In Your Eyes: Anytime, Anywhere Video and Audio Streaming for Couples

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ABSTRACT
Long distance couples face challenges in staying connected and must rely heavily on technology to mediate their relationship. To provide new ways for couples to virtually ‘be together,’ we explore a futuristic use of video communications technology where it is possible to see through the eyes of a partner at any point in time to more deeply stay connected and share experiences together on a daily basis. We created a technology probe called In Your Eyes that uses a smartphone and Skype in auto-answer mode. Partners can connect to one another at any time without needing to answer a call. Two couples used the probe for one month. One found it beneficial while the other found it intrusive. We explore the reasons behind these experiences and show the benefits and pitfalls of anytime, anywhere streaming for long distance couples. Our study provides new ways of thinking about presence and connection over distance where the ability to connect and the intention to do so—even if not acted upon—can create feelings of closeness for some and overconnection for others.

Author Keywords
Long distance couples; media spaces; video communication systems; always-on video and audio

ACM Classification Keywords
H.5.3. Group and Organization Interfaces: Computer-supported cooperative work.

INTRODUCTION
Couples typically stay connected on a regular basis throughout the day using text messages, phone calls, and, if living in the same place, they see each other and talk about daily happenings in person [19,35,51]. As couples become separated by distance, communication tools become even more important to mediate interactions [1,35,46]. New technologies have meant increased access to one’s remote partner [13]. Prior work has found that long distance couples highly value technologies such as video communications [35,44]. They support virtual face-to-face conversations that allow couples to see each others’ facial expressions and body language [35,44]. Video links can be left open in homes to allow partners to ‘virtually’ live together over distance [35].

Building on early visions from Steve Mann [29], we are now seeing a proliferation of video streaming technologies that allow people to share live video feeds with others from virtually any location (e.g., Periscope, Meerkat, UStream). These types of tools are making it easy for people to stream their life anytime, anywhere. We were curious by this trend and wondered what the future of video chat might entail and how such services could be extended and explored for those who share a very intimate relationship like a long distance couple. As such, we explored anytime, anywhere video streaming for long distance couples.

We created a technology setup called In Your Eyes. The probe was deliberately simple and involved users placing a smartphone in a shirt pocket with the camera facing outwards (akin to the movie, Her) and running video chat software (Skype) in auto-answer mode. Rather than having to call and wait for the other person to answer, partners could see and talk to each other at any point without explicit permission. While this may seem privacy intrusive, and it likely is in some respects, we wanted to see how this type of system would be used, if it would create an intimate connection throughout the day between partners, and what would matter the most to long distance couples: immediate access to one’s partner anytime, anywhere or having a greater sense of autonomy and control over one’s privacy and the use of the technology. Next, we conducted a study with two long distance couples over four weeks to explore these ideas.

First, our research contributes an understanding of how couples used anytime, anywhere video streaming to support their relationship. We highlight how In Your Eyes benefitted partners by allowing them to see new places and people, in particular through one’s partner’s eyes, be playful with each other, share important events, find value in seeing everyday mundane activities, and comfort one another when alone. The probe was not used without its challenges though. One couple faced issues in being overconnected where In Your Eyes altered their existing
conversational routine. It affected its ‘special’ nature and the role it was playing in their relationship. Second, we contribute a series of considerations and ideas for how researchers and designers might think about anytime, anywhere video communication technologies. Here the goal is to sensitize readers to the benefits, complexities, and challenges that such a technology poses.

RELATED WORK
Long Distance Relationships
Long-distance relationships (LDRs) are becoming fairly common in present culture due to many reasons [51], including work demands [1,54] and school commitments [51,55]. In these situations, computer-mediated communication tools are important for connecting couples over distance and have even been shown to increase feelings of closeness [1], build trust, and improve relationship satisfaction [11]. Thus, they are critical for helping couples perform relationship maintenance, the simple acts that partners do throughout the day to maintain their relationship [51,53]. These include talking positively to one another, being open, managing conflicts, and sharing tasks or chores [6,14], which all help to promote relationship satisfaction [56]. A common assumption is that those people in long distance relationships are less satisfied with their relationship [51]; however, this is often not the case if long distance partners are able to effectively use the same relationship maintenance strategies as those couples who live together [51]. Even still, long distance partners tend to idealize their relationship and avoid talking about topics that might create conflict [11,51,54].

Technology Prototypes for Long Distance Couples
We now see a variety of technology prototypes specifically focused on supporting partners in long distance relationships. This typically focuses on one of three design areas with the goals of supporting awareness, feelings of closeness, and connection. First, prototypes have focused on passive awareness sharing where information is collected implicitly (through sensing) and shared between partners. For example, interconnected rings track and share heartbeats [60] or interconnected beds sense and share sleep information [15]. Second, prototypes have been designed for partners to share subtle forms of interaction. For example, partners perform lightweight interactions with photo frames [8], lovers’ cups [10], note sharing devices [17], custom-designed mobile phone ringtones [50], colored icons on a screen [26], inflatable vests [33], slippers [9], and even hand-holding devices [17]. Interaction on one partner’s object causes changes on the other partner’s object. Third, systems and prototypes support rich interactions that might be found in conversations between partners. For this type of interaction, we turn to communication tools such as video chat, which are described in the following sections.

Video Chat Usage by Family and Friends
Research has shown that family and friends value using synchronous video systems for both conversations as well as sharing longer term experiences and activities [4,23,27] despite challenges in setting up and maintaining video calls [2,27]. Synchronous video communication provides an intimate and personal way to connect given the ability to see people [2,19,35]. Sometimes privacy is a challenge, especially if individuals are concerned about their own appearance on camera [5] or the inopportune timing of video calls [23]. This relates to the idea of a moral economy where people ‘do what they feel is right’ while balancing the needs and concerns of themselves and others [12,58]. The ‘moral order’ of video chat calls suggests ‘the way things ought to be done.’ Here people feel obligated to stay focused on a video call and keep a video connection going despite connectivity issues [27]. They also feel as though they should carefully plan or preplan calls so one knows the remote party is fine with a video call [23]. This is related to concepts of conversational turn taking where people follow and understand a known structure for conversational exchange and feel obligated to do so [48]. Studies of asynchronous video messaging show that sometimes people find it difficult to share the everyday, mundane details of their life over video despite feeling obligated to do so [45]. This is because people tend to think of what they do as ‘being ordinary’ [47]. We explore how these ideas manifest themselves for long distance couples when using anytime, anywhere video streaming.

Video Communication by Long Distance Partners
Long distance couples make use of video chat to stay connected where they highly value being able to see each other in order to feel especially close [19,35,36]. Thus, the use of video chat builds on the more simplistic information exchanges found in research prototypes focused on the sharing of awareness information. Research has shown that some long distance couples use open video links during the evening to connect to one another and simulate shared living [19,35,36]. Such connections are used during weekday evenings, given the ease of making video calls when at home, as well as the desire to do things away from their partner on the weekends [35]. What we do not know, though, is how long distance couples would use a video system that gives them access to their partner at any point in time, where many points in time may involve being mobile and not at home. This pushes against the existing norm of video calls being mostly restricted to home settings to see what might happen if it were easier to connect with a partner at any point in time and in any location.

Video Communication Prototypes
Researchers have created new video communications prototypes for the home to build on the ways in which family and friends presently use video chat systems. These systems begin to blur the goal of information exchange and the manner in which this occurs by including properties of awareness exchange, subtle interaction, and rich
interactions. For example, always-on video as part of domestic media spaces supported passive awareness exchange by allowing family members to see video of each other at any moment, subtle interactions through handwritten messages, and rich communication through conversation [24,25,61]. Such systems were found to benefit family members yet they could sometimes infringe on people’s privacy [24,25]. Problems related to seeing sensitive situations at remote homes [24], having too much connection [25], or losing control over when people were connected [61]. In contrast to our research, these systems were explored for family relationships that were likely much less intimate than long distance couples. For example, they predominantly focused on connecting parents and their adult children or grandparents and grandchildren. This raises the question of what privacy issues might emerge for anytime, anywhere video calling amongst couples and how severe they might be.

**Mobile Video Chat**

We are now seeing video communications starting to occur in outdoor settings and locations away from the home with commercial systems like Skype and Apple’s FaceTime. Here the focus is mostly on rich interactions. For example, people are using video communications to remotely attend major life events such as weddings, parties, and funerals [30,36]. Teenagers use video during outdoor performances for remote friends (e.g., skateboarding) [5,36]. People may even make video calls to one another while on transit [37] or out shopping [22,42], touring locations and site seeing [42,59], or at restaurants [42]. Research has shown that mobile camera work can be challenging and require extra efforts by the person with the camera to provide a good view of the remote location [22,30,36] especially if they are taking on dual roles by both participating in the space and trying to stream video [43].

Researchers and designers are now creating new and innovative mobile video communication systems. These include portable or mobile cameras [34] to share outdoor activities (e.g., zoo trips, picnics, children’s activities) as well as wearable cameras to support remotely connected user embodiment [28,32,40,41]. Again, the focus tends to be on rich forms of communication as opposed to more subtle forms of interaction or awareness sharing. Wearable cameras were found to make partners feel especially close to each other when they were performing a similar activity [41]. Studies of commercial live streaming technologies, Periscope and Meerkat, found that streamers attempted to create their own personal brand through their public streams [57]. Streams were seen to be ‘authentic’ depictions of their lives [57].

We build on the aforementioned research by exploring the design of a wearable video communication technology that presents long distance couples with opportunities for all three types of information exchanges: awareness sharing in a passive manner, subtle interaction exchanges, and rich interactions through conversation. This extends the explorations of always-on video and video streaming to that of long distance partners with a specific focus on usage that might occur anytime and anywhere in order to understand the technology’s value and limitations.

**‘IN YOUR EYES’ TECHNOLOGY PROBE**

Our design goal was for couples to be able to stay connected throughout the day as desired, when at home and away from it, in an effort to support relationship maintenance and connection. Our design work was inspired by related research along with pop culture. First, we were inspired by mobile device applications such as Meerkat, Periscope, and UStream. Here the audience of the video is potentially much broader than what we were interested in for long distance couples and only the sender of the video stream has the choice to start it. We were interested in exploring what might happen if remote audiences, such as a long distance partner, could initiate the stream. We hypothesized that in the future this type of streaming may be a possibility. We wanted to explore it now in order to learn about how such experiences may best be designed or if the privacy risks would outweigh the benefits of such technologies.

Our design efforts were also inspired by two movies, “Her,” and “In Your Eyes.” In the movie, “Her,” the main character falls in love with the digital personal assistant on his smartphone, Samantha. To help Samantha experience the physical world he places his phone in the chest pocket of his shirt with the camera facing outwards. In the movie, “In Your Eyes,” a man and a woman are unexpectedly linked telepathically and are able to see and hear what the other experiences at any point in time. Our work was also inspired by Microsoft Research Cambridge’s SenseCam project where a wearable camera continuously records images throughout one’s day [7,49]. Similar to SenseCam, we explored the design and use of wearable cameras; however, our focus was on video streaming rather than video/image recording.

![Figure 1: The In Your Eyes technology probe.](image)
anytime, anywhere video communication. We prototyped various ways that a mobile camera could augment clothing items and be easily worn throughout the day. We tested a camera embedded or attached to scarves, ties, hats, waist pouches (e.g., fanny packs), shirts, and suspenders. Many of these did not work well as the camera angle was either too low or too high or suffered from excessive camera shake. Some placements made the camera device overly visible; instead, our goal was to make it somewhat obscure and more private as to not attract a great deal of attention. This might make the connection feel more personal to the couple. Items like hats or suspenders were problematic because they might not match current fashion trends or the idiosyncratic desires of users. After weighing our options and these issues, we decided to use a simple setup similar to the movie, Her, where a smartphone is placed in a user’s shirt pocket with the camera facing outwards (Figure 1). We called our technology setup ‘In Your Eyes’ to reflect our design inspiration.

In our setup, the smartphone runs Skype with ‘Auto Answer’ mode enabled. This means users can take the phone out of their pocket, select their partner, and automatically connect. Thus, remote partners do not have to answer the call. Audio transmits through earphones containing a microphone, or via a Bluetooth earpiece. The placement of the phone in one’s shirt pocket makes the phone easily accessible for moments when the user wants to connect with his or her partner. To reduce camera shake, we used safety pins to adjust the size of the shirt pocket and how tightly it holds the camera in place. Naturally, not everyone wears shirts that have a pocket in the front to accommodate a smartphone. Thus, rather than be a generalized design solution that will work for everyone in all situations, In Your Eyes is meant to be an exploratory probe to understand the experience. Future work could identify other ways to situate a mobile device for streaming.

Based on past literature, we anticipated that In Your Eyes would be used by couples to share an awareness of each other’s life and a means for conversations throughout one’s day. Our goal was to support relationship maintenance through short exchanges of an emotional nature (e.g., terms of endearment), longer conversations for discussion, and a shared sense of context via the video view. We purposely did not alter the technology in an attempt to reduce or mitigate potential privacy concerns prior to our study of it. Instead, we wanted to leave the potential for privacy issues to emerge, such that we could see what matters most to couples: 1) immediate access to one’s partner anytime, anywhere or 2) having a greater sense of autonomy and control over one’s privacy and the use of the technology.

Our technology probe is very simple and uses existing technology to connect long distance couples by using Skype and smartphones in ways that have not yet been explored. In fact, many would likely feel that the setup is overly privacy intrusive and would never use Skype in this way. For these very reasons, we feel that this makes the technology setup interesting to explore as a means to understand how people might react to it. In some ways, one may consider it a form of breaching experiment where we aim to understand a set of social practices that emerge through the intentional disruption of the existing social order [31]. Thus, the intention of our research is not to present the technology probe as a design contribution; instead, the contribution of our research primarily lies in the study of how an existing software tool is used in an unfamiliar way, with potential implications for privacy, connectedness, and intimacy.

**STUDY METHODOLOGY**

We conducted a study to explore how In Your Eyes would be used by couples in long distance relationships for staying connected. The goal of our study was to understand when and how the design would be used by the couples, and what benefits and challenges they might experience.

**Participants**

We recruited two long distance couples for our study via posts on Facebook and email to our university community and acquaintances. All participants were students and in their early 20s; thus they generally represented a young demographic. Both pairs were heterosexual couples and in a long-term relationship. During the duration of the study, the female participants lived in a major metropolitan system in Canada and were interns at our university (but outside of our department) for a three-month period in the summer. They started the study about a month and a half after moving apart and returned home several weeks after the study completed. Male participants lived in Brazil and Mexico respectively; these were the home countries of the females as well. Both couples regularly used communication technologies such as text messaging, Facebook, and WhatsApp to communicate with each other. Couple 1 had never used a video communications tool before and Couple 2 used one nearly everyday. We purposely chose to not recruit couples who had large time zone separations as this would have meant long periods of overlapping sleep/day, which would make the technology much less useful.

**Ethics**

As said, we recognized that our study was somewhat of a breaching experiment where there was potential to disrupt the relationship of our participants. Our study was approved by our university research ethics board and, in addition to such formal approval, we were also very cautious in terms of conducting the study, given the potential for negative effects. For this reason, participants were made aware that the study could affect their relationship, were told they could cease participation at any time without repercussion, and had the freedom to choose when to and when not to use the probe. Thus, they had autonomy over their own behavior and were willing and ongoing participants in the study. They also completed an informed consent process. We purposely only chose two couples for our study as we
wanted to be able to stay in close contact with them, collect detailed information about their usage, and monitor each couple’s situation for negative effects on their relationship.

While there is high potential for bystanders to be streamed over In Your Eyes, we did not include them as participants in the study as it would be relatively difficult to know a priori who these individuals would be. This is because our couples could use In Your Eyes at virtually any point in time and location. This is akin to how other live streaming technologies such as Periscope or Meerkat are used in public settings with the potential for bystanders to be streamed in the background of the video link. That said, our study does reflect on privacy intrusions by bystanders.

Method
Our study method consisted of several stages:

1. Initial survey: We first conducted online surveys with our participants to obtain demographic information and details about their existing communication routines.

2. Study planning and setup: Participants were provided with a detailed description of the project including the objectives of the study along with various instructions for preparation. Here we ensured that they had an Android-based smartphone that could be used along with a data plan. This was because only the Android version of Skype supports auto-answer at present time. We explained how participants should setup Skype. We also discussed clothing options with them and asked if they had shirts that would accommodate the phone’s placement. Some did not and so we gave participants an $80 clothing allowance to purchase any necessary shirts.

We had participants use their own phone rather than a secondary phone that we might provide because we wanted to integrate the experience of the technology setup into their existing practices. This would mean periodically using their phone for other activities besides Skype. We felt this was more natural and indicative of real usage. Future research should consider the use of a secondary device to understand how such usage would differ from our results.

3. Technology probe usage: Participants were asked to use the technology probe to communicate and stay connected with their partner over the course of four weeks. We asked that they use their phone and Skype as described in the In Your Eyes setup with the phone in their chest pocket and camera facing outwards throughout the day, as much as possible. We recognized that they may not always be able to do so, or want to, and we were interested in knowing if and when they might deviate from this setup. Such deviations might suggest social challenges or design problems with the technology.

4. Interviews and diaries: Participants used an online diary to record their thoughts throughout the four weeks. Questions were open ended and focused on the participant describing stories of their experiences. Each participant was asked to make at least one diary entry every three days. Diary entries were meant to aid the participants’ memory about the experiences they had while using the probe.

We conducted weekly semi-structured interviews with each participant individually throughout the four weeks so that each person could share their views independently and even comment on their partner’s behavior. Interviews with the local female participants were in person while the remote male participants were interviewed over Skype. Each week when we met with participants we were very careful to assess the relationships and explore how the probe was affecting them.

The first two interviews (Weeks 1 and 2) were approximately one hour in duration, whereas the last two interviews (Weeks 3 and 4) were comparatively shorter as participants often repeated similar types of stories and situations. The initial interviews covered various topics such as how they operated the device, how they used the device to stay connected, the effect of In Your Eyes on their relationship and connectedness, the time and location of use, frequency and duration of calls, the manner in which calls were planned or not, reasons for disconnecting the calls or not using the probe, and memorable moments while using the probe. The interviews also addressed any difficulties faced by the users such as comfort issues, privacy issues, and technical difficulties. The latter interviews mainly focused on the changes in the user’s experience as compared to the previous weeks. Each interview included a review of the week’s diary entries.

At the end of the study, each couple received a payment of $450, which included funds to cover the cost of their smartphone data plans and the clothing allowances.

Data Collection & Analysis
We audio-recorded all interviews and kept handwritten notes throughout. We transcribed key portions of all weekly interviews (only excluding conversation that did not focus on the study). We then used open and axial coding to find themes within the interview data and diaries and categorize findings. Our open codes related to specific instances of use (e.g., talking, showing, sharing, reminiscing) and participants’ emotional reactions (e.g., feelings of dependency, connectedness, comfort, sadness, excitement). Axial coding categories emerged around topics such as relationship effects, connectedness, presence, availability, awareness, engagement, privacy, and conversational content. Following this, we performed a selective coding stage where we reviewed our data and codes to draw out the salient themes that described the users’ experiences and reactions to the technology probe. Next we present our results based on the main themes that emerged in our analysis. These include how the technology created feelings of connection between partners, the ways it created a sense of over-connection and dissatisfaction, the types of experiences the couples shared using the technology, and the privacy challenges they experienced.
Overall, both couples felt their communication frequency and duration increased as a result of In Your Eyes, yet they had opposite views about the effect of the technology probe on their relationship. Couple 1 received many benefits from the technology, while Couple 2 faced many challenges. By the end of the study, Couple 2’s relationship had deteriorated and they were experiencing relationship challenges including frequent arguments. They described this as not having to do with In Your Eyes though we describe the technology’s likely effect on it in our results. Across these experiences, our results present both the positives and negatives of the technology probe. We describe these experiences and reactions next by describing each couple in turn. Throughout our results, we provide quotes from our participants whose names have been anonymized.

**COUPLE 1: AMY AND ADI**

Couple 1 was comprised of Amy (female) and Adi (male). They experienced a two-hour time zone difference and had been in a relationship for five years. They had never used video chat prior to the study since they would see each other nearly everyday. During the study, Amy was a summer intern visiting Canada and Adi was a university student in his home country of Brazil. Amy and Adi used In Your Eyes very similar to our imagined scenario where the device was in auto-answer mode and worn during the day and evening within one’s shirt pocket. Both wore the device during weekdays when at work and on weekends Amy would wear it while doing various site seeing activities in her new country. Adi connected to see these locations from his home.

Amy and Adi typically called each other four to five times a day. The duration of the calls depended on their purpose but usually lasted for 10-15 minutes. Calls were sometimes spontaneous and other times they were planned. Both Amy and Adi told us that they usually did not worry about whether or not the other person wanted to be connected at a given moment, aside from not connecting during times that they knew the other person was busy. Thus, they mostly connected based on their own needs. This reflected the close nature of their relationship.

If Amy or Adi happened to be using their mobile phone at the moment when the other connected in, they would simply place it back in their pocket so their partner could see the location through the camera. These situations were rare.

Adi preferred to not show his face to Amy, her friends, and others who might happen to be around as he never felt ‘ready enough’ to be seen. Thus, he preferred when In Your Eyes was being used from his pocket since it did not show his face. Because of this, the couple nearly always used In Your Eyes as we had originally described with the camera facing outwards. We detail the types of things Amy and Adi did with In Your Eyes and their reactions to the technology probe next.

**Seeing New Places and Revisiting the ‘Old’**

One of the first things that Amy and Adi did with In Your Eyes involved Amy showing Adi around her new location and introducing him to some of the people she was meeting. Amy felt it was important that Adi have a better sense of her new life and the places around her.

“She starts walking through the university, she was passing through the people, she opened some doors...and she showed me almost all the university...I think it’s it’s excellent to know, to get closer to what she’s doing in a in a far away, a far place. I can know more about her life... And, that’s so nice, that’s so nice." - Adi

Amy also toured Adi around her new house. Adi said that even though Amy had sent pictures of her new home, the experience of being walked through it gave a very different impression. This made him feel closer to her. Thus, the viewpoint of In Your Eyes created a unique and valuable experience for Adi. This type of location sharing was reciprocated by Adi at various points in time for Amy so she could revisit her home city and the university campus. Here we see a sense of obligation that Adi should continue to provide Amy with a reminder of his context and the place she used to live. Seeing the world through In Your Eyes even allowed her to get a different understanding of Adi’s location where she paid more attention to his surroundings than she would have normally if she was there in person.

"I used to knew the place that he is...The time that he showed me our university...in Brazil...and I was like ‘Oh my gosh! This exists there I didn’t remember’...I was paying attention." – Amy

Amy told us that looking through her partner’s eyes in these situations helped with the longing she had to be by his side. It also caused her to reflect and remember their times together in person. She compared In Your Eyes to other technologies such as texting and highly valued being able to see Adi’s environment. Because of this, she preferred it over the other communication mediums that they used (phone calls and text).

"...we used to walk together to everywhere...every time we were by side. When I am seeing I feel like I am there...in my case I know the places where he is so I feel like "Oh! That place," and it gets some memories... we’re seeing the things, and it’s more participatory." – Amy

**Quietly Watching**

Amy and Adi talked about connecting to each other with In Your Eyes simply to see what was happening at the other person’s location. They tried this initially to see what it might be like and, after that point, it became a recurring theme of their usage. Such connections were often unplanned and the remote person did not always know they were occurring. Adi initially felt such connections could be overly intrusive and he was somewhat apprehensive about Amy being able to connect to him at any moment. Even
still, he felt somewhat of an obligation to allow Amy to connect in this way since he wanted to remain close to her. During the first week of the study he told us:

"Oh my God...someone can call you the times she want...I think...the way that I look for my studies...the way that I look for my dinner, my lunch changed because I know that someone can call me and see what I’m seeing." – Adi

At the onset of the study, Adi described the ability to quietly watch Amy as being somewhat socially awkward. Given the way video chat is normally used, Adi felt a moral obligation to talk and by not doing so, he was violating what was typically expected of video exchanges. That is, he was so used to talking to Amy that it felt weird to just watch and not say anything. Over time, this behavior became more natural and Adi began to see many benefits to In Your Eyes, including being able to feel more connected to Amy at moments when he was not able to normally call her or talk to her, such as when one of them was attending a university class. Here he could connect to her and watch her view. This let him notice more details about Amy’s life without the distraction of talking. Amy expressed similar sentiments.

As time progressed, Adi began to connect with Amy more often and, in particular, in moments when she may not even know he was connecting. Sometimes these moments were interesting to him, but other times they turned out to be less than exciting. This sometimes occurred when she was at work during the day.

"Weird because she was in front of the computer [laughs] mmm working with the the the documents...I was looking what she was doing but it was not so exciting so I get bored. [laughs]” – Adi

Despite the moments being somewhat mundane and less than interesting, they still had the effect of making Adi feel closer to Amy simply because he could connect to her and he had the intention to connect with her more often.

Playful Connections

As the study progressed, Amy began using In Your Eyes in a playful manner with Adi where she would call him to say hi or offer terms of endearment. They were playful in the sense that she knew Adi was not always free to talk, but she wanted to poke fun at him by purposely calling in these moments. Thus, she was playing with the ways in which she and Adi normally understood the conversational exchanges they had, and the ability to call anytime, anywhere afforded this opportunity. For example, this behavior occurred when Adi wasn’t responding to Amy’s instant messages.

"Oh! [The auto connect] is really good. I like it. It’s really funny. Sometimes I see that he is on WhatsApp and he not answer me and I just call him on [In Your Eyes] and he has to talk to me. And he is like ‘Baby! I am just finish this please.’ and I am like ‘No! I want to talk to you right now’" – Amy

Amy told us that she similarly liked to be surprised by Adi with spontaneous calls. This added excitement to their relationship. To her it resembled the natural experience of communication when both her and Adi were side by side and could start talking at any moment.

"Ya, I like this way [automatic answer]...Ya because when we are together we don’t plan like ‘I’m not listen you now’ like this. He just say and I listen.” – Amy

In rare occasions, Amy’s desire to be playful with Adi did not work out well. For example, one day she connected to Adi and mistakenly thought he was at her cousin’s house when she looked at the video link. Unfortunately, he was actually in a university class and had unplugged his earphones from the phone.

"We have an experience that was awful...I was really busy, and really tired the whole day... and I I completely forgot that he, at this time, he would be at class. So I called him [laughs], and I thought that he was at my cousin’s house, and I just screamed, ‘Oh, you are at my cousin’s house house!’ and he was at class, and every everybody at the room listen, and he was like, "O my God!” and...his face turned red, and he turned it off like...ya disconnect...and I was, ‘Oh my gosh, I can’t believe I did this.’ ” - Amy

Naturally, Adi was not so happy with this type of situation and there were other moments that also caused Amy’s playful calls to be less desirable by Adi. This occurred most often when Adi was trying to focus on a solitary task like writing and he did not want to be interrupted.

"When I was writing...somethings like poem...my partner called me...and its really weird because...I can’t do when someone is looking at me. But ah it was a little different because she was not looking, she was just looking through my eyes and she was not by my side...it was a little weird to write when she looks at me...I couldn’t write very well [laughs].” – Adi

In situations like this one, Amy and Adi would talk through their issues and express their feelings and desires around In Your Eyes to adjust future behaviors.

Important Life Events

Lastly, Amy and Adi used In Your Eyes to witness what could be considered a major life event together. This only happened once during the study time period, yet it was a very critical part of their usage given the event’s significance. The couple was the second parents to a baby that was born while Amy was away. She was sad that she was not able to see the child in person so Adi took her to see him using In Your Eyes.

"It was great because her [my friend’s] son, her kid was just born... me and Amy, we are close to to our friend to be the second parent to this kid. But when [Amy] needed to
travel the kid was not was not born yet. So Amy was really sad because she wanted to see the kid and she couldn't see and when I was in the home of my friend... I looked at to the baby crib and she was looking to the baby face.... it was like a special moment for her because she was really wanting to see the baby...the baby started crying [laugh]. It was really cute....Amy looking at the baby in the real moment."

— Adi

Not alone did this event fulfill Amy’s desire to see the newborn child, but it also helped to fulfill feelings of obligation that she should be there for her friends and a part of the new child’s life.

COUPLE 2: TARA AND TED

Couple 2 was comprised of Tara (female) and Ted (male). They had a four-hour time zone difference and were in a relationship for just over one year. Prior to the study, they used Skype frequently but never in auto-answer mode and always for face-to-face conversations. In contrast to Couple 1, Tara and Ted found it difficult to use In Your Eyes in the way we had intended it to be used. They tried to have the device in their pocket continuously, but they found it undesirable at times. Tara spent her workdays as an intern in a laboratory where it was not safe to have a smartphone and earphones in use. Ted regularly trained at Brazilian Jiu Jitsu and it was not acceptable to have In Your Eyes going at these times. Tara and Ted typically had two or three calls per day using the In Your Eyes setup and they lasted 10-20 minutes depending on the situation. Calls were usually initiated by Tara and often planned because of conflicting schedules. Tara generally did not like unplanned calls because she saw them as interruptions to her workday. That is, they disrupted her normal conversational exchange with Ted. Despite this, Amy liked it when Ted would connect to her at times when she was working alone or feeling lonely. Tara and Ted also routinely had an evening Skype call to discuss their day; this started prior to the study and was done using a regular Skype call because they wanted to see each other’s facial expressions (described more later). Sometimes they had In Your Eyes calls while Tara was outdoors and site seeing; these lasted longer (~30 minutes).

New People and Experiences

Like Couple 1, Tara and Ted used In Your Eyes as a way for Tara to show Ted where she worked and who her work colleagues were. While she had sent him pictures of the same locations, In Your Eyes allowed Ted to meet her colleagues. She also showed him the scenic forest and mountain area near her residence along with her friends. Thus, we see that, like Amy and Adi, Tara felt an obligation to share her environment with Ted so that he would understand her situation and context, including places and people.

"Now he knows where I work, now he knows who I work with, now he knows like who these people are that I live with you know... I called him when I was on the mountain... and I was like 'Okay! Look ... these are my friends. These are like the views from here.'...it felt nice to be able to like show things...he really liked it."

— Tara

"It's good cause ahh ...being able to know new places, because she is in a place I don't know, I think that's the best part of it."

— Ted

Tara and Ted also tried using In Your Eyes so that they could witness a felicitation ceremony together. Ted was physically present in the ceremony and Tara was an observer. Unfortunately the experience turned out to be negative for Tara. She felt extremely disengaged because she was not able to talk with Ted during the event, yet she could hear the other conversations he was having and sounds from the ceremony.

"Like when he was showing me around at the party it was like...I don’t really feel engaged...it's like really uncomfortable because if I cannot be there then it's really weird to just see him doing stuff without me...It's like watching a TV show."

— Tara

Spontaneous Connections

Like Couple 1, Tara and Ted tried to have spontaneous connections. Yet, in contrast, neither Ted nor Tara felt that these connections added a great deal of value and, in many ways, they created more tension in the relationship. For Ted, In Your Eyes did not provide a lot of new information that he did not already have. In this way, it was difficult to talk about ‘ordinary’ life because it was just that, ordinary.

"I think it's good cause we are talking more but I don't feel like a lot of difference [in the relationship]."

— Ted

Both Tara and Ted described situations where they felt overconnected because of In Your Eyes. The most valued part of their communication routine was a regularly planned Skype call (not in In Your Eyes mode) that they had before bed. Both of them felt that using In Your Eyes throughout the day reduced the number of topics for them to talk about in their nightly call and neither person liked that.

"Sometimes like mmm talking in the night usually we are like ‘oh what how was your day?’ and now sometimes I know how her day was so its now its like we have like less topics to talk...it like takes some of some of the face to face communication with it so I don’t like that cause its like less time really talking so I don’t like it that much."

— Ted

Tara preferred to learn about Ted’s daily activities from him all at once at the end of the day when he was able to reflect on them and explain things in details. She also wanted to see his facial expressions when he did so as opposed to looking outwards at what he saw. This is more indicative of a normal Skype call and reflects their previous routine.

"It's fine seeing what he is doing but it's it's better when he tells me about it. Because I cant like I can't see whether he didn't really care much or whether he was excited about it...its like I'm just seeing the experiment...I prefer when he
Tara told us that she preferred to know only the high level details of Ted’s activities, rather than more detailed information that came with acquiring knowledge in the moment. This was especially the case when Ted was frustrated during the day; Tara disliked hearing about these situations when they were happening because they did not involve her.

In Your Eyes caused Tara to think about their distance separation even more and, in many ways, it was a constant reminder of how far away Ted was. This problem was exacerbated when Tara would connect to Ted and he was busy doing other things or with other people. In these times, he would continue on with his activities. Because In Your Eyes was always available, he felt less of an obligation to talk when Tara called. Tara felt sad and left out as a result.

"It makes me realize how far apart we are from each other...i feel left out sometimes... That's kind of shitty actually... I don't like this whole futuristic thing of like the movie or what not ... he is not really there it's just like a trick. It's not my thing... I don't feel like I am communicating at all...he has to be paying attention to what he is also doing so it's not really as engaging as 'okay I am going to just pay attention to you'...I feel more engaged when I am in the night calls with him." - Tara

Solitude and Autonomy
Initially Ted felt it was fine for Tara to connect with him at any point, but over time, he found it somewhat annoying.

"I think I prefer to like get noticed of the call and then like answer it...I don't know it's not like I have to hide something but ah ...I think it coz I'm used to it...it's just feel like weird for me I feel like I am like being invaded." - Ted

In contrast, Tara did not have concerns about her solitude and autonomy. Usually Ted or Tara would purposely take off their In Your Eyes device in order to gain solitude. For example, one evening Ted inadvertently interrupted Tara by calling out to her when she was in the bathroom and had left the phone in her bedroom. Thus, while she had purposely placed the phone outside of the bathroom to gain some solitude, she could still hear his audio when she returned to her room, which caused an interruption.

There were times that Ted or Tara wanted to be alone with one or more co-present people and not interrupted by their partner. For example, Ted often played video games with his friends and, at times, Tara would call In Your Eyes while he was playing. This bothered Ted because the calls interrupted his gaming time.

"Sometimes she is like talking to me and if I'm like... disconnect for a little and she is like 'Hey are you hearing me?' and I'm like 'No! wait!' and just finish what I am doing and then like talk to her. Sometimes she gets a little mad but a...The problem is when she is already talking to me and I start playing or something; that's when she is like obviously gets mad." - Ted

Serious Conflict
For the third and fourth weeks of the study, Tara and Ted began to have occasional verbal fights with one another while using In Your Eyes and also during their evening Skype calls. In the final interviews of the study, we learned from Tara and Ted independently that they were currently having a major fight and not talking with each other. While the conflict we were hearing about in the prior weeks seemed minor at the time and indicative of many long distance relationships [51], it inevitably was building towards the current situation. They both told us that In Your Eyes was not the reason for their fight; however, as researchers, we could see that the technology probe likely contributed.

Both Tara and Ted expressed similar feelings about their relationship and the communication challenges they experienced. Tara felt that Ted did not fully pay attention to her when they were having conversations and this became increasingly frustrating over time and caused her to feel socially disconnected from him. Ted recognized his behavior as well and knew it was an issue, but had never tried to correct it.

In Your Eyes provides the opportunity for increased access to one’s partner and more frequent conversations throughout the day. If people connect to one another and are busy, they may easily ignore their partner or favor engagement in their current activity. This often happened for Ted and so it is certainly conceivable that Tara would be frustrated with it. Increased instances of frustration, caused by the ability to more frequently connect, could have helped lead to the couple’s deteriorating relationship.

DISCUSSION
Our goal for In Your Eyes was to explore how long distance couples would react to and make use of anytime, anywhere video streaming. We now discuss our results and present considerations for how researchers and designers might think about anytime, anywhere video communication technologies. Naturally, given the sample size, our goal is not to generalize our findings to all long distance couples nor anytime, anywhere video communication more generally. Such attempts would be fruitless given the sample size. To the contrary, the point of the discussion is to explore the benefits and pitfalls of the design space and raise awareness of what might happen with anytime, anywhere video streaming technology. Thus, we aim to sensitize researchers and designers to the possible benefits and issues such that they are aware of them if research or industry should move forward in this design space. We do so by exploring ideas around autonomy, solitude, intention, and presence.
First, our study of anytime, anywhere video revealed a delicate balance of moral order as it relates to long distance couples. While many of the activities that the couples used In Your Eyes during might be similar to the experiences faced by collocated couples (e.g., video chat from work), the fact the couples were not together physically in the same country meant that additional emotions and a desire to be together were tied up within their use of the technology. Conversations and exchanges between people typically follow a natural turn taking order, be it when talking in person, or part of a longer communication episode spread across time [47,48]. People typically know when and how to interact, and can do so gracefully in turn. Yet with anytime, anywhere video, calls did not need to be accepted by the receiver; control was in the hands of the caller. This caused disruptions to the ways in which the couples in our study were used to exchanging information and interacting with one another and created an imbalance in their normal social order. These disruptions infringed on both the autonomy of the partners—when and how they chose to use the technology—and their solitude—the desire to sometimes be alone and free of interruption [3].

Couple 1 (Amy and Adi) used these disruptions to their advantage as a means to keep their relationship fun and exciting through acts of playfulness. It is difficult to say if this behavior would last long term or if it might diminish over time. But, nonetheless, it suggests opportunities for the ways in which anytime, anywhere video might help create new and valued relationship dynamics. On the other hand, Couple 2 (Tara and Ted) saw breakdowns in the moral order of their communication. They were not able to balance the potential benefits from anytime, anywhere video with their desire for autonomy and solitude and, instead, faced relationship challenges. Again, this reflects the delicate balance that is at play in long distance relationships and how easily a sense of overconnection can lead to issues.

Second, we found that anytime, anywhere video created a sense of continuous presence and feelings of intimacy—not from continuously streaming video, but from having continuous access to video and the intention to stay connected, regardless of whether such access was acted upon. This had the effect of changing the nature of video calls when compared to prior research. Past research found that video calls over Skype where used to simulate ‘shared living’ amongst long distance partners where the video link was left on for long periods of time during weekday evenings at home [19,35,36]. The couples in our study tended to share their activities with short rather than long, open connections. That is to say they tended to not ‘hang out’ for long periods of time together in the order of hours for such activities. Instead, they would ‘pop in’ and ‘pop out’ during such events. They did not feel the need to hold on to the video connection and leave it open. It could be, at any point, accessed again by reconnecting. Thus, communication was not necessarily about making people feel like they were at the remote location; communication was about the ability to connect at any point, and the intention to do so.

For Couple 1 (Amy and Adi), this ability and intention was what made them feel close to one another. For example, they talked about knowing in their head that they could receive an incoming call at any point in time. A call did not need to be initiated to ‘feel’ their partner, simply having the technology around was enough. In contrast, it was the continuous sense that one could share his or her moment-to-moment happenings with one’s partner that caused Couple 2 to feel over connected. The knowledge that a connection was so easy to create caused an imbalance in the natural order of communication between Tara and Ted. Neither were able to grapple with how they might include such anytime connections in their routines and how they would make use of them while balancing their desire for solitude and autonomy. Like past research on asynchronous video messaging [45], they had difficulties in knowing how to share the everyday, ordinary things that were happening to them. Instead, they favored their ritualistic evening Skype call to learn about each other’s day. This call was special to them as it was reflective and showed the emotional reaction to one’s day when each partner saw the other’s face. It was widely anticipated and this anticipation was what ‘built up’ the moment and helped make it special. Yet In Your Eyes took away from the importance of this call. For Couple 2, we see the potential devaluing of connection. Because it is possible to connect at any point in time, the value in having such a connection can diminish because the ability to connect is so easy and effortless.

While video communication systems have long been described as difficult to use where it is challenging to maintain a connection long term [2,4], in some ways the additional effort in finding a time to sit down and connect with someone and overcoming any connectivity challenges heightens the importance of the connection. If a technology is easy to use, and one could use it at any point in time, there is a chance that it may be valued less. Of course, we are not trying to say that video communication systems should be made so they are difficult to use. Instead, what we are suggesting is there is a tradeoff when it comes to a connection that is, perhaps, too easy to obtain. This ease of connection can disrupt the moral order of a couple’s communication (Couple 2) just like it might enhance it (Couple 1). The balance is extremely delicate.

Overall, our study raises questions around how one might think to design video communication systems that still place value in the creation of special moments, the build-up of an anticipated call, and the feelings of accomplishment when one is able to maintain a call long term. Our work also sheds light around notions of designing for ability and intention rather than purely connection. That is, how might we think about creating communication systems that suggest (and even provide) continuous access between
partners, where they may not necessarily actually need to connect and share information to feel connected.

In the literature we see video calls described as focused conversational transactions (akin to a phone call) versus longer-term open connections [23,27,36]. We propose a design space that is somewhere in the middle where connections can be ‘open’ in the sense that they are always available but not necessarily left ‘on’ for long periods of time. This raises interesting design questions. Would long distance couples always value such access? Or might the feelings of presence it provides diminish over time? Stepping back from long distance couples, how might this idea expand to other relationships, or should it? What types of relationships might benefit from the feelings of presence that are afforded by the ability to call and connect at anytime? Which relationships would find it too extreme? We leave these as open design questions that certainly warrant future research.

CONCLUSION
We created a technology setup called In Your Eyes that allowed long distance partners to connect with each other at any point or time automatically without the call recipient having to accept the call. In Your Eyes, created strong feelings of connection for one couple because they found value with anytime, anywhere access to each other which helped fulfill their longing for each other. On the other hand, In Your Eyes was problematic for a couple who valued less frequent moments of connection where they could share time together that was more reflective in nature. Together, our results point to several themes around the nature and design of anytime, anywhere video including design questions around disruptions to typical conversational and communication turn taking as it relates to solitude and autonomy; feels of connection from the ability and intention to call; and, the role of anticipation and delay in communication. Overall, we feel our research provides a valuable starting point for further design work and explorations around anytime, anywhere video streaming.

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