Investigating Phubbing in Everyday Life: Challenges & Lessons for Future Research

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ABSTRACT

The ubiquitous presence of smartphones has made them an integral part of our social lives. A well-known example of this phenomenon is *phubbing*, where smartphone use distracts people from their daily interpersonal interactions. While previous research has mostly relied on often biased global self-reports, our work introduces a novel approach to assessing phubbing in real life. To this end, we conducted an empirical study that integrated experience sampling and mobile sensing methods to obtain a more objective measure of phubbing behavior. Based on the evaluation of our concept, we contribute insights on reliable phubbing assessment in real life and the design of phubbing-aware technologies based on it. By highlighting the challenges associated with existing methods, we aim to stimulate discussion in the field of HCI and encourage the development of socially friendly technologies that benefit real-life interpersonal interactions.

CCS CONCEPTS

• **Human-centered computing → Empirical studies in collaborative and social computing**.

KEYWORDS

Phubbing, Technoference, Experience Sampling, Mobile Sensing, Smartphone Usage

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1 INTRODUCTION

In today's rapidly evolving digital landscape, the ubiquitous use of smartphones has significantly changed the dynamics of human interaction and led to new challenges. These go beyond the digital realm and extend into everyday life and social relationships. One such challenge is known as *phubbing* (*ph*one and snu*bbing*) – the act of snubbing others in favor of engaging with the smartphone [26]. Phubbing occurs as daily practice in social situations where individuals are engaged in face-to-face interactions but prioritize their digital devices over interpersonal communication [47]. While smartphones have revolutionized real-time global connectivity, empowering users to stay connected and strengthen social ties, they have concurrently introduced challenges in maintaining offline social interactions. Phubbing can be considered a prime example of technology's social impact, with initial findings suggesting negative outcomes such as reduced relationship satisfaction or lower levels of mental health [8, 18, 48]. The use of new technologies is changing people's everyday life to such an extent that some researchers are now even questioning whether phubbing has become a new social norm [1, 13, 33]. This underlines the urgent need to tackle phubbing as a social problem and raises the question of whether new technologies and their HCI concepts could be redesigned to mitigate potentially harmful effects associated with phubbing [25, 34].

An important first step that would enable the development of these phubbing-aware technologies in the first place is the reliable assessment of phubbing in real life. Recent advancements in research methodologies, particularly in experience sampling and mobile sensing methods, offer a promising way to capture phubbing *in situ*. In particular, mobile sensing enables the detection and analysis of subtle behavioral cues, contributing to a more holistic assessment and understanding of phubbing. Therefore, we propose a preliminary concept integrating experience sampling and mobile sensing methods for the assessment of phubbing ”in the wild”, to shed light on the technological feasibility, and current challenges and considerations for future technology design.

2 RELATED WORK

2.1 Phubbing and its Association With Life Outcomes

In recent years, different authors have proposed a variety of conceptualisations for phubbing [20], but they all have the following aspects in common: During the setting of a social interaction, one interaction partner (*phubber*) ignores one or more present others (*phubbee(s)*) and/or interrupts, escapes, or (mentally) 'disappears' from the social interaction in order to focus on the smartphone or any other mobile device [14]. Phubbing has been found to be related to negative interpersonal outcomes in various types of relationships, such as friendships [1, 43], romantic relationships [39, 48], parent-child relationships [18, 50, 51], or supervisor-employee relationships [40, 52]. Phubbing signals relational disengagement [47] and thus is associated, for example, with lower perceived quality of conversation [2, 14], lower feelings of social connection [7], lower trust towards the phubber [27, 40], and lower relationship satisfaction [14, 43, 48]. Relationship satisfaction, in turn, has been shown to mediate the association between phubbing and depression [48]. In addition, phubbing has been found to be directly related to several other indicators of mental health. For example, higher levels of being phubbed by parents were related to reduced sleep quality in adolescents [18] and higher levels of phubbing were associated with higher levels of stress and anxiety [8]. To sum up, all these findings emphasize that phubbing is a new social phenomenon with serious implications for various life outcomes that needs to be further investigated [14].

2.2 Designing for Human-Human Interaction

As phubbing has been identified as daily practice with harmful effects on individuals' social relations and well-being [47], HCI researchers have started to explore concepts that shift the focus from human-technology interaction back to human-human interaction [25, 34]. Accordingly, some researchers have found technical solutions to help individuals reduce their smartphone use during group activities [12, 28]. For example, Choi et al. [12] proposed a prototype that works with an external object connected to the smartphones of the group members. To raise the awareness for smartphone use during in-person interactions, the external device signals through movement and ambient light that one or more present people in the group are using their smartphone [12]. Another approach was proposed by Ko et al. [28] who developed an app that enables the management of smartphone use during co-located social interactions in group settings. Using the app's *socialization mode*, group members agree to limit distractions by locking their smartphones together. The app's *temporary usage mode* enables controlled smartphone use within groups by requesting/granting permissions to each other [28]. Finally, Park et al. [35] proposed a social context-aware smartphone notification system that postpones display of notifications to a later time if the user currently is in a social interaction.

The majority of participants rated the concepts focused on human-human interaction in these earlier studies positively. In particular, they found them helpful to focus on primary social activities [12, 28, 35]. However, despite the positive evaluations, these concepts have not yet been widely adopted in practice. This could be related to the fact that some of these concepts already require users to have a certain level of awareness for the problem of phubbing and a willingness to change it. This means, that users must actively commit to agree on times of non-use [28] or to monitor an external device and to counteract if it signals too much smartphone use [12]. Low-threshold approaches that do not require active user action to prevent phubbing, but instead focus on social context-related technical design (e.g., withholding notifications), are in turn often still only used in controlled experimental setups [35]. One reason for this could be that reliably assessing phubbing in the real world - a prerequisite for applying these HCI concepts in everyday life - is still a challenging task.

2.3 Assessing Phubbing

In empirical studies, phubbing is mostly assessed using global self-report instruments such as the Phubbing Scale [26], or the Generic Scale of Phubbing (GSP, [15]). One of their major advantages is that they can be used to economically study phubbing on a large scale. Although these scales explicitly formulate the goal of assessing phubbing *behavior* (as per definition of the construct), they conceptualize it as a multi-dimensional, stable psychological trait that additionally assesses affective and cognitive evaluations [15, 26]. In addition, these scales capture people's self-concepts of behaviors that have little to do with actual behavior in everyday life [6, 22]. Accordingly, they are not well suited to assess phubbing behavior in daily life, and thus to form the basis for the implementation of social context-aware interaction concepts (see section 2.2).

As an alternative, a few studies have started to use observational study designs. In Abeele et al. [3], dyads of students were covertly observed to detect phubbing behavior during real-world conversations. Other researchers used multi-dimensional video recordings [5]. These direct observations offer a promising approach to grasp the dynamic nature of phubbing. However, using them for the assessment of daily phubbing behavior at scale is not feasible as human-coded observations are very time-consuming and rather privacy invasive.

A second alternative is ambulatory assessment. This term refers to various methods used to examine individuals and their naturally occurring behaviors and experiences in a variety of real-life situations, if possible in real time, to reduce retrospective bias, which is a known problem with global self-report questionnaires [16, 44]. The experience sampling method (ESM), in which people are sent short questionnaires, for example via smartphone, is one of them [29, 45]. So far, only a handful of studies have applied ESM for phubbing research. If so, researchers have often conducted daily diary studies to capture day-to-day processes in phubbing with shortened versions of the above mentioned global self-report scales

[11, 31]. Thus, they take over some of the problems of these scales, as discussed above.

Another idea for using ESM to operationalize *actual* phubbing behavior could be to ask people about their smartphone use during social interactions for shorter time windows (e.g., the past two hours). However, Abeele et al. [3] found that 25% of their sample even had difficulties in correctly recalling if they had used their phone in the last 10 minutes. So people have difficulty remembering their own phone use [4]. This issue could be avoided by supplementing ESM with other ambulatory assessment approaches. Accordingly, mobile sensing methods allow the unobtrusive and intensive longitudinal collection of data in the background of electronical devices such as smartphones [24, 32]. Thus, objective information about individuals' smartphone usage behavior can be assessed without any participant burden [23].

3 PRELIMINARY CONCEPT FOR PHUBBING BEHAVIOR ASSESSMENT IN DAILY LIFE

We took up the idea of using different ambulatory assessment approaches jointly to assess phubbing behavior in daily life. In our preliminary assessment concept, we used ESM to capture social interactions in situ and mobile sensing to track smartphone usage during these interactions. By utilizing smartphone logs, we objectively detected actual smartphone usage without having to rely on self-reports prone to distortions due to recall or social desirability biases [3, 17].

In more detail, we sent participants notifications to ask them repeatedly at pseudo-randomized times of the day about starting time and duration of their most recent physical face-to-face interaction. As shown in Figure 1, we asked for the duration of social interactions in categories. These self-reports allowed us to determine social interaction intervals. In order to be absolutely sure that we were really extracting smartphone use *within* social interaction intervals, we used the lower limit of the respective categories and accordingly defined the length of the social interaction intervals rather strictly. We then utilized smartphone logs to extract smartphone usage within these intervals. Thereby, a smartphone usage session was defined as the sequence of turning the screen on and off again. On this basis, we calculated for each interval of social interaction whether (i) phubbing occurred and for the intervals in which it occurred, (ii) the proportion of total phubbing time, (iii) the total number of phubbing events, and (iv) the average duration per phubbing event. Finally, we aggregated these indicators as a function of the duration of each social interaction interval over several weeks to obtain measures of individuals' typical phubbing behavior in daily life.

4 CONCEPT EVALUATION PROCEDURES

To evaluate our concept, we used data collected from March to July 2023 as part of the multi-study Coping with Corona (CoCo) project [1]. The project was approved by the Ethics Committee of LMU Munich under the study title „Coping with Corona (CoCo): Understanding individual differences in well-being during the COVID-19 pandemic". We utilized an Android mobile sensing app that was created for research purposes to observe different facets of users' everyday life behaviors. To be included, participants had to be at least 18 years old and install the PhoneStudy App [2] on their smartphones. The final sample for this study consisted of 320 participants (62% female, mean age = 29.72, range between 18 and 72 years). 2% of participants had lower secondary education, 7% had a high school diploma, 51% had finished their A-levels, 19% had a Bachelor's degree, 19% had a Master's Degree, and 3% had a PhD. Our sample was biased towards students (45%).

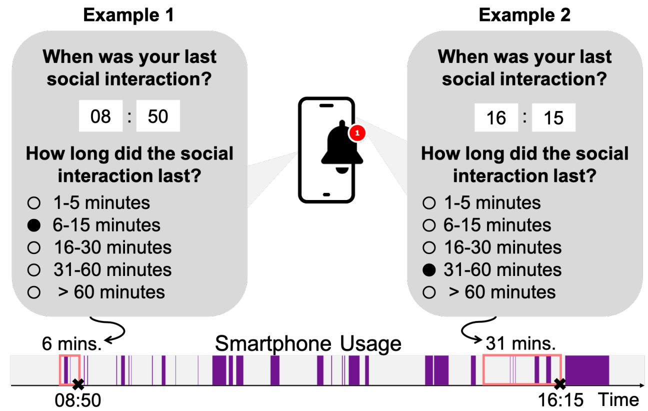

Figure 1: Conceptual overview of our phubbing assessment concept: The two examples visualize how we extracted smartphone usage variables based on the self-reported ESM data on timing and duration of social interactions (pink rectangles) from the continuous mobile sensing data (purple bars in the timeline). Thereby we used the lower bound of the reported social interaction intervals. Icons made by Freepik from www.flaticon.com.

Participants' individual study period was four weeks during which the app provided them with up to five ESM surveys per day. We pseudo-randomized the timing of sending ESM surveys to participants, with the exact ESM scheme varying randomly across participants and study weeks (including details on timing calculation and the logic of sending notifications; further details on the implemented ESM schemes can be found in van Berkel et al. [46]).

In addition, participants answered an online questionnaire upon entering and finishing the study. These questionnaires (among others) included general demographic questions and the GSP [15] which we used for comparison. The GSP measures phubbing across the four domains Nomophobia (fear of detachment from one's phone), Interpersonal Conflict (perceived conflict between oneself and others), Self-Isolation (phone use to escape from social activities and isolate oneself from others), and Problem Acknowledgement (acknowledging the own phubbing problem) [15]. It comprises 15 items on individuals' own phubbing (e.g., "I use my phone even though I know it irritates others") that are rated on a 7-point scale ranging from 1="never" to 7="always".

Further, we utilized log data from the PhoneStudy App, which collected various types of long-format log data (e.g., screen on/off,

[1]For more information, visit the project website at: https://coco-study.org/en/

[2]For more information on the app, visit the project website at https://phonestudy.org/en/

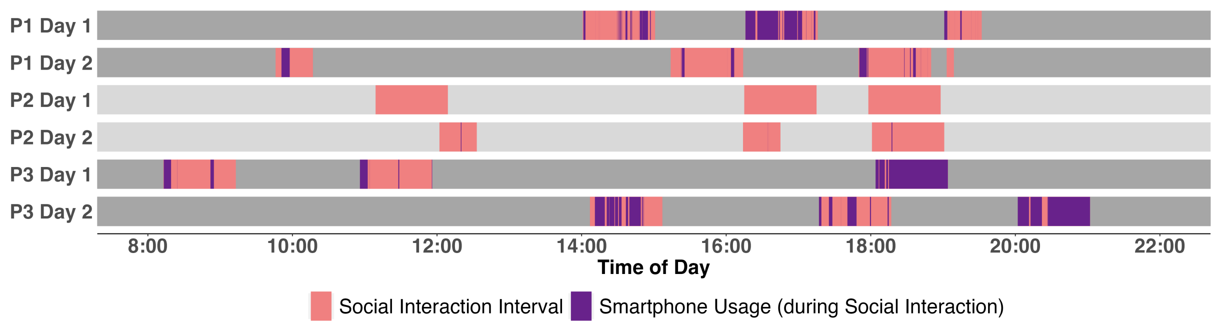

Figure 2: Smartphone usage events (purple bars) during self-reported social interactions (pink bars) throughout the course of a day (gray bars) for two different study days (Day 1 and 2) of three selected participants (P1, P2, and P3). Participants were selected to highlight variability at intra- and inter-individual level.

receiving calls, opening apps, charging the battery, GPS, ambient light). For this paper, we only used the log data for screen events to extract smartphone usage sessions. For a more comprehensive overview of the variety of the logged data and sensing capabilities of the PhoneStudy App see [38, 41].

5 RESULTS

We evaluated our assessment approach by inspecting the descriptive statistics of our phubbing indicators, as described in section 3. In addition, we compared our measures of daily phubbing behavior with the domains of self-reported phubbing assessed with the GSP.

5.1 Descriptive Analysis

To get a first impression of our phubbing indicators, we selected two study days of three participants each as examples to inspect them visually. The patterns depicted in Figure 2 show that participants' smartphone use during social interactions varied both at the intra-individual (i.e., variation across study days 1 to 2 of the same user) and the inter-individual level (i.e., variation across participants P1 to P3). While some participants (e.g., P2) did almost never use their phone during social interactions, smartphone usage was highly prevalent for others (e.g., P3). In line with this, we found that daily smartphone usage behavior (independent of social interactions) varied remarkably across participants (median = 4.42h, 5- to 95-percentile range: [0.83h, 10.03h]).

In addition, we calculated descriptive statistics of daily phubbing behavior as a function of the self-reported duration of social interactions (see Table 1). As the duration of social interaction increased, the probability of participants phubbing at least once increased from 36% for an interaction duration of 1 minute to 91% for an interaction duration of 60 minutes. We also compared these numbers with the observational measures reported by Abeele et al. [3], who covertly observed individuals during a dyadic 10-minute interaction. For reasons of comparability, we restrict ourselves here to our measures based on social interaction intervals of 6 and 16 minutes. While Abeele et al. [3] reported that 43.5% of people phubbed at least once at the person-level (62% at the dyadic level), we found a somewhat higher prevalence of 62% (in 6-minutes intervals) and 74% (in 16-minutes intervals) based on our assessment concept.

As presented in Table 1, the average proportion of phubbing time during social interaction decreased from 69% to 28% as the duration of the social interaction increased. For those, who phubbed at least once, the average number of phubbing events increased from 1.07 events for 1-minute social interaction intervals to 7.21 events for 60-minute social interaction intervals. The average duration of phubbing events was lowest at 0.64 minutes for 1-minute intervals of social interaction and highest at 2.35 minutes for 16-minute intervals, leveling off at about 2 to 2.5 minutes for longer interactions of 31 and 60 minutes. While Abeele et al. [3] reported phubbing occurring on average 2.3 times with an average total duration of 2.33 minutes during 10-minute social interactions, our assessment concept revealed a comparable average of 1.53 to 2.45 phubbing events with a comparable average duration of 1.95 to 2.35 minutes during 6- and 16-minute intervals, respectively.

5.2 Comparison With Self-Reported Phubbing

We also compared the measures collected using our preliminary assessment concept with our participants' self-reported phubbing using the GSP [15]. For this purpose, we standardized our social interaction interval-specific indicators for the proportion of phubbed time and the number of phubbing events with the respective social interaction duration. Based on this, we created person-level averages of these indicators. For the duration of phubbing events, we aggregated person-means by averaging phubbing event durations per participant.

Figure 3 displays the correlations for our resulting person-level phubbing indicators with each of the four domains of self-reported phubbing. Five of the 12 depicted correlations were significant on a Bonferroni corrected significance level of α = 0.42%. That is, the average proportion of phubbed time correlated positively with Interpersonal Conflict (r = .17). The average number of phubbing events correlated positively with all four GSP domains (between r = .17 and r = .24). Across all measures, the correlations (range of r = -.05 to r = .24) were of medium effect size at most [19], although both our concept and the GSP aim to measure the same construct.

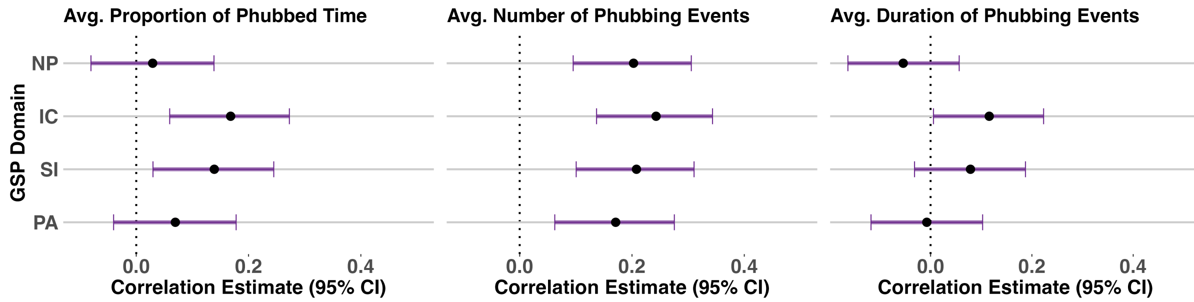

Figure 3: Pearson-correlations and their 95% confidence intervals (CI) between behavioral phubbing indicators and the GSP domains Nompophobia (NP), Interpersonal Conflict (IC), Self Isolation (SI), and Problem Acknowledgement (PA).

6 LESSONS & CHALLENGES IN PHUBBING RESEARCH

Following our goal to explore an assessment concept enabling the investigation of phubbing behavior in everyday life, we took an initial step by conducting a multi-method study combining ESM and mobile sensing. In this section, we discuss our preliminary findings on the prevalence of daily phubbing and the feasibility of our assessment concept. We reflect on yet-to-solve technological challenges as well as opportunities for future work to build technologies that respect and promote in-person experiences. In doing so, we aim to stimulate future interdisciplinary work on phubbing-aware technologies.

6.1 Social Interaction Detection

Our behavioral phubbing indicators were only slightly related to the phubbing scores obtained with the GSP. This finding is in line with our expectations from the psychological literature, which shows that people's self-concepts of their behaviors, as assessed by global self-report scales, correlate only to a certain extent with their actual specific behaviors [6, 22]. That is, global self-report scales measure different aspects of phubbing than observational measures of phubbing. Moreover, in the present study Nomophobia and Problem Acknowledgement correlated less with behavioral phubbing indicators than Interpersonal Conflict and Self Isolation. One reason behind could be that Nomophobia and Problem Acknowledgement encompass perceptions and attitudes toward smartphone use and require a certain amount of problem understanding and reflection. Interpersonal Conflict and Self Isolation, in turn, are more directly linked to observable behaviors like ignoring others due to smartphone use. Our results therefore point out once more that self-report measures alone are not suited to capture actual phubbing behavior in daily life.

To take this aspect into account, we aimed to integrate direct behavioral observations in our assessment concept by using mobile sensing methods to assess smartphone usage. However, we still relied on self-reports to assess social interactions. This could be problematic in two ways. First, even though ESM tries to mitigate retrospective biases, they can still entail memory distortion, bias for social desirability, and reactivity or fatigue due to the repeated nature of the method [42]. Secondly, the repeated sending of short questionnaires could lead to respondents using their smartphones even more during social interactions and the measurement could thus distort the research object of phubbing [9].

Therefore, we think that one important next step for reliable phubbing assessment is to expand our concept by passively detecting social interactions. However, social context detection is a tough task [49]. It requires various data types such as accelerometer and GPS data for activity detection, microphone data for conversation detection, and Bluetooth data for detecting other people as well as a smart algorithmic and preferably battery-friendly combination thereof [35, 49]. To the best of our knowledge, we have not seen this approach to be applied at large scale outside of experimental setups or/and in phubbing research so far. Apart from the technical feasibility of social interaction and phubbing detection, future studies also must investigate how users feel about it, especially when being asked to provide sensitive data such as smartphone usage logs or GPS data.

Table 1: Descriptive Statistics of Phubbing Behavior by Social Interaction Duration

Interaction Duration	Probability of Phubbing (at least once)	Avg. Proportion of Phubbed Time	Avg. Number of Phubbing Events	Avg. Duration of Phubbing Events
1	0.36 (0.48)	0.69 (0.35)	1.07 (0.29)	0.64 min (0.37)
6	0.62 (0.49)	0.50 (0.37)	1.53 (0.96)	1.95 min (2.16)
16	0.74 (0.44)	0.36 (0.32)	2.45 (1.93)	2.35 min (3.82)
31	0.82 (0.39)	0.29 (0.28)	4.14 (3.42)	2.17 min (4.66)
60	0.91 (0.29)	0.28 (0.26)	7.21 (6.72)	2.29 min (6.21)

Note. Means for phubbing indicators are presented grouped by the duration of social interaction intervals. Numbers in brackets indicate standard deviations. The average proportion of phubbing time and the number and duration of phubbing events are based on the data of social interaction intervals in which phubbing occurred at least once.

6.2 Distinguishing Phubbing from Shared Phone Use

Our findings also show that for social interactions that lasted more than 15 minutes, more than a quarter of the social interaction time was spent on smartphone use. This proportion seems quite high to us and brings us to the consideration that we did not only assess phubbing with our approach but also shared phone use. Phubbing by definition is only existent if the users' focus shifts completely away from the social encounter in favor of the device [26]. In contrast, shared use of the smartphone (e.g., viewing photos together) could even stimulate further conversation and thus be beneficial for social interaction.

The differentiated detection of phubbing versus 'shared' or co-present phone usage is thus a further challenge to be addressed in future research [5]. In this context, multi-modal interaction analysis in laboratory settings [5] could be a way to determine, for example, indicators for disengagement from conversations, which in turn can be detected by mobile sensing in observational field studies. To our knowledge, one potential that has not yet been fully exploited could be the integration of eye tracking in smartphones [14, 30]. Apart from this, previous studies highlight that perception and evaluation of phubbing can be affected by what a participant is doing on the phone which, however, is hard to assess with observational or self-report methods [3]. But the variety of data gathered via mobile sensing methods would offer a more detailed understanding of participants' smartphone usage during social interactions. Although we only used the screen time in our study, future studies could additionally extract information about phone-checking behavior (e.g., quickly checking the time or notifications), specific phone settings (e.g., the do not disturb setting), or the usage of specific apps (e.g., social media or gaming apps) to get a more detailed picture of smartphone use in the presence of others.

6.3 Designing for Phubbing Aware Technology

In line with previous literature [47], our results show that phubbing has become an everyday social practice: During one hour of social interaction, the probability of phubbing at least once was on average 90%. When phubbing occurred, people looked at their smartphone on average about 7 times, each time for an average of 2.29 minutes. Consequently, on average, 15 minutes were spent on the smartphone even though interaction partners were present. These numbers illustrate the extent of daily phubbing very clearly and point to the relevance of addressing phubbing in the field of HCI.

Reliable assessment of daily phubbing behavior, as described in the previous challenges, would make it possible to develop concepts that mitigate or even reverse the negative effects of phubbing. Over the past years, the idea of designing interaction concepts for deeper meaning, happiness, and human flourishing has gained great momentum in HCI and has become known by terms such as *digital well-being*, *positive computing*, and *positive design* [10, 36, 37]. With regard to phubbing, one solution could be to limit technologies from interfering with their users' everyday lives by design. For example, smartphones could recognize social contexts and actively put the smartphone into a 'silent' mode during social interactions or prompt users only in opportune moments [35]. Another solution could be to design HCI concepts to educate users how to use technologies more responsibly and mindful. For example, Genç and Coskun [21] proposed interaction concepts aiming to enable users to reduce excessive smartphone use, ultimately promoting a healthier balance between technology use and social interaction.

With regard to the design of HCI concepts, it is also important to consider that we have found initial evidence of intra- and inter-individual differences in phubbing. Research on these differences has just begun [20] and future research should investigate which situational factors and personal or relationship characteristics might be related to these differences in phubbing behavior. Based on these findings, technologies could be designed both situation-aware and personalized in order to fit seamlessly into specific contexts for individual users. Future studies could thus explore innovative and collaborative solutions that improve interpersonal relationships and foster meaningful in-person conversations.

7 CONCLUSION

New technologies introduce novel challenges to our social lives, with phubbing being one notable concern. This paper introduced a preliminary concept for assessing phubbing, combining ESM and mobile sensing methods. Our findings reveal that phubbing is a prevalent social practice in daily life. The presented work serves as a foundation to inspire future research focused on the passive in-situ detection of phubbing in everyday contexts. This in turn lays the foundation for the development of phubbing-aware, socially useful technologies that contribute to increasing the overall (digital) well-being of their users.

8 ONLINE RESOURCES

The code used for data-preprocessing and analysis together with the pre-processed data is available at the associated osf-repository at https://osf.io/fjd8b/.

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