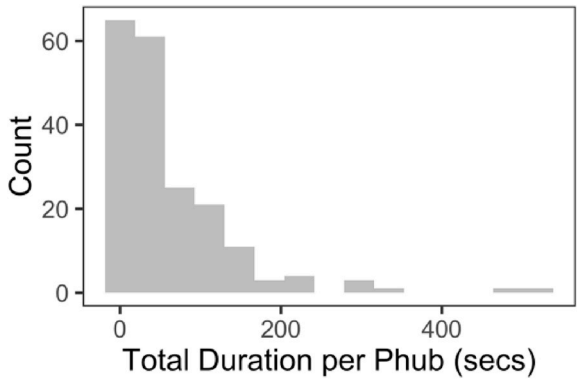


Fig. 3. The duration of all phubbing events. Most events were short (mode is 10 s), but the distribution is highly skewed with the median phubbing event lasting 33 s and the average length over 61 s. See Appendix B for tables of this figure.

Fig. 3 shows the full distribution of the duration for the 196 observed phubbing events, and as with aggregate dyad- and person-level distributions, the distribution is peaked at very low durations (10 s) but shows a strong positive skew. This power law distribution is characteristic of a Zipfian distribution (Zipf, 1949) which are characteristic patterns in other forms of human communication (e.g. Hendrickson & Perfors, 2019) as well as other phone-use behavior (Hendrickson et al., 2019).

How did the phubbing behavior of one member of the dyad impact phone usage of their partner? Of the 87 persons who were in a conversation with a phubber, 37 persons (42.5%; 18.5% of the total sample) underwent their conversation partner's phubbing behavior without engaging in phubbing themselves. Fifty persons (57.5% of the phubbers; 25% of the total sample), however, were both phubber and phubbee during the 10-min timeframe. Thus, in 25% of the 100 observed dyads, both conversation partners used their phone at least once.

In the 25 dyads where both conversation partners used their phone, 19 were dyads in which both people used their phone at the same time.

[1] Note that every second when both people were using their phone was counted as 2 s of phone use (one for each person) to ensure the total number of seconds was constant across dyads.

[2] All Bayesian analyses conducted using the default prior distributions in the BayesFactor package, version BayesFactor_0.9.12–4.2 with R version 3.5.1.

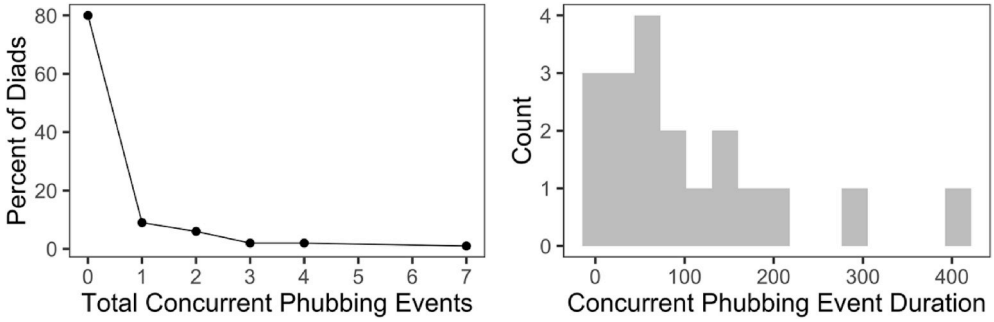


Fig. 4. Concurrent phubbing behavior. The left panel shows the percentage of dyads that display a given number of overlapping phone use events, the right panel shows the duration of all overlapping phone use events. See Appendix B for the tables of these figures.

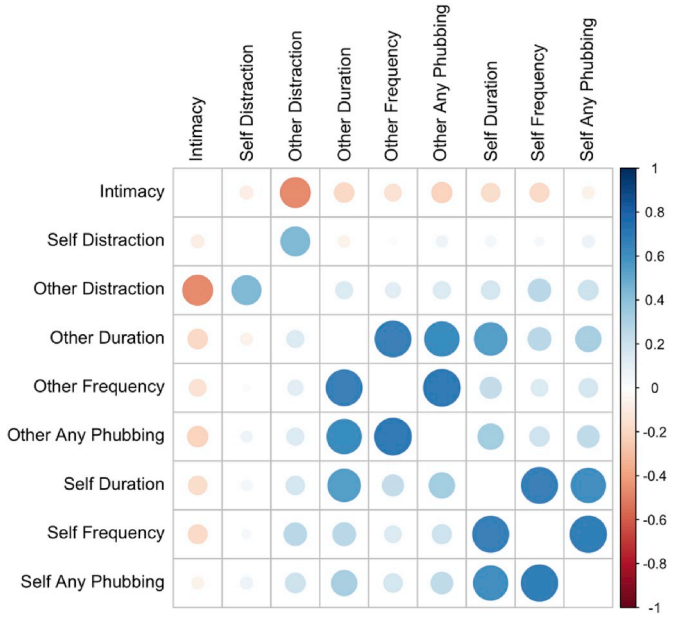


Fig. 5. Correlation between the measures of perceived conversation intimacy, own distraction, partner distraction, as well as own and partner phubbing frequency and duration. The size of the circle indicates the magnitude of the correlation between the two factors with positive correlations indicated by blue and negative with red. The overall pattern suggests a stronger positive relationship between the measures of phubbing behavior than with the measures of distraction and intimacy. The order of features was determined by hierarchical clustering. See appendix C for full scatterplot comparing each variable. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

As seen in the left panel of Fig. 4, overall the number of concurrent phone use events was relatively low in these dyads (14 of 19 had 1 or 2 overlap events), but as before the distribution was skewed right (*Mean* = 2.2; *SD* = 1.5; *Median* = 2; *Mode* = 1). The total duration per concurrent phubbing event tended to be long (*Mean* = 2.2; *SD* = 1.5; *Median* = 2; *Mode* = 1).

Males (51.0%) and females (41.2%) engaged in phubbing behavior at roughly the same rate; indeed, a Bayesian contingency table test between any phone use and gender found support in favor of the null hypothesis of no relationship (BF_{01} = 1.6). Furthermore, a Bayesian analysis shows moderate evidence that a person's gender had no effect on their likelihood of their partner being the only person to phub (BF_{01} = 4.9), thus suggesting the data are 4.9 times more consistent with the hypothesis that males and females are equally likely to be the 'phubbee' (i.e., victim).

4.2. RQ 2 & 3: the occurrence of mirrored ('contagious') and shared phone use

Did we see instances of mirrored phone use? In other words, did phone use by one participant lead to use by the other? In five of the 25 conversations in which both people used their phones the phone use initiated by one conversation partner was mirrored by the other conversation partner within 5 s. Given that 78 of 200 participants used their phone, the probability of any participant using a phone was 0.44. If phone usage by a participant is independent of the behavior of the other participant, the expected proportion of dyads in which both participants use their phone would be 0.19 ($= 0.44^2$). The actual proportion was 0.25, suggesting people were more likely to use their phone given the other participant used their phone. However, using a Bayesian proportion test between the expected number of co-using dyads and the actual number, this produces only anecdotal evidence in favor of the null hypothesis (BF_{01} = 1.31 : 1).

Shared screen use, which we defined as events where one conversation partner shows their phone screen to the other conversation partner, was observed in 19 conversations by twenty-five people (28.7% of the phubbers; 12.5% of the total sample). A Bayesian contingency table test between screen sharing and gender found anecdotal evidence in favor of the null hypothesis (BF_{01} = 1.6 : 1).

4.3. RQ 4: accuracy of recalling phone use

In general, participants were relatively poor at recalling whether they or their partners had engaged in phone use in the past 10 min of the conversation. Twenty five per cent of people could not correctly recall if they used their phone (87 of 200 used them), with a higher proportion of people failing to recall usage (N = 28 of 87, 32%) than falsely reporting usage (N = 21, 17%). Similarly, 24.5% of people did not correctly recall if their partner used their phone (87 of 200 used them but one survey response was missing), with – again – a higher proportion failing to recall usage (N = 29 of 86, 33.7%) than falsely reporting usage (N = 21 of 113, 18.5%). Interestingly, people were incorrect on both recall tasks only 7% of the time, suggesting that recall of one's own behavior and recall of another person's behavior are independent and not driven by a single recall probability per person that is consistent with overall good or poor memory for phone use by either person. Indeed, a Bayesian contingency test shows moderate evidence that accuracy on these two tasks was independent (BF_{01} = 4.51).

4.4. RQ 5: the association between the occurrence, frequency and duration of phubbing with perceived distraction and perceived conversation intimacy

Clearly there is significant variation in how phones are used within a conversation. In some dyads, one partner phubs without the other engaging with the phone. In other dyads both partners used their phone serially, in parallel, or as a shared resource. In the follow sections we

evaluate the impact of using a phone, and of the duration and frequency of use, on perception of distraction and intimacy.

4.4.1. Phubbing and self-distraction

First, we evaluate the degree to which variability in a person's judgment of their own level of distraction can be explained by their own and partner's phubbing behavior. Surprisingly, less than 1% of the variance in self distraction level can be accurately predicted with a linear combination of the number of phubbing actions, the duration of phubbing, or a binary indicator of phubbing (multiple $R^2 < 0.01$, $F(3, 195) < 1$, $p = .67$). Similarly, including the same measures of the phubbing behavior of the partner does not improve prediction (multiple $R^2 = 0.03$, $F(6, 192) < 1$, $p = 0.31$[3]). The factor that does improve predictions of self-distraction is the perceived distraction of the partner (multiple $R^2 = 0.21$, $F(8, 190) = 6.66$, $p < .001$). However, this full model does not explain significantly more variance than a model containing only the perceived distraction of the partner as a predictor (multiple $R^2 = 0.17$; $F(7) = 1.56$, $p = .15$).

Alternatively, the impact of individual factors can be evaluated by performing significance tests on the coefficients for a full model. We begin with a model containing all predictors listed above[4]. This model accounts for 21.9% of all variance in judgments of self-distraction, significantly more than an intercept-only model (multiple $R^2 = 0.219$, $F(8, 190) = 6.66$, $p < .001$). Two predictor variables have significant impact on self-distraction ratings at the 0.05 level. An increase in the judgment of partner distraction is associated with an increase in self-distraction ($b = 0.26$, $SE = 0.04$, $t = 6.62$, $p < .001$) and an increase in the duration of the partner's phone use is associated with a decrease in self-distraction ($b = -0.0013$, $SE = 0.00058$, $t = 2.24$, $p = .026$). In other words, the more distracted persons perceived their conversation partner to be, the more distracted they report themselves to be. And the longer one's conversation partner used their phone, the less distracted persons reported themselves to be.

4.4.2. Phubbing and perceived distraction of conversation partner

Second, we evaluated the degree to which variance in judgements of a partner's level of distraction can be explained by the same predictors. Less than 3% of the variance in perceived partner distraction can be explained by the three measures of the partner's phubbing behavior (multiple $R^2 = 0.03$, $F(3, 195) = 2.10$, $p = .11$). Interestingly, adding the three measures of a person's own phubbing behavior to the model explains a significant amount of variance (multiple $R^2 = 0.08$, $F(7, 191) = 2.42$, $p = .021$) though this model does not explain significantly more variance than the previous model ($F(4) < 1$, $p = .42$). The model of partner distraction that explains the most variance is one that includes predictors based on partner phubbing, self phubbing, and self-distraction (multiple $R^2 = 0.25$, $F(8, 190) = 8.07$, $p < .001$). This model accounts for significantly more variance than a model based only on self-distraction ($F(7) = 2.89$, $p = .007$).

Similar to the analysis of the self-distraction judgments, the impact of individual factors on partner distraction can be evaluated by performing significance tests on the coefficients for a full model.[5] This model accounts for 27.8% of all variance in judgments of partner distraction, significantly more than an intercept-only model (multiple $R^2 = 0.278$, $F(8, 187) = 8.98$, $p < .001$). Again, two predictor variables have a significant impact at the 0.05 level: An increase in the judgment of self-distraction is associated with an increased judgment of partner distraction ($b = 0.75$, $SE = 0.107$, $t = 7.04$, $p < .001$) and an increase in the frequency of one's own phone use is associated with an increased perception of partner distraction ($b = 0.19$, $SE = 0.06$, $t = 3.13$, $p = .002$).

4.4.3. Phubbing and perceived conversation intimacy

Finally, we evaluate the degree to which variance in judgements of conversation intimacy can be explained by phubbing behavior. A full model containing measures of self and partner phone usage as well as distraction measures[6] accounted for 27.7% of variance in judgments of intimacy and this model was significantly better than an intercept only model ($R^2 = 0.277$, $F(9, 189) = 7.93$; $p < .001$). Furthermore, the parameter weights of this model suggest which features indicate a significant effect on perceived intimacy. If the partner used their phone, this decreased the intimacy rating by more than half a point on a 7 point scale ($b = -0.50$, $SE = 0.24$, $t = 2.10$, $p = .038$), this was not the case for one's own phone use ($b = 0.24$, $SE = 0.23$, $t = 1.03$, $p = .30$). Similarly, judgements of partner distraction had a significant negative effect on intimacy judgments ($b = -0.55$, $SE = 0.08$, $t = 6.89$, $p < 0.001$). Counterintuitively, increasing self-distraction had a significant positive association with intimacy ($b = 0.26$, $SE = 0.13$, $t = 2.0$, $p = .048$).

4.5. RQ 6: the association between shared screen use, perceived distraction and perceived conversation intimacy

Our final analyses concerned whether phone sharing behavior had an effect on perceived distraction and conversation intimacy. Overall, phone sharing was relatively rare, occurring in 19 of 100 dyads. The results of three Bayesian t-tests show anecdotal evidence in favor of the null hypothesis that screen sharing during a conversation has no effect on a person's judgments of intimacy ($BF_{01} = 2.66 : 1$), self-distraction ($BF_{01} = 2.89 : 1$), or partner distraction ($BF_{01} = 1.14 : 1$).

5. Conclusion and discussion

This study was guided by three overarching aims: (1) to assess the nature of phubbing behavior during dyadic conversations by drawing from systematic, naturalistic observation data, (2) to examine how accurately participants can recall phubbing behavior, both of themselves, and of their conversation partners, and (3) to explore associations between the observed behaviors and self-reports of perceived distraction and conversation intimacy. The findings show that while phubbing is quite common, it is poorly recalled. Moreover, while we found that some aspects of phubbing behavior are associated with participants' perceptions of distraction and conversation intimacy, the entire picture is quite nuanced.

With respect to the nature of phubbing behavior, we found that co-present phone use occurred in 62% of the observed dyads. This is substantially more than the 43% in the study of Kruger et al. (2017), which may be due to differences in the nature of the setting (waiting settings versus a restaurant) and the population (general versus students) that was observed. When phones were used, they were oftentimes used multiple times and – quite noticeably – also for extended periods of time. Given the short time span in which participants were observed, we may conclude from these results that – at least in the current population – phubbing is a common practice.

Nonetheless, it is relevant to point out that in some dyads, the phubbing behavior was outspoken. For example, in one conversation, a

[3] All models containing a binary indicator for both self and partner phubbing also include the interaction of these variables.

[4] full model is lm(formula = self_distraction ~ my_use_binary + my_freq + my_duration + other_use_binary + other_freq + other_duration + other_use_binary:my_use_binary + partner_distraction).

[5] full model is lm(partner_distraction ~ my_use_binary + my_freq + my_duration + other_use_binary + other_freq + other_duration + other_use_binary: my_use_binary + self_distraction).

[6] full model is lm(perceived_intimacy ~ self_binary_phone_use + self_phone_freq + self_phone_duration + partner_phone_use_binary + partner_phone _freq + partner_phone_duration + partner_phone_use_binary: self_binary_phone_use + self_distraction + partner_distraction).

participant phubbed their conversation partner nine times during the 10-min observation period, and in four conversations we observed one partner spending more than 5 min on their phone - without sharing the screen or their conversation partner co-using their phone at the same time. These latter findings illustrate that phubbing behavior can contribute to a situation in which conversation partners are 'absent present' (Gergen, 2002) or 'alone together' (cf. Turkle, 2011).

With respect to our second study aim, our study findings show considerable discrepancies between the actual and the recalled phubbing behavior of the participants and their conversation partners. It is important to point out that the fact that some participants falsely recalled phubbing behavior may be a result of the method that we used: Given that participants were unaware of the start and end time of the observation period, they may have included instances of phubbing behavior into their recollection that took place shortly before the actual observation started. However, an alternative explanation for the false recollection, that aligns with observations from recent interview studies involving young populations (Aagaard, 2019; Kadylak et al., 2018; Miller-Ott & Kelly, 2017), is that phubbing behavior has become so automatized and socially engrained that it happens without people being aware of it – even when they actually dislike themselves and other people doing it (Aagaard, 2019).

Our third study aim was to explore whether phubbing behavior is associated with perceptions of distraction and conversation intimacy. With respect to the phubbing measures in relation to perceptions of distraction, our study findings show a complex picture. For self-distraction, we found a counterintuitive, yet weak negative association with the duration of the conversation partner's phubbing: the longer one's conversation partner phubbed, the less distracted participants perceived themselves. For perceived distraction of the conversation partner, we found a positive association with the frequency of the participant's own phubbing behavior: The more frequently a participant had phubbed, the more distracted they judged their conversation partner. With respect to conversation intimacy, the only association found was with the occurrence of partner phubbing: Participants whose conversation partner had phubbed them at least once during the conversation, experienced lower conversation intimacy. In sum, these study findings altogether do not provide strong support for the assumption that phubbing produces an attentional conflict in either phubbers or phubbees, nor for the assumption that phubbing is experienced as harmful for processes of relational intimacy.

An overall conclusion that can be drawn from our study, is that - while phubbing is common - people do not really seem to notice it, and any effects on distraction and conversation intimacy, whether positive or negative, appear to be rather small. This conclusion raises interesting questions concerning the role of phubbing as a behavior that may – or may not – violate the norms that we have surrounding polite and attentive behavior in conversations. The work of Miller-Ott, Kelly and colleagues (Kelly et al., 2017; Miller-Ott & Kelly, 2015a, 2017) already shows that phubbing behavior does not always violate conversational expectations; the degree to which violations occur depend on various factors, such as the formality of the setting or the nature of the interaction. Kadylak et al. (2018) noticed that, especially among young, mobile-adept persons, the reading of what counts as attention-giving and -getting may be changing. At a more abstract, theoretical level, this would imply that the 'established' non-verbal proxemics in co-present interaction that are read as signs of giving and receiving attention, such as mutual eye gaze and keeping an open posture, are less fixed than commonly assumed. Assuming that mobile use and its associated norms are generational, a replication of this observation study among an older population could be insightful in that regard. In addition, future experimental work needs to look deeper into the non-verbal behavior expressed when people phub during co-present interactions, how these behaviors are perceived and interpreted, and how factors such as the level of automatization of one's phone use influence the interpretation process.

It is important to remark that the causality of the relationships explored between phubbing on the one hand, and distraction and conversation intimacy on the other, may be reversed. Previous research shows that internal triggers, such as feelings of boredom or a desire for additional stimulation, make people more susceptible to engage in self-interruptions (Adler & Benbunan-Fich, 2013). It may be the case that some of the phubbing behavior that was observed in this study resulted from conversation partners' experience that the conversation was boring and/or not engaging enough to devote one's full attention – although the lack of any strong association also speaks against such an association: After all, the findings do not suggest that phubbing and a perceived lack of attention and conversation intimacy necessarily go hand in hand.

There are several limitations to this study that are worth mentioning. A limitation of the current study is that we did not measure more specific aspects of the phubbing behavior. First, we do not know how absorbed the phubbers were in their phone use. Based on the assumptions of expectancy violation theory (Burgoon, 1993) and social ostracism theory (Williams, 2007), we may expect that when a phubber displays a greater level of absorption in the phone, this affects the quality of the conversation and the relationship more negatively because higher levels of absorption likely lead to a stronger violation of the conversation partner's expectations and make him/her feel more socially rejected during the conversation. Second, we do not know what the phubbers were doing on their phone. Qualitative studies have shown that playing games during a conversation is viewed as a more negative expectancy violation than quickly texting back a person and excusing for it (Miller-Ott & Kelly, 2015a, b). Third, we did not assess whether participants had verbally addressed their phubbing behavior during the conversation; Previous work shows that this may be relevant, as apologizing for one's phone use or verbally sharing what one is doing, may mitigate any experience of a negative expectancy violation (Kelly et al., 2017). Future observational studies need to incorporate all of these aspects as much as possible into the research design, for example by registering to what extent phubbers' phone behavior is active (e.g. typing) or passive (e.g. scrolling), by asking or logging what activities they perform, and by asking about (or recording) verbal utterances in relation to the participants' phone use.

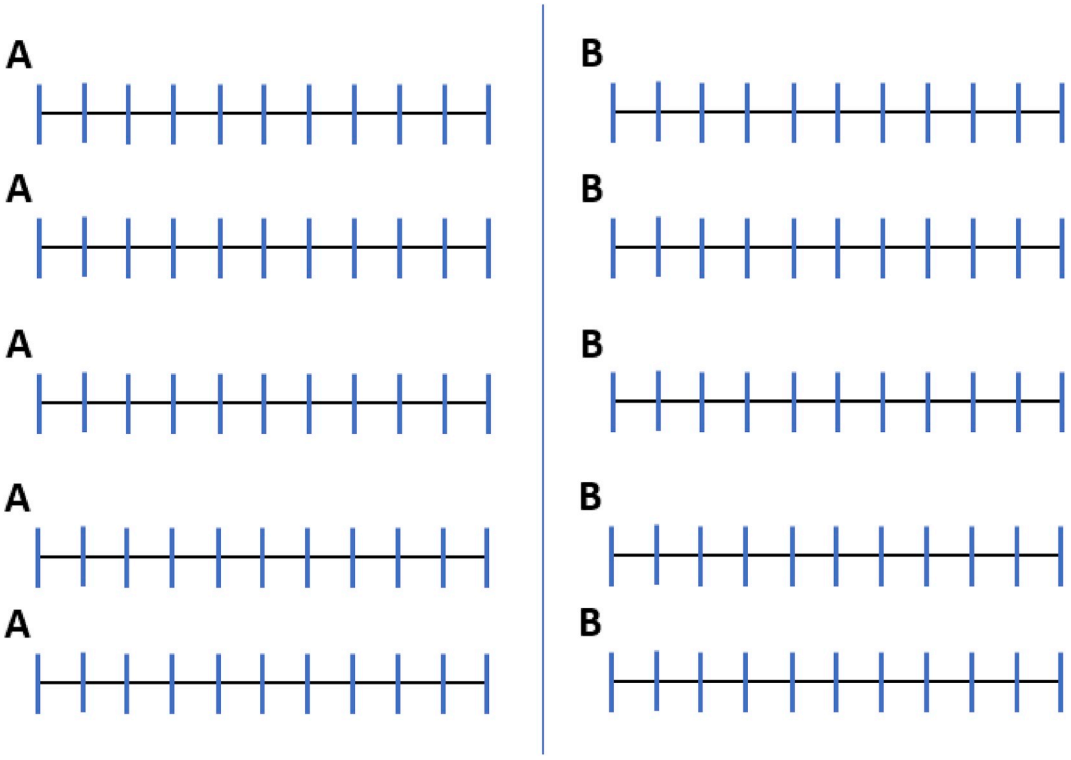
Future studies could also take into account whether phubbing behavior and its consequences differ for different relationships. In this study, we did not have the statistical power to distinguish between friends, family, lovers and colleagues, but phubbing may be perceived differently in these different contexts. During a first date, phubbing is probably perceived as a stronger violation than during a dinner with one's sibling. Relatedly, one could also look deeper into the temporal characteristics in the patterns of co-present phone use. When longer interactions were collected, time series analysis could be used, for example, to examine time patterns in the occurrence of phubbing, and how these time patterns relate to momentary assessments of conversation and relationship quality during that interaction.

As the body of research on the relational correlates of co-present phone use continues to grow, research that focuses on facts and figures remains scarce. This study provides an answer, by presenting metrics on the occurrence, frequency and duration of phubbing behavior among university students. Additional observation research in different populations is necessary, however, as the current population is likely not 'typical' for the general population, and only one setting, the informal student restaurant, was explored. Other behavioral, dispositional, relational, cultural and contextual factors may play a role (Vanden Abeele, 2019). A relevant behavioral factor, for example, may be the extent to which the phubber succeeds in keeping eye contact or not (cf. Vanden Abeele & Postma-Nilsenova, 2018); rejection sensitivity might be a relevant dispositional factor (cf. Chotpitayasunondh & Douglas, 2018); a relational factor may be whether the conversation partners are in a hierarchical relationship (e.g. boss – employee) or not (e.g. 'boss phubbing'; Roberts & David, 2017); a cultural factor may concern the

impact of a local or national culture; and a contextual factor could be an aspect such as the formality of the setting (Miller-Ott & Kelly, 2017). Future research is needed to tease these factors apart, and to unravel the mechanisms that explain when phubbing behavior affects various relational outcomes.

Finally, in certain related strands of research, such as that which explores the association between parental phone use and parental responsiveness to young children, the naturalistic observation method is currently taking on a central role (e.g. Abels, Vanden Abeele, van Telgen, & van Meijl, 2018; Hiniker et al., 2015; Radesky et al., 2014). The naturalistic observation method, however, can also take a central role on other types of phubbing research. We hope that our study has contributed to that line of inquiry.

Appendix A. Observation sheet



Appendix B. Tables corresponding with Figs. 1–4

Raw dyad-based phone uses (left panel Fig. 1)

Phone Uses	0	1	2	3	4	5	6	7	9	11
Percent of Ss	38	20	13	9	6	3	5	2	2	2

Quantiles of dyad phone use duration in seconds (right panel Fig. 1). To aid interpretation, the figure excludes dyads with no phubbing behavior, the quantiles of the complete dataset are presented here.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0	0	0	0	9.6	32.5	64.2	101.5	188.6	403.6	975

Quantiles of individual phone use event durations in seconds (Fig. 3).

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0	6.5	11	16.5	25	33	47	69	100	146.5	520

Raw dyad-based instances of concurrent phone use (left panel Fig. 4).

Concurrent Events	0	1	2	3	4	7
Percent	80	9	6	2	2	1

Raw person-based phone uses (left panel Fig. 2)

Phone uses	0	1	2	3	4	5	6	8	9
Percent of Ss	56	22	8	8	2	1	2	0	1

Quantiles of person phone use duration in seconds (right panel Fig. 2). To aid interpretation, the figure excludes people with no phubbing behavior, the quantiles of the complete dataset are presented here.

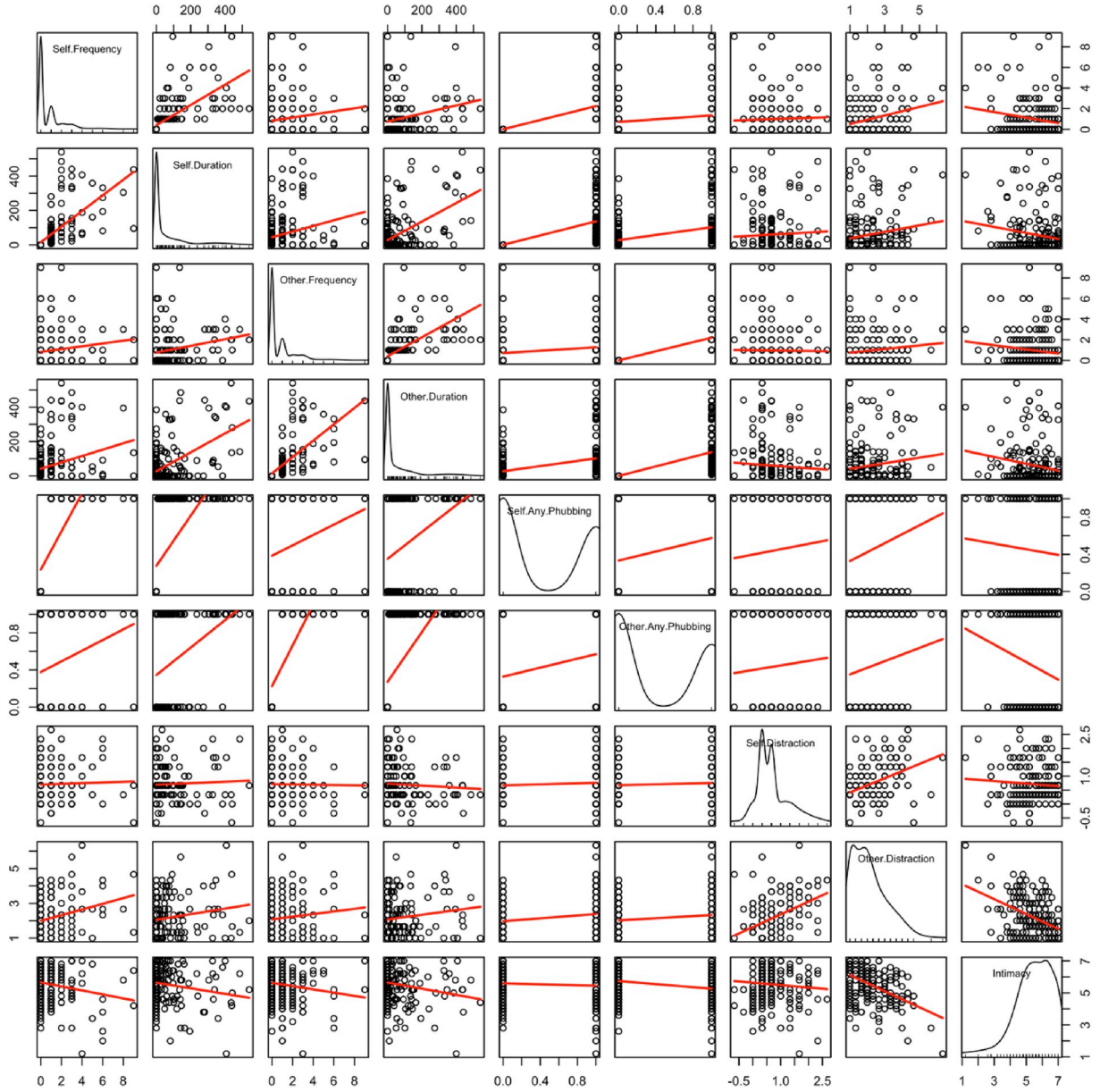
0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0	0	0	0	0	0	13.2	48.3	98.2	198.1	540

Quantiles of dyad-based concurrent phone use duration in seconds (right panel Fig. 4). Since concurrent phone use is relatively rare (25% of dyads), only the duration of concurrent phubbing behavior from dyads with at least one concurrent event are included here.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
8	10	22	36.2	52.4	71	91	132.2	160.4	218	415

Appendix C. Relationship between all pairs of predictor variables in Research Question 5.

Figure: Relationship between all pairs of predictor variables in Research Question 5. The main diagonal shows the distribution of that variable. Red lines indicate the best fitting OLS regression line between the two variables. Note the measures of phone uage are highly skewed (first four columns and rows), the two phone use indicator variables are binary (Any.Phubbing), and the judgements of Distraction and Intimacy are more normally distributed.



Appendix D. Correlations table for correlations in Fig. 5.

	Self Frequency	Self Duration	Other Frequency	Other Duration	Self Any Phubbing	Other Any Phubbing	Self Distraction	Other Distraction	Intimacy
Self Frequency	1								
Self Duration	.67***	1							
Other Frequency	.14*	.23**	1						
Other Duration	.27***	.55***	.66***	1					
Self Any Phubbing	.68***	.61***	.18*	.33***	1				

Other Any Phubbing	.19**	.33***	.69***	.61***	.24***	1			
Self Distraction	.03	.05	-.01	-.07	.07	.06	1		
Other Distraction	.26***	.17*	.11	.15*	.20**	.15*	.43***	1	
Intimacy	-.18**	-.17*	-.14*	-.20**	-.07	-.21**	-.08	-.46***	1

*p < .05, **p < .01, ***p < .001.

Appendix E. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.chb..06.004.

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