Us-Reflection: Designing for Meaningful Social Interactions

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Technology increasingly shapes our social interactions, both online and in person. Strong social connections and face-to-face interactions are vital for wellbeing, especially with close relationships. In this context, technology can play an ambivalent role: whereas it often has a negative impact on the quality of these interactions, it carries potential to enrich conversations and improve social interactions if used in a meaningful way. We design a prototype that implements subtle intervention strategies to foster meaningful technology use, specifically aimed at enhancing close relationships during in-person interactions. We evaluate the prototype within an exploratory, two-week in-the-wild user study with 6 tandems (*N*=12). Our findings suggest that the strategy of "us-reflection" – a social approach to reflection – contributes to mutual awareness of participants' shared time. Our prototype encouraged more meaningful interactions by proposing conversation topics or suggesting activities, ultimately strengthening close relationships and fostering more intentional, engaging, and rewarding social experiences.

CCS Concepts: • **Human-centered computing** → **Collaborative and social computing**; *Human computer interaction (HCI).*

Additional Key Words and Phrases: Us-Reflection, Social Reflection, Meaningful Social Interactions, Technology-Mediated Communication, Technology for Wellbeing, Social Technology

1 Introduction

Social interactions are essential for human wellbeing and deeply embedded in our daily lives. They shape our emotional health, sense of belonging, and overall quality of life. In particular collocated social moments, such as shared meals, walks or downtime, hold potential for reflection, emotional awareness and deeper interpersonal communication and connection. Technology, in particular mobile devices such as smartphones, tablets or smartwatches have become pervasive within our environment and daily routines – including social interactions in collocated settings. Some scholars argue that in particular smartphones have become integral to many of the activities [24] that we humans engage in nowadays - such as communication, entertainment, and access to information.

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On the other hand, the ubiquitous presence of technology arguably comes at a cost, particularly when it *interferes* with activities and experiences in the physical world – rather than supporting them. Social settings are no exception to the ambivalent role of technology.

Whereas technology could in cases support our social interactions, *currently* most often it does not [50]. A phenomenom, coined as *technoference* [35] or *phubbing* in case of particularly smartphones [27], describes how prioritizing technology use over the conversation partner during collocated social interactions can make the social counterpart feel neglected [5] and as such reduce the quality of the interaction [2]. Strong social ties are especially important in the context of social wellbeing [33] and negative effects of phubbing are especially present in intimate relationship settings [3, 35] – in fact, McDaniel and Coyne [35] originally introduced technoference in the context of couples, investigating the wellbeing and relationship consequences of technology use for couples. A more recent study on dyadic social interactions [50] found that people in general regret their technology use in collocated settings as it seems to take the opportunity to spend time more meaningfully with the other person [50].

As reaction to this sentiment, early HCI interventions reacted to decrease technology and smartphone use in collocated social settings, ideally to a point of no use. These mainly focus on group settings aiming to reduce smartphone use while talking or on the approach to negotiate phone use collaboratively [12, 30, 41]. However, some studies show that smartphone use in group settings can facilitate conversations and make it seem less disruptive [4, 30].

These align with a more recent shift in research that advocates for supporting more meaningful and mindful engagement with technology, in order to reshape and design technology for the physical world [26, 36, 44, 50, 55].

Following this call to design for more meaningful social interactions, a common approach in Personal Informatics (PI) research supporting users' overall and social wellbeing has explored reflection, not just as an individual cognitive task to foster self-awareness [49] and even motivate behavior change [42], but its social dimension [37]. It can help people draw links between their wellbeing and the quality of their social life [49], and in many contexts, reflection itself becomes a social activity [43].

In this work, we investigate how reflective technologies can support couples in engaging in shared reflection, with the goal of increasing awareness of how they spend time together and the role technology plays in their interactions. Our aim is to foster awareness of mindless co-present technology use by the means of technology, next to technology adding to the quality of face-to-face social interaction by shifting the focus back to the co-located interaction itself. We build on prior HCI work that aims to redirect attention from screens back to human-human interaction to foster a richer, more intentional shared experience. Our design encourages couples to be more active during their time together and supports communication. This approach may be especially valuable in scenarios where behaviors like phubbing arise from boredom, lack of shared topics, or missing rituals of connection. We aim to provide a more balanced understanding of technology's role to support couple-reflection, next to nurturing social interactions in collocated settings, through the means of the following two research questions:

RQ1 What subtle intervention strategies carry potential to support meaningful collocated social interaction?

RQ2 What role do subtle technological interventions play in collocated social interactions in the wild?

We address our research questions with a mobile intervention that we informed based on related work. We develop and evaluate our mobile prototype in-the-wild within a 14-day exploratory user study with 6 tandems (12 participants in total). The user study also combines pre- and post-interviews with questionnaires to evaluate the impact of the developed interventions on intimate relationships. The aim of the prototype is to enable meaningful interactions in real-world settings using the mobile technology itself through two specific features: 1) "us-reflection", i.e., a joint reflection action on the social interaction, and 2) conversation and activity suggestions, i.e. topics and small activities designed to support the social setting and help strengthen the interpersonal bond. Our approach thus integrates two different intervention strategies to explore both real-time engagement and post-interaction reflection techniques, aiming to foster deeper awareness, mutual understanding, and enriched social experiences. By shifting the focus from merely limiting distractions to actively enhancing connection and awareness, we contribute a novel perspective on navigating technology use in face-to-face interactions. In doing so, we contribute to the ongoing HCI discourse on how technology might not only avoid harm to social life, but actively nurture social wellbeing within close relationships.

Our field study with the mobile interventions demonstrated that raising awareness of smartphone usage patterns in collocated social settings allowed participants to engage more meaningfully with each other. Suggestions given by the mobile prototype, such as conversation starters and activity ideas, can strengthen inter-human bonds. Participants also reported increased self-awareness, awareness of their partner's feelings and of their time spent together, that contributed to a more mutual understanding.

Overall, this paper contributes (1) the design and in-the-wild evaluation of an app that supports couple-reflection, enabling users in tracking and reflecting on their shared social interactions with a close tie, (2) the potential of technology as a connecting digital support tool to enhance collaborative awareness and enrich face-to-face interactions meaningfully, and (3) design implications for future mobile systems that aim at supporting meaningful collocated social interactions.

2 Related Work

We reflect on the paradoxical literature on the role of technology within collocated social interactions. While technology negatively impacts social interactions when it results in a disruption of an ongoing interaction and shifts user attention away from the experience that is present in the real world, it can be beneficial and even contribute to enriching collocated interactions, when it supports the interaction in the collocated space as a primary goal [50]. Sakel et al. [50] took a holistic lens on technology within dyadic interactions and identified different usage patterns and purposes that contribute to make an interaction perceived as rather positive or negative. While shared use has the potential to create a shared experience, parallel and imbalanced use often create situations of individual engagement that takes away from the joint interaction and therefore can foster more negative perceptions. Along with the way technology is used simultaneously in dyadic interactions determining its role, the purpose of use plays a crucial part. Thus, the way people use technology determines how it is perceived and creates this ambivalent role it has in collocated settings. In the following, we review literature to (1) understand the role of technology as both hindering and enabling social interactions in collocated spaces, to (2) explore the design elements that bear potential to support collocated social interactions, as well as (3) explore the strategy of reflection to support social interactions and social wellbeing.

2.1 Technology as Source of Disruption

There are multiple terms and concepts that describe how technology disrupts our social experiences today. One such concept is *technoference*, introduced by McDaniel and Coyne [35], which refers to everyday interruptions and disruptions caused by technology devices. Their study focuses on family dynamics, exploring the impact of technology on wellbeing and relationships, particularly between couples. Even brief or unintentional use of technology can negatively affect the quality of time spent together. This concept has also been examined in the context of parent-child relationships, where parents' preference for technology over spending time with their children results in detrimental outcomes for both their relationship and their children's behavior [34]. A similar phenomenon, known as *phubbing*, has become widespread in modern social interactions, where face-to-face communication is disrupted by smartphone use. Phubbing occurs more frequently in close relationships, with research showing that people tend to phub their partners more often [3]. In romantic relationships, partner phubbing often leads to conflicts regarding phone use, which in turn affects relationship satisfaction and personal wellbeing [45]. Nowadays, it's common for couples to bring their phones into the shared bed [51], using them simultaneously, which disrupts their sleep. Many find it hard to regain their partner's attention once it is on the phone.

Phubbing has been associated with negative outcomes across various relationship types, including friendships [1, 54], romantic partnerships [46, 59], parent-child relationships [15, 60, 61], and even supervisor-employee interactions [47, 62]. It is a sign of relational disengagement [58] and is linked to lower perceived conversation quality [2, 14], reduced social connection [5], diminished trust towards the phubber [29, 47], and lower relationship satisfaction [14, 54, 59].

Relationship satisfaction also plays a key role in the connection between phubbing and depression [59]. Moreover, phubbing has been directly linked to several negative mental health indicators, such as poor sleep quality in adolescents whose parents engage in phubbing [15], and higher levels of stress and anxiety associated with greater exposure to phubbing [7]. These findings underline phubbing as a significant social phenomenon that disrupts interpersonal connections and impacts wellbeing, calling for further research [14].

2.2 Technology as Tool to Support Collocated Social Interactions

When used thoughtfully, technology offers the potential to enhance, rather than hinder, our social interactions. We review literature on the potential to enrich collocated social experiences and explore interventions designed to refocus attention on the physical world.

2.2.1 Technology's Potential to Enrich. In the first place, we must understand the context of social interactions in order to better shape future technological solutions. Liu et al. [33] found that people mostly enjoy spending time in-person with strong social ties, engaging in day-to-day, light-weight interactions, often in intimate private spaces or without a specific location. While digital devices are frequently used to initiate social encounters, participants prefer that technology does not disrupt or overshadow ongoing face-to-face interactions. Similarly, Stepanova et al. [53] propose strategies for the design of technology to foster genuine connection between people, among which are designs that support self-disclosure, reflection on unity, or promote shared embodied experience. This is also in line with findings from Olsson et al. [40] to focus on designing for collocated technologies that support interactions, that have already been initiated. The authors distinguish technologies potential to enhance collocated social interaction into approaches that (1) *invite* users through sparking off social interaction, (2) *facilitating* ongoing interactions, or (3) *encouraging* and motivating people to interact or engage in joint activities. They suggest *enhancement* as "technology not only enabling social interaction but taking an active role in deliberately attempting to improve its quality, value or extent."[40]

Technology can catalyze conversation by offering subjects to discuss. Access to the internet and various apps allows individuals to share interesting news, videos, memes, and articles instantly, sparking engaging discussions. Studies have shown that this can lead to more dynamic and interactive conversations as people share and discuss content in real-time [4, 33, 51]. Moreover, the ability to access relevant information quickly during a conversation can be immensely beneficial. Whether it's looking up facts to settle a debate, finding a restaurant location, or checking the weather, technology enables individuals to provide accurate information that can enrich the conversation. This instant access to information supports informed and meaningful discussions [33] in different contexts, including intimate relationships such as parents with their children[11].

As conversation always happens in an environment and specific context, mobile phone disturbances are not purely a technical issue, but also shaped by the physical and social environment, social norms, and perceived privacy of the environment in which they occur [56]. In a similar vein, setting the right ambiance can significantly affect the quality of an interaction, illustrating how technology can actively shape—and not just disrupt—the context in which interactions unfold [33]. Technology enables individuals to play music, show videos, or even adjust lighting through smart home devices, which can set the mood and enhance the atmosphere of a conversation. Music, in particular, has been noted for its ability to create a pleasant environment and foster a sense of shared enjoyment [33].

2.2.2 Proactive Technology Interventions for Collocated Interactions. The disruptions through technology in face-to-face social interactions seem to become the new norm [13] while this behavior has detrimental effects on social relationships and wellbeing [9, 14]. Thus, HCI researchers have begun to investigate technology designs to refocus attention from human-technology interaction to human-human interaction [26, 36].

Efforts to mitigate phubbing have become a prominent thread in research aimed at reducing or eliminating smartphone use. Some works propose technological solutions aimed at reducing smartphone use during group activities [12, 30]. For example, a prototype developed by Choi et al. [12] incorporates an external object that connects to the smartphones of group members. This device uses movement and ambient light to alert the group when someone is using their phone, thus raising awareness about smartphone use during face-to-face interactions. Similarly, Ko et al. [30] developed an app that helps manage smartphone use in group settings by allowing users to limit distractions through features like locking phones together in a "socialization mode" or controlling phone use with permissions granted within the group. Another innovative approach was introduced by Park et al. [41], who designed a social context-aware notification system that delays notifications when the user is engaged in social interactions.

In contrast to approaches that seek to minimize smartphone use, a growing body of HCI research investigates how technology can be designed with and through, rather than against, our everyday social behaviors. This line of work embraces socially intelligent systems that complement human interaction instead of constraining it. Rather than mitigating smartphone-related disruptions by eliminating phone use, HCI literature explores means to support conversations and communication.

Extending this perspective, Genç and Coşkun [21] present *Boost*, a conversational aid that detects pauses in dialogue and introduces personalized movie trivia to stimulate social exchange. The system was shown to reduce awkward silences, foster engagement, and improve conversational quality. The authors emphasize the importance of context-aware, privacy-respecting designs that enhance rather than govern the dynamics of social interaction—acknowledging both the value of dialogue and the role of silence. Similarly, Genç et al. [22] propose *WHISPER*, an interactive audio narrative device that supports public, face-to-face interactions by playing short, pre-recorded audio stories during conversational lulls, gently drawing participants back into shared engagement. Although

targeted at individual smartphone use, Terzimehić et al. [55] propose short *social challenges* (such as calling a friend) to redirect attention to the physical world after spending an extended amount of time with the smartphone. The authors show that social challenges, in particular, offer the greatest satisfaction once completed, despite requiring the most effort.

Another line of research is targeting specifically dyadic couple relationships. Branham et al. [8] propose mutual reflection as an open space to design for intimacy, and propose the concept of a digital journaling system that enables selective sharing between paired journals as one example to support local partners. However, the proposed concept was not evaluated. Similarly, Troitskaya and Batkhina [57] propose a "virtual psychologist" chatbot designed to help couples communicate about personal issues. Their findings show that users experienced greater satisfaction, tenderness, constructive dialogue, and a stronger commitment to their relationship. Khatra et al. [28] introduce a third-party intervention in the form of a smartphone-based virtual agent designed to support collocated, but digitally distracted couples. They found that the agent acts as a neutral mediator, facilitating communication and prompting reflection on phone use within relationships. It allows users to implicitly express concerns, encourages alternative shared activities, and ultimately serves as a catalyst for more mindful and engaged togetherness. These approaches resonate closely with our work, which employs reflective tools, such as diaries and structured prompts, to encourage mutual understanding and meaningful couple interactions and communication.

2.3 Technology-Supported Reflection for Social Wellbeing

PI practices have become increasingly common, allowing users to track personal data in different ways and on various aspects of their lives [20]. As social wellbeing is crucial for overall wellbeing, literature explored PI to consider a social context by tracking and reflecting on social interactions capturing an individuals' social life [49]. The authors argue that prioritizing the quality and context of social exchanges, rather than merely quantifying interactions, offers a richer basis for reflection. By enabling individuals to identify associated emotions and potential social patterns, recognize meaningful connections, and better understand their social dynamics, PI tools can promote awareness and support social wellbeing.

Overall, reflection itself is increasingly recognized as a process that even extends beyond individual contemplation, incorporating a significant social dimension across various contexts. There is a growing interest in broadening the scope of self-reflection to include interpersonal dynamics. This shift calls for expanding existing theories and methods to conceptualize reflection not merely as an individual exercise but as a collaborative and social task [37]. Viewing reflection and tracking as a social activity, past work has explored how sharing, comparing, and discussing tracked data with others can enhance reflection [6]. Murnane et al. [38] highlight that PI tools are fundamentally social technologies, rather than simply tools for self-monitoring. They argue that for PIs to effectively support long-term mental health, their design must account for the interpersonal environments in which these tools operate. By addressing these social contexts, PIs can foster collaboration, enhance communication, and strengthen relationships, which are also critical to effectively managing chronic mental health conditions. Researchers prompted discussion on how to design for shared interactions and experiences with data that recognize the complexities, nuances, transitions, and sensitivities inherent in human relationships [19]. Similarly, LiKamWa et al. [32] expands on the individual focus in self-tracking by integrating a social support component to daily mood tracking, connecting their entries with another person.

While common PI tools are driven by technologies that primarily focus on facilitating individual engagement with data (e.g., tracking performance metrics or monitoring activity and health), Puussaar et al. [43] introduce the concept of social sensemaking. This concept suggests a shift from relying solely on high-level statistical summaries to leveraging reciprocal sharing of fine-grained

self-tracker data. This social exchange, they propose, offers individuals richer contextual insights that enhance their ability to interpret and act on personal data.

Ploderer et al. [42] take it one step further and explore how social interaction and reflection support actual behavior change, highlighting five key approaches, namely social traces, social support, collective use, reflection-in-action, and reflection-on-action.

In the context of intimate couple relationships, Branham et al. [8]'s stage-based model of couple connection highlights the role of mutual reflection in strengthening relationships. Technologies for mutual reflection for local partners and tools that support deep interpersonal sharing are both underexplored areas in the design space for intimacy for couples. In line with this, Ellegaard Christensen et al. [18] present *Shaping Romance*, a technology probe designed for co-located couples that facilitates mutual reflection and intimacy by allowing partners to express and visualize their desires through a shape-changing interface. Their findings emphasize the potential of such interventions to support inward and outward reflection, shared understanding, and joint action.

> ***Research Gap.*** Research on technology in collocated settings has mostly examined its negative effects, such as phubbing and technoference. These can disrupt social interactions and reduce satisfaction with the social interactions' quality. Boredom, missing conversation topics, or unconscious use are among the reasons for phubbing. We target these issues by exploring the use and perception of technology in collocated dyadic interactions, focusing on technology's potential to support and enrich these shared social experiences. We place particular emphasis on close relationships, such as those with close friends or romantic partners, as these interactions are vital to individual wellbeing.
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> We deduce two intervention strategies for technology to support collocated dyadic social interaction: 1) technology as *reflection enabler*, both individually and mutually, in the context of raising awareness of the time spent together, and 2) technology as *proactive conversation enabler* with topic and joint activity suggestions.

3 Prototype

Technology frequently plays a role in social interactions, particularly within close relationships. Given that these relationships are important for social wellbeing and significantly influence the quality of enjoyable interactions [33], we centered our research on social interactions within close relationships—primarily romantic partnerships. Inspired by the call of Liu et al. [33] to design for group-specific, in-person interactions and support long-term relationships, our focus is on specific social dynamics, such as those between romantic partners or close ties, and helping them establish routine-like activities.

We explored both the potential benefits and drawbacks of technology in social settings, aiming to design technologies that enhance, rather than disrupt, face-to-face interactions. Technology often leads to inattentiveness and mental disengagement, ultimately diminishing the perceived quality of conversations. Drawing from PI research [20], self-tracking may serve as a tool to raise awareness of time spent together, emotional experiences, and technology use. This, in turn, could encourage reflection and motivate behavioral change. Our prototype is designed to support Reflection-on-action, which occurs after an interaction [42], allowing users to reflect on individual situations and daily recaps without interrupting real-time social interactions. The overarching goal is to raise awareness of time spent together and technology's role in shaping these moments. Since reflection

itself can be considered a social activity, we apply it within a highly social context, exploring how technology can foster shared reflection. Our goal is to build technology that supports both partners in a close relationship, facilitating joint reflection and implicit communication. By enabling users to journal about their interactions, either privately or collaboratively with their partner, we aim to provide a structured means to recognize and discuss social behaviors, emotions, and the role of technology in their relationship. This reflective practice can also serve as a constructive alternative to implicitly calling out a partner's technology use which has the potential to cause tension or conflict when directly verbalized.

In addition, we prioritize strengthening face-to-face interactions while mitigating technology's negative effects. Our subtle intervention acknowledges that phubbing often stems from factors such as boredom, a lack of conversational topics, or automatic phone-checking behaviors. Therefore, we introduce a solution that provides users with opportunities to practice social skills, discover new conversation topics, and engage in suggested activities aiming towards ultimately refocusing attention on the ongoing interaction. Rather than letting technology become a distraction, we propose designing it as a supportive tool that enhances, rather than replaces, in-person interactions. By suggesting content that contributes to the face-to-face experience, we advocate for technology that remains secondary to human connection.

Based on related work presented, we focus our research to a specific kind of social interaction with close ties that are especially relevant for social wellbeing, such as a romantic partner or close friend. With that in mind, we've created a mobile prototype for tandem scenarios, which are used by and connect two people. The prototype aims to highlight focus on the face-to-face interactions, fostering awareness, supporting social skills, and meaningful content for the time spent together. In the following, we present the prototype's main features deduced from related work and implementation details.

3.1 Journal for Reflection

Related work found that journaling about social interactions and their impact on mood can trigger reflection and support social wellbeing [49]. Further, technology use in dyadic one-on-one scenarios is often regretted and often happens unconsiously [50]. Thus, based on the *The Social Journal* [49], we incorporated a journaling and reflection part into our prototype to enable self- and us-reflection on time spent together. We further adapted the content of the journal entries, e.g. to incorporate the technology occurrences during the social interactions and added the option to share entries between the tandem to have a joint journal. The prototype is designed for paired usage, enabling two individuals in a close relationship, such as romantic partners or close friends, to log and reflect on meaningful shared social interactions, the involvement of technology, and the emotions experienced.

Track Meaningful Social Interactions. A key component of the prototype is the Journal, as illustrated in Figure 1. Drawing from Sakel et al. [49], who highlighted time and duration, type of interaction, associated emotions, number of people, and type of relationship as essential elements of interactions, we tailored the context information accordingly, as shown in Figure 2. While time remains a relevant factor, we adjusted it to represent general times of day rather than specific hour-minute formats, recognizing that individuals in close relationships, such as cohabiting partners, may not distinguish time so precisely. Additionally, we included details about the technology present during the interaction, who used it, and the reason for usage, emphasizing the role of technology in social interactions. We also included details about the activity, retained the associated emotions based on the Circumplex Model of Affect [48], and provided space for notes. Users track their

Journal View   Daily Recap (1)   Daily Recap (2)
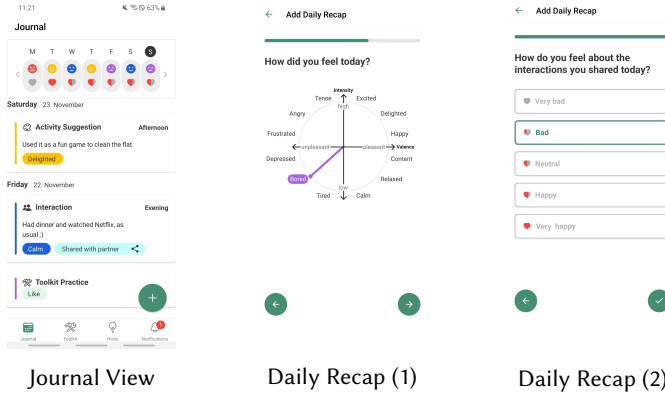
Fig. 1. On the left, the Journal Overview displays daily recaps on the top, and individual Social Interaction Entries as a Scroll View on the bottom. The middle and left figure visualize the sser flow to track a daily recap retrospective for the whole day, capturing mood (1), and feelings about the interactions with their partner (2) step-by-step.

social interactions with their tandem partner manually, adding contextual details and emotions step-by-step, as illustrated in Section 3.1.

Paired Journal. As the time spent together has a strong social aspect that impacts both parts of the interaction, we explore the option to open up the journaling and reflection benefits as a shared experience. Thus, in our prototype we allow users to share their journal entries with each other to gain insights into their partner's perspective. Shared interactions are then viewable within the journal view of each tandem partner, though only the original creator can edit them.

Daily Recaps. At the top of the journal, a week banner displays daily recaps, as shown in Figure 1 middle and left. Daily recaps offer a straightforward, three-step process for reflecting on the emotions and interactions of the day. This feature enables users to track and evaluate the overall satisfaction and emotions associated with the interactions shared with their tandem partner that day. To represent satisfaction, we used a heart emoji with five levels: a grey heart indicates the user felt "very bad" about the shared interactions, while a fully red heart represents a "very happy" feeling, with partially filled red hearts signifying intermediate levels of satisfaction.

3.2 Digital Support Tool

We added components to the prototype that offer content for conversations and activities, as well as content that supports healthy interaction practices to explore technology as a support tool for physical interactions. The toolkit practices and hints, both, the questions for the conversation starters and activity suggestions, were developed using ChatGPT [1]. We created the content iteratively, based on related work and considerations of what we wanted the content to be, and finally hard-coded it into the prototype.

Toolkit. The *Toolkit*, as shown in Figure 3, includes six exercises aimed at enhancing users' soft skills to stay engaged in conversations and support meaningful interactions. Users can track their progress on all selected exercises or mark a practice as complete. They also have the option to

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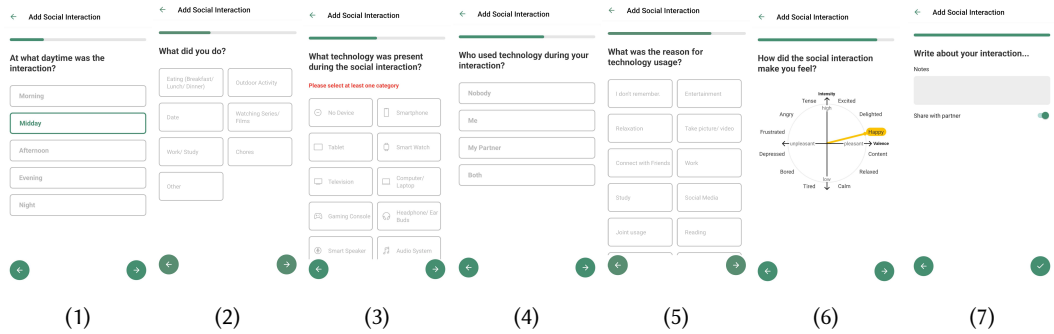[1]https://chatgpt.com/, accessed at 09/30/24, Version 4o

Fig. 2. User flow to track social interactions entering the time of day of interaction (1), the activity (2), the technology present during the interaction (3), the person using the technology (4), the reason of technology use (5), mood (6), and notes (7) step-by-step. The entries can be shared with the tandem partner for collaborative reflection.
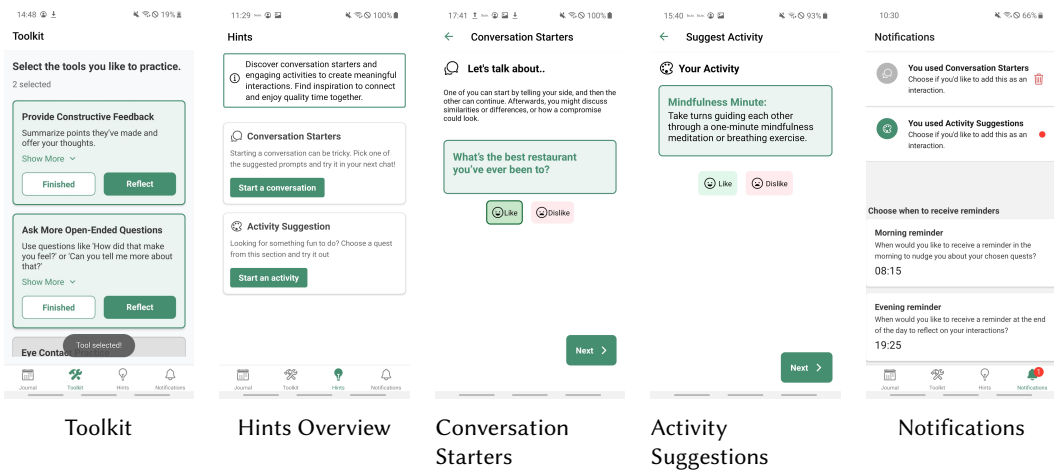

Fig. 3. The *Toolkit* provides content to support users' social and conversational skills while *Hints* enrich everyday social interactions with *Conversation Starters* and *Activity Suggestions*. When using one of the features, a notification allows for a journal entry about the respective interaction.

record their satisfaction with their progress and provide brief feedback on their experience. A notification reminds users each morning to engage with the toolkit.

Hints. The *Hints* section of the prototype, see Figure 3 includes new topics through the *Conversation Starters*. These aim to provide the opportunity to learn something new about one's partner, reminisce about experiences, or start a conversation. A variety of topics consisting of open questions and either-or questions should provide the opportunity to share their perspective or even start a discussion. *Activity Suggestions* strive to create shared memories or even leave the comfort zone together to experience something new. Users have the option to mark conversation starters or activities, provide feedback on whether they liked or disliked them, and skip unwanted content.

3.3 Notifications

In order to support users by incorporating the available features regularly in their daily lives, the app sends two default push notifications, one in the morning reminding participants to practice their personal toolkit throughout the day and a second one in the evening reminding them to add the interactions they had during that day. By default, these notifications are scheduled for 8:30 a.m. and 8 p.m., but users can adjust the timing in the settings screen, see Figure 3. Additionally, push notifications are sent in case an activity or conversation was tracked but not added or deleted, and if a feature was not used within the last 48 hours. Lastly, the users received an in-app notification after using hints. This should suggest users to add an interaction that was potentially sparked using the app.

3.4 Implementation

We developed a fully functional prototype using Android and utilized a university server as the backend for storing the collected data. The app delivers two daily push notifications to remind users to engage with their social toolkit challenges and complete their daily journal entries. Alongside the design considerations outlined in previous subsections, we adhered to HCI design principles (e.g., [39, 52]) and complied with the Web Content Accessibility Guidelines[2].

4 User Study

We carried out a 10-day in-the-wild tandem study with participants in close-tie relationships. We specifically recruited tandems with close-knit connections, where individuals frequently interact or ideally live together. Such relationships are vital for social wellbeing, creating context for enjoyable interactions [23, 33] and occur frequently, making them an ideal context for testing our concept in a real-world setting. As such, we collected data on app usage including the time spent on different screens in the app, the number of social interactions and daily recaps entered, and the usage of and entries about the toolkit and hints suggestions. Finally, to gain a deeper insight into the user's experiences, we also collected qualitative responses through tandem exit interviews. We interviewed both participants together about their experience, what they liked and disliked about the app, how the app influenced the way they reflect on social interactions, reflect on their partners' perceptions, and whether this reflection impacted their social interactions.

4.1 Procedure

We recruited participants via a university mailinglist, online survey participants of a related study interested in follow-ups, and word of mouth. Both participants of each tandem got a verbal introduction to the study via a video call, where they each completed the pre-study questionnaire, downloaded the app, and received a short tutorial about the app. To ensure comparability, we instructed participants to use the app until they had completed 10 active days of participation, resulting in additional study days for each missed day without usage. After 10 recaps, participants filled out the post-study questionnaire followed by a semi-structured exit interview via a video call that lasted an average of 40 min. Figure 4 shows the entire study procedure.

4.2 Participants

Six tandem couples participated in the study. Among them, three tandems were married and lived together, two were in relationships with one partner living together, and the last tandem consisted of close friends who also worked together. All tandems used the application for at least ten consecutive days and tracked their in-person interactions.
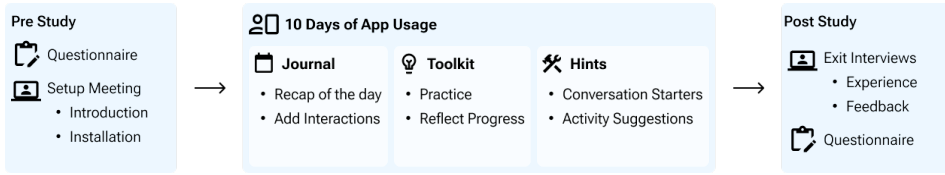
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[2]https://www.w3.org/WAI/standards-guidelines/wcag/

Fig. 4. Study Procedure of a 10-day in-the-wild evaluation of the app concept.

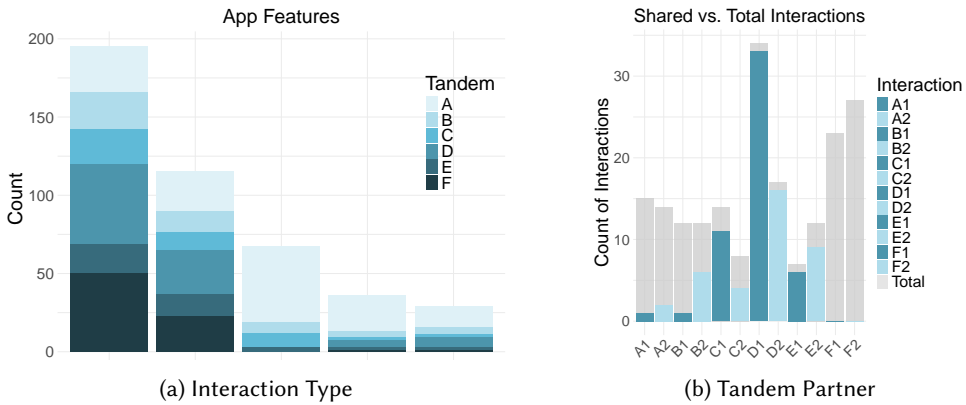(a) Interaction Type   (b) Tandem Partner

Fig. 5. The left figure shows the usage of the different app features per tandem. The count represents the amount of journal entries that capture individual social interactions in the journal, daily recaps, toolkit practices, conversation starters, and activity suggestions. The right figure displays the total and shared entries for each tandem partner.

Participants ranged in age from 22 to 31 years (M=27.1, SD=3.3). 7 participants identified as female and 5 as male. The tandems had known each other for 1 to 15 years (M=7.1, SD=5.0). Time spent physically together varied widely, from meeting two to five times a week to spending several days together, averaging around 15 hours per day. Time together largely depended on work arrangements, such as both partners working from home simultaneously for extended periods.

To ensure clear identification, each tandem was assigned a letter (A–F), with participants within each tandem labeled as 1 and 2. For example, the first participant in tandem A is referred to as A1, and the second as A2. Statements and experiences specific to individuals or tandems are referenced accordingly in the following sections.

4.3 Quantitative Results

We present quantitative, descriptive results on the app usage first, followed by the content of the journal entries.

4.3.1 App Usage Details. Figure 5 on the left, provides an overview of used features per tandem. Creating social interactions was the most used feature, participants created a total of 195 entries. Sharing interactions with one's tandem partner, as displayed in the right figure, was used from not at all (F) up to sharing 33 out of 34, so 97% of all entries (D1). The second most frequently used feature was Daily Recaps, ranging from 11 (C) to 28 (D) entries. 0 (D, F) to 48 (A) entries were added for the Toolkit practice, 1 (F) to 23 (A) entries for Conversation Starters, and 1 (F) to 13 (A) entries for Activity Suggestions.

Daytime of the Interactions   Activity during Interaction   Mood During Interaction
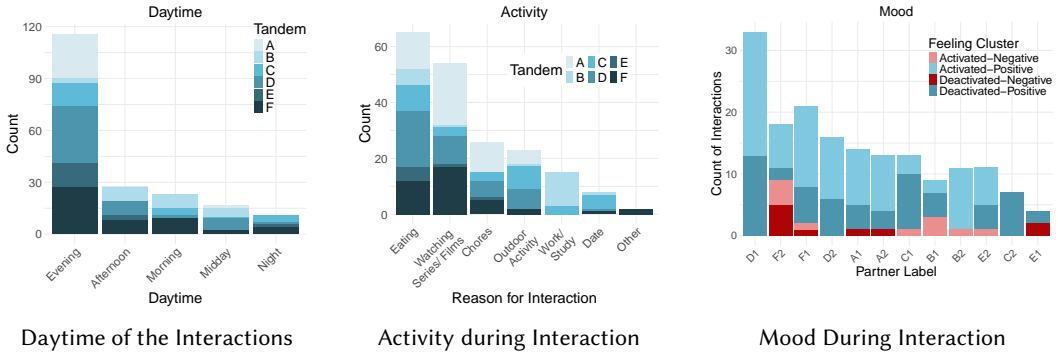
Fig. 6. The left figure shows the usage of the different app features per tandem. The count represents the amount of journal entries that capture individual social interactions in the journal, daily recaps, toolkit practices, conversation starters, and activity suggestions. The right figure displays the total and shared entries for each tandem partner.

Technology Device during the Interactions   Reason for Technology Use during the Interactions   Technology User during the Interactions
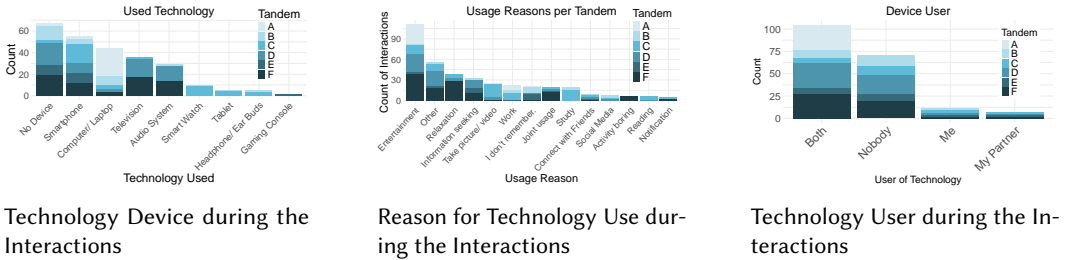
Fig. 7. The left figure shows the tracked technology devices present during interactions per tandem. The middle figure shows the tracked reason to use technology during interactions per technology device. The right figure shows the tracked technology device user during interactions per tandem.

4.3.2 Context Information of the Interactions in the Journal. As **times of day** in which the recorded interactions happened, 116 occurred in the evening, followed by in the afternoon (28), the morning (23), midday (17), and night (11), see Figure 6 left.

Eating was the most selected **activity during an interaction**, stated in 65 entries, followed by watching series/ films (54), chores (26), outdoor activities (23), and work/ study (15), , displayed in Figure 6 middle. Lastly, dates were selected 8 times and the category others in two cases.

Journal entries are always reflecting the feeling during the interaction, based on the Circumplex Model of Affect [48] spanning an emotion wheel with valence representing the x-axis stating how positive or negative the emotion is, and arrousal representing the y-axis stating how (de-)activated the feeling is. This results in four quadrants that we distiguished for the results: highly positive and (de-)activated to highly negative and (de-)activated. Figure 6 on the right, summarizes the tracked **feeling during an interaction**. For all interactions over all couples, 170 entries rated the time spent together with a positive valence, where 89 interactions were rated activated positive feelings, and 81 rated deactivated positive feelings. The interactions perceived as negative in valence accounted for only 20 entires, 10 activated, and 10 deactivated mood entries on the arrousal dimension.

Participants stated that they did not use any technical device for 67 entries, which is around a third of all interactions. For the other interactions, they state the Smartphone (55) was the most used device as **technology present during an interaction**, followed by Television (36), Computer/

Laptop (44), and Audio System (29), see Figure 7 on the left, while the middle figure displays all **reasons for device usage** and how often each reason was selected as participants could select multiple options for one interaction. In most instances, **technology users during an interaction** were both tandem partners (105), or Nobody at all (71), see Figure 7 on the right.

4.4 Qualitative Results

We transcribed all exit interviews verbatim. Two researchers independently coded two of the six interviews, reaching consensus on the codes. One researcher then coded the remaining interviews. Subsequently, two researchers collaborated to organize the codes and identify key themes. Ultimately, we established 141 codes, six code groups, and two overarching themes on SOCIAL REFLECTION, and TECHNOLOGY-SUPPORTED SOCIAL INTERACTIONS.

4.4.1 Social Reflection. Reflection was a key theme across all participants, with mood tracking playing a particularly significant role for all tandems (A-E). Monitoring their mood in relation to time spent with their partner opened up a new perspective for reflection (B-E), encouraging them to track and analyze their emotional experiences. Many found this enriching, as it heightened their awareness of their feelings (B-E). Others appreciated the heightened awareness of their technology use while spending time with their partners (A,C-F), while this awareness led to fewer technology use (C,D,F). Some even admitted they had never truly reflected on their mood before which was sometimes hard for them (C,F). Reflection often occurred in the moment of entering interactions (B,C,F). For some, it took the form of joint reflection, where they discussed their experiences and created journal entries together (A,D,E). Others engaged in shared reflection, where both partners individually captured interactions and later shared them (A,C,D,E). Many used this as a way to communicate their emotions (A-C) and compare their perspectives on shared experiences (E, D).

The reflection process had a strong social focus, always involving the partner in some way. Participants reflected not only on their own behavior but also on how their partner experienced their time together (A,C,D,E). Many expressed a desire for meaningful interactions with as little technology use as possible (C,F). Instances of *phubbing* – where one person shifts away mentally to prioritize using their phone during an interaction – were perceived negatively (B-E). Participants acknowledged these moments but often felt ashamed and expressed a desire to change their behavior (C,D,F). Interestingly, the act of journaling, particularly when documenting technology use, served as motivation for some to stay off their devices, as they wanted to avoid having to record such moments later (B-E).

Overall, participants reported increased awareness of their technology use (A-F), as well as a deeper understanding of how they spent time with their partner in general (A,B,C,E,F). Sharing journal entries or capturing them together often sparked conversations about their interactions and how they experienced those moments (A,C,D,E). While most tandems shared a lot or nearly all their entries (A,B,D,E), with one even suggesting that sharing should be the default option (E): ”*I mean, it's preferable to share if somebody is involved in it, so that they should also know what I am feeling about them.*” (C1) Others appreciated the ability to choose whether to keep entries private (B,C,F). The option to share selectively allowed them to communicate their emotions openly when desired, while also giving them space to process their thoughts individually (B, F) before potentially discussing them with their partner (F).

4.4.2 Technology-Supported Social Interactions. Communication between couples was a central theme, with controversial opinions on the conversation starters. Many participants highlighting the role of conversation starters in sparking discussions serving as a starting point for further conversations (A-C). Most tandems found them to be a helpful way to initiate conversations and keep them flowing. Additionally, many participants felt that these prompts helped them get to

know each other better (A,B,D,E), though the extent of this benefit depended on how well the couples already knew one another (D,F).

Tandem B even introduced the conversation starters in a group setting, suggesting their usefulness beyond romantic relationships. More broadly, many participants believed the app could be valuable for friends, groups, or other social connections beyond couples (A-C), the conversation starters (B) as well as expanding the journaling component to encompass all social interactions throughout the day, rather than limiting it to their romantic relationships: *"I also think this would be something very useful if you do it with other people as well, because it just worked focused on one particular interaction and one particular person. But if it's in general, then it makes it a little nice diary to where you can also look at how you've improved along the way, with how you talk to people"* (B1)

Regarding the suggested activities, reactions were mixed. While some couples appreciated them, others engaged with them less frequently, often because they already had established shared activities, sometimes highly specific or niche. However, one participant expressed a desire for more flexibility, wishing to personalize the activities and create their own options that they could then randomly select within the app.

The toolkit was generally well received, with some participants noting that it helped them become more aware of their partner and develop beneficial social skills. However, one tandem wished for more guidance on how to conduct some of the exercises, as they found them unclear. Others felt that the exercises seemed too long-term in nature. More broadly, some participants suggested making the toolkit and activities more interactive to enhance engagement. Tandem A described several practices as fine or good, while B2 described that they had to get used to the practice: "[f]eels a bit weird but I'll get used to maintaining eye contact more." Both tandem partners started to reflect on their soft skills and determined behaviors they would like to address or practice in the future. Within their progress tracking, B1 wrote: "I felt like I don't let the person fully complete the sentence, so I was trying to be patient to let them finish." Similarly, B2 noted: "I think I need to practice my facial expressions more, to for example not have all emotions show them as I feel them."

Regarding Active Listening practice, C2 noted it was "[r]eally nice, it helps me to understand things better." Further practices were described as fun, nice, and relaxing, especially for the Eye Contact Practice. Participants reported that it resulted in a good interaction, and once they noted, keeping eye contact "became a challenge between us." Even though tandem E selected a few practices, it was at the end of their usage period, and therefore, there was no feedback provided in their notes.

5 Discussion

In this paper, we set out to answer two research questions on technology in dyadic face-to-face social interactions in close relationships: (RQ1) *What subtle intervention strategies carry potential to support meaningful collocated social interaction?*, and (RQ2) *What role do subtle technological interventions play in collocated social interactions in the wild?* We deduced subtle intervention strategies in RQ1 and built a prototype embodying the deduced intervention strategies. We evaluated the prototype in a field study to collect in-the-wild insights. In the following, we discuss insights gained from the design, implementation, and evaluation of our prototype for technology-supported reflection on and enrichment of social interactions and discuss how the results address our research questions.

5.1 Us-Reflection: Reflection is as Social as the Social Interaction

As result of exploring the design space for couple intimacy in collocated scenarios [8], that identified mutual reflection for collocated couples as an underexplored potential for technology support, we implemented a fully functional diary that we tested in the wild.

Our findings suggest that tracking time spent with close relationships (e.g., romantic partners) in a diary, can foster reflection and raise awareness of how couples experience their shared time, how it makes them feel, and how technology influences these moments. Two key factors emerged as particularly relevant for users when reflecting on their time together: 1) one's own emotional perception, as well as the emotional state of the other, during social interactions and 2) the effects of the presence of technology on the social interaction's quality.

By recognizing how they feel in different moments, how they spend time together, and identifying when and how technology is involved, couples can develop a deeper awareness of their shared experiences. This connection between daily interactions and emotions encourages more mindful time together, often leading to a reduction in unnecessary technology use.

The observed use of the diary prototype to track shared daily experiences, particularly around activities like eating or watching TV, indicates a day-to-day tool for mutual reflection where partners document and possibly later revisit moments from their shared routine. This aligns with Branham et al. [8]'s emphasis on mutual reflection as a means of deepening couples' connection. While their proposed journaling system focused explicitly on selective sharing for deeper emotional insight, our prototype engaged users more casually, embedded within meaningful everyday contexts.

Moreover, the frequent co-occurrence of technology use, i.e., where both partners were either simultaneously engaged with technology or none of them, suggests a shared digital rhythm.

The findings additionally highlight a particularly strong social aspect of reflection, aligning with existing research that suggests reflection can be a social activity [8, 32]. This is emphasized in close, dyadic relationships, where partners naturally consider each other's perspectives. Our in-the-wild study suggests that reflection on social interactions is inherently social, with participants often taking their partner's perception into account—whether by observing their reactions, reflecting on their journal entries, or discussing shared experiences. This process fosters open conversations and deeper mutual understanding. We refer to this shared approach to reflection—where both individuals contribute to and are impacted by the process—as *Us-Reflection*. A shared journal, in this context, serves as a tool for capturing both perspectives of a shared experience, making implicit emotions and perceptions more visible to each other.

Our study participants reported that *sharing journal entries* helped enhance awareness of technology's presence during their time together. In some instances, the shared journal served as an implicit means of communication, allowing partners to express their feelings and perceptions without direct confrontation. This complements findings by Ellegaard Christensen et al. [18], who noted that partners should be able to reflect inward and outward on their relationship needs. While our prototype did not offer real-time visualization or synchronization of partner states, it facilitated a form of retrospective mutual awareness.

The generally positive perception in the diary entries of time spent together indicates that technology use, when aligned or jointly experienced, does not necessarily hinder social interactions. In line with previous work [8, 28, 57], our findings highlight the potential of technology as lightweight reflective tools embedded in everyday moments that foster a mutual reflection and understanding. This can help couples to be more aware of their everyday routines and habits, open up and provide the means to implicitly communicate emotions and perceptions within the relationship, and even spark conversations about it in the physical world. Additionally, some participants suggested expanding the journaling component beyond their romantic relationships to include all social interactions throughout the day. Prior research has explored the concept of social journaling for tracking and reflecting on meaningful daily interactions, showing that technology can support users in fostering greater self-reflection, social wellbeing, and awareness of the connections between emotions and social interactions [49].

5.2   Technology as a Subtle Intervention to Enrich Human-Human Interaction

Olsson et al. [40] call for HCI research to move beyond simply enabling interactions between co-located individuals, advocating instead for the design of technology that actively enhances human-to-human connections. This approach prioritizes the quality of social interactions, aiming to strengthen relational bonds through thoughtfully designed digital interventions. Similarly, Isbister [25] calls for a shift in HCI and technology design, moving away from individual-centered interactions toward strengthening human-to-human connections. Rather than isolating individuals in personal digital experiences, the paper emphasizes designing technology that enhances physical co-presence, fosters collective action, and enriches shared experiences. Facilitating interaction involves creating environments or tools that make it easier for people to converse, collaborate, and connect. Effective facilitation not only fosters desirable emotions and equitable dynamics but also minimizes negative experiences. The goal is to maximize positive aspects of social encounters, ensuring that people make the most out of their shared experiences. Within this context, facilitation often refers to supporting ongoing interactions. Design strategies like providing relevant information about others or suggesting engaging topics can enrich encounters, helping to nurture more meaningful connections. Interestingly, many design approaches serve multiple roles, such as creating open spaces for shared activities, which can enhance various facets of social interaction [40].

Previous related work [21, 22, 50] suggests that technology use in a collocated social setting can positively impact the social interaction when it supports the conversation without diverting attention away from it. For instance, offering relevant content or creating shared digital experiences can foster deeper connections. Specifically targeting couple communication, technology can serve as a neutral mediator, facilitating communication and prompting reflection on phone use within relationships [28, 57]. In that vein, our prototype and subsequent in-the-wild study explored how technology can serve as a digital support tool, encouraging individuals to improve social skills and providing topic or activity suggestions to refocus attention on meaningful, engaging face-to-face interactions. This approach also counters common causes of "phubbing," where individuals use their phones out of boredom or due to a lack of conversation topics. Liu et al. [33] emphasize that while chatting is a central social activity, it is frequently accompanied by complementary actions. Their research shows that people rarely engage in conversation without simultaneously participating in another activity, indicating that technology should support this multi-faceted nature of socializing. They further argue that technology is most valuable when it enhances, sustains, or enriches the primary activity.

Our findings highlighted, that the potential for technology to enrich social interactions varies widely among couples. Factors such as familiarity, established routines, and mindfulness in spending time together all influence its effectiveness. Nonetheless, sparking new conversations remains a reliable method for fostering engagement. Introducing lightweight questions requires minimal effort, while deeper questions enable couples to reflect on their values and discover new aspects of each other. Personalization, including customizable categories, enhances the relevance of these prompts, allowing couples to choose the most suitable topics for their current context.

Similarly, we found that activity suggestions must be tailored to individual preferences, activity levels, time availability, and locations. Effective customization ensures that activities align with the couple's unique dynamics and shared interests.

Some couples from our study reported enhancing social skills to deepen social their interactions, making them more immersive and meaningful, thus wishing for even more support. We envision a tool that provides initial guidance, ultimately as a teacher to be left out once unnecessary anymore.

Overall, the design of technology for social interaction should focus on enhancing existing dynamics while providing tools for meaningful engagement. By doing so, we can foster deeper, more fulfilling relationships that are enriched rather than hindered by digital interventions.

5.3   Limitations and Future Work

There are several limitations to consider when interpreting our results. Given the exploratory nature of this study, our investigation provides initial insights into how technology can support reflection and enrichment in social interactions, while also highlighting potential avenues for future research. We anticipate that future studies will further explore and validate the findings and directions identified in our work.

Conducting an in-the-wild user study enabled us to examine the prototype in real-world settings, yielding ecologically valid findings [10]. However, field studies tend to have lower internal validity [16], due to the difficulty of controlling various external variables.

Our study did not include a control group, as it would be challenging to establish a meaningful comparison without capturing any social interactions at all. Since the intervention itself revolves around shared reflection and interactive elements that inherently involve tracking and facilitating conversations, a traditional control group would lack these key components, making direct comparisons difficult. Moreover, participants' awareness of being part of a study may have influenced their engagement and responses, potentially introducing self-report biases. Nevertheless, future research could explore alternative study designs, such as incorporating a control group with minimal or passive interaction tracking, to better assess the specific influence of shared journaling and interactive reflection on couples' dynamics while addressing this methodological challenge.

Additionally, our study sample consisted of participants from Germany. To include a wider cultural background, we probed participants' mother language, however, keeping it optional led to the result that no participant answered this question – and thus did not reveal us their cultural background. In addition, we sampled these participants through a university mailing list, online survey participants of a related study interested in follow-ups, and word of mouth. While this allowed us access a large pool of potential participants from both within and outside the university, it may not fully represent the broader population and, as such, potentially hinders insights into different cultural responses that are not entirely representative in terms of demographic diversity or technological usage patterns. Moreover, the relatively small sample size limits the generalizability of our findings. A larger, more diverse sample would provide a more comprehensive understanding of the effects observed and allow for more robust conclusions to be drawn.

The duration of the study is another limitation. Although two weeks provided sufficient time to gather initial insights into user interactions with a shared reflection tool and uncover valuable data that might not be captured in a lab setting, it was not long enough to assess long-term effects.

While our results indicate that using the app can increase mutual awareness and encourage behavior changes that promote more mindful interactions and reduced technology use, this change was mainly reflected in the subjective experiences and self-reports of the participants. Further investigation is needed to confirm whether these changes translate into actual reductions in technology use during interactions with their tandem partners. This study provides a foundation for future research into the long-term effects of the app on time spent together in dyads, technology use in social interactions, and the role of reflection. Prior studies suggest that several weeks, or even months, are necessary to reveal sustainable, long-term effects in an in-the-wild study setting [10].

Finally, engaging in self-reflection practices such as journaling about sensitive topics like emotions or social connections can lead to negative emotions, including self-surveillance, emotional pressure, and rumination [17, 31]. For example, participants may feel obliged to report a certain emotional response to be socially accepted by their counterpart. As such, these tools should be designed with care and extreme cautiousness of its benefits and challenges with respect to user's context and the technology itself [17], ultimately making it an optional tool to use if people are at their own level of comfort with it.

6   Conclusion

In this paper, we explored the role and potential of technology in enhancing dyadic, face-to-face social interactions within close relationships, aiming to create meaningful shared experiences. Our investigation involved a mobile app and an in-the-wild study. We focus on a paradox in technology's role within in-person interactions: while it often hinders meaningful engagement by making it difficult to maintain attention on the other person and mentally participate in the interaction when it is omnipresent, it also holds the potential to enrich conversations and enhance interactions when used as a supportive tool that keeps the focus on the physical experience of the interaction.

The results also provided valuable insights into how individuals use such an app in daily life to track and reflect on time spent with their romantic partners or close ties, incorporating mood reflection and technology use to assess emotional experiences and relationship dynamics. Our findings suggest that "us-reflection", a shared, social form of reflection, helps cultivate mutual awareness of their shared time. Additionally, our prototype facilitated more meaningful interactions by proposing conversation topics and suggesting activities, although these features would benefit from being customizable or personalized to better accommodate the unique dynamics and interests of each couple. Ultimately, our prototype has the potential to strengthen close relationships by fostering mutual awareness, intentional engagement, and more rewarding social experiences.

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