Mediating Intimacy with DearBoard: a Co-Customizable Keyboard for Everyday Messaging

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ABSTRACT

Co-customizations are collaborative customizations in messaging apps that all conversation members can view and change, e.g. the color of chat bubbles on Facebook Messenger. Co-customizations grant new opportunities for expressing intimacy; however, most apps offer private customizations only. To investigate how people in close relationships integrate co-customizations into their established communication app ecosystems, we built DearBoard: an Android keyboard that allows two people to co-customize its color theme and a toolbar of expression shortcuts (emojis and GIFs). In a 5-week field study with 18 pairs of couples, friends, and relatives, participants expressed their shared interests, history, and knowledge of each other through co-customizations that served as meaningful decorations, interface optimizations, conversation themes, and non-verbal channels for playful, affectionate interactions. The co-ownership of the co-customizations invited participants to negotiate who customizes what and for whom they customize. We discuss how co-customizations mediate intimacy through place-making efforts and suggest design opportunities.

CCS CONCEPTS

• **Human-centered computing** → **Empirical studies in collaborative and social computing**; **Collaborative and social computing systems and tools**.

KEYWORDS

CMC, mediated intimacy, close relationships, soft keyboard, co-customizations, ecosystems of communication apps, communication places, emoji, GIF

1 INTRODUCTION

Messaging apps play an important role in maintaining close relationships: they provide a means of staying connected when apart [31, 41], filling the "empty moments" of a day with "thinking of you" messages [14, 33], and exploring new forms of expression via emojis [27, 42], stickers [56], and GIFs [24, 49]. The relationships that users hold with their contacts influence how they use messaging apps. For example, they may organize their contacts so that "WhatsApp is for family and Messenger is for friends" [38] or re-purpose emojis with special meanings, e.g., sending the pizza emoji 🍕 to convey "I love you" [54]. People use messaging apps in special ways with their most intimate contacts. Our goal is to support these close relationships by offering them new opportunities for expressing intimacy in their everyday online communication.

Some messaging apps now feature collaborative customizations dedicated to specific conversations, which we define as *co-customizations*. Co-customizations allow users in the same group to jointly customize their communication space in a way that better reflects their preferences and relationships. For example, Griggio et al. [19] illustrated how a user changed the color of the chat bubbles to green, his husband's favorite color, for their conversations on Facebook Messenger (from now on, Messenger); another user changed Messenger's shortcut to the thumbs up emoji 👍 for a bike 🚴 in the conversation with a friend who shared her love of biking. Since co-customizations are collaborative and belong to a specific group, users in close relationships can adopt them as new means of expressing intimacy, persisting their shared identity in the medium itself [18]. However, the design space of co-customizations remain widely under-explored. We see co-customizations as a promising way of tailoring functionality to close relationships, and we are interested in understanding how they can contribute new opportunities in the design space of mediated intimacy.

Providing users with new co-customizations to learn what value they bring to their everyday messaging presents a dilemma. One possible direction is to build a new, fully co-customizable communication app and invite users to leave their current apps. However, this would deprive participants of their usual means of expression and the established communication patterns that we seek to support and enrich. The growing literature on ecosystems of
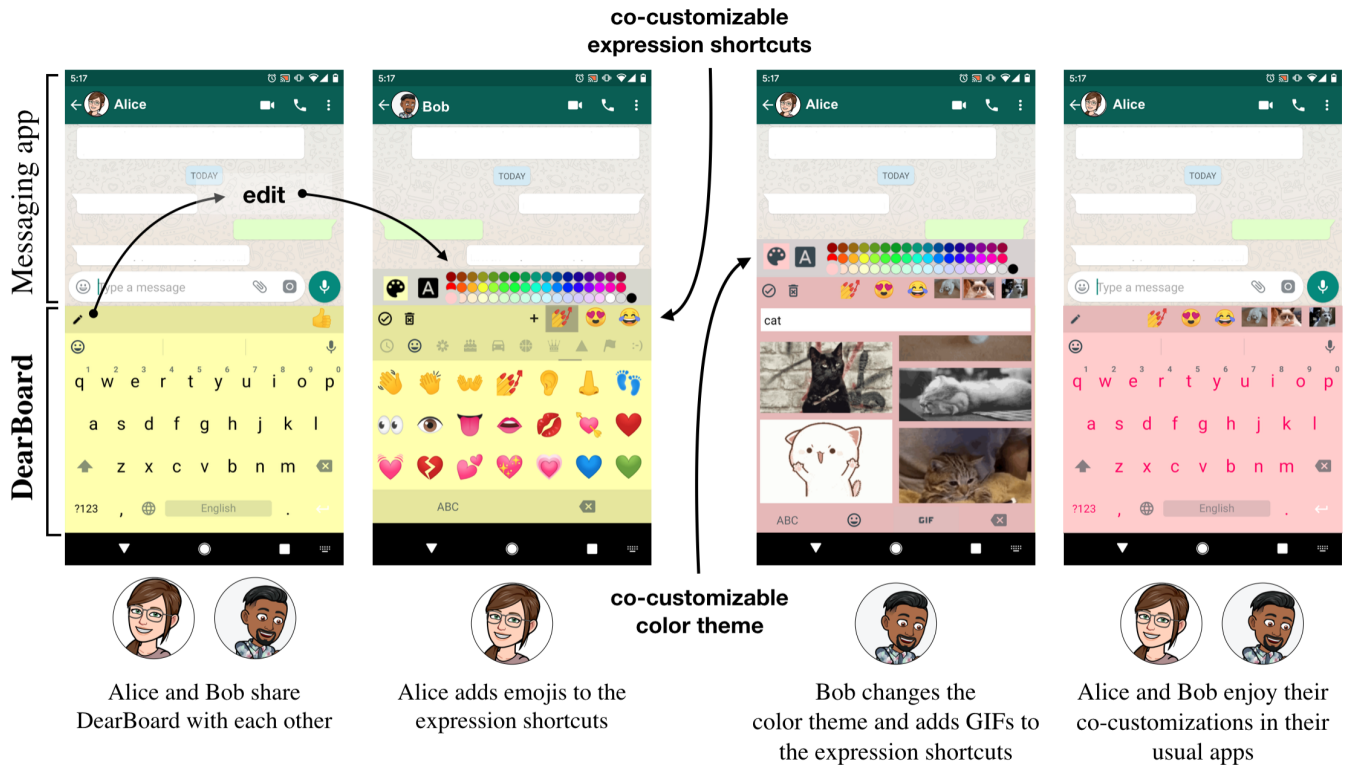
Figure 1: DearBoard enhances existing apps with co-customizations. Alice and Bob can see and control a toolbar of EXPRESSION SHORTCUTS above the keyboard, as well as its COLOR THEME. First, Alice adds three EXPRESSION SHORTCUTS to the nail polish, heart eyes and laughing with tears emojis, which she and Bob use often. Bob sees these shortcuts and adds three cat-theme GIFs. He also changes the color theme to red, Alice's favorite color. They can both see, use and change their co-customizations on WhatsApp, as well as any other app where they chat together.

communication apps [4, 14, 38, 43] and social media ecologies [15, 25, 55] argues that the communication mediated by one platform is shaped by the content, contacts, functionality, and cultural norms of *other* platforms in their app ecosystem. It is thus important that our investigation would preserve participants' existing communication places [38] while allowing them to experience co-customizations.

To this end, we explore an *app-agnostic* approach to augmenting apps with co-customizations, so that users combine our co-customizations with their usual messaging apps. We instantiated the concept of co-customization as a mobile soft keyboard, called DearBoard (Figure 1), and conducted a five-week-long field study with 18 pairs of couples, close friends, and relatives. DearBoard is an Android keyboard with a co-customizable color theme and a toolbar of emojis and GIFs. We repurpose a soft keyboard as a "Trojan Horse" [53] that introduces new functionality into closed, unmodifiable messaging apps to empower users in close relationships with co-customizations that are app-agnostic, i.e., that they can be brought into any conversation with each other regardless of the app they use. We contribute novel, nuanced insights into how co-customizations mediate intimacy in everyday messaging, as well as DearBoard, the first technological artifact designed to augment ecosystems of communication apps with co-customizations between two users.

2 RELATED WORK

We ground our work in previous research on mediated intimacy through messaging apps, communication places in app ecosystems, and app customizations and soft keyboards for supporting personalized expression.

2.1 Mediating Intimacy via Messaging Apps

Technology-mediated communication increasingly matters for maintaining relationships, for example, by contributing to couples' relationship satisfaction [50] or granting new means for controlling the impression we convey to others [52]. Licoppe [31] discusses how mobile messaging enabled a state of "connected presence" between people in close relationships, where a never-ending exchange of mundane interactions flows without the need of explicitly starting or ending a conversation. Similarly, Ohara et al. [39] discuss how the interactions on WhatsApp can be described as "being" with others, where *"togetherness and intimacy are enacted through small, continuous traces of narrative, of tellings and tidbits, noticings and thoughts, shared images and lingering pauses"*. Communication apps also support expressions of intimacy through *effortful communication* acts. Kelly et al. [26] studied how communication partners carefully craft their messages to reflect

their knowledge of each other, hoping that the recipient will recognize this as an expression of their intimacy.

People in close relationships often construct new intimate bonds via secret codes, references to anecdotes, or through repurposed meanings of emojis and GIFs that only they can understand. Kelly and Watts [29] proposed that the appropriation of emojis within close relationships promotes feelings of closeness, arguing that *"what begins as a relatively meaningless endeavour can become something that is likely to be relationally valuable through the co-creation of unique meanings"*. Jiang et al. [24] found a similar usage pattern around GIFs, where users relied on the shared understandings and inside jokes with close friends when selecting the perfect GIF for *reacting* [37] to a message. Despite the evidence above, apps offer little support for customizing conversation interfaces to support the intimate communication styles that users develop with intimate partners.

Previous work has argued that communication technologies should acknowledge the personal relationships that users maintain with their contacts. Ceccinatto et al. [11] explain that the "always on" culture enabled by mobile devices blurs the lines between work and personal life. They suggest that *"notification settings should leverage on users' existing contacts lists and starred contacts, rather than on single apps, in order to select when, where and how to be notified by certain people"*. Wiseman and Gould [54] warn that machine-learning techniques for understanding how people use emojis may miss important nuances if they neglect the repurposed meanings that emojis often take within close relationships. Arnold et al. [4] raise concerns around policies that force messaging apps to support interoperability dedicated to accessing the contacts of one app from another, as these may disrupt user practices around compartmentalizing their contacts in different apps based on the closeness of their relationships. This suggests that we need systems that acknowledge the relationship between two users and recognize when they message each other, so that their co-customizations only appear in their mutual conversations.

2.2 Customizations in Communication Apps

Previous research studied the social dynamics of sharing software customizations and configuration files between users [20, 35], such as the If-This-Then-That (IFTTT)[1] recipe for automating tasks on a smartphone. But there is little research on customizations that users co-own and can change collaboratively.

A few examples of what we call co-customizations appear in commercial apps: most let users in a group chat customize the title of their conversation collaboratively, but only Messenger lets users co-customize their nicknames, the color of their conversation's chat bubbles, and shortcuts to particular emojis. Griggio et al. argue that users adopt customizations to communication apps as means of expression and relationship maintenance, contrasting with the more common practice of customizing software to improve task efficiency [36]. They illustrated how users customize their messaging apps to express their personal identities (e.g., by expressing emotions with stickers of their favorite singer instead of emojis), intimate bonds in close relationships (e.g., by decorating a chat group title with emojis that denote the group identity),

and organizational culture (e.g., by adding custom emojis to Slack that evoke internal jokes in the workplace). They proposed a taxonomy of customization options in messaging apps according to their Visibility (who sees it, *Private* or *Social*), Ownership (who controls it, *Shared* or *Individual*) and Scope (where is it available, *Conversation*, *App* or *Ecosystem*). This study focuses on the scope of *Social* Visibility between the user and another contact who can *see* them, *Shared* Ownership between the user and another contact who can *control* them, and *Ecosystem*-level Scope to grant availability across apps—an unexplored combination of this taxonomy.

2.3 Communication Places and Ecosystems of Communication Apps

There is a growing trend of adopting not one, but many co-existing communication apps and social media platforms [4, 17, 34], which calls for an ecological perspective when studying mediated communication. Shklovski et al. argue that *"social activity and connectedness are about ongoing enactments of relationships across technologies"* [44]. Cramer and Jacobs [14] illustrate this perspective by describing how couples use many apps in parallel to express care in diverse ways, to adapt to different contextual needs (e.g., working vs. leisure time), and to convey urgency by sending the same message through many apps. They recommend that designers integrate novel functionality into couples' existing app ecosystems rather than creating new apps that compete with each other.

Nouwens et al. [38] showed that people often use multiple communication apps side-by-side even if they offer almost identical features. Over time, users build "communication places" in their app ecosystems: idiosyncratic constructs around a messaging app, each with its own membership rules i.e., which contacts are allowed in, which ones are not, perceived purposes, and emotional connotations. Arnold et al. [4] supported these findings through a survey with over two thousand users of messaging apps. A user might prefer to chat with their closest friends and family on WhatsApp and use Messenger for other acquaintances; use WhatsApp for personal communication and Telegram for work; or prefer talking with friends on Messenger because it feels "white and happy and empty" over the "slow and old" WhatsApp [38]. The definition of a communication place is recursively shaped by the use of its associated app as well as other apps in the ecosystem, as relationships evolve and contacts move from one app to another.

While the hard separation between apps supports the construction of communication places for different groups of people, users often miss the functionality and available media from one app when using another [38]. Griggio et al. [18] frame this as "expression breakdowns in app ecosystems": frustrations around media, (e.g. GIFs, emojis, stickers), customizations and functionality that users internalize as personal means of expression and need across apps, but can only use in one (e.g., wanting to use Snapchat's customizable Friendmojis [7] in WhatsApp, which was not possible at the time). Moreover, they show that app-exclusive customizations that express intimacy with a specific person may also lead to expression breakdowns when the user and that person communicate via multiple apps (e.g., colleagues that express inside jokes with custom Slack emojis miss them on Messenger). They propose shifting from *app-enclosed* to *user-owned tools* that people can

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take with them across their app ecosystems, supporting their cross-app relationships. Similarly, Sleeper et al.'s [46] study on cross-app sharing patterns calls for designs that *"account for realistic ecosystem-level behaviors".*

Researchers have explored innovative ways of mediating intimacy with communication technology [22, 51], such as messaging apps for inspiring meaningful effort in conversations [28]; visualizing heart beats [23] in a conversation; or sharing contextual cues (e.g., location, music cues) that convey meaning through the lenses of shared understandings [10]. While these explorations contribute novel insights into how close relationships adopt new means for expressing intimacy, they often require users to leave their established communication places and move their conversations to a new, isolated app. This suggests the need for an app-ecosystem perspective when mediating intimacy, with a common mechanism for enabling two people in a close relationship to establish their own communication place, regardless of app.

2.4 Soft Keyboards for Enhanced Expression

Previous research has enhanced expression with soft keyboards, but these usually address individual expression rather than intimacy between multiple users. Expressive Keyboards [2] translates users' gesture-typing style (e.g., speed, curviness) into text colors, inviting users to control their gestures to create expressive output. TapScript generates a hand-written-like font according to how users place their fingers when tapping on keys, making text input more expressive [9]. CommandBoard [1] and MojiBoard [3] also repurpose gesture typing for issuing font-style commands and personalized emojis. All of these keyboards leverage typing for new means of expression; however, their output depends on a custom-made application and cannot be used in commercial communication apps. The app market of soft keyboards focuses instead on customizations, such as colorful background themes or personal collections of emoji and stickers, as in GBoard[2] or SwiftKey[3]. This suggests that we still need to explore and understand how co-customizations can affect communication dynamics between intimate partners.

3 CO-CUSTOMIZATION AND DEARBOARD

Co-customization is a mechanism that allows multiple users to make modifications to the same conversation interface, thus letting users contribute equally to the control of customizable functionality or aesthetics. Our goal is to study how users adopt co-customizations as part of everyday messaging to understand their value in mediating intimacy and find new design opportunities in this design space. To this end, we repurpose a soft keyboard as a host to app-agnostic co-customizations that users can bring into any of their apps. In contrast to creating a new co-customizable messaging app for the study, our approach lets users combine new co-customizations with their existing apps: this allows them to preserve their communication places [38], increasing the ecological validity of the study, and also mitigates *expression breakdowns* by preserving the forms of expression they developed around the media, functionality and customizations of their usual apps [18].

3.1 DearBoard

DearBoard (Figure 1) is a standard QWERTY soft keyboard featuring two co-customizable interface components: its COLOR THEME (background color and keys color) and a toolbar of EXPRESSION SHORTCUTS (emojis and GIFs). When one user changes a color or adds an emoji to the toolbar, the other also sees these changes. When users open DearBoard in a conversation with anybody else, the co-customizations disappear, showing a regular Android keyboard.

The co-customizable COLOR THEME allows users to choose a background and text color for the keys as two separate settings. Compared to Messenger's chat bubble color, which allows a single color setting, our COLOR THEME has two customizable dimensions, allowing color combinations between two users. Users can change these colors through the Edit mode (Figure 1).

The co-customizable EXPRESSION SHORTCUTS appear in a toolbar that accepts up to six emojis or GIFs. When Edit Mode is on, users can add, remove or replace expressions in the toolbar. We limited the toolbar to only six EXPRESSION SHORTCUTS to encourage users to reflect about which are the most relevant expressions to share with each other. Users can tap on the emojis or GIFs in the toolbar to send them in a message.

These two co-customizations satisfy three main design goals and technological restrictions: First, they resemble Messenger's chat bubbles color and emoji shortcut, which have documented expressive value for close relationships [19]. Second, the COLOR THEME allows us to study co-customizations to *aesthetics*, and the EXPRESSION SHORTCUTS to study co-customizations to *functionality*, two main types of customizations for which users may assign different social and practical purposes [40]. Third, studying these new co-customizations with DearBoard instead of Messenger also enables us to study appropriations [16] and negotiations around co-customizations that afford *combinations* of settings rather than *overwriting* of settings. With Messenger, users can choose only one color for the chat bubbles or one emoji shortcut at a time; however, with DearBoard, users can combine the background color chosen by one with the keys color chosen by the other, and also mix EXPRESSION SHORTCUTS chosen by each. Moreover, we can study how co-customizations can contribute to creating *communication places* [38] with a specific person not only on Messenger but on any app used within a close relationship.

3.2 Implementation

We extended the AOSP (Android Open Source Project) LatinIME keyboard[4], which previous research portrayed as a reliable option for field studies [6, 8]. This is the default keyboard on many Android phones, and its layout resembles GBoard, another popular keyboard. Since the focus of DearBoard is on enabling co-customizations rather than introducing novel input techniques, we used LatinIME to provide robust text entry functionality, including dictionary-based auto-corrections, auto-completions, emoji menus, dictation, and even gesture typing. We based our implementation on the ResearchIME [8], a version of LatinIME with logging capabilities for field studies on text input. While we disabled the logging of text input data, ResearchIME provided us with a starting point

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for our own logging and extensions to the LatinIME. We added GIF searching (using the Tenor API[5]), the toolbar of EXPRESSION SHORTCUTS, and the UI for editing the COLOR THEME and EXPRESSION SHORTCUTS. We also parametrized the colors of the background and keys to make them customizable.

DearBoard assigns a User ID and a Group ID to every participant. All co-customizations are associated with a Group ID so that all users with the same Group ID share the same settings for the COLOR THEME and EXPRESSION SHORTCUTS. To synchronize co-customizations within a pair, the keyboard connects with a Node.js server application running in the Heroku cloud service. Every time the participant customizes the COLOR THEME or EXPRESSION SHORTCUTS, the keyboard sends a JSON to the server with the User ID, Group ID, background color, keys color, and list of emojis and GIF URLs in the toolbar. When the other participant in the same pair opens the keyboard to send a message, the keyboard retrieves the latest settings associated with their Group ID and updates its appearance.

Since the co-customizations are dedicated to a particular pair in our present study, we decided to only show them in conversations with each other. We thus needed to identify with which contact the user is chatting. Since apps do not offer APIs for getting such data, we implemented an image-based mechanism to allow participants to identify their "keyboard partner" with a manual set-up. When setting up the keyboard, the participant also opens a conversation view with their "keyboard partner" in a messaging app. They then open a hidden menu by holding down the comma key and indicate "I am sharing the keyboard with this contact". The system triggers a screenshot functionality to sample three one-pixel tall, screen-wide images that include the name of the contact. Every time the keyboard is opened, it takes another sample of the pixel-tall screenshots and compares them with the reference images. If they match, the keyboard infers that the participant is in a conversation with their "keyboard partner", and shows the co-customizations. Otherwise, participants see only a regular Android keyboard. The screenshots are only used internally and are never sent to the server.

4 METHOD

Our goal is to gather novel, nuanced insights into the role of co-customizations in everyday messaging to open up the design space of mediated intimacy. Because we value high ecological validity over assessing the particular features of this implementation of DearBoard, we apply a qualitative approach that includes deploying a novel technology in the wild and logging usage data that informs the interview questions asked during the study. We deployed DearBoard in a 5-week field study with 18 pairs of participants who were in a close relationship, i.e., couples, close friends and relatives that considered each other important to their daily lives.

4.1 Participants

We recruited 18 pairs (36 participants, 19 women, 17 men) via Reddit (/r/samplesize), Reddit ads, Twitter, and Facebook. Ages ranged between 22 and 43. We required participants to be users of Android phones (version 7 or newer) and to participate with someone

with whom they were in a close relationship and communicated daily. We conducted the study in Japan, however, the LatinIME keyboard does not support Japanese. Thus, we recruited people that mainly used English, Spanish, German, or other languages using the Latin alphabet, using social media to reach foreigners in Japan (e.g., the "Tokyo Expat Network" on Facebook) and to ask our international networks to advertise the study. Participants were originally from Canada, Italy, France, Argentina, Germany, USA, Moldova, China, South Korea, Russia, Bangladesh, Antigua and Barbuda, Dominica, The Netherlands and Vietnam. At the time of the study, they lived in Canada, Luxembourg, France, Argentina, Sweden, Singapore, Germany, Italy, USA, Japan, and Vietnam. Seven pairs self-identified as best or close friends. Nine pairs self-identified as couples. The remaining two pairs consisted of two sisters and two cousins. The cousins (Date pair) stopped participation about 10 days after the study started due to personal reasons. We offered ¥4000 (approximately 40 USD) to each participant as compensation. We refer to each pair with the name of a fruit (e.g., Banana), and to each participant as A or B (e.g., Banana-A, Banana-B). We list all participants in Table 1 (Appendix A).

As we detail in Section 7, we conducted the study during the COVID-19 pandemic. The first recruited pairs were mostly cohabiting couples who started self-isolating around a week into the study, which disrupted their communication patterns and led to less frequent messaging in many cases. We thus adjusted the recruiting criteria for a second round of participants, prioritizing non-cohabiting couples, friends and relatives, or cohabiting couples that were used to messaging each other even when at home (e.g., cases where both partners frequently worked from home).

4.2 Procedure

The following protocol was approved by the IRB of The University of Tokyo. The study consists of four parts spanning five weeks:

4.2.1 Setup and initial interview. We provide participants with the installation file of DearBoard via e-mail, along with instructions on how to set it up and a Group ID. In a video call with each study pair, we help them ensure that the keyboard is executable on their phones and that the contact recognition is activated in every app they used for chatting with each other. When opening the keyboard for the first time, participants are asked to enter their Group ID in a registration form, and the system generates the Participant ID that is automatically linked to their anonymized usage logs.

Next, we conduct a short interview (15 – 30 minutes) about their communication habits, asking them about what makes their online communication different with respect to other people, whether they use the functionality of apps in a special way with each other, and whether they express secret codes or inside jokes in their chats. In cases where they use more than one app with each other, we ask why one app is not sufficient to support their communication, what is their main communication channel, and what kind of functionality they miss when shifting from one app to another.

Finally, we invite them to customize the keyboard. We first ask one of the participants of the pair (from now on, partner) to customize the COLOR THEME and EXPRESSION SHORTCUTS while keeping in mind that these changes would also be seen by their partners. Then, we ask that participant to explain the

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reason, if any, behind their changes. When the other participant finishes the setup and opens the keyboard for the first time, they see the co-customizations already made. We ask what the co-customizations suggested to them and how they felt. Then, we also invite the other participant to customize the keyboard, and conduct the same procedure to let both partners become familiar with DearBoard.

We finish the setup by asking participants to send emojis and GIFs from within the keyboard instead of using their apps' built-in menus. We clarify that they could still send stickers and other app-specific expressions that the keyboard lacks, as well as switch to their usual keyboards, as necessary.

4.2.2 First week interview. One week after the installation of DearBoard, we conduct separate video calls with each partner. Before the interview, we examine patterns or surprising events in the logged data (see Data Collection section) for probing about specific stories around their experience. For example, we asked about new co-customizations to the keyboard and what triggered them, EXPRESSION SHORTCUTS that were frequently—or never—used in their conversations, or recurring combinations in the COLOR THEME. We also probe about episodes where the co-customizations are particularly valuable or frustrating, about how they manage the co-ownership of the co-customizations, and other functionalities they would like to share through DearBoard.

4.2.3 Fourth week interview. Three weeks later, we conduct another interview with each partner following the same pro-tocol. After the interview, we ask participants to disable the co-customization feature so that the keyboard looks the same for all contacts.

4.2.4 Post-study questionnaire. One week after disabling the co-customization feature, we send participants an online questionnaire asking about whether they would continue using the DearBoard if it was possible and why. We send this questionnaire after a week of no co-customizations so participants can contrast how their communication feels with and without them.

4.3 Data Collection

All the interviews were conducted as video calls, but only the audio was recorded. DearBoard collected anonymized usage logs from each participant on three main events:

- When the keyboard is opened: timestamp and foreground app.
- When a message is sent: timestamp, foreground app, whether the message was sent to the participant's partner or someone else, and the emojis and GIFs used in the message. Note that we **do not** log the actual content of the messages.
- When a user customizes: the Group ID and Participant ID of the customization author, as well as the background color, text color, and the list of emojis and GIFs of the new configuration.

We used these logs to detect interesting episodes or patterns before the interview with each participant. Our logging functionality had a few technical limitations. The contact recognition mechanism for turning on/off co-customizations relied on screen-capture permissions that expired from time to time, causing DearBoard to ignore the logging of some messages that were sent between participants until the permissions were renewed. Moreover,

DearBoard was not able to identify what app was used or what contact was addressed when replying to messages from within app notifications or Messenger's floating chat heads, since they did not match our image-based contact recognition template. Nevertheless, we collected sufficient data to probe participants on specific events and patterns during the interviews.

4.4 Analysis

We collected 104 interviews from 36 participants: three interviews from each, except for the Date pair's last interview, and Kiwi-A and Melon-B's first interview, who reported scheduling issues. We conducted a few interviews in Spanish, but we present all quotes translated to English. We also generated visual timelines from the logged data that illustrated participants' co-customization history, as well as their sent emojis and GIFs over time. We used these visual timelines to help our interpretation of the co-customization stories reported in the interviews.

We conducted a thematic analysis on interview transcripts and notes, combining an inductive (data-driven) and deductive (question-driven) approach. An inductive analysis on a subset of 18 interviews (three pairs) informed a list of preliminary themes that helped us narrow the focus of analysis and continue in a more deductive way. We approached the analysis with a constructivist perspective: our findings reflect a shared understanding we built with participants about their experiences around using co-customizations and we do not claim absolute truths about how co-customizations affect everyday communication.

Two of the authors coded a first set of 18 interviews from three pairs of participants with an inductive approach. Each coder analyzed the interviews independently, resulting in 117 initial codes for one and 128 codes for the other. Examples of codes in common between coders included "splitting ownership of co-customizations", "customizing to convey a message", "customizations based on time-specific events", and "customizations as surprises". Coders discussed the most salient data in the interviews, i.e. recurring patterns and rare but surprising behaviors, and curated codes into preliminary themes about participants' lived experiences and opinions around co-customizations. We used these preliminary themes to drive a deductive analysis of the rest of the interviews.

The same authors coded the segments of the remaining interviews that fit within the preliminary themes. We reused codes from the inductive analysis, and also added new codes for data that would contribute more nuances to the themes. We iteratively discussed the cohesion of each theme as we analyzed more interviews.

5 RESULTS

From the 36 participants, 34 completed the survey: 88% (30 participants) stated that they would continue using DearBoard, including reasons such as enjoying to *"surprise each other with customization"* (Apricot-B), *"communicate and play jokes without actually being verbal"* (Cherry-A), and *"because it tells me that I have a special connection with the person I'm talking to"* (Pear-B). On the other hand, 4 participants preferred not to use it anymore, explaining that their current keyboard was enough and did not find personal value from DearBoard. In this section, we present a nuanced account of participants' experiences with
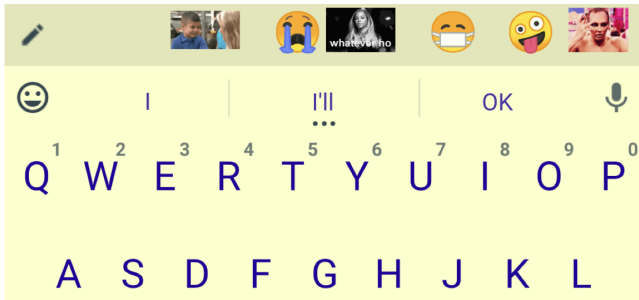
Figure 2: The Grape friends co-custommized the EXPRESSION SHORTCUTS with a frequent GIF meme, emojis related to their conversations about COVID-19, and GIFs representing their shared love for *Beyoncé* and *Drag Race*.

co-customizations in their app ecosystems. We describe how they supported expressions of intimacy, the diverse roles they played in everyday communication, negotiation styles around their co-ownership, and their contributions to redefining communication places dedicated to a specific, special person.

5.1 Expressing Intimacy through Co-Customizations

Most co-customization examples evoked shared understandings and diverse bonds between partners, serving as a way of expressing intimacy. For example, participants often authored customizations with unique conversation shortcuts (e.g., adding GIFs of their favorite TV show) or colors that demonstrated their intimate knowledge of each other (e.g., setting the background to the other's favorite or least favorite color).

5.1.1 Shared interests and activities. Many co-customizations represented common interests and activities that acted as bonds that characterized the relationship. For example, the Peach pair (close friends) went to the gym together, so one of them added the lifting weights emoji 🏋️ to the toolbar. Apple-A set the background color to pink, and Apple-B recognized it as a reference to how they both love wearing pink clothes. The Cherry pair (close friends) often met online to play games and added a game console 🎮 emoji to use in their game-related conversations.

While using GIFs for reactions is a widespread practice to express full-body gestures [49], some pairs curated their reaction GIFs according to TV shows or other interests that they considered a characteristic bond in their relationship. For example, Grape-B stated *"if it's going to be a GIF, it's going to be something from Drag Race or Beyoncé"* because they were both big fans of these, and they talked often about them (Figure 2).

5.1.2 Shared understandings: history, secret codes and inside jokes. Some participants co-customized to express anecdotes and significant episodes of their relationship. For example, Plum-A added a GIF of the Disney movie "Rapunzel" as a reference to the very first conversation she had with Plum-B. Pear-A added a shortcut to the *shaka* sign emoji 🤙: he adopted it as a variation of the waving hand emoji 👋 after their honeymoon in French Polynesia, where it was a common way of greeting people. The Banana friends had fun with "color wars", customizing the color
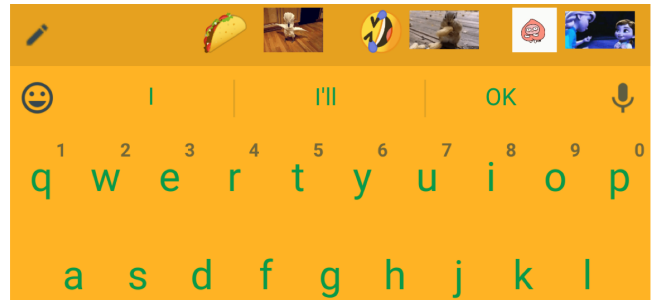

Figure 3: The Plum couple added EXPRESSION SHORTCUTS to GIFs that represented funny traits of each of them, a frequent emoji and two expressions dedicated to their Taco Tuesday tradition; the COLOR THEME was temporarily orange during Taco Tuesday.

theme back-and-forth based on a whimsical dispute as old as their friendship:

> Me and Banana-A have had a fairly long relationship. And when we started chatting on online applications back on MSN Messenger, she would always color her text bright pink, and I would always color mine bright blue. So, for the rest of this study, we're going to be switching this [background] back and forth between pink and blue. Yes. You know, on another level, this is just a reflection of the length of our relationship and shared whatever-you-want-to-call-it, like insider jokes. (...) It's more like a shared memory, something that's been part of our relationship for a long time, because we've been using these chats ever since like our relationship started, so these colors have been associated with our communication for like 13 years. (Banana-B)

Many pairs co-customized the toolbar with GIFs and emojis that conveyed inside jokes and secret codes that no one would understand outside of their relationship. The Plum couple added a GIF of a chipmunk stuffing food in its mouth food referred to Plum-A's eating habits, and a GIF of a cockatoo with a tall, white crest represented Plum-B's hair when waking up (Figure 3). The Almond sisters sent the cowboy emoji 🤠 as a code name for the person one of them was dating, and Berry-B added the detective emoji 🕵️ in reference to Berry-A's cat, whose name is Inspector.

5.1.3 Routines and traditions. Some co-customizations to the toolbar featured GIFs and emojis that participants had adopted for routines in their relationships. For example, the Plum couple celebrated "Taco Tuesday" every week, for which they usually sent taco emojis 🌮 to each other on Tuesdays. They co-customized the keyboard to support this tradition: *"There will be tacos every Tuesday, you've just got to have that emoji ready"* (Plum-B). Besides adding the taco emoji to the toolbar, they also added a GIF of Elsa (from Disney's Frozen) materializing a taco out of thin air, and a temporary taco-like orange background. Similarly, Coconut-A added GIFs of sleeping cats to the toolbar, echoing their habit of signaling it is time for bed: *"That's what we do, actually. We send sleeping cat GIFs if it's time to go to sleep and one of us is still at the computer or something."*

5.1.4 Avatars. We found particularly interesting how the toolbar co-customizations revealed an existing custom of using GIFs and
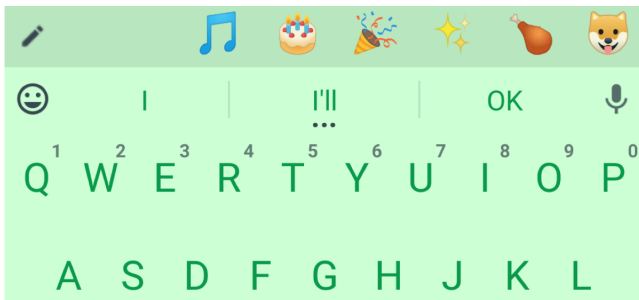
Figure 4: The Berry friends used the toolbar to surprise each other; in this case, Berry-A set a birthday theme for Berry-B.

emojis as avatars that represented each partner. For example, Kiwi-B explained *"The unicorn 🦄 it's her because she loves unicorns"*. Melon-A also explained two emojis in terms of "who" they were: *"He is the lion and I am a lioness, but there is no lioness, so I'm cat there"*. Guava-A explained that the cowboy emoji in the toolbar represented the name of Guava-B, which she used to signal messages that needed his attention: *"I just tell him something and I put the cowboy. And sometimes I use it when I want him to see something on Facebook, I put the cowboy and he sees it"*. Pear-A added a GIF of dancing avocados in reference to how his friends call him, which he usually sent to Pear-B along with good news or happy messages, as if he was the one dancing in the GIF. We believe the use of emojis and GIFs as avatars points to a special kind of intimate communication act, as if sending visual tokens of themselves just for the sake of it helped communication partners make the conversation more "theirs".

5.2 The Role of Co-Customizations in Everyday Messaging

Participants adopted the co-customizations for diverse purposes that colored them with practical, affective or communicative value.

5.2.1 Interface Optimizations. Some pairs valued the co-customizations for adding comfort and efficiency to their conversations. Those aware of the emojis and GIFs they used most often with each other populated the toolbar with shortcuts, making GIF and emoji input more efficient. Some also appropriated the color theme for interface optimizations, mostly related to reducing eye strain and preventing messages to the wrong recipient. For example, the Peach friends chose a black color theme towards the end of the study, agreeing that it felt more comfortable when they texted at night. Kaki-A liked the dedicated color theme to make sure he was in the conversation with his wife:

> I often start typing on a wrong message thread. Instead of writing to her, I'm writing to someone else in my frequent list. And so if the keyboard color changes automatically, I have a sense instantly that yes, I'm writing to the right person. (Kaki-A)

5.2.2 Extra communication channel for playful and affectionate interactions. Many pairs adopted the co-customizations as *"another form of communication"* (Banana-B). In contrast to those using the toolbar for shortcuts to frequent GIFs and emojis, some stuffed the toolbar with GIFs and emojis that they never send. In such cases, the customized toolbar was often a message in itself. Coconut-A once changed the entire toolbar to display only emojis of breakfast food, implicating he was hungry. He also filled the toolbar with

sleep-related GIFs and emojis as a hint that it was time for bed. Coconut-B value this as *"another layer of messaging"*, explaining: *"I think me and Coconut-A are using this board with emojis just as if we would send them, like you can go to the keyboard to see the saved emojis and then, you kind of read it"*. Berry-B echoed this: *"being able to play with the emoji as like a secondary messaging was pretty fun"*. They liked changing the toolbar to collections of emojis that evoked recent conversations, internal jokes or special events as a way of surprising the other or offering a digital gift (Figure 4):

> She messaged me at midnight my birthday. It was really cute being able to put the emoji up there, even though you don't necessarily use it, it still gives a feeling of an event. So this time was my birthday, but for example, if it's Christmas, it makes it cute and event-like. I like that. (Berry-B)

The color theme also supported a parallel channel for playful interactions. Some teased their partners with colors they would hate, or combinations that made the keyboard keys hard to read. To our surprise, six participants at some point selected the same color for the background and the text, resulting in a keyboard with invisible letters (Figure 5). While most went back to a readable keyboard shortly after the joke was discovered, the Peach friends typed on an invisible keyboard for eight days straight, taking it as a challenge dedicated to their conversations. Banana-A reflected about how the shared ownership of the color theme enabled playful interactions:

> When it's a personal setting, I couldn't care less what color the keyboard is. It doesn't matter. When it's a shared setting, it's a game. It is a war. I can win this. I can do something interesting. I can make something so horrendous that you can't look at it. Like it's another aspect to the interaction. (Banana-A)

5.2.3 Dedicated decorations. Some pairs co-customized the keyboard to dedicate decorations to each other. These decorations carried shared meanings, embedding expressions of intimacy in their conversation spaces. For example, the first color theme that
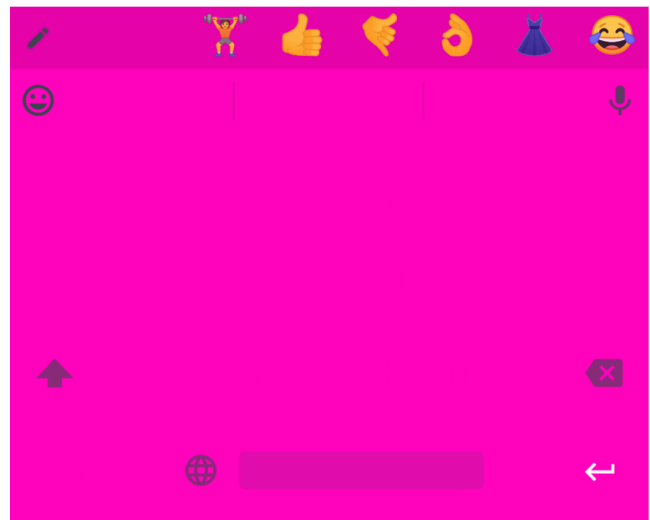

Figure 5: The Peach friends typed on an "invisible" keyboard for eight days straight after one of them chose the same color for the background and text as a joke.

Figure 6: The Mango couple co-customized DearBoard to feature a COVID-19 conversation theme.

Cherry-A selected was an orange background: *"That's our favorite color. We have the same favorite color at different times in life. Weird"*. The Pear couple knew right away that their keyboard would be purple (Figure 7-b), characterising their couple as *"monochromatic"*: they have purple decorations and objects at home (e.g. purple cutlery), their wedding theme was purple, and every time they have to choose a color, purple is their first choice. Co-customizing the color theme with purple and the toolbar with their frequent emojis turned their conversations into a more personal space that felt like home:

> This is a special place that you share virtually with your significant other. It's like a visual help to make you feel in that common space. At least, when you open that [keyboard] up, it's like when you enter home, like when you open your door and you see the furniture, the paintings or anything, it's like "Oh, I'm home". (Pear-A)

The adoption of the co-customizations as relationship-dedicated decorations was even more evident with participants who added emojis to the toolbar simply to be there, without any intention of using them as shortcuts. For example, the Purple couple added a French and a Chinese flag as symbols of their nationalities, but neither of them ever sent them in a conversation. The Berry friends usually sent ASCII emoticons such as XD or :D rather than emojis but still added emojis to the EXPRESSION SHORTCUTS as decorations, which contributed to increased feelings of connectedness:

> Well, I like the idea of having a toolbar of emojis I use all the time to make my life easier. But I also like the idea of being able to share the decorations with Berry-A instead of anybody else because it creates more of a connection in a chat. Especially since I don't like *Line* themes or anything so the actual chat is pretty... it's the same as everything else. So it's nice to open up the keyboard and it's different and I know I'm in Berry-A's chat, and there's the emoji and it makes the decoration... it makes it a unique chat that I don't have with anybody else. (Berry-B)

5.2.4 Conversation themes. A few pairs surprised us by appropriating the toolbar as a collection of emojis that *"set the stage"* (Coconut-A) for a conversation. Regardless of whether those emojis were meant to be sent or not in the conversation, they were intended to support or even inspire conversations about ongoing events. For example, Coconut-A once replaced the toolbar with snow and winter emojis when it unexpectedly snowed in the middle of Spring. Mango-A customized the keyboard to an Easter theme

with yellow background and the bunny emoji; once Easter was over, he changed the keyboard to a "coronavirus" theme (Figure 6), with green background and emojis of a crown ("corona" in Spanish), a hospital, a syringe and an alien (as a proxy for the microbe emoji they could not find). Mango-B contrasted how they used the keyboard's menu of recently used emojis (reflecting already used emojis) and the toolbar on top: *"I mean the recently used emojis are hidden. There's like another button to click while those [in the toolbar] are already there. They're kind of like a chat marker. And it's almost as if it's like a subject as well."*

5.3 Negotiating the Co-Ownership of Co-Customizations

Unlike private, individual customizations [19], the co-customizations on DearBoard afforded social interactions and gave room to negotiations of a co-owned space, especially around *who* made a change and *for whom* that change was.

5.3.1 Targeted efforts: who are the co-customizations for? We noticed customization efforts oriented in three ways:

SELF-CENTERED co-customizations favor the author. For example, Kiwi-A changed the background color to purple, her favorite color, and also populated the toolbar with her most frequent emojis. Kiwi-B refrained from customizing, seeing the co-customizations as "hers" and adopting them as decorations that emphasized the *Kiwi-A-ness* of their conversation.

OTHER-CENTERED co-customizations act as dedications to the other or selfless, other-oriented gifts [45]. For example, Mango-B once set the background color to pink for his partner, explaining: *"Her favorite color is pink, I think she would like that"*.

RELATIONSHIP-CENTERED co-customizations relate to both parties or represent a bond that characterizes the relationship itself. For example, the Melon couple called themselves a lion and lioness, and usually used cat-themed emojis instead of the regular smileys. Melon-A thus added a lion, a cat, and a hearty-eyes cat emoji to the toolbar. Mango-A added a skull emoji 💀, which was their special emoji for expressing laugh. In some cases, a combination of self-oriented and other-oriented customizations also served as a dedication to the relationship:

> She's a cat person. I'm a dog person. She put both of the emojis there in the [toolbar]. So it's really cute. It's very like her to go ahead and do stuff like that that would make us both happy. (Berry-B)

For most pairs, DearBoard hosted a mix of co-customizations for different beneficiaries, inviting participants to negotiate and balance "what is mine, what is yours and what is ours". The Apple friends explained that one of them was good with colors and the other with emojis, so they explicitly agreed on splitting the ownership of DearBoard and each be in charge of different co-customizations (Figure 7-a): *"We made a perfect agreement. I do the colors and she can do the icons"* (Apple-B). These kind of agreements and negotiations around the co-ownership of DearBoard were often perceived as another expression of intimacy:

> I think that what adds value to it is that you are doing it together and that you have to find a way to do it together. And that is either by making—kind of making someone head of keyboard and maybe someone else head of emoji. Or always changing it
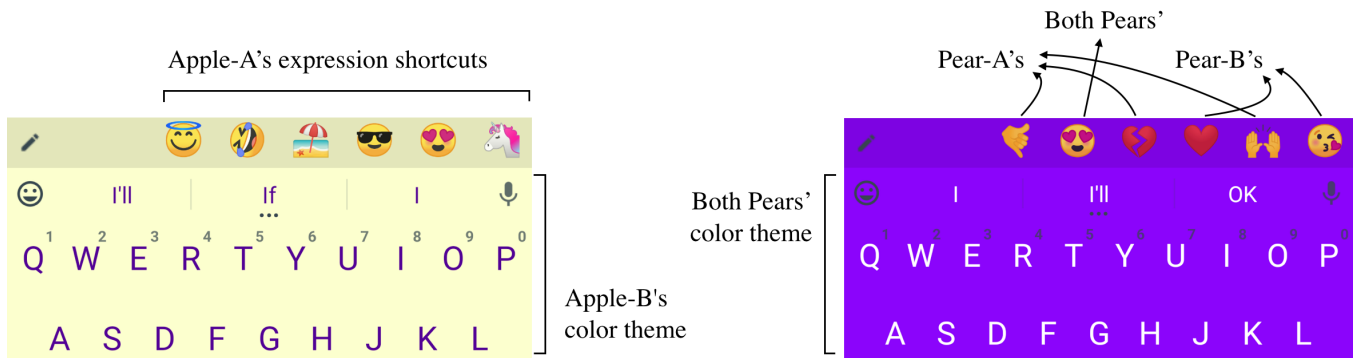
Figure 7: Left: The Apple friends split the ownership of DearBoard so that Apple-A was in charge of the EXPRESSION SHORTCUTS and Apple-B in charge of the COLOR THEME. Right: The Pear couple split the ownership of the EXPRESSION SHORTCUTS to have some for Pear-A and some for Pear-B, and some for both; their COLOR THEME was purple, their favorite color.

however you would like and just hoping the other person likes it. And yeah, there's many ways in which you can do that now. But I think it adds value by making it something that happens to the two of you (Apple-A)

Most often, the split ownership was implicitly negotiated within the same co-customization option. For example, after many days of "color wars" switching back-and-forth between pink and blue, the Banana friends tried COLOR THEME with a pink background for Banana-A and blue font for Banana-B. The Pear couple agreed on a RELATIONSHIP-CENTERED COLOR THEME with their favorite color, but split the ownership of the EXPRESSION SHORTCUTS to accommodate his and her SELF-CENTERED emojis (Figure 7-b):

It's interesting because we share some of the things that we both use, but the raising hands [emoji] 🙌 is something that I use a lot and she doesn't. And the heart, she uses that a lot and I don't. It's like, okay, you have this, I have that. Like a negotiation, very much like living together. (Pear-A)

It is also worth noting that not only most participants combined SELF-, OTHER-, and RELATIONSHIP-CENTERED efforts, but also that a few changed their preferred approach over time. In the case of Peach-B, shifting from a RELATIONSHIP-CENTERED to a SELF-CENTERED style was driven by valuing the EXPRESSION SHORTCUTS for their practical utility rather than for expressing intimacy:

I realized that in the end, the top bar emojis were the ones I used the most. When I first added emojis, I thought of the ones that were the most representative of my relationship with Peach-A, but I ended up putting the ones I use the most because—well, I use the gym one [weight lifting] only occasionally. And I use facepalm [emoji] all the time, so I thought it was more useful (Peach-B)

5.3.2 Authorship: who customizes? Some pairs displayed a "main customizer", while others showed more balanced initiatives to make changes:

BALANCED authorship is characterized by fluid interchange of co-customizations by both parties. We noticed that this pattern often came with acts of reciprocity: *"When he put the GIF of the chipmunk which is expressing me, I added a parrot because I want to send parrot things to him in a teasing way."* (Plum-A). Some pairs

adopted a dialogue-like dynamic where they responded to a co-customization with another: when Date-A set the COLOR THEME to two shades of purple (his favorite color), Date-B responded by changing the text color to green, evoking an inside joke about his purple-and-green outfits in the 90s. Some participants even counted on their co-customizations not lasting long, relying on a relaxed approach with no agreements on how to co-customize: *"I knew that the keyboard was going to flip the next time that Banana-B opened it, so I didn't really feel bad [for changing the color theme]"* (Banana-A).

DOMINATING authorship presents one person as the main author of co-customizations. This was not seen as a problem; those who co-customized less explained themselves as being lazy or just not as interested. Guava-B appreciated his girlfriends' co-customizations as an *"unexpected, collateral service"* since she picked shortcuts that were useful for him as well.

Many pairs explained their co-customization authorship style as a reflection of the overarching dynamics of the relationship. For example, Cherry-A predicted a balanced authorship with a teasing intent: *" Since I'm doing it [color theme] first, he'll probably switch on me. The classic Cherry-B move is to just change it on me because he can, so I can see him changing this constantly just because he can"* (Cherry-A). When asking Grape-B how he felt about Grape-A authoring most of the co-customizations, he responded:

I just didn't want to change it. I didn't mind the color. And she, usually in most situations is the one who takes control of everything. Even when we're going out, she's choosing the place. Or if we're out taking pictures of something, I'm just going along with it. But I will give my opinion if I don't like it. (Grape-A)

5.4 Place-Making with App-Agnostic Co-Customizations

The app-agnostic nature of the co-customizations in DearBoard allowed participants to integrate them into their existing app ecosystems in diverse ways. A few pairs explained that their main place used to be in a different app than the current one, and they leveraged DearBoard to bring back some of the "placeness" they had lost when switching. The Banana friends had lost their pink text vs. blue text rivalry from MSN Messenger after adopting Hangouts as

their main place, which they brought back into DearBoard in the form of COLOR THEME wars. The Plum couple used to have Kakao as their main place, but after moving away from South Korea, they also "moved away" from Kakao and adopted WhatsApp as their main app. One of their favorite GIFs in the EXPRESSION SHORTCUTS featured "Apeach", one of the official Kakao characters for stickers and app themes, which they had adopted as part of their shared identity even beyond their online communication:

> [The Apeach in the EXPRESSION SHORTCUTS] is kind of our character between us. He loves that character and I also used an Apeach theme [in Kakao]. So I went and bought him an Apeach doll. Okay, I'll show you [brings the doll from the nearby sofa]. Look at this! This is Apeach. So this one looks so like him for me. He's a big boy but he looks like this for me. (Plum-A)

Pairs that relied on multiple apps were able to bring the same "placeness" to different conversations. Pear-A said that seeing the purple color pop-up on Instagram, when their main place was Telegram, felt like a nice, comforting surprise. The Coconut couple speculated that they would like to keep using the keyboard to set "conversation themes" and surprise each other across different apps, although they did not use many during the study.[6] And Grape-A appreciated having access to their EXPRESSION SHORTCUTS not only on their main place, but also on Instagram and Snapchat:

> While we predominantly chat on one app, we do use other apps. So there's still a chance, even like on Snapchat—he sent me something and we went back and forth for a little bit on there. Sometimes he'll send me somebody else's story, and if I don't feel like making a video, I'll send a text response, right? And then I'll have the emojis right there in the toolbar. (Grape-A)

Some participants combined the aesthetics and functionality of DearBoard with those of their main places. Almond-A set the COLOR THEME to a dark green: *"I liked it because we speak much more in WhatsApp and it is the same color with WhatsApp"*. Pear-B had already customized Telegram's chat bubbles to purple, so she was happy that their purple DearBoard *"matched everything else on my phone"*. The Apricot friends and Kiwi couple eventually removed their favorite emoji from the EXPRESSION SHORTCUTS because their main communication app (Messenger) supported a shortcut to one emoji. This helped them gain "an extra slot" for a GIF or emoji on DearBoard: *"I removed it [the purple heart emoji] because we already have the heart on Facebook [Messenger]"* (Kiwi-B).

6 DISCUSSION AND OPPORTUNITIES FOR DESIGN

We contribute new insights into how co-customizations mediate intimacy, extending initial findings on how customizations contribute to maintaining relationships online [18]. We discuss our main takeaways to identify opportunities for design.

6.1 Beyond Personalizing Messages: Expressing Intimacy by Co-Customizing Interfaces

Research on mediated intimacy has focused on mediating intimacy by exploring new types of communication content, such as

novel modalities, media or intimate data [22, 24, 32, 51, 54, 56], such as messages based on lyrics of love songs [30], recordings of ambient sounds [33], visualizations of heart beats [23], and contextual data about users' whereabouts and activities [5, 19]. In contrast, our data shows how participants expressed intimacy by co-customizing the *interface* that mediated their communication. Their co-customizations to the EXPRESSION SHORTCUTS and COLOR THEME evoked shared interests, activities, common history, inside jokes, traditions, and routines apart from the expressions of intimacy they explicitly conveyed in their messages. We see this the most clearly in examples of co-customizations with intimate meanings that were strictly decorative and never used as input, such as Cherry's shared favorite color in the COLOR THEME, and Berry's emojis in the toolbar of EXPRESSION SHORTCUTS, which symbolized their relationship but were never sent in messages.

Co-customizations also offer new ways of designing for *effortful communication* practices. Kelly et al. [26] propose that close relational partners value effort invested in communication, such as sending lengthy messages, avoiding spelling mistakes, or sending an Internet meme that reminds them of the other. They point to new design perspectives that consider how to provide opportunities for effortful actions that are meaningful to users. Our data contributes more examples of discretionary effort in close relationships in the context of communication apps (e.g., curating the EXPRESSION SHORTCUTS to show GIFs and emojis relevant to their current situations), suggesting that effort can not only be conveyed in the content and crafting of messages, but also by co-customizing the interface that mediates them.

These insights open up the design space for mediated intimacy by suggesting that co-customizations to *user interfaces* can support expressions of intimacy in addition to the modalities, media or data used for the *content* of the communication. In other words, any communication app can add an extra layer of opportunities for expressing intimacy by allowing users to co-customize its user interface. For example, Zoom[7], the video-conferencing system, lets users set a virtual background on their video feeds. By making this virtual background co-customizable, users that have frequent calls could set it to a background that reflects some aspect of their shared identity, such as the favorite coffee place of two close friends.

6.2 Making intimate communication places with co-customizations

Co-customizations offer new opportunities to support a sense of connected presence [31], complementing the everyday messaging in a close relationship with a new space for *persisting* expressions of intimacy. Participants often described their co-customizations as decorations to a shared space that reflected their relationship. We see co-customizations as a space for making *intimate communication places*: communication places [38] dedicated to a close relationship that reflect and reinforce their intimacy.

Harrison and Dourish [21] argue that when designing collaborative and communication technologies, the distinction between *space* and *place* is key. While space is *"the structure of the world"*, place is *"a space which is invested with understandings of behavioural appropriateness, cultural expectations, and so forth"*.

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[6]As noted in the Limitations section, many pairs reduced their everyday messaging when starting to self-isolate together during the COVID-19 pandemic.

[7]Zoom: http://zoom.us/

Places are defined through use and have social meaning and value. Similar to how we turn a "house" into a "home", collaborative and communication technologies can also be embedded with meaning and emotional connotations that create a sense of place. In short, *"space is the opportunity; place is the understood reality"*. In the context of mobile messaging, *"apps provide the structure for communication, independent of the user, whereas communication places encompass the rules, roles, and feelings that users apply to their apps"* [38]. Our data suggest that the co-customizations in DearBoard provided a space to create intimate communication places where participants added meaning to their conversation space by decorating it with references to their shared identity and affection. Moreover, a sense of place may not only come from decorating the interface, but also from the negotiations around *who* customizes what and *for whom* they customize. Co-ownership negotiations often aligned with the overarching social dynamics in their relationship (e.g., *"in most situations [she] is the one who takes control of everything"*, Grape-B) and helped defining the appropriate behaviour or *etiquette* around co-customizing.

We cannot design places, but we can design *for* them [21]. To allow for place-making, it is critical for a space to offer opportunities for adaptation and appropriation. Our study shows how participants adapted and appropriated DearBoard for place-making. Many adapted the EXPRESSION SHORTCUTS and COLOR THEME with meaningful emojis, GIFs and colors, such as the drag queen GIFs of the Grape friends, or the color purple of Pear, the "monochromatic" couple. These adaptations often led to interesting appropriations, such as using EXPRESSION SHORTCUTS as conversation themes or playing "color wars" by changing the COLOR THEME back and forth. Moreover, many pairs valued DearBoard simply because it made their conversation different from the rest (e.g., *"it makes it a unique chat that I don't have with anybody else"*, Berry-B). We believe that such a sense of place is valuable in itself, acting as a reminder of their intimacy every time they enter their conversation.

We propose co-customizations as simple but powerful design resources for expanding the space in messaging apps from which close relationships can build intimate communication places. Designers of messaging apps, especially of those dedicated to close relationships such as Between [48] or Instagram's Threads [47], may consider what elements of the user interface can serve as co-customizable space that users can adapt and appropriate with their own meanings and expressions of intimacy. For example, existing customizations could change into co-customizations, allowing users to collaboratively control their notification sounds, reaction emojis, sticker collections, or background colors.

6.3 Augmenting messaging apps with app-agnostic functionality

DearBoard extends the input functionality of a keyboard with co-customizations and contact recognition. This contributes an approach to mixing relationship-dedicated functionality with existing mobile apps, allowing dyads to preserve their communication places as well as defining a more intimate sense of place in the conversations with each other. We believe this approach enables higher ecological validity in field studies of novel communication

functionality, and that it may inspire new technological frameworks for supporting personal expression and close relationships.

When studying new messaging functionality, a common approach is to require participants to relocate their communication to a new app [10, 28, 30], which deprives them from their existing contacts, messaging history and favorite functionality. By extending a soft keyboard with new functionality, we allow participants to mix it with their usual apps and study their adoption in the context of their everyday communication. This approach could support higher ecological validity in field studies, allowing for observations on how a prototype interacts with other app features, how users adopt it for different relationships, or for which situations it is perceived as most valuable. For example, MessageBuilder [28] is an app for supporting effort in the composition of text messages, which requires that *"each message sent must be longer than the previous message"*. This feature could be integrated into a soft keyboard so that close relational partners use it in their usual app(s). Similarly, the keyboard could be extended with the HeartLight and HeartButton versions of HeartChat [23], so that users can see live indicators of each other's heart rate or send snapshots of their heart rate as a message in any of their apps.

Our study also points to opportunities for mobile operating systems, keyboards and app vendors. For building DearBoard, we cloned, modified and recompiled the source code of Android's LatinIME, similar to previous studies on text input in the wild [6, 8]. Moreover, we implemented our own image-based mechanism for recognizing contacts within and across apps. However, keyboards, apps and mobile operating systems should provide specific support for developers interested in building reliable app-agnostic, relationship-dedicated products for everyday use. Soft keyboards could support plug-ins and third-party modules so that developers can integrate new functionality without asking users to install a new keyboard. Without mechanisms to extend soft keyboards in runtime, we shift the problem of asking users to switch apps to asking users to switch keyboards, which can also be uncomfortable. Some participants reported that DearBoard often auto-corrected special words that their old keyboard had learned to recognize over time. For example, this happened to the Almond sisters who mixed four languages: *"Our conversation is in a language that nobody understands. For example, taking a Romanian word and pronouncing the Russian way, adding a Russian termination."* The Jade couple used Italian words when texting in Spanish, and complained that the keyboard rejected "mascherina" (face mask) as a valid word. Apple-A also missed her customizations to her SwiftKey keyboard, which she had made bigger to type more comfortably.

Supporting keyboard extensions could enable the integration of app-agnostic functionality such as DearBoard's co-customizations while allowing users to preserve their usual keyboards. Moreover, new APIs between apps and keyboards could enable more reliable ways of identifying contacts within and across apps to support relationship-specific functionality. For example, when opening a WhatsApp conversation with a friend, GBoard's recently used emojis and GIFs could show only those used with that friend. Keyboards could also enable relationship-specific dictionaries to adapt their auto-correct to the recipient. Last, mobile operating systems could enable alternative mechanisms for app-agnostic functionality. Similar to how DearBoard repurposes a keyboard as a

host to app-agnostic functionality, other research has experimented with notifications [13, 19] and chat heads [12] as global access points to functionality that complement existing apps. This shows a demand for mechanisms that support app-agnostic, cross-app functionality, and mobile operating systems could provide more robust, standardized means for realizing such research prototypes into stable products.

7   LIMITATIONS AND FUTURE WORK

The diversity of our participants in terms of country of residence, culture, messaging apps used, and relationships with each other limits confidence in the generalizability of the insights. However, we believe that such diversity contributed to expanding the range of practices and values we observed around co-customizations. Future work could study particular demographics to inform, for example, the design of co-customizations that are more relevant to a specific culture or close relationship. Moreover, we limited our study to dyads, but the same image-based contact recognition used in DearBoard can be used to enable co-customizations for groups such as families or teams of colleagues. Future work could expand this design space by exploring and studying group co-customization.

We conducted the study between February and May 2020, when the COVID-19 pandemic led to lockdowns around the world. This impacted on the lifestyle and routines of some participants and changed their communication habits. Most notably, some co-habiting couples reported sending messages less frequently than normal while self-isolating at home together, since they had less needs for micro-coordination and thinking-of-you messages [14, 19]. Some participants also reported that, in general, the frequency of messaging decreased as they opted for video calls more often. Indeed, in April 2020, WhatsApp increased the limit of participants in a video call from 4 to 8 in response to how "people all over the world are turning to voice and video calling on WhatsApp more than ever before"[8]. While we see this as an interesting data-collection challenge during the COVID-19 pandemic, we collected sufficiently rich data to gather insights into how co-customizations mediate intimacy. Future work could explore new designs and revisit the role of co-customizations in ecosystems of communication apps where audio and video calls are more prominent.

Our data describes experiences around two particular co-customization options (the COLOR THEME and EXPRESSION SHORT-CUTS), which we were scoped by Android's technical limitations and we intended as instruments to study similar (but more complex) co-customizations than those possible on Messenger. However, we believe that our insights can transfer to other designs as long as they offer open-ended opportunities for persisting expressions of intimacy. In particular, we encourage future work on designs that let users combine SELF-CENTERED, OTHER-CENTERED and RELATIONSHIP-CENTERED customizations rather than completely replacing each other's settings (e.g., Messenger's current emoji shortcut) to inform the design of more complex co-customizations based on the co-ownership negotiations and other social dynamics that emerge from them.

Future work could also explore the combination of customizations for individual expression with co-customizations across app-ecosystems, allowing users from switching between "my" and "our" customizations. We hope this work inspires new co-customizations in messaging apps for mediating intimacy as well as creative explorations of app-agnostic functionality.

8   CONCLUSIONS

We explored the concept of co-customizations to mediate intimacy in the everyday messaging of close relationships. Adopting an ecological perspective, we built DearBoard: a keyboard with a co-customizable COLOR THEME and toolbar of EXPRESSION SHORTCUTS (emojis and GIFs) that are app-agnostic, i.e., that users can bring into any of their existing apps. We conducted a 5-week field study with 18 pairs of couples, close friends and relatives to understand the role that co-customizations may play into online relationship maintenance. We found that participants adopted the co-customizations for expressing intimacy, e.g., by setting the COLOR THEME to a color that defines their shared identity. They also appropriated the co-customizations for interface optimizations relevant to the communication with each other, dedicated decorations that increased feelings of connectedness, conversation themes to support ongoing chat topics, and non-verbal channels that supported playful, affectionate interactions. The co-ownership of these co-customizations inspired negotiations around *who* customized and *for whom* the customizations were, often echoing the overarching dyanmics of their relationships and being perceived as intimate acts of their own. We contribute the first design and empirical investigation of app-agnostic co-customizations for messaging apps and offer insights into how users build *intimate communication places* by persisting expressions of intimacy in the user interface that mediates their communication.

REFERENCES

[1] Jessalyn Alvina, Carla F. Griggio, Xiaojun Bi, and Wendy E. Mackay. 2017. CommandBoard: Creating a General-Purpose Command Gesture Input Space for Soft Keyboard. In *Proceedings of the 30th Annual ACM Symposium on User Interface Software and Technology* (Québec City, QC, Canada) *(UIST '17)*. ACM, New York, NY, USA, 17–28.   https://doi.org/10.1145/3126594.3126639

[2] Jessalyn Alvina, Joseph Malloch, and Wendy E. Mackay. 2016.   Expressive Keyboards: Enriching Gesture-Typing on Mobile Devices. In *Proceedings of the 29th Annual Symposium on User Interface Software and Technology* (Tokyo, Japan) *(UIST '16)*. ACM, New York, NY, USA, 583–593.   https://doi.org/10.1145/2984511.2984560

[3] Jessalyn Alvina, Chengcheng Qu, Joanna McGrenere, and Wendy E. Mackay. 2019. MojiBoard: Generating Parametric Emojis with Gesture Keyboards. In *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, Scotland Uk) *(CHI EA '19)*. Association for Computing Machinery, New York, NY, USA, 1–6.   https://doi.org/10.1145/3290607.3312771

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[8]WhatsApp Blog, "Group Video and Voice Calls Now Support 8 Participants": https://blog.whatsapp.com/group-video-and-voice-calls-now-support-8-participants/?lang=en

[4] René Arnold, Anna Schneider, and Jonathan Lennartz. 2020. Interoperability of interpersonal communications services – A consumer perspective. *Telecommunications Policy* 44 (04 2020). https://doi.org/10.1016/j.telpol.2020.101927

[5] Elizabeth Bales, Kevin A. Li, and William Griwsold. 2011. CoupleVIBE: Mobile Implicit Communication to Improve Awareness for (Long-distance) Couples. In *Proceedings of the ACM 2011 Conference on Computer Supported Cooperative Work* (Hangzhou, China) *(CSCW '11)*. ACM, New York, NY, USA, 65–74. https://doi.org/10.1145/1958824.1958835

[6] Florian Bemmann and Daniel Buschek. 2020. LanguageLogger: A Mobile Keyboard Application for Studying Language Use in Everyday Text Communication in the Wild. *Proc. ACM Hum.-Comput. Interact.* 4, EICS, Article 84 (June 2020), 24 pages. https://doi.org/10.1145/3397872

[7] Bitmoji. 2020. Bitmoji — Your Personal Emoji. https://www.bitmoji.com/ [Online; accessed 16-September-2020].

[8] Daniel Buschek, Benjamin Bisinger, and Florian Alt. 2018. ResearchIME: A Mobile Keyboard Application for Studying Free Typing Behaviour in the Wild. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (Montreal QC, Canada) *(CHI '18)*. Association for Computing Machinery, New York, NY, USA, 1–14. https://doi.org/10.1145/3173574.3173829

[9] Daniel Buschek, Alexander De Luca, and Florian Alt. 2015. There is More to Typing Than Speed: Expressive Mobile Touch Keyboards via Dynamic Font Personalisation. In *Proceedings of the 17th International Conference on Human-Computer Interaction with Mobile Devices and Services* (Copenhagen, Denmark) *(MobileHCI '15)*. ACM, New York, NY, USA, 125–130. https://doi.org/10.1145/2785830.2785844

[10] Daniel Buschek, Mariam Hassib, and Florian Alt. 2018. Personal Mobile Messaging in Context: Chat Augmentations for Expressiveness and Awareness. *ACM Trans. Comput.-Hum. Interact.* 25, 4, Article 23 (Aug. 2018), 33 pages. https://doi.org/10.1145/3201404

[11] Marta E. Cecchinato, Anna L. Cox, and Jon Bird. 2017. Always On(line)?: User Experience of Smartwatches and their Role within Multi-Device Ecologies. ACM Press, 3557–3568. https://doi.org/10.1145/3025453.3025538

[12] Fanglin Chen, Kewei Xia, Karan Dhabalia, and Jason I. Hong. 2019. MessageOnTap: A Suggestive Interface to Facilitate Messaging-Related Tasks. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, Scotland Uk) *(CHI '19)*. Association for Computing Machinery, New York, NY, USA, 1–14. https://doi.org/10.1145/3290605.3300805

[13] Hyunsung Cho, Jinyoung Oh, Juho Kim, and Sung-Ju Lee. 2020. I Share, You Care: Private Status Sharing and Sender-Controlled Notifications in Mobile Instant Messaging. In *Conference Companion Publication of the 2020 on Computer Supported Cooperative Work and Social Computing* (Virtual Event, USA) *(CSCW '20 Companion)*. Association for Computing Machinery, New York, NY, USA, 13–17. https://doi.org/10.1145/3406865.3418571

[14] Henriette Cramer and Maia L. Jacobs. 2015. Couples' Communication Channels: What, When & Why?. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (Seoul, Republic of Korea) *(CHI '15)*. ACM, New York, NY, USA, 709–712. https://doi.org/10.1145/2702123.2702356

[15] Michael A. DeVito, Jeremy Birnholtz, and Jeffery T. Hancock. 2017. Platforms, People, and Perception: Using Affordances to Understand Self-Presentation on Social Media. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing* (Portland, Oregon, USA) *(CSCW '17)*. ACM, New York, NY, USA, 740–754. https://doi.org/10.1145/2998181.2998192

[16] Alan Dix. 2007. Designing for appropriation. In *Proceedings of the 21st British HCI Group Annual Conference on People and Computers: HCI... but not as we know it-Volume 2*. BCS Learning & Development Ltd., 27–30.

[17] Maeve Duggan and Nicole B Ellison. 2015. Social media update 2014. (2015).

[18] Carla F. Griggio, Joanna McGrenere, and Wendy E. Mackay. 2019. Customizations and Expression Breakdowns in Ecosystems of Communication Apps. *Proc. ACM Hum.-Comput. Interact.* 3, CSCW, Article 26 (Nov. 2019), 26 pages. https://doi.org/10.1145/3359128

[19] Carla F. Griggio, Midas Nouwens, Joanna McGrenere, and Wendy E. Mackay. 2019. Augmenting Couples' Communication with Lifelines: Shared Timelines of Mixed Contextual Information. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, Scotland Uk) *(CHI '19)*. ACM, New York, NY, USA, Article 623, 13 pages. https://doi.org/10.1145/3290605.3300853

[20] Mona Haraty, Joanna McGrenere, and Andrea Bunt. 2017. Online Customization Sharing Ecosystems: Components, Roles, and Motivations. ACM Press, 2359–2371. https://doi.org/10.1145/2998181.2998289

[21] Steve Harrison and Paul Dourish. 1996. Re-place-ing Space: The Roles of Place and Space in Collaborative Systems. In *Proceedings of the 1996 ACM Conference on Computer Supported Cooperative Work* (Boston, Massachusetts, USA) *(CSCW '96)*. ACM, New York, NY, USA, 67–76. https://doi.org/10.1145/240080.240193

[22] Marc Hassenzahl, Stephanie Heidecker, Kai Eckoldt, Sarah Diefenbach, and Uwe Hillmann. 2012. All You Need is Love: Current Strategies of Mediating Intimate Relationships Through Technology. *ACM Trans. Comput.-Hum. Interact.* 19, 4, Article 30 (Dec. 2012), 19 pages. https://doi.org/10.1145/2395131.2395137

[23] Mariam Hassib, Daniel Buschek, Pawel W. Wozniak, and Florian Alt. 2017. HeartChat: Heart Rate Augmented Mobile Chat to Support Empathy and Awareness. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (Denver, Colorado, USA) *(CHI '17)*. ACM, New York, NY, USA, 2239–2251. https://doi.org/10.1145/3025453.3025758

[24] Jialun Jiang, Casey Fiesler, and Jed R Brubaker. 2018. 'The Perfect One': Understanding Communication Practices and Challenges with Animated GIFs. *Proceedings of the ACM on Human-Computer Interaction* 2, CSCW (2018), 80.

[25] Harmanpreet Kaur, Isaac Johnson, Hannah J. Miller, Loren G. Terveen, Cliff Lampe, Brent Hecht, and Walter S. Lasecki. 2018. Oh The Places You'll Share: An Affordances-Based Model of Social Media Posting Behaviors. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems* (Montreal QC, Canada) *(CHI EA '18)*. Association for Computing Machinery, New York, NY, USA, 1–6. https://doi.org/10.1145/3170427.3188601

[26] Ryan Kelly, Daniel Gooch, Bhagyashree Patil, and Leon Watts. 2017. Demanding by design: Supporting effortful communication practices in close personal relationships. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing*. ACM, 70–83.

[27] Ryan Kelly, Daniel Gooch, and Leon Watts. 2016. Technology appropriation as discretionary effort in mediated close personal relationships. *Collaborative Appropriation: How Couples, Teams, Groups and Communities Adapt and Adopt Technologies* (2016).

[28] Ryan Kelly, Daniel Gooch, and Leon Watts. 2018. 'It's More Like a Letter': An Exploration of Mediated Conversational Effort in Message Builder. *Proceedings of the ACM on Human-Computer Interaction* 2, CSCW (2018), 87.

[29] Ryan Kelly and Leon Watts. 2015. Characterising the inventive appropriation of emoji as relationally meaningful in mediated close personal relationships. *Experiences of Technology Appropriation: Unanticipated Users, Usage, Circumstances, and Design* (2015).

[30] Taewook Kim, Jung Soo Lee, Zhenhui Peng, and Xiaojuan Ma. 2019. Love in Lyrics: An Exploration of Supporting Textual Manifestation of Affection in Social Messaging. *Proc. ACM Hum.-Comput. Interact.* 3, CSCW, Article 79 (Nov. 2019), 27 pages. https://doi.org/10.1145/3359181

[31] Christian Licoppe. 2004. 'Connected' presence: The emergence of a new repertoire for managing social relationships in a changing communication technoscape. *Environment and planning D: Society and space* 22, 1 (2004), 135–156.

[32] Miki Liu, Austin Wong, Ruhi Pudipeddi, Betty Hou, David Wang, and Gary Hsieh. 2018. ReactionBot: Exploring the Effects of Expression-Triggered Emoji in Text Messages. *Proc. ACM Hum.-Comput. Interact.* 2, CSCW, Article 110 (Nov. 2018), 16 pages. https://doi.org/10.1145/3274379

[33] Danielle Lottridge, Nicolas Masson, and Wendy Mackay. 2009. Sharing Empty Moments: Design for Remote Couples. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Boston, MA, USA) *(CHI '09)*. ACM, New York, NY, USA, 2329–2338. https://doi.org/10.1145/1518701.1519058

[34] Peter Lyle, Henrik Korsgaard, and Susanne Bødker. 2020. What's in an Ecology? A Review of Artifact, Communicative, Device and Information Ecologies. In *Proceedings of the 11th Nordic Conference on Human-Computer Interaction: Shaping Experiences, Shaping Society* (Tallinn, Estonia) *(NordiCHI '20)*. Association for Computing Machinery, New York, NY, USA, Article 88, 14 pages. https://doi.org/10.1145/3419249.3420185

[35] Wendy E. Mackay. 1990. *Users and customizable software: A co-adaptive phenomenon.* Ph.D. Dissertation. Citeseer.

[36] Wendy E Mackay. 1991. Triggers and barriers to customizing software. In *Proceedings of the SIGCHI conference on Human factors in computing systems*. ACM, 153–160.

[37] Kate M. Miltner and Tim Highfield. 2017. Never gonna GIF you up: Analyzing the cultural significance of the animated GIF. *Social Media+ Society* 3, 3 (2017), 2056305117725223.

[38] Midas Nouwens, Carla F Griggio, and Wendy E Mackay. 2017. WhatsApp is for family; Messenger is for friends: Communication Places in App Ecosystems. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*. ACM, 727–735.

[39] Kenton P. O'Hara, Michael Massimi, Richard Harper, Simon Rubens, and Jessica Morris. 2014. Everyday Dwelling with WhatsApp. In *Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work & Social Computing* (Baltimore, Maryland, USA) *(CSCW '14)*. ACM, New York, NY, USA, 1131–1143. https://doi.org/10.1145/2531602.2531679

[40] Antti Oulasvirta and Jan Blom. 2007. Motivations in Personalisation Behaviour. *Interact. Comput.* 20, 1 (July 2007), 1–16. https://doi.org/10.1016/j.intcom.2007.06.002

[41] Frank Hodges Richard Harper. 2006. *Beyond Talk, Beyond Sound: Emotional Expression and the Future of Mobile Connectivity.* Frank & Timme. https://www.microsoft.com/en-us/research/publication/beyond-talk-beyond-sound-emotional-expression-and-the-future-of-mobile-connectivity/

[42] Monica A. Riordan. 2017. Emojis as tools for emotion work: Communicating affect in text messages. *Journal of Language and Social Psychology* 36, 5 (2017), 549–567.

[43] Lauren E. Scissors and Darren Gergle. 2013. "Back and Forth, Back and Forth": Channel Switching in Romantic Couple Conflict. In *Proceedings of the 2013 Conference on Computer Supported Cooperative Work* (San Antonio, Texas, USA)

(CSCW '13). ACM, New York, NY, USA, 237–248. https://doi.org/10.1145/2441776.2441804

[44] Irina Shklovski, Louise Barkhuus, Nis Bornoe, and Joseph 'Jofish' Kaye. 2015. Friendship Maintenance in the Digital Age: Applying a Relational Lens to Online Social Interaction. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing* (Vancouver, BC, Canada) *(CSCW '15)*. ACM, New York, NY, USA, 1477–1487. https://doi.org/10.1145/2675133.2675294

[45] Jörgen Skågeby. 2010. Gift-giving as a conceptual framework: framing social behavior in online networks. *Journal of Information Technology* 25, 2 (2010), 170–177.

[46] Manya Sleeper, William Melicher, Hana Habib, Lujo Bauer, Lorrie Faith Cranor, and Michelle L. Mazurek. 2016. Sharing personal content online: Exploring channel choice and multi-channel behaviors. In *Proceedings of the 2016 CHI conference on human factors in computing systems*. ACM, 101–112.

[47] Robby Stein. 2019. Introducing Threads for you and your Close Friends. https://about.instagram.com/blog/announcements/introducing-threads-app [Online; Accessed 16-September-2020].

[48] Between Team. [n.d.]. Between - Relationship App for Couples. https://between.us/

[49] Jackson Tolins and Patrawat Samermit. 2016. GIFs as Embodied Enactments in Text-Mediated Conversation. *Research on Language and Social Interaction* 49, 2 (April 2016), 75–91. https://doi.org/10.1080/08351813.2016.1164391

[50] Catalina L. Toma and Mina Choi. 2016. Mobile Media Matters: Media Use and Relationship Satisfaction among Geographically Close Dating Couples. In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work and Social Computing* (San Francisco, California, USA) *(CSCW '16)*. Association for Computing Machinery, New York, NY, USA, 394–404. https://doi.org/10.1145/2818048.2835204

[51] Frank Vetere, Martin R. Gibbs, Jesper Kjeldskov, Steve Howard, Florian'Floyd' Mueller, Sonja Pedell, Karen Mecoles, and Marcus Bunyan. 2005. Mediating intimacy: designing technologies to support strong-tie relationships. In *Proceedings of the SIGCHI conference on Human factors in computing systems*. ACM, 471–480.

[52] Joseph B Walther. 2007. Selective self-presentation in computer-mediated communication: Hyperpersonal dimensions of technology, language, and cognition. *Computers in Human Behavior* 23, 5 (2007), 2538–2557.

[53] Wikipedia contributors. 2020. Trojan Horse — Wikipedia, The Free Encyclopedia. https://en.wikipedia.org/w/index.php?title=Trojan_Horse&oldid=978263763 [Online; accessed 16-September-2020].

[54] Sarah Wiseman and Sandy J. J. Gould. 2018. Repurposing Emoji for Personalised Communication: Why Pizza Means "I Love You". In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (Montreal QC, Canada) *(CHI '18)*. ACM, New York, NY, USA, Article 152, 10 pages. https://doi.org/10.1145/3173574.3173726

[55] Xuan Zhao, Cliff Lampe, and Nicole B. Ellison. 2016. The Social Media Ecology: User Perceptions, Strategies and Challenges. ACM Press, 89–100. https://doi.org/10.1145/2858036.2858333

[56] Rui Zhou, Jasmine Hentschel, and Neha Kumar. 2017. Goodbye Text, Hello Emoji: Mobile Communication on WeChat in China. ACM Press, 748–759. https://doi.org/10.1145/3025453.3025800

A   TABLE OF PARTICIPANTS

Participant	Age	Gender	Nationality	Residence	Occupation	Relationship	Languages	Messaging apps
Banana-A	26	Woman	Canadian	Canada	Librarian	Best friends	English	**Hangouts**, Discord, SMS
Banana-B	27	Woman	Canadian	Canada	Student			
Melon-A	30	Woman	Italian	Luxembourg	Researcher	Couple	**French**, English	**WhatsApp**, Wickr, Telegram, SMS
Melon-B	28	Man	French	Luxembourg	Office worker			
Kiwi-B	32	Woman	French	France	Executive assistant	Couple (cohabiting)	French	**Messenger**, Signal, WhatsApp, SMS
Kiwi-A	31	Man	French	France	Unemployed			
Lemon-A	26	Woman	Chinese	Sweden	UX designer	Couple (cohabiting)	English	**Messenger**, WhatsApp, WeChat, SMS
Lemon-B	25	Man	French	Sweden	Software Engineer			
Pear-A	32	Man	Argentinian	Argentina	Photographer	Couple (cohabiting)	Spanish	**Telegram**, WhatsApp, Instagram, SMS
Pear-B	29	Woman	Argentinian	Argentina	Hairdresser			
Plum-A	31	Woman	South Korean	Singapore	Interior designer	Couple (cohabiting)	**English**, Korean	**WhatsApp**, KakaoTalk, Instagram, SMS
Plum-B	29	Man	American	Singapore	Consultant			
Kaki-A	31	Man	Bangladeshi	Sweden	PhD Student	Couple (cohabiting)	**English**, Swedish	**WhatsApp**, **SMS**, Messenger
Kaki-B	31	Woman	Bangladeshi	Sweden	Student			
Cherry-A	29	Man	Canadian	Canada	Insurance Manager	Best friends	English	**SMS**, Snapchat, Discord
Cherry-B	30	Man	Canadian	Canada	Project Coordinator			
Coconut-A	33	Man	German	Germany	PhD student	Couple (cohabiting)	**English**, German	**Telegram**, WhatsApp, Skype, SMS
Coconut-B	28	Woman	Russian	Germany	Office worker			
Apricot-A	25	Man	Vietnamese	Japan	Software Engineer	Close friends	Vietnamese	Messenger
Apricot-B	25	Man	Vietnamese	Viet Nam	Software Engineer			
Berry-A	29	Woman	American	Japan	Translator	Best friends	**English**, Japanese	**Line**, Twitter DM
Berry-B	32	Woman	American	Japan	Office worker			
Peach-A	22	Man	Argentinian	Argentina	Office worker	Close friends	Spanish	**WhatsApp**, Messenger, Telegram, Instagram
Peach-B	23	Man	Argentinian	Argentina	Student			
Date-A	43	Man	French	Japan	Interpreter	Cousins	French	**WhatsApp**, Messenger, Skype
Date-B	31	Woman	French	France	Science educator			
Guava-B	28	Man	Argentinian	Italy	Software Engineer	Couple (cohabiting)	**Spanish**, English	**WhatsApp**, Messenger, SMS, Telegram, Hangouts, Instagram
Guava-A	26	Woman	Argentinian	Italy	Teacher			
Grape-A	33	Woman	American	USA	Office Assistant	Best friends	English	**Hangouts**, Snapchat, Duo, Messenger, Instagram, SMS
Grape-B	34	Man	American	USA	Warehouse worker			
Mango-B	23	Man	Antiguan	USA	Software Engineer	Couple	English	**WhatsApp**, Messenger, Instagram, SMS
Mango-A	22	Woman	Dominican	USA	Student			
Apple-A	37	Woman	Dutch	Japan	Language teacher	Close friends	Dutch	**WhatsApp**, **LINE**, Messenger, Instagram, Snapchat, SMS
Apple-B	22	Woman	Dutch	Japan	Student			
Almond-A	25	Woman	Moldovan	Luxembourg	Student	Siblings	**Romanian**, **Russian**, English, French	**WhatsApp**, Hangouts, Instagram, SMS
Almond-B	23	Woman	Moldovan	Luxembourg	Student			

Table 1: Study participants. "Languages" and "Messaging apps" refer to those used within the relationship, where bold indicates the main one.