Online Dating as Context to Design Sexual Consent Technology with Women and LGBTQ+ Stakeholders

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ABSTRACT

This paper uses online dating as a context to explore futures for sexual consent technology: systems that mediate how partners exchange consent in order to prevent nonconsensual sex. Motivated by evidence that sexual consent is already mediated by computers in ways that challenge perceptions of sexual agency, we present a participatory design study in the United States with 17 women and LGBTQ+ stakeholders (demographics at disproportionate risk of sexual violence). Contrary to consent apps that are used right before sex to record irrevocable consent, participants envisioned alternative consent technology being used across online and offline interaction to normalize candid dialogue about sexual expectations and informed verbal consent throughout sex. Findings demonstrate opportunity for dating apps and associated technologies to foster voluntary adoption of affirmative consent, which has been widely advocated in public health for sexual violence prevention yet historically under-adopted by the general public. **Content warning: graphic descriptions of sexual activity.**

CCS CONCEPTS

• **Human-centered computing** → **Participatory design**; • **Social and professional topics** → **Gender**; **Sexual orientation**.

KEYWORDS

consent, affirmative consent, sex, sexual violence, online dating, dating apps, participatory design

1 INTRODUCTION

Sexual experience is mediated by computers in a variety of ways. Dating apps are used for discovering sexual partners near instantaneously [20, 75] and for sharing sex-related information such as

HIV status [54, 129]. Sex toys [48] can enable intimate moments between long-distance partners and the physically disabled [47]. Even emerging technologies like VR have augmented online pornography [23, 136] and interaction with sexual partners [115], and sex robots are on the horizon [111, 123].

Perhaps the most crucial element of sexual experience that computers can mediate is the exchange of consent—or agreement—to sexual activity [74, 113] because the absence of consent is the defining characteristic of sexual violence: sexual acts that are "committed or attempted by another person without freely given consent of the victim" [13]. Sexual violence does not necessitate physical force as the term may imply; it often occurs without intent to cause harm or recognition by the victim that harm is occurring [27, 77]. This is due to problematic consent exchange practices (how one gives and perceives to receive consent) such as interpreting consent through ambiguous nonverbal cues [40, 63], and through sexual scripts [118] that challenge one's perception of sexual agency (the right to decline sex) such as the gendered belief that women are asking for sex based on their clothing choice [58].

While various computer-mediated solutions to sexual violence have been discussed in HCI literature (e.g., [5, 106]), there is a lack of solutions that address consent practices as a root cause. We argue that design of computer-mediated consent to sex needs to be revisited and expanded in light of evidence that current consent technologies actually perpetuate, rather than prevent, sexual violence. Controversial "consent apps" that allow users to record—but not revoke—consent to sex have been criticized for subverting sexual agency (what if a partner changes their mind during sex?) [90, 98]. Dating apps have also inadvertently become consent technologies that scaffold harmful consent practices and sexual scripts [75, 103]; for instance online daters have assumed consent to sex through interpretation of emojis and profile pictures, leading them to make sexual advances in-person without confirming that their partners desire sex [139].

The importance of sexual consent technology has been recognized by potential users and researchers alike. LGBTQ+ online daters have tried to repurpose dating apps as makeshift affirmative consent technologies in an (often failed) attempt for more transparent discussion of sex and consent practices before meeting partners face-to-face [139]. Women in a different study requested more information about consent in dating app interfaces [3]. Researchers have likewise considered consent an important aspect of computer-mediated sexual wellbeing [64, 121], and design patterns for giving computer-mediated consent to humans and even sex robots have been suggested by researchers [90, 122]. Yet there is an absence of user involvement in consent technology design, particularly from stakeholders most at risk of sexual violence.

Research questions driving our work include: *(RQ1) What should sexual consent technology do, or what should it mean to mediate consent to sex? (RQ2) Where and when should sexual consent technology be used? (RQ3) What types of devices or applications could be designed into sexual consent technology?*

In this paper we report a participatory design study conducted in the United States (n=17) about how technology should mediate practices of exchanging consent to sex. We use online dating as a focal context due the ubiquity of using social computing platforms for augmenting sexual encounters—either through dating apps [6, 21, 31, 37, 38] or social media apps (e.g., "sliding into DMs") [28]—therefore providing various intervention points across an online-to-offline process for participants to envision new consent technology. Participants identified as LGBTQ+ and/or women; demographics that are disproportionately victims of nonconsensual sex [43, 82, 120]. **Contributions of the study include:**

- *A new way to conceptualize what consent technology should do from the perspectives of women and LGBTQ+ people.* In contrast to consent apps that serve as ledgers of irrevocable consent [90, 98], participants envisioned consent technology as tools to be used beyond the very moment sex occurs. They envisioned computer mediation of consent spanning across online and in-person interaction to normalize candid dialogue about sexual expectations leading up to sex and, ultimately, informed verbal consent exchange throughout sexual activity.

- *Specific design concepts that demonstrate opportunity for consent technology to increase adoption of affirmative consent* [61], which is a widely advocated consent exchange model for mitigating sexual violence [62, 73, 95, 104, 112] yet one that is historically under-adopted by the general public [51, 132]. Design themes include: 1) consent technology that assumes responsibility for initiating and maintaining conversation about transient sexual expectations, 2) consent as interface design pattern to ensure mutual comfort with discussing sex, and 3) supplementing verbal consent with machine translation of latent sexual discomfort. Devices and applications that participants envisioned being used pursuant to these design themes included dating apps, mobile games, social robots, wearable devices, and augmented reality (AR) glasses.

2 BACKGROUND

This section begins by reviewing key themes in research on consent to sex beyond HCI to lend context for sexual consent technology. We then review HCI research into sex to situate our work amongst other facets of computer-mediated sexual experience and sexual violence. We conclude by reviewing the state of knowledge for computer-mediated consent to sex in order to elucidate the absence of stakeholder involvement in design of consent technologies.

2.1 Theories and Practices of Consent to Sex

Consent to sex has been a research interest in fields beyond HCI for over 30 years, pursuing three general areas: theories of what consent is, models of what consent should be, and empirical research into how the general public understands and practices consent to sex.

We review literature across these themes to lend context for sexual consent technology.

Definitional theories of what consent is have been inconsistent, with the literature generally subscribing to one of two interpretations: consent is a strictly behavioral act independent of one's actual willingness to have sex, and consent is behavior that is reflective of, and thus dependent on, one's willingness to have sex. Of note, literature across these perspectives tends to discuss consent primarily in the heteronormative context of a woman giving consent to a man, thus their applicability to the reverse dynamic or LGBTQ+ partnerships can be unclear.

Literature pertaining to the first definition understands consent as a purely behavioral or "performative" act of agreement to sex [7, 130], independent of whether the performer of the act actually wants sex to occur [97, 131], including when force or coercion is used to elicit the performative act [33, 94, 127]. Some work categorizes different types consent on the basis of whether coercion or force is used [7, 68, 117], although these categories still imply that sex is consensual if the performative act is manipulated [18]. The literature generally leaves the acts which constitute consent up to interpretation of the recipient [88, 93], with some scholars [33, 93] asserting that there are certain actions or inactions, including silence, that are commonly understood as consent—leading to the conclusion that one can accidentally give consent to sex if they inadvertently perform such a behavior [18].

The other, and more popular, theoretical perspective understands consent as behavior representing evidence of a "particular mental state" corresponding to willingness to have sex [81]. For such behavior to be a reflection of internal willingness to have sex it must be voluntarily given [49, 57] and free from force and coercion [49, 57, 59]. Although, there is some debate over whether ubiquitous social, economic, and gender power imbalances qualify as coercion—and thus whether sex can ever truly be consensual [80, 87, 101] (see West [131] for critique of this position). Scholars have recognized that willingness to have sex may change during a sexual encounter, leading some to characterize consent as an ongoing negotiation of giving and assessing signs of "active participation" [17, 19, 59]. In this paper we adopt a definition of consent following the "mental state" theorists: as behavior indicative of willingness to have sex.

Along with attempts to describe consent as an already-occurring phenomenon, extensive work has pursued new models of what consent should mean. The motivations behind this work have been to reduce the prevalence of sexual violence through adoption of consent behaviors that prevent unwanted sex, as well to differentiate legal from illegal sexual activity in a court of law (an example to the latter would be morally transformative consent which argues that consent should render any sexual act legal [130]). Consent models designed to reduce sexual violence include communicative sexuality [99] and affirmative consent [102], both of which seek to shift responsibility for receiving consent onto the initiator of a sexual advance instead of on the recipient to refuse. Core tenets of affirmative consent include freely given agreement to sex, the ability to revoke consent during a sexual act, and informed agreement to specific sexual acts to reduce misinterpretation over what is consenting to [95]. These tenets have been condensed into promotional campaigns and slogans to encourage public adoption such

as "yes means yes" [39] and Planned Parenthood's FRIES model (Freely given, Reversible, Informed, Enthusiastic, Specific) [95].

Affirmative consent has been widely advocated in literature and public policy [14, 26, 35, 36, 88, 92, 95, 102], yet it has been critiqued for ignoring social dynamics that influence consent decisions [44, 102] and for being too burdensome and unrealistic for widespread practice [51, 132] (see [88] (p. 464) for an extensive review of affirmative consent criticisms and open questions). At least some of this critique is supported with empirical study: affirmative consent is not widely practiced [88, 102, 132].

The third line of consent research, empirical study of how the general public understands consent, has found consent practices to be inconsistent with many susceptible to misinterpretation. Per Muehlenhard et al.'s review of sexual consent practices: "Most individuals do not discuss sexual consent [. . .] explicitly, however; instead, they usually rely on more indirect cues and signals, which others might interpret as indicative of willingness" [88] (p. 462). Consent practices are socially learned behaviors according to sexual script theory [41, 58, 118], which can obfuscate realization that one is perpetrating or becoming victim of a nonconsensual act. For instance, sexual scripts can challenge sexual agency (one's right to not give consent) through socially learned perceptions that women must oblige the sexual advances of a partner they are in a relationship with [30, 60] or that men always want sex and thus automatically consent [14, 58].

2.2 Computer-Mediated Sexual Activity

Our study of computer-mediated consent follows a long history of research into computer-mediated sexual experience. It is nearing two decades since Bell, Blythe, and Sengers [16] pointed out the "elephant in the room" (p. 169) that was the absence of HCI research into pornography and sex. The field of HCI has since witnessed several calls for research into sex [25, 64, 65] given its intersection with third wave topics such as social justice, embodiment, and intimacy [9].

Some of the ensuing research has considered how computers can support solo sexual experiences, such as through online pornography [23, 136]. Computer-mediated sex toys have also been studied as forces for personal sexual health and wellness [9, 47, 48]. Sex robots have received attention as well, including study of sex dolls as precursive technology [34, 123], public perceptions of sex robots [111], and ethics of sex robot design [15, 50].

Computer-mediation of sexual experience between humans has been another research focus. Dating apps are well known facilitators of sexual partner discovery [20, 21, 31, 140] and sexual risks [3] including HIV [54, 128, 129]. Additional work has studied dedicated technologies for sexual health such as a Condom Token Finder app [133], HIV-related digital resources [119], and a mobile phone game for sex education [134, 135]. Virtual worlds like Second Life have also been used for BDSM and fetish sex experiences [10–12], and sex-oriented social platforms like I Just Made Love [66, 67] have been found to foster discursive practices of sexual exhibitionism. Research into computer-mediated sexual experience has been used to demonstrate that technology not only enables fulfillment of preexisting sexual desire, but fosters novel forms of sexual experience and behavior [67]. Emerging research into computer-mediated

consent to sex, which we unpack in the next subsection, provides another example of this through the impact of social computing technologies on how sexual partners understand consent.

Other research has studied computer-mediated sexual violence, or nonconsensual sex. Social computing platforms are well known as enablers of online nonconsensual sexual acts such as sexting, unsolicited pornographic content, and sexual harassment [6, 55, 105]. They also facilitate sexual violence in the physical world through sex trafficking [8] and cyber-grooming [78, 83] to coerce victims into physical sexual abuse [85]. Dating apps in particular have been repeatedly linked to sexual violence [1, 29, 45, 46, 100, 107, 116].

There have been considerable efforts to design computer mediated solutions to sexual violence. These include AI-based detection of sexual harm and predation on social media [106] as well as mobile and wearable technologies to respond to sexual assault and harassment in urbans areas [2, 4, 22, 84, 86, 109, 110] including panic buttons [2, 58], GPS tracking [137], user reports of assault and harassment [2, 21], and safe routes [4, 108]. The roles of social media [5, 105] and conversational agents [70, 96] in support seeking after sexual violence have also been studied. Yet despite (the absence of) consent being a defining characteristic of sexual violence, computer-mediated solutions that target consent exchange are relatively uncommon.

2.3 Computer-Mediated Consent to Sex

Consent in general has become a popular HCI research lens [141] for topics such as collection of personal data [69, 71, 79, 91] and online research participation [52, 126, 138]. Regarding HCI research into consent to sex more specifically, some work has considered how popular models for sexual consent could be applied to nonsexual human-computer interaction. Im and colleagues used affirmative consent as a lens for generating solutions to various problems with social platforms such as content feed curation, profile visibility, and content sharing [61]. Planned Parenthood's FRIES model of sexual consent [95] has been used as a framing for "consentful technology" that gives individuals control over their personal data (or "digital bodies") [72], and for designing embodied interactions with emerging technologies [122].

Research has also begun to explore consent exchange with sex robots. Strengers and colleagues [122] proposed design concepts aligned with the FRIES model such as programming sex robots with "safe words" to rapidly inform a human sexual partner to stop a nonconsensual act, "traffic lights" to visually indicate ongoing consent, and aftercare during which a sex robot can initiate conversation with the human partner about how the experience met expectations for consent exchange. Relatedly, it has been speculated that the inability of voice assistants and sex robots to refuse consent to inappropriate commands or behavior from their users may subsequently foster harmful perceptions of sexual consent exchange between humans [121, 124].

Empirical evidence of computers shaping how people give and perceive to receive consent to sex can be best demonstrated through the online dating literature. Zytko and colleagues found that women and LGBTQ+ online daters repurpose Tinder's interface as consent technology by establishing overt dialogue about consent through

profiles and messaging interactions [139]. They found that Tinder also mediates consent exchange practices that are susceptible to sexual violence, such as how some male-identifying users infer and imply agreement to sex through Tinder's interface without any confirmation of consent before physical sexual contact. Similar patterns of inferring interest in sex have been discovered across several dating apps [142]. Further, the perceived purpose of Tinder as an app for sex, coupled with the frequency of sexually objectifying message content, has led some users to question their right to decline sexual advances [139] (p. 13). This parallels other research [75, 103] that has found dating apps to act as mass modelers of sexual scripts that perpetuate sexual objectification and challenge perceptions of sexual agency.

The computer-mediation of consent exchange through dating apps is likely inadvert by designers, however online daters have indicated a desire for more deliberate support of consent mediation, particularly to mitigate sexual harm [3, 42]. Likewise, researchers have also called for integration of consent exchange design patterns into social platforms to better accommodate the nuances between consensual and nonconsensual sexting [56].

To our knowledge there are few attempts to deliberately design for computer-mediated consent to sex between humans. One notable exception, Nguyen and Ruberg [90] highlight the emergence of sexual "consent apps" such as LegalFling, We-Consent, and Good2Go, which collectively serve as a warning for how *not* to mediate consent to sex. These mobile apps exhibit a "checkbox" design pattern through which sex partners record their consent to a sexual act before it occurs. While this design pattern may reduce the chances of misinterpreting initial willingness to have sex, it has also received critique [90, 98] for restricting sexual agency by failing to accommodate users who may become uncomfortable during sex and wish to revoke consent. Nguyen and Ruberg suggest that sexual consent apps could be improved by drawing on design concepts for computer-mediated consent exchange from video games through which players have sexual experiences with non-player characters [90]. Consent design concepts they discovered in games include: making consent exchange intentionally burdensome to ensure that a sexual partner has fully thought through their decision (e.g., by pressing and holding a button for several seconds), enabling consent withdrawal when one is no longer comfortable, having a discrete phase for negotiating sexual boundaries, and aftercare of one's sexual partner to reflect on the sexual experience together.

While designs for intentionally mediating consent to sex are beginning to proliferate the literature, they are conspicuously absent of stakeholder input. Anticipated users (people who would practice computer-mediated consent to sex) have seldom been involved in design [42].

3 METHOD

We conducted an IRB-approved participatory design [89] study with 17 online daters in the United States to generate new conceptual designs for sexual consent technology. Online dating was used as the backdrop in design sessions because of the normativity of using social computing platforms for discovering and interacting with potential sexual partners, therefore posing ample opportunities across an online-to-offline timeline for participants to consider consent

technology intervention. Participants were not required to incorporate dating apps in their designs, but rather propose technology to be used anywhere in an online-to-offline timeline of discovering and interacting with sexual partners. Because we are using consent mediation as a lens towards sexual violence mitigation, we chose to recruit stakeholders who identified as LGBTQ+ and/or women because these demographics are disproportionately victims of sexual violence [43, 82, 120].

3.1 Recruitment

Recruitment of participants entailed members of the research team aligning with our target demographics raising awareness of the study through communities intersecting with their gender and sexual identities. Recruitment methods included posters at LGBTQ-friendly establishments, a recruitment ad that was shared through social media, posts to Discord servers related to the LGBTQ+ community, emails to university clubs for women, and snowball sampling. Recruitment materials described the study as involving design and creative reflection on technology for consent to sex and clarified that to qualify for the study one must self-identify as a woman and/or LGBTQ+ and have previously used a dating app (the latter to help ensure familiarity with, and receptiveness to, technology for augmenting sexual experience). Participants signed and returned digital consent forms before participating in design sessions.

A total of 17 people participated across five design sessions, with attendance in each session ranging from 2-5 people. Rationale for group sessions is provided in the next subsection. Participants identified as Caucasian (14), Vietnamese American (1), Asian (1), and African American (1). They identified their genders as cisgender female (13), non-binary (2), genderqueer (1), and gender non-conforming (1). They identified their sexualities as bisexual/pansexual (9), heterosexual (5), demisexual/asexual (2), and lesbian (1). Ages ranged from 19 to 25, which is in line with the age range most susceptible to sexual violence [111], although participants were not directly asked if they self-identified as victims of sexual violence. Participants were compensated with a $20 virtual gift card.

3.2 Participant Care Precautions

To inform best practices for broaching discussion of sexual consent and adjacent topics, the research team consulted with a certified Sexual Assault Nurse Examiner (SANE) who has practiced with a community-based agency for more than nine years, which involves direct interaction with perpetrators and victims of sexual assault. We also consulted a Psychology researcher with a record of conducting sexual violence research and other applicable university staff to understand our responsibilities as mandatory reporters of Title IX violations that participants may disclose. It was determined that experiences of sexual violence reported through the study were exempt from mandatory reporting.

The moderator for each design session was a pansexual nonbinary person to establish comfort with participants based on shared demographics. We had initially intended to conduct design sessions with participants individually due to the sensitive subject matter, however during pilot testing it was recommended that we allow

group sessions so that participants could have a social support structure of other people with shared gender demographics. We afforded both options in recruitment and all participants opted for group sessions. Group sizes were based on predetermined session days/times that participants selected in the recruitment survey based on their availability. Participants used fake names to maintain their privacy although the possibility remained that their voice could be recognized by others in their session, which was conveyed in the consent form and again at the start of each session. Session introductions also included ground rules from the moderator to maintain civility and respect; to this point participants included their pronouns next to their fake names to avoid misgendering. Lastly, participants were reminded during the study of the right to leave the session at any time if they were uncomfortable.

3.3 Design Session Protocol and Data Analysis

Design sessions were conducted online over voice chat with screen and file sharing in a private Discord server. Session lengths ranged from 75 to 150 minutes. After introductions and ground rules participants described their preferred practices for exchanging consent in order to stimulate discussion of the consent practices that technology should mediate. As researchers we took an impartial stance on participants' preferred consent practices, opting not to scaffold design with affirmative consent or other established consent models because of their inconsistent adoption by the general public, amongst other critique [88], and thus risk of imposing a consent model onto participants that they may inwardly disagree with.

Following elucidation of participant-preferred consent practices we showed a visual timeline of an "online dating process" to exemplify the range of spatiotemporal intervention points for new consent technology. This process comprised: discovering a potential sexual partner online > interacting with the partner online > meeting the partner face-to-face > physical sexual activity occurring. Participants worked in groups of 2-3 to design new ways that technology could support adoption of their consent practices anywhere in the timeline and with any device/application that they imagined. Designs varied between written, drawn, and verbal ideas. We purposely avoided giving participants particular situations of nonconsensual sex (sexual violence) to design for in order to avoid inadvertently labeling them as victims or perpetrators if they had comparable sexual experiences in their personal life.

After the first design exercise the whole group reconvened to share and discuss ideas, which involved modifications and remixes of the original designs. Afterwards participants split into small groups again to generate a design for consent technology "10 years in the future" in order to inform long-term design agendas and remove creativity constraints around what participants may think is technologically possible. Sessions concluded with another group-wide discussion.

All Discord sessions were audio recorded and transcribed. A semantic approach to reflexive thematic analysis [24] was applied to the transcripts to identify and refine emerging themes. A team of three researchers (a pansexual non-binary person, a heterosexual woman, and a heterosexual man) individually coded transcripts and then collectively reviewed coded transcripts in recurrent meetings to refine the evolving codebook. After multiple iterations of coding

the transcripts the final codebook consisted of 60 codes, which the team collaboratively organized, along with a fourth, supervisory researcher (heterosexual man), into patterns and themes through the web app Miro. Exemplary quotes in the next section are attributed to the fake names that participants provided.

4 FINDINGS

Participants introduced a variety of consent technology designs, some of which were features to be incorporated into dating apps while others were envisioned as separate applications or devices.

Proposed technologies collectively supported a vision of sexual encounters (Figure 1) in which partners exchange unambiguous verbal consent to each sexual act (e.g., touching, kissing, penetration) and then continuously reconfirm verbal consent in case a partner becomes uncomfortable. Participants also envisioned consent technology supporting candid discussions of sexual expectations across online and face-to-face interaction that precedes sexual activity. This was considered important for informing initial decisions to have sex, and to normalize the occurrence of unambiguous verbal consent exchange. Topics comprising "sexual expectations" included specific sexual activities, each partner's preferred consent exchange practices, and expectations around intimacy and monogamy. Given the emphasis on verbal consent exchange, proposed designs were devoid of replacing how consent is actually given—in stark contrast to "consent apps" currently on the market.
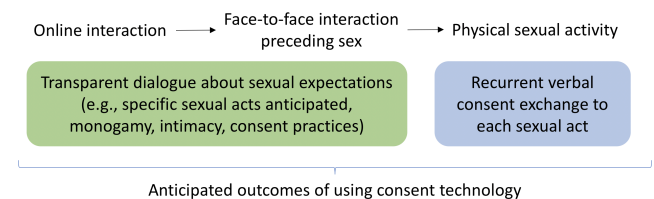
Figure 1: Designs for sexual consent technology sought to normalize unambiguous and recurrent consent exchange between partners, as well as transparent discourse about sexual expectations prior to sex.

The word *"comfort"* was used deliberately and frequently by participants when describing their consent technology designs, reflecting a hesitance with forcing users into sexual dialogue against their will. An overarching theme behind their designs was a targeting of comfort barriers: reasons why participants believed some people are not comfortable voluntarily discussing sexual expectations and consent despite the perceived benefits to safety. Coding elucidated three design themes around how consent technology could address these comfort barriers. We summarize these in Table 1 and illustrate where they mediate consent exchange across online and face-to-face interaction in Table 2.

Table 1: A summary of design themes for mediating sexual consent

Design Theme	Comfort Barrier Addressed	Example Design Concept
Consent technology that initiates and maintains transparent dialogue about sex across online and offline interaction	Discomfort with personally broaching discussion of sexual expectations and consent	Shared mobile device broaches a discussion topic about sex if two users are about to leave a bar for a private residence
Consent exchange as interface design pattern to ensure mutual comfort with transparent discourse about sexual expectations	Discomfort with abrupt transparency about sex	Online dater "swipes" on a particular part of another user's profile to reveal content about sexual expectations
Supplementing verbal consent with machine translation of latent sexual discomfort	Hesitance to verbally disclose discomfort with a sexual act that one has already verbally consented to	Biometric data about sexual discomfort sent to partner's AR glasses, prompting them to stop the sexual activity and discuss consent with partner

Table 2: Example implementations of design themes organized along an online-to-offline process towards sex

	Discover sex partner online →	Online interaction →	Face-to-face meeting →	Physical sexual activity
Design theme 1: Consent technology that initiates and maintains transparent dialogue about sex across online and offline interaction		AI-mediated progression of messaging interaction towards sexual expectations	AI-mediated progression of interaction towards (updated) expectations for sex	Shared mobile device broaches a discussion topic about sex if two users are about to leave a bar for a private residence
Design theme 2: Consent exchange as interface design pattern to ensure mutual comfort with transparent discourse about sexual expectations	User gives consent to dating app befor viewing another user's profile content about sexual expectations	Partners give consent to unlocking messaging channels about sex topics when comfortable	User can "veto" AI-prompted sex topics when uncomfortable	
Design theme 3: Supplementing verbal consent with machine translation of sexual discomfort				Smart watch detects discomfort during sex; alerts partner to stop

4.1 Design Theme 1: Consent Technology that Initiates and Maintains Transparent Dialogue About Sex Across Online and Offline Interaction

"So pretty much I found through dating apps, like no one ever really talks about consent, or, uh, you know, talks about boundaries before they meet up." – Sarah

Several proposed designs stemmed from the perceived rarity of discussion around sexual expectations prior to sex. Participants stressed the importance of discussing sexual expectations well before the moment sex is supposed to occur so they can navigate potential incompatibilities and dealbreakers without putting themselves at risk of sexual harm. With online dating in particular, multiple participants referenced past experiences in which expectations for a face-to-face sexual encounter were vaguely mentioned online and ultimately misunderstood upon meeting face-to-face. Yet participants also admitted discomfort with personally broaching discussion of sexual expectations, either online or in-person, due to prior experiences in which attempts were misinterpreted as flirtation or invitation to be sexually objectified. Participants interested in same-gender partnerships also found these conversations to be rare due to confusion over which partner should take the initiative: *"Like in, in my female relationships, it's really hard to even have that*

kind of conversation because you don't like traditionally know who's gonna go first."

In response to discomfort with personally initiating these discussions, participants proposed design concepts that would put consent technology in charge of initiating and progressing transparent dialogue about sexual expectations while being sensitive to users' (dis)comfort. We present three variations of this design idea that span online and offline interaction: 1) AI-mediated messaging prompts in dating apps to broach discussion of sexual expectations online, 2) AI-mediated transition of online interaction towards safe sexual encounters in the physical world or dissolution of online interaction when sexual expectations are incompatible, and 3) a shared mobile app "game" to be used during face-to-face meetings to maintain transparency in progression towards physical sexual activity.

4.1.1 Comfort-Oriented Progression of Online Interaction Towards Discussion of Sex. Some proposed designs involved a dating app's messaging interface mediating online interaction between two users by providing a series of conversation prompts that would gradually progress interaction towards talk of sexual expectations. The messaging interaction may start with *"lighthearted"* topics like shared hobbies and slowly escalate to more sensitive topics. Participants envisioned artificial intelligence (AI) being used to analyze the course of messaging interaction to identify the right

moments to introduce increasingly sensitive topics without imposing discomfort. For instance, some suggested that the messaging interface could position serious or potentially uncomfortable topics like consent practices after humorous topics so that laughter may ease two messaging partners into a more serious conversation.

Some participants wanted to instruct the AI on *"how"* progression of online interaction should be mediated. As Pablo described: *"It'd be nice if the app just straight up told you like, how do you want to talk about anything? [...] And that'd be cool if it then gave you usable ways to do that."* One of the more popular ideas for informing AI-based conversation progression involved a repurposing of online dating profile pages into private instruction manuals for the AI that were described as virtual *"Want-Will-Won't"* lists. Want-Will-Won't (WWW) lists have historically been promoted by the LGBTQ+ community to establish sexual preferences [114] with three categories: what the person wants to do during sex, what they are willing to do during sex, and what they won't do during sex. Participants described these lists being broadened to also include tangential topics like preferences around cuddling, displays of affection, and monogamy. While WWW lists could presumably be visible to other online daters on one's profile page too, participants were skeptical that the average user reads text content on profiles closely (*"I feel like a lot of the thing with the profile stage, and like people on dating apps, is they look at the pictures and they swipe a direction"* – Sabrina). Incorporating WWW content as prompts in online interaction was considered a way to better ensure that potential sexual partners would become aware of them.
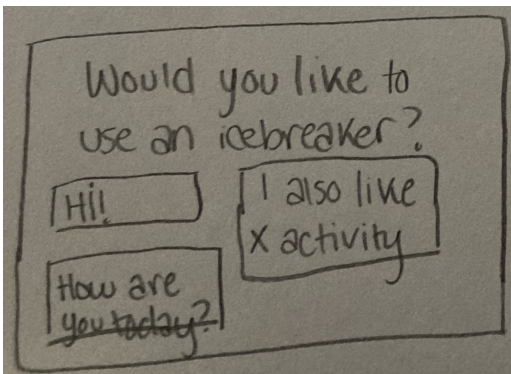
Figure 2: One variation of AI-mediated messaging interfaces involved users selecting from multiple conversation prompt options to control the progression towards more sensitive topics around sex.

Sophia illustrated an approach to user-AI collaboration in which the messaging interface broaches topics of varying levels of sensitivity, with users being able to select one and therefore the pace of progressive sensitivity. She explained: *"You could have like the categories of conversation starters. So ones that are like lighthearted, ones that are a little bit more suggestive, and then ones that are like explicit, and that could get into kind of like [more specific sexual desires], especially if you were looking for something that is not vanilla [vanilla in this instance refers to relatively common sexual acts]."*

4.1.2 Comfort-Oriented Interaction Dissolution and Transition to Face-to-Face Encounters. Increased transparency in sexual expectations may elucidate incompatibility between potential sexual partners and thus the desire to discontinue interaction. Participants described dissolution of online interaction as extremely uncomfortable because of the unpredictability in how a partner may react; some mentioned past experiences of online harassment in retaliation for rejection. Accordingly, they considered it essential for AI-mediated interaction progression to also manage dissolution of interaction. Design examples focused on the moment in which an invitation for face-to-face meeting is broached, which was considered a point of no return because it introduces the risk of physical sexual harm.

Ideas that emerged in discussion amongst participants involved the AI identifying or collecting reasons for a disconnect in desire to meet face-to-face and reporting those in the interface. This would alleviate the burden of users having to personally provide—and defend—their rationale. Sarah gave an example of the AI reacting to two partners giving different answers about their desire to meet face-to-face: *"There could be like a little prompt [. . .] like, would you want to meet in person? And then like, if you [have different answers to that question], like maybe it could say, like, pop up, be like, hey, you guys have different expectations."*

Others were uncomfortable with sending any message that indicates an unwillingness to meet face-to-face because it could incur harassment by a messaging partner. In response to this discomfort there was one suggested design that several participants liked, which involved users covertly triggering AI-mediated interaction dissolution with message responses that have a double meaning. Emma drew an interface example (Figure 3) in which the user can covertly tell the AI that they no longer want to continue interaction with the message "Yeah, we could meet up," which would trigger an end to the messaging chat.
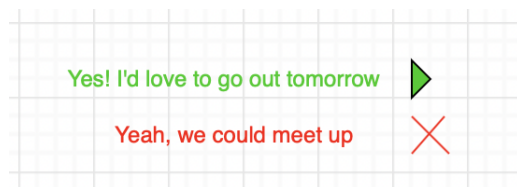
Figure 3: Emma's design for avoiding discomfort with interaction dissolution involved messages that covertly trigger the dating app to close a messaging conversation.

4.1.3 Mediating Face-to-Face Interaction for Transparency in Updated Sexual Expectations and Escalation to Sex. Participants expected consent technology to mediate progression of face-to-face interaction as well, to ensure transparency of sexual expectations but also mutual comfort with moving to a private location where sex can occur. This was considered particularly valuable when time has elapsed between online and face-to-face interaction due to miscellaneous life events that could alter desire for sex and, in online dating contexts, the possibility of physical appearance not matching profile pictures. Participants envisioned sexual partners using one mobile device to answer or trade prompts with one another.

As one group described: *"Yeah, something that you can have like on your phone, you can put it on the table. And then both of you just look at it and see and talk about it or switch the phones and always one question than the other question."*

This single-device mediation of face-to-face interaction was conceptualized as a *"game"* that seeks to keep interaction fun while also maintaining transparency in sexual dialogue. The game would motivate voluntary use through *"unpredictable"* insertion of humorous prompts for sheer enjoyment amongst more serious or potentially *"awkward"* topics pertinent to sex. As one example of a humorous prompt: *"You would have like questions that are goofy, like, what's the most embarrassing moment of your life? You know, like, questions that would inspire laughter."* Sabrina compared the strategy of alternating serious and humorous prompts to one she had manually tried to employ on dates:

"I think it's like a really, like, great accessible game, right. Like, I feel like girls kind of already do that, like, in their head before. [. . .] Definitely in my head I'm like, okay, what are questions that I could, like, potentially bring up [to gradually progress the conversation towards sexual expectations]? Like, if the conversation was, like, just like, have conversation starters in the first place, I think you can never go wrong with it, especially if, like, if it's more of like, a random thing. And then you also have consent questions in there. You know, like, it would be more of like, something to laugh about, but also to have like, those deep conversations."

A key moment on dates, aside from the actual exchange of consent to a sex, is a transfer of location from a public to private space for sex to occur, during which individuals lose structural protections against sexual violence such as bystander availability. Participants expected the shared-device game to mediate this key moment with conversation prompts to ensure mutual comfort with escalation to a private location or, alternatively, to navigate an amicable departure. In Susan's words: *"I think that I'm also like, in the meet, like, those questions should also like kind of entail like [. . .] a way to see if, like, the date's gonna continue going on further too. Because like, I think that's a huge major part of like, the positive consensual sexual experiences. Like, are we going to leave here [the public date location] together afterwards?"*

4.2 Design Theme 2: Consent Exchange as Interface Design Pattern to Ensure Mutual Comfort With Transparent Discourse About Sexual Expectations

"What I'm not okay with, I had a person that [. . .] would not stop talking about stuffing a drum stick up his ass. And I'm like, oh my goodness." – Amy

Participants wanted consent technologies that could facilitate normativity in discussions of sexual expectations, however they were sensitive to proposing designs that may usurp user agency in how and when sexual expectations are disclosed. They were concerned that discomfort from being asked to discuss sexual expectations too soon, or being abruptly informed of another user's sexual expectations, may inadvertently amplify resistance to such transparency. In reaction to these concerns some participants sought to integrate consent exchange as an interface design pattern to ensure

that users are comfortable with, or consenting to, the disclosure of sexual expectations with a given partner.

Participants drew inspiration from Tinder's *"swiping feature"* that—perhaps inadvertently—serves as a design exemplar for consent exchange by requiring two users to mutually swipe on each other's profiles to enable messaging interaction. Ideas from participants involved extending a consent exchange design pattern to moments in dating apps and other standalone consent technologies that would directly precede transparency in sexual expectations. Two ideas included applying consent exchange to viewing and disclosing portions of online dating profiles regarding sexual expectations as well as initiating discussion of individual conversation topics online and in-person pertinent to sex.

4.2.1 Consent Exchange to Disclosure of Online Dating Profile Content About Sex. Some participants advocated for online dating profile designs that included nuanced information about sexual expectations, such as *"BDSM tests"* and a *"sexual level spectrum bar"* which would collectively convey detailed information about one's sexual desires. Yet other participants, reflecting on their own online dating experiences, remarked that content on profiles about sexual expectations can be *"jarring"* and even outside of their own *"comfort level."* At least one participant admitted to rejecting a potential sexual partner for being too graphic about sexual interests in their profile. To rectify the tension between desires to express sexual expectations on profiles and potential discomfort that such disclosure could cause, participants suggested partitioning a profile into distinct sections, or creating separate versions of profile pages, that would require consent exchange before sexual expectations can be disclosed to a given profile viewer. Michelle captured these two ideas:

"We wanted like parts of profiles to be locked, maybe just general bio information and like two or three pictures or something. And then if someone wants to see more, they have to send out a request, and they need permission from whoever's account it is, like, do you want this person to view your [sexual information]?"

Regarding the multiple profile idea: *"We mentioned having multiple kinds of profiles [referring to conversation with other participants in the design session]. So if you have a, like, 'I'm looking for friends' profile, or looking for dates, or looking for sex. For each one of those, same deal, you need permission to view those."*

4.2.2 Consent Exchange to Online Interaction "Channels" About Sex. Some participants proposed partitioning online interaction in dating apps and other messaging platforms into distinct conversation topics that are consented to one-by-one. One idea that garnered support from several participants was a *"channel"*-based messaging interface in which conversation topics are organized into channels or *"tabs"* that serve as a *"checklist"* of topics that should or could be discussed leading up to a face-to-face meeting. The channels would include consent practices and sexual boundaries but also more mundane topics and those of personal interest to the user. Each partner in a messaging interaction would have their own series of channels, and they would *"unlock"* a given channel during online interaction to express consent or comfort with discussing it. Per Kat: *"You start messaging said person, like, you'll see like your tabs, and you'll see if they're, like, locked or unlocked. [. . .] And in*

that case, it's one person's prerogative to unlock theirs, like when they're comfortable with it."

Upon unlocking a channel, one's interaction partner can express their own consent to the topic through initiating conversation in the channel: *"…that also ensures that, like, you know that conversations are consensual because the person reading that can look at that [unlocked channel] and say, like, I don't really want to talk about that, and then just not message you [in that channel]. But you know that if someone does message you about it, like, they also want to talk about that. […] So it kind of can ensure that like, your initial conversation with them [about sex] is like a mutual and consensual one."*

4.2.3 Consent Exchange to Progression of AI-Mediated Discourse About Sex Across Online and Offline Interaction. Consent as an interface design pattern was also imagined as being integrated into other technologies proposed by participants. While they were receptive to AI posing conversation prompts to progress interaction towards transparency of sexual expectations online and offline (see section 4.1), there was also persistent concern that the AI could get the pace of progression wrong and impose discomfort rather than transparency onto users.

Participants considered several interface metaphors for incorporating explicit consent exchange into AI-mediated conversation progression to give users the opportunity to confirm comfort with an upcoming conversation prompt. For messaging interaction, participants favored metaphors to express discomfort, such as *"red cards"* (borrowed from football/soccer) and a more literal copy of the *"swiping"* mechanism from Tinder that would allow users to decline a potential prompt from being formally broached in the messaging interface.

"If it was like, more of like a swiping feature, like the questions that you don't want to answer, you can just swipe away from." – Sabrina

Participants also considered ways to support consent exchange to conversation prompts from a shared device during face-to-face interaction so that users could avoid prompts of a sexual nature if they are *"having a bad date experience and don't really want to talk about explicit stuff."* While some of the aforementioned design metaphors could apply in-person, participants also considered design patterns that accommodated partners using a shared mobile device for conversation prompts. An example was a *"two-factor identification type thing"* in which partners would use their individual mobile devices to privately express consent to upcoming prompts before they are broached on whichever device of the two they are using for shared prompts.

4.3 Design Theme 3: Supplementing Verbal Consent with Machine Translation of Sexual Discomfort

"If you can tell that someone is physically uncomfortable, but their [consent] language does not match that, you should stop what's happening." – Tabasco

Perhaps the most obvious intervention point for consent technology is when sex is about to occur, and several participants did propose designs for this stage. These designs predominantly focused on a distinction between verbal consent to sex and nonverbal signals of discomfort with sex. Participants described past instances

in which a sexual partner gave verbal consent to a sexual activity while simultaneously conveying body language of discomfort that seemed to conflict with the verbal consent. In these situations they cast doubt on the validity of verbal consent and stopped the sexual activity, usually followed by conversation about the unspoken signals of discomfort.

"I feel like body language is something you should pay attention to. Because if you can clearly tell like, okay, they're not into this, or this is something that they seem very uncomfortable with, like, getting that confirmation from them, like, hey, are you okay with this? Or like, oh I noticed you're kind of uncomfortable. We totally don't have to do this. I feel like that's something that should be like, like, as well as verbal consent, someone's body language, you should be paying attention to that." – Pablo

A few participants offered reasons why their past sexual partners gave verbal consent to a sexual activity that they were not actually comfortable with. Uncertainty around how partners may react to rejection was mentioned. Perceived obligations to engage in a sexual act due to time spent with a partner was another reason. Susan acknowledged these feelings impacting her own decisions to continue sex that she was uncomfortable with: *"I definitely agree that there's definitely a safety and a guilt issue too, mainly with women and heterosexual relationships, especially. And I've definitely felt that myself as well. Mhm."*

A consent technology design that was proposed to address this consent/comfort conflict involved machine translation of ambiguous or latent signals of sexual discomfort into explicit visual or auditory information directly before, or during, a sexual act. Notably, machine translation of sexual discomfort would not be a replacement for verbal consent exchange, but a supplement to verbal consent.

Sexual comfort translation was pitched by participants as a tool for protection of their sexual partners more so than themselves. Receiving machine-detected signals of discomfort from an otherwise verbally-consenting partner would enable them to stop their own inadvertent perpetration of a truly nonconsensual act and the ensuing trauma. The idea received particularly strong reception from participants who doubted their natural abilities to detect social cues around sex. For example, one participant identifying as neurodivergent described struggles with detecting the true feelings of sexual partners across online and face-to-face interaction.

4.3.1 Anticipated Technologies for Detection and Conveyance of Discomfort with Physical Sexual Activity. Technologies that participants incorporated into their sketches and verbal concepts for sexual discomfort detection included *"wearable tech"* such as smart watches that collect biometric information and augmented reality (AR) glasses for conveying comfort indicators to one's partner. More futuristic technologies like comfort detection robots and brain-computer interfaces were also mentioned.

Participants sometimes used pop culture characters to personify and relate their ideas to other participants in design sessions. For instance, Jo drew a picture of the Disney robot Baymax to demonstrate their idea for a discomfort-detecting robot that exhibits friendliness and a desire to *"help"* sexual partners have a mutually pleasurable experience (Figure 4). Susan described a scenario in which a *"Sherlock Holmes"*-like robot would be continually

sensing body language, but only alerting one's partner through AR-equipped smart glasses in moments of discomfort.

"Well, I'd hoped that they could, like, read people, like almost like a Sherlock Holmes inside of a little robot, like, reading body language better than I could. Or, and then like, somehow, it's like, like, mash it with the wearable tech. And somehow, like, I'm like alerted like whether I'm wearing glasses or like a watch. Like, I'm alerted when it has like a scan [of discomfort]."
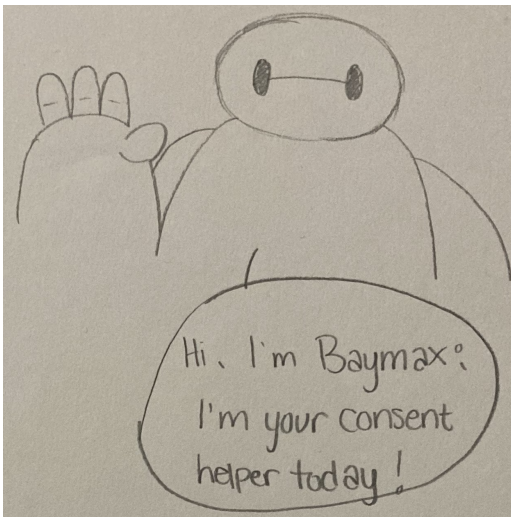

Figure 4: Some participants used relatable pop culture references to convey their ideas for consent technology, such as a Baymax-inspired robot that detects sexual discomfort.

Participants spent time discussing technologies best suited for rapid transmission of sexual discomfort information (Figure 5) because timely awareness of discomfort can mean the difference between perpetration and prevention of nonconsensual sex. They expected that sexual partners would likely be too distracted to notice traditional mobile app notifications if they are actively engaged in a sexual act and so they considered wearable technologies that can instantly grab attention through audio or visual alerts like smart watches that would prompt its wearer to immediately stop the sexual activity. Sophia's group gave an example in which a partner has consented to physical contact and a brain-computer interface conveys a bright red light when the partner becomes uncomfortable with their body being touched.

"If something is occurring on or near your body that is good, and you want to keep that going, like that could be a green light, so to speak. Whereas if something's not feeling good, or you want to stop, that could really like give a flashing signal to the person." – Sophia

4.3.2 Managing Trade-Offs With User Control Over Expression of Sexual Comfort. Participants did recognize a trade-off with user agency that would come with machine translation of sexual comfort: sexual partners would lose at least some control over when and how information about sexual comfort is expressed to a potential partner. Some participants vocalized concern with one's mind becoming completely transparent to a sexual partner, and they advocated for retaining some agency or *"mystery"* with internal dialogue. For
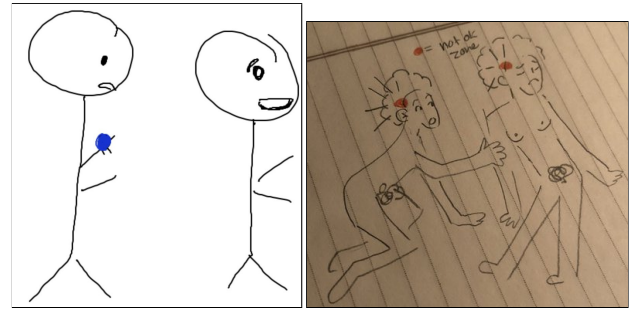
Figure 5: Participants considered ways to rapidly alert users of sexual discomfort so they can immediately alter their behavior. Visual and auditory cues on smart watches (left) garnered support, as did visual cues through a brain-computer interface for informing users when their sexual partner is no longer comfortable with an ongoing sexual activity (right).

example, Jo said: *"I don't want to know every detail how he's feeling, how just everything would, that would be too much for me personally. If he's feeling in the mood, or just like, how, how he has a person [that always knows] what he's thinking, I'm kind of like, I still, I would still want him to have mystery. So I wouldn't want to go too much."*

To address these agency concerns participants wanted machine translation to be limited only to *"explicitly sexual contexts,"* such as when two partners are in a private location where sex could occur. They also made a point to distinguish the wealth of data that could be potentially collected about users and the relatively narrow information about discomfort that would eventually be conveyed to one's partner.

Participants debated the notion of *"discrete"* translation—having the ability to receive indicators of a partner's sexual comfort level without their awareness. Reasoning behind a desire for discrete translation was to ensure that the mere presence of the technology did not cause oneself or one's sexual partner to act unnaturally (*"I don't think that I'd want to be aware of the other person having it. Oh, you know what? I don't think like, I don't think I'd want it to be super obvious that I'm doing it as well."*).

Devices for discrete translation were referred to as a *"lie detector"* and *"bullshit radar."* While these terms may read as distrustful, they were intended to reflect specific use cases in which one's sexual partner verbally lies about being comfortable with a sexual act or being sexually attracted to the user possessing the lie detector. This was particularly relevant when one's sexual partner identifies as a man because of gendered sexual scripts that men should always desire sex and are therefore acting outside of their gender role if they forego a sexual opportunity. Woman-identifying participants envisioned a *"secretive"* device being embedded in women's clothing such as earrings and necklaces to inform them only when a man is not being truthful about their sexual attraction or willingness to engage in a sexual act.

5 DISCUSSION

Technology for mediating sexual experience has existed for decades, since at least the 1910s going by the Sears Roebuck catalog [25]

(p. 1696), and yet the mediation of consent exchange between sexual partners has been largely overlooked as a deliberate design focus. Recent literature has begun to introduce design concepts for computer-mediated consent to sex from mobile consent apps [98] to video games [90] and even sex robots [122]. To our knowledge this study is the first to produce empirical knowledge about how anticipated users, particularly women and LGBTQ+ stakeholders, would want sexual consent technology to be designed.

Beyond the individual technology ideas proposed by our participants—which vary in immediate practicality—it is important to examine the bigger picture behind what they wanted consent technology to do and how this might inform future research. In this section we first elucidate three design guidelines for sexual consent technology based on our research and use them to compare other designs for consent technology in the literature. We conclude the section with methodological reflections: a retrospective on key decisions in our participatory design protocol that can help future researchers incorporate marginalized stakeholders in the design of technology for consent, sex, and sexual violence mitigation that is sensitive to unintended consequences of participation.

5.1 Design Guideline 1: Consent Technology Should Normalize, Not Replace, Verbal Exchange of Consent

Two approaches to sexual consent technology design become apparent across our study and prior related work: 1) technology that sexual partners give consent to/through, and 2) technology that seeks to normalize candid discussion of sex and exchange of consent directly between partners. According to our study the latter is clearly preferred by anticipated users identifying as women or LGBTQ+.

The first category, technology that sexual partners give consent through, is exemplified by the "checkbox" model: a one-time provision of consent that sexual partners record in apps like LegalFling, We-Consent, and Good2Go. This design pattern has already received critique [90, 98], and our study provides further evidence against this design. It does not support withdrawal of consent if one becomes uncomfortable, nor does it allow for nuanced dialogue and agreement regarding progression of individual sexual acts, which were important considerations to our participants. Another example is technology that makes consent exchange intentionally burdensome (e.g., holding down a button for several seconds to convey consent), which has received praise from Nguyen and Ruberg [90] for demonstrating "a model of designing consent in which consent cannot be given without deliberate thought, effort, and time on the part of the user" (p. 6). But as pointed out by our participants, transparent dialogue about sex and consent is already rare and a theme across their design concepts was to make adoption of transparent sexual dialogue easier.

There was a conspicuous absence of consent technology designs from our participants targeting how people actually give consent to each other; they wanted the act of giving consent to remain a direct verbal exchange. We conclude that consent technology should not try to directly mediate the act of giving consent at all, but to reduce barriers to direct verbal exchange of consent. The following two guidelines provide avenues towards this type of mediation.

5.2 Design Guideline 2: Affirmative Consent Technology Should Prioritize Comfort

Affirmative consent is a model for sexual consent exchange that is advocated by public health organizations and scholars—including in HCI [122]—due to its potential to mitigate sexual violence (see section 2.1 for a review). Our participants did not explicitly use the term "affirmative consent" however there are significant parallels with the consent exchange practices and considerations underlying their consent technology designs. Most notable are the unambiguous verbal exchange of agreement to sex to reduce chances of misinterpreting consent, the notions of ongoing and revocable consent during a sexual act, and the sensitivity to inadvertently coercing a partner into sex (freely given consent). These findings provide support for other consent technology designs founded on affirmative consent (e.g., sex robot interactions [122]). They also suggest potential for consent technology to increase adoption of affirmative consent (under-adoption has historically been an issue, fueling criticism that the model is unrealistic [88]).

Yet comfort was also a recurring theme in participants' designs, reflecting a hesitance to force users into practices that align with affirmative consent principles, most notably ongoing transparent dialogue about sex which is critical for informed consent. For instance, users would be able to "opt out" of conversation about sexual topics or observation of sex-related information online that the proposed consent technologies would otherwise encourage. The motivation behind this comfort prioritization was to avoid immediately repelling users who are not accustomed to discussing sex openly. In order to sustain user adoption, especially users unaccustomed to affirmative consent practices, we recommend that future consent technologies similarly prioritize comfort and retain user agency in how, when, or if consent is mediated.

Interestingly, proposed designs around machine translation of sexual discomfort in face-to-face settings appear to conflict with the user agency that is pervasive across their other ideas. Participants justified the automatic transmission of sexual discomfort with urgent need of such information to ensure that they do not inadvertently pressure their partner into sex. Yet one may feel sexual discomfort for various reasons; they may not want to share these feelings if they do not consider them germane to their consent and as such we cannot recommend this particular design concept. Future work could explore how to develop comfort with voluntary adoption of all facets of affirmative consent, including voluntary expression of sexual discomfort during physical sex acts.

5.3 Design Guideline 3: Consent Technology Should Intervene Before Situations Where Sex Occurs

Our participants viewed consent as a process, not a single event. This aligns with "mental state" theories describing consent as an ongoing negotiation [19]. Conceptualizing consent as a process provides expanded opportunities for consent to be computer-mediated beyond the moment when physical sexual contact is about to occur. Our participants illustrated this with consent technology concepts that intervene across online and face-to-face interaction, such as AI-mediated dialogue about sexual expectations while partners are communicating through a dating app or during face-to-face

dates in public locations. These pre-sex intervention points could be key to normalizing patterns of overt dialogue about sexual expectations and consent, which is crucial to affirmative consent principles like informed consent, enthusiastic consent, and consent to specific sexual acts. Participants also expressed that having such dialogue online could help them rule out potential dates who express problematic or conflicting views on consent before meeting them face-to-face.

While our participants routinely designed for intervention prior to sex occurring, there are surely other intervention points that can be explored. Consent exchange designs discovered in the games *HUGPUNX* and *Hurt Me Plenty* [90], and envisioned for sex robot interactions per Strengers' TEASE process [122], frame the aftermath of sex as furtive design territory. For instance, *Hurt Me Plenty* incorporates an "aftercare" phase for a player's partner in BDSM roleplay (a non-player character) to reflect on how well the player recognized and abided by the character's comfort or discomfort with the sexual experience. Post-sex interaction could be important for informing future sexual encounters between the same partners and establishing patterns of harm-mitigative consent practices and is thus a prime target for further research into consent technology design. We recommend that future research and design of sexual consent technology consider the full breadth of intervention points across online and face-to-face contexts.

5.4 Reflections on Method: Involving Marginalized Stakeholders in Design of Sexual Consent Technology

While the HCI community often puts a spotlight on the unintended consequences of emerging technologies, there can also be unintended consequences of the methods used to produce those technologies. This is particularly true for research and design methods that involve direct interaction with marginalized stakeholders around sensitive—and at times traumatic—topics such as consent and sexual violence. Might the act of participation itself be traumatic, distressing, or negatively impactful on one's future sexual encounters? In this subsection we offer a retrospective on key decision points in our participatory design process and in doing so offer methodological suggestions for future user-centered research of technology for consent to sex and adjacent sexual topics.

5.4.1 Which Sexual Situations Should Stakeholders Design For? A decision made towards participant wellbeing was to allow participants to determine for themselves which sexual situations necessitate consent technology intervention, as opposed to broaching researcher-selected sexual situations that encompass an exhaustive range of sexual violence occurrences. A drawback of our decision was the possibility of participants overlooking critical situations in which nonconsensual sex could occur, or in other words designing for a rather narrow range of sex contexts, leaving questions as to if or how proposed designs may apply to unacknowledged forms of sexual violence. Nonetheless, we considered the advantages for participant care to outweigh this drawback.

During preparatory interactions with sexual violence experts we learned of the great lengths they go through to probe specific sexual situations with extremely precise wording to avoid victim blaming and re-traumatization. We opted to avoid broaching specific sexual situations in design workshops, which involve ample impromptu dialogue, in order to sidestep these dangers. In retrospect this decision had other benefits. Participants were able to discuss scenarios for consent technology with significant nuance because they had personally lived them (something we could not guarantee with preidentified situations). Another unanticipated, but welcomed, outcome was participants' focus on positive sexual experiences and how consent technology could enrich them, reminding us that consent technology should lead not only to the absence of sexual violence, but the presence of mutually gratifying sexual experience.

For future work we advocate for participant-driven identification of sexual situations for design in light of the above reasons. However, we do recognize the possible need of introducing specific sexual violence situations to produce truly inclusive consent technology. In such cases we urge following best practices from public health and psychology when introducing these situations to participants, such as using objective, behaviorally specific wording that avoids victim and perpetrator labeling (see the sexual experiences survey for example [125]), or directly involving a sexual assault nurse examiner (SANE) or equivalent practitioner in design sessions.

5.4.2 Should Stakeholders Design for a Particular Consent Model? The absence of a consent model to scaffold design sessions was another important methodological decision—stakeholders instead designed according to their own preferred consent practices. Introducing and encouraging design for a specific consent model would have had its benefits like honing attention to latent facets of consent exchange that participants may not have naturally considered like an aftercare phase [122]. On the other hand, scaffolding design with a consent model would risk alienating stakeholders who may inwardly disagree with the it (a concern for affirmative consent given inconsistent public adoption), raising questions of whether resultant designs would truly reflect a stakeholder's vision of consent technology. Applying a consent model may also inadvertently label stakeholders as victims or perpetrators of sexual violence. For example, an affirmative consent scaffolding may imply to stakeholders that they did something wrong if they did not verbally exchange consent in a previous sexual experience.

We do not recommend always scaffolding design with stakeholder-preferred consent practices. This may not be appropriate with stakeholder groups at disproportionate risk of perpetration, such as cisgender men, given a history of adopting problematic consent practices that perpetuate gender bias and restrict sexual agency. Yet the choice to forgo a consent theory for our demographic of women and LGBTQ+ stakeholders, who are disproportionately victims of sexual violence, does appear justified in retrospect. Participants focused on intervention points that may not have been obvious if using an affirmative consent model, such as communication about consent practices themselves and the consent/comfort distinction. They also had minor nuances in their preferred consent practices, some of which may not have been communicated had participants felt they did not align with a proposed model. Perhaps most importantly, participants' consent technology designs *did* largely align with affirmative consent, but had affirmative consent been used

to scaffold design from the beginning this voluntary gravitation towards affirmative consent-minded technology would not have been discovered.

5.4.3   How Do We Protect and Care for Stakeholders In-Session? Various precautions were taken for participant wellbeing during design sessions, starting with the choice to conduct sessions online due to COVID-19. Participants had fakes names for privacy, pronouns attached to their fake names to avoid misgendering, a moderator that similarly identified with a marginalized group, ground rules to maintain civility, and a reminder of the right to discontinue participation at any time (in the consent form and verbally in-session).

No signs of distress were detected by researchers or expressed by participants, yet this does not mean distress was completely avoided. Upon reflection we did not offer clear avenues or structures for expressing discomfort or decisions to discontinue participation. Here we distinguish simply *having* communication channels with researchers (e.g., email, direct messages in Discord—which were available) from formally *announcing procedures* for using those communication channels. In retrospect too much of an onus was put on participants to figure out "what to do" in situations of discomfort, including after the design session when discomfort may linger or cause one to redefine a previously unacknowledged incident of sexual harm. For our own future research, and that of others intersecting with computer-mediated consent and sexual violence, we recommend 1) clarifying formal avenues for expressing discomfort during and after participation, and 2) providing all participants with post-study resources such as sexual violence survivor hotlines.

5.4.4   How Can We Be More Intentional With Stakeholder Recruitment? For our study we broadly sought participation from dating app users who identify as women and/or LGBTQ+ because these demographics are at elevated risk of dating app-facilitated sexual violence. We found this relatively broad inclusion criteria to be valuable for encouraging participation of diverse voices in design, and a likely reason for the diversity in consent technology concepts that our study produced. However, there are benefits to more granular or intentional recruitment approaches that went unrealized in our study, and which have motivated our rethinking of intentionality in participant screening for future work.

For one, screening for more specific demographics can enable researchers to better anticipate stakeholder needs and sensitivities, and provide associated resources. For example, limiting inclusion to self-identified sexual violence victims for some design sessions or activities could enable researchers to better prepare victim support services and contacts, or perhaps recruit a provider of victim services to attend the design activities.

Furthermore, recruitment of secondary stakeholders—commonly called proxies [32, 53]—with intimate knowledge of consent and sexual violence could lend unique perspectives on consent technology without unnecessarily re-exposing primary stakeholders to trauma. Whereas therapists and family members have been incorporated as proxies in participatory design of technologies for sensitive populations like children [53, 76] and people with dementia [32], applicable proxies for consent technology may include those who have regular interactions with sexual violence victims such as sexual assault nurse examiners (SANEs), sexual violence shelter workers, and support hotline workers.

We can also consider the specific research questions that can be explored through deliberate recruitment of proxies. Findings from the present study suggest that affirmative consent principles should be incorporated into sexual consent technology, yet affirmative consent has received critique for its practicality in the real world [88]. Exploring nuanced questions around the feasibility of affirmative consent-based technologies, relative to other models or practices of consent, may be difficult with a generalized sample that has inconsistent knowledge of affirmative consent. Intentional recruitment of consent experts would be better suited to such exploration, including sexual assault nurse examiners (SANEs) as mentioned earlier as well as sex education professionals and advocates who regularly teach and hear reactions to affirmative consent principles.

6   CONCLUSION

We conducted a participatory design study with 17 United States-based women and LGBTQ+ stakeholders—demographics at disproportionate risk of sexual violence—about how technology should be designed to mediate consent to sex. Their designs for mediating consent introduced new approaches for dating apps and associated technologies like wearable devices and social robots dedicated to ensuring mutually consensual experiences. In contrast to controversial "consent apps" currently on the market, the purview of consent mediation in the eyes of our participants goes well beyond the moment a sexual activity begins. Their designs sought to normalize transparent dialogue about sexual expectations during online and face-to-face interactions preceding sex, which would inform one's decision to give consent and reduce misconceptions over what particular sexual acts are consented to. Design concepts intended for use during sexual activity sought to identify misalignments between verbal consent and nonverbal discomfort with sex in order to promote open discussion about the sexual scripts and pressures that may incline one's partner to agree to sex that they actually do not want. Collectively the study's findings demonstrate potential for consent technology to increase adoption of affirmative consent, a model of consent exchange intended to prevent sexual violence, but that has historically been under-adopted due to perceived barriers and burdens to its consistent practice. The study also informs methodological considerations for future work involving marginalized groups in design of technology for consent and other facets of sexual experience.

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