IIS you is my digital baby: An Intimate Interface System for persons with disabilities

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ABSTRACT

Virtual worlds, avatars and cybersex are becoming more commonplace and acceptable. Virtual environments such as Second Life™ allow for the construction and exploration of virtual selves or agents that are bounded only by imagination and fantasy of their participants. However, they are also informed by the attitudes, limits and agendas of the real life participants that invade these worlds. For people with disabilities, virtual environments may allow the crossing of boundaries of taboo subjects such as disability and sex, and intimate technologies. The Intimate Interface System (IIS) was designed to support and encourage intimacy and cybersex discovery for people with disabilities in an inclusive manner. It is composed of a virtual world component replete with customizable avatars, animations and sound combine with physical devices including a vibrating chair and a pressure pad. Results were derived from an initial focus group with four persons with motoric disabilities. Notions of positive and negative aspects of cybersex, such as the ability to do things in virtual life that cannot be done in real life, and spending time in virtual relationships is for people who are socially inept were found reflecting the literature. However, there were also unique viewpoints such as the desire for more realism that were brought to bear on the discussion. Reaction to IIS was generally positive, however, participants wanted more features such as temperature control and enhanced realism.

Keywords: Inclusive Design, Accessibility, Avatar, Virtual World, Social Interaction, Intimacy, Cybersex.

Index Terms: H.5.2 User Interfaces: Tactile feedback, user interfaces, input devices and strategies, Evaluation H.5.1 Multimedia Information Services: Artificial, augmented, and virtual realities, K.4.2 Social Issues: Assistive technologies for persons with disabilities. K.8.0 [Personal Computing]: General – Games.

1 INTRODUCTION

The World Health Organization states that access to sexual and reproductive rights for all people is a central aspect of global sustainability and equity [32]. For persons with disabilities (PWD) this right to access of sexual expression may be unfamiliar due to circumstances of care and education as well as it may be considered too abstract, unattainable or unsafe [6, 26].

One possible option is to use technology for sexual purposes, which include cybersex and teledildonics. This means of access can be a positive expression of the variability, creativity, and

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adaptation of human sexuality. These novel practices offer creative alternative forms of sexual expression that might increase safety, accessibility and autonomy for persons with disabilities (PWD), while offering greater opportunity for experimentation, and varieties of identity and self-presentation [21]. Online environments may in fact be some of the first or only places that PWD can access sexual content or be comfortable with sexual expression as the possibility of real life experiences are often denied, not available or not discussed [19].

While substantial literature exists in the area of mediated sexuality, these practices are often negatively portrayed based on assumptions of social harm [31] or pathological models of compulsion and addiction [6]. However, there is some evidence of the benefits of mediated sexuality, especially when it facilitates sexual education, development, experimentation and accessibility [8]. For some, cybersex interaction may become a prelude to an offline or real life (RL) encounter but it may also be pursued for a variety of other reasons, including: sexual education, learning and expression, exploration of sexual identity and gender, fantasy, sexual orientation and group affiliation, accessibility in relation to disabilities, overcoming geographical and cultural barriers, or the pursuit of friendship, romance, and intimacy.

While there are important potential benefits as well as negative effects of cybersexual activities for PWD, few, if any, systems have been designed for inclusion of this target audience. For most cybersex oriented systems, whether they are online pornography sites or virtual worlds such as Second Life™ (SL), inclusion is not part of the design strategy of the system. People with disabilities or their supporters (e.g., care staff, parents, medical personnel, friends, etc.) must thus find ways to circumvent the barriers of these systems, create customized modifications or use alternative access technologies such as scanning keyboards for access to these cybersex systems/designs.

The theory of inclusive design [18, 28] provides a theoretical foundation for not only a design approach but also a strategy for exploration of cybersex opportunities for PWD. Newell et al. [18] argue that users with disabilities are often ignored or forgotten and that it is the responsibility of designers to ensure that the broadest range of user are included and provided with useful and usable services. As such, when developing any technology or process, the "user population" and "potential uses" of designs must be broadly defined to include a variety of users and user abilities that lie outside the definition of average. These considerations should occur from the beginning of the development process [18].

In this paper, we describe an intimate interface system (IIS) that has been designed for people with motoric disabilities. As part of the inclusive design process, an analysis of an initial discussion of the concepts of cybersex for PWD as well as reactions to the functions of the IIS by a small sample of participants from the target audience is provided. The main contributions of this work are a summary of concerns, priorities and interests on the topic of cybersex and virtual intimacy by PWD, the description of an example system and recommendations for future designs which can support intimacy for PWD.

2 BACKGROUND

Shah [22] suggests that virtual relationships, including those involving cybersex, have promoted changes "in the living, leisure and communication patterns of the people across the globe" [para. 1]. These changes have been driven by various social media technologies, online virtual environments, opportunities for anonymity, ease of access/usability, exploration in relative safety, and interest. However, there are also negative consequences and risks associated with participating in these activities, such as blackmailing [29], unintended exposure and even death that have been sensationalized in popular media and caused governments to enact cyberbullying legislation. Vybiral et al. [29] also suggest that people who are mentally vulnerable or suffer from compulsive behaviour are particularly susceptible to the negative consequences.

A 2005 Scandinavian study found that 30% of males and 34% of females out of 1835 online respondents had engaged in online sexual activity (OSA) [7]. The authors defined OSA or cybersex as "when two or more people engaged in simulated sex talk while online for the purposes of sexual pleasure" (ibid., p. 235). The study found that those engaging in OSA were also those who had higher rates of offline sexual activity, contrary to popular ideas of cybersex participants as socially inept or sexually inhibited.

One of the most popular online environments where cybersex occurs is Second Life (SL) [24, 30]. It is a partially re-constructed social world that allows multiple users to maintain virtual identities and avatar bodies in a common space. The avatar interface provides a basic correspondence of real life (RL) social space and SL graphical space, making use of the semantic knowledge systems of its users [13]. The physically separated, anonymous quality of SL avatar social interaction allows users to define and control access to personal information, such as age, sex, gender, and identity. Previous studies suggest that anonymity, physically separated, and user-content creation contribute to the creative, diverse, and sometimes-deviant quality of avatar sexualities. Gilbert et al. [10] found that the occurrence of atypical sexual practices in SL, such as BDSM,[1] matched RL occurrences. Surveyed non-disabled participants were divided on whether SL or RL sex was more satisfying. The extent to how these findings to people with disabilities remains an issue as few studies have included their voices.

In his ethnographic study of Second Life, [3] found that sexual intimacy was linguistically oriented and motivated by a desire for sexual exploration and play. Waskul & Martin [30] also found linguistic and dramaturgical features of avatar sexual interaction. The linguistic nature that drives sexual interaction in virtual worlds could present an important barrier to PWD particularly those who have low literacy, use signed languages or are unable to enter text in an efficient manner. While audio/visual interfaces exist in SL and other virtual worlds they do not seem to be as prominent. Would this then present PWD with more barriers and discouragement to engage in cybersex or can new forms of more inclusive interactions be developed?

There has been considerable research on the benefits and issues of online virtual environments for people with disabilities specifically regarding social supports [2], cultural expression [26], education [15] and new opportunities to extend beyond limitations of real life [9]. There has been considerably less focus in the literature on opportunities and barriers that online environments offer PWD for sexual expression, exploration and establishment of intimate relationship and practices. However, PWD are

participating in these activities [5, 25]. In order to begin to reconcile design parameters with the needs of PWD, we need to gain a sense of what type of sexual and intimate activities PWD prefer in online environments and what their needs and desires for support would be.

The question of identity and agency disintegration has been applied in the context of able-bodied users in a general virtual world such as SL where there is a connection to and recognition of real life structures and norms (physical, social and communication). For people with disabilities their real life norms may not only be difficult but also erect barriers and propagate exclusionary practices [5]. While there are groups within virtual worlds such as GimpGirls in SL, there is a lack of participation by PWD. There may be many different reasons why this is occurring including lack of access to resources, disinterest or it may be due to prevalent and systemic barriers that have been transferred from the real world to the virtual ones.

3 SYSTEM DESIGN

The Intimate Interfaces System (IIS) was designed to support intimacy and sexual expression needs of PWD using a mixed reality environment. These intimacy needs can range from relationship development to sexual expression and fantasy. The IIS involves at least one person participating in a simulation/avatar environment combined with the physical i/o components of a pressure pad and a vibrating chair called the Emoti-chair [14] and audio. These components were selected because we wanted alternative access, multi-sensory devices that did not have overtly sexual connotations; the touch pad provided alternative input to a keyboard and mouse and the Emoti-chair provided vibrotactile output. For some PWD, intimacy and sexual experience may be foreign or even "forbidden" concepts [19]. We did not want the initial exposure to this topic or system to be frightening or off-putting which may have occurred if sex toys or sexually explicit physical devices such as dildos were used. The visuals began with low levels of intimacy and built up to more sexual expression. If these visual made people uncomfortable they did not need to watch/see the visuals in order to understand the expressions.

Figure 1 provides a high level system diagram of IIS. Users would provide input to the system through various possible devices including touch-based input, mouse/keyboard, and other USB enabled devices. The open source OpenSimulator (OpenSim) [20] environment is used to host the virtual elements of the system, including virtual objects such as trees, structures, sky components typically found in virtual world settings, as well as customizable avatars. Audio, visual and tactile output is then provided to users (same or different user, in person or remote) using speakers, screens and the Emoti-chair [14]. Details of each block are described in subsequent sections.

Figure 1: System diagram of the IIS.

3.1 Touch-based Pressure Pad as Input

It is important that an IIS that supports PWD have novel and intriguing methods of input that not only fit with alternative access needs but also facilitate diverse styles of intimacy. The

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[1] BDSM: bondage, domination, sadism, and masochism.

initial alternative input device designed for the IIS is a soft, flexible pressure pad that can be used with different body parts including hands, tongues and feet. Currently, the device can be used to change the speed of the actions that a user's avatar is performing e.g., faster/slower sexual animations.

3.2   OpenSimulator Technology

OpenSimulator (OpenSim) is an open source server for creating and hosting multi-user 3D applications (or virtual worlds) (opensimulator.org). For the initial prototype, a standalone OpenSim server is used to implement the IIS Island (see Figure 2d).

The IIS Island was designed to convey the visual aspect of the user experience and to make this experience attractive by mixing Real Life (RL) aspects of accessibility with virtual life (VL) fantasy elements such as floating spaces, the ability to fly and modify avatar appearances (see Figure 2c). New inclusive elements were added to ensure that all venues were not only accessible to avatars with disabilities but also enticing to these avatars. For example, there is a brick path for wheelchairs connecting all venues within the island (see Figure 2a) as well as ramps at all entrances (Figure 2b), the pool has ramp access which makes it possible for an avatar in wheelchair to enter and exit the pool smoothly. Another feature uses scripted spherical objects called poseballs, which animate the avatar when touched or sat upon. For example, the club within the island contained a dancing poseball for wheelchair users intended to look natural and realistic while preserving the restrictions of the lower limbs of wheelchair users. Other specialized poseballs included kissing and cuddling animations.

3.3   The Emoti-Chair Technology as Output

The Emoti-Chair is a sensory substitution system that brings a high-resolution vibro-tactile version of music to the body [14]. The Emoti-Chair consists of two parallel rows of eight voice coils (16 in total) placed on the back and bottom of a chair form factor. The voice coils are directly driven by audio signals that are divided into eight frequency bands or eight independent channels of audio as discussed in [14].

Early workshops with the Emoti-Chair discovered that people felt excited when vibrations from the Emoti-Chair were applied on their bottom and genitalia. As the Emoti-Chair was a flexible system designed specifically for PWD where each of the eight channels could be controlled independently via audio patterns and it used a neutral and accessible form factor, it was selected as the initial vibrotactile device for the IIS. In addition, the sex therapist specialising in sexuality and PWD advised against using purpose built sex devices or complicated interfaces that would likely be off-putting to PWD. Other vibrotactile devices that range from vibrating sex toys to haptic output systems could be examined in future implementations.

For the Emoti-Chair portion of the system, physical stimulation occurs by means of three different patterns created to play a sound/vibration in the chair:
1. Patterns for the lower four voice coils were created to stimulate the type of excitement identified in early studies.
2. The top four voice coils are used to play music selected by the user to convey the desired emotion. If the user does not have sensation in the lower limbs, the upper voice coils can use the same patterns as those created for the lower voice coils.
3. All channels can play sounds as originally designed for the Emoti-Chair.

Figure 2. II Island: a) night club and a private home with connecting brick pathways; b) pool area with beach entry; c) floating "hang-out" area; and d) full island birds-eye view.

3.3.1   VibraPlayer Architecture

In order to facilitate the communication between the Emoti-Chair and the virtual environment software, the VibraPlayer was created. The VibraPlayer was developed in Java™ and the open source library JAsioHost[2]. The VibraPlayer has three modules that are responsible for handling sound information (currently in 32-bit .wav format only), connection and signal interpretation from the sound files to the patterns on the voice coils (Emoti-chair), and server side management (see Figure 3).

3.3.2   Communication between VibraPlayer and Emoti-Chair

For our research, the virtual world (OpenSim) activities control the Emoti-Chair through the VibraPlayer. For example, an event that occurs in virtual world such as a kiss or a dance is mapped so that the OpenSim sends a message to the VibraPlayer. The VibraPlayer interprets the message received and plays the corresponding vibration in the chair.

When an event is initiated, a command is sent to the VibraPlayer through the network. A corresponding sound is played in the chair so that the user seated in the chair can feel vibration produced by that sound. The sounds were derived from free online sounds that were modified so that volume and frequency levels were strong enough to be felt by a person seated in the chair.

4   USER STUDY

4.1.1   Research Questions

1. What are the attitudes towards sex and cybersex by PWD and potential needs?

2. What is the impact of the hardware and interface of the example IIS on potential for engaging in cybersex? What design recommendations result?
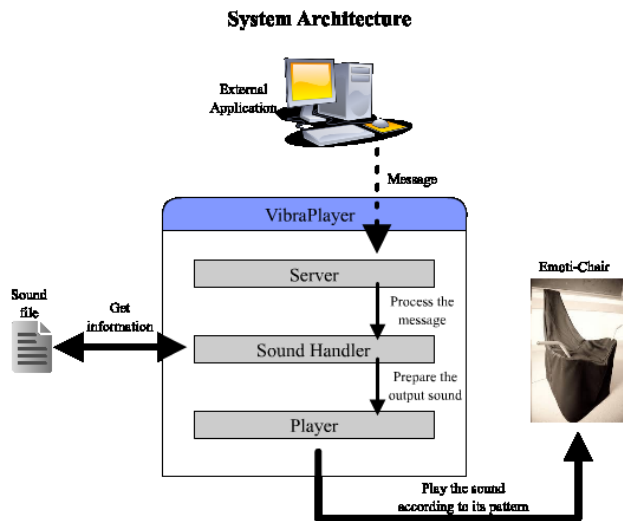

System Architecture

Figure 3. System architecture.

4.1.2 Methodology

Four individuals (one male, three females), aged between 18 and 54, with a variety of mobility disabilities participated in a 1.5 hour focus group to provide an initial assessment of the IIS as well as to gain an understanding of how a mixed-reality system could be used to support the sexual needs of individuals with mobility disabilities. It should be noted that it is difficult to recruit participants with disabilities, particularly given the nature of the topic, hence the small participant number. This study was approved by the Ryerson University Ethics Board.

Three of the participants had a university degree and one a high school diploma. Three participants defined themselves as heterosexual and one as other. One participant was disabled from birth and two had acquired their disability as adults. One participant was the partner of a person with a disability. Two people were unfamiliar with virtual worlds, and two were familiar with them and were somewhat active in them. All participants reported that their real life sexual experiences were mostly positive with those experiences ranging from fantasizing to intercourse. All participants reported that they wanted to have their sexual fantasies realized online. Two reported being comfortable having sexual experiences online, one was uncomfortable and one was very comfortable. When asked to select the reasons why they wanted to participate in online intimacy, three of the four participants said they wanted to do things that they were unable to do in real life. Other selections were: to meet people (1); and to try something new (1). Finally, participants said that they would approach an online environment in several ways: two wanted to work with others then participate independently; one wanted to "jump right in and meet someone"; and one wanted to "do my own thing" and "invite someone I know."

After completing a pre-study questionnaire, participants viewed four scenarios shown as one-minute movies of a variety of intimate situations that were possible in IIS: 1) meeting and dancing scenario (Figure 4); 2) auto-erotic scenario; 3) hugging and kissing scenario using avatars appearing with non-human characteristics (Figure 5); and 4) sexual intercourse involving three individuals. All scenarios were animated and included music. In three of the scenarios, people with motoric disabilities

were included. All scenarios were demonstrated with the Emoti-chair. Participants were invited to sit in or touch the Emoti-chair to experience the different scenarios.

Participants were then asked to consider eleven questions related to their perceptions and/or experience with cybersex, how they wanted themselves and partners to be represented, levels of control and fantasy, perceptions of disability and cybersex or sex, and finally their reaction to the IIS that was demonstrated.

Figure 4. Initial meeting and dancing scenario

Figure 5. **"Kissing and hugging"** with alien avatars.

Table 1: Themes and definitions used to analyse recorded data.

Theme	Definition and examples
1. Attitudes on cybersex	Expressions of interest and reasons for these expressions, and types of behaviours or experiences. Example, controlling who you want to be, interacting with people who are similar, not having to take medicine.
2. Attitudes on sex and disability	How individuals with disabilities think about the assumptions others make about them regarding sexuality. What individuals think of others. Example, expressions of how limitations cause others to misunderstand desires.
3. Interface/IIS environment	Positive and negative reactions to four scenarios presented, avatar appearance or behaviour. Example: natural versus unnatural and body image.
4. Hardware	Reaction to the physical aspects of the system including the Emoti-chair and touchpad. Positive example, can feel the beat, Negative example, would not use it. Suggestions for improvement.

The focus group session was recorded and then analyzed using a thematic analysis methodology as outlined by [16]. An open coding method was used to identify four main themes that related to the research questions. Table 1 provides the definitions and examples of those themes. Two independent raters reviewed and categorized all of the data

4.1.3 Results and discussion

From the discussion that took place during the focus group in response to moderator questions and to additional commentary regarding attitudes toward cybersex, and sex and disability, responses to the IIS environment, interface and hardware. Some of the attitudinal commentary, positive and negative, reflected the literature and some were unique.

Attitudes on cybersex

Positive attitudes that mirrored those in the literature involved opportunities for exploration and satisfying curiosity. For example, one participant stated, "…maybe exploring one's sexuality." Other positive attitudes that are found in the literature relate to having more privacy/anonymity [27] being able to escape and do things that a PWD is unable to do in real life. For example, "a place you can escape – don't have to deal with reality." Participants also highlighted the potential advantages associated with anonymity and virtual interactions such as increased freedom to satisfy sexual desires unmet in RL and reduced social censure and accountability to others for one's unique sexual expression. This observation was linked to participants' comments that they are often seen as not needing or desiring intimacy in RL and when they do express those desires they are often either ignored or seen as deviant (see also attribution of asexuality and deviance to PWD in [12]). The need for opportunities for independent exploration and sexual expression without having to make requests of care givers/medical personnel is a key aspect in supporting PWD in virtual environments.

There were important negative attitudes concerning cybersex that were also found in the literature that engaging in cybersex was cheating on a partner [4], and social isolation [27]. Participants suggested that there was still "stigma" about

participating in online sexual activities perhaps because of the negative portrayals in the media, or the possibilities of addiction or compulsive behaviour [17]. Similar to the OSA study [7] participants suggested that cybersex is a "last resort" when other options have been exhausted or when people do not have the skills to enter into RL relationships. For example, one participant said "people could stay in their room and not go out." This perception is challenged by quantitative [4], [7], [24] and qualitative studies [30], [24]. However, it is a well-known concern of PWD that they will be relegated to being home-bound or prevented from participating in society due to their disability [11]. The concern expressed about cybersex may reflect this more general concern rather than being specific to cybersex.

Unique comments involved online cybersex, in general, as being too "cartoonish" and not emulating the "natural experience" enough, which was desirable to most participants. Participants did suggest that they believed that the technology would eventually become more realistic and acceptable.

Participants expressed a desire for more realism from the technology while also appreciating the ability to escape reality in the acts of intimacy and participation in cybersex. There is a tension that must be navigated in the design and fidelity of the IIS to meet these potentially disparate needs.

Attitudes on sex and disability

When discussing attitudes on sex and disability there were no positive comments, which was surprising. Instead, participants discussed their interpretations of other people's attitudes. For example, that PWD's limitations also extend to sexual activities. Other people make assumptions that sex is painful, not a priority for, or that PWD "cannot feel or love." They stressed that PWD are like everyone else and "want to be touched and participate in sex." These types of attitudes seem to reflect the representation of disability as a medical issue where disability is seen as an individual's medical problem that should be "remedied" in order to fit in society [1]. The social model of disability would consider sexuality as a normative social expectation for all and that society must be adjusted to include everyone [23].

Interface/IIS environment

The IIS system is a virtual world, like other virtual environments such as Second Life that can include all participants regardless of appearance, attitude or behaviour. However, it is also a world shaped by real life individuals who bring to it their own attitudes, and preconceived notions and expectations of desired characteristics and behaviours. What is important to consider in the development of IIS (and other virtual worlds) is that inclusion is not simply allowing individuals to construct visual representations of avatars as any form possible but to build inclusion into the entire system. For example, the environment building tools would have ramps, sliding doors and elevators as defaults, methods of communication can just as easily use text as signed languages, and exploring the concepts involved in and meaning of intimacy is just as important as being actively involved in cybersex.

With respect to the reaction to IIS participants offered positive and negative assessments, however these were variable with respect to the feature assessed. Key features of the IIS are discussed in the next section, reporting the variation in participant assessment.

The ability to design a personal avatar and setting

Participants' positive responses for elements of self-designing [24] included praise for the visuals presented in the test scenarios

and enthusiasm for the ability to further create and customize personal avatars and worlds while some appreciated the ability to adopt fantasy identities For example, one participant said: "I wouldn't mind being Lara Croft." Others appreciated the ability to create an avatar that resembled themselves and the ability to improve upon and vary their physical appearance through variations in clothing and accessories.

Participants' negative responses for elements of self-designing included criticism of the 'cartoonish' quality and diminished realism of the avatars and world, and the perceived conformity of avatars to stereotypical standards of beauty such as muscular physique in males and thin physiques with large breasts in females). For those unfamiliar with avatars the idea of representing oneself as an avatar was strange and unappealing.

Participants' variable negative and positive responses of the user design features appear to address the extant and potential quality of the IIS. Negative evaluations, such as 'cartoonish,' apparently related to positive evaluations, where participants anticipate that technological advances will realise the potential of these currently 'cartoonish' graphics in more highly rendered realistic graphics.

The ability to interact virtually with others

Participants' positive responses to the interpersonal interactivity features included recognition of the potential for affective immersion in the IIS through the use of avatar animations, instant messaging between sexual partners, and the setting of mood through the design of intimate environments and control of lighting. Participants also appreciated the degree of ethical agency afforded by the IIS through the ability to control personal space and screen contacts and the ability to replicate or deviate from RL moral and ethical standards for interacting with others in the IIS.

Participants' negative responses to the interpersonal interactivity features included a lack of emotional capability stemming from the diminished realism of the environment, and the nature of virtual interactions, including issues related to anonymity, such as deception and infidelity. One participant highlighted the burden of creativity that must be assumed by participants in the IIS: "I can do anything I want but I am having a hard time going outside of my reality bubble."

Some of the negative evaluations of the IIS associated with stereotypical representations and limited scenario selection appear to stem from the few choices represented in our test scenarios. For example, one participant responded "I liked it. Want more possibilities." This indicates that a more thoroughly developed IIS may better highlight the options for users to effectively self-design according to their imagination and fantasies.

Response to hardware

Finally, there were encouraging positive reactions to the hardware components of the IIS, specifically the Emoti-chair. Participants liked that they could feel the music, beat, and bass on their backs. One said "if feels like a Night Club." They also had suggestions for improvement that would make their experience even more realistic and intense. Suggestions were made to improve the interface such as adding temperature control, a stronger alignment of touch with visual sensation, more intensity, and making it similar to a massage chair. One participate thought that using virtual reality goggles would intensify the experience. There was also some discussion about making the Emoti-chair a "robot" but that was generally dismissed unless it was made to be "realistic."

5 DESIGN RECOMMENDATIONS

Taking an inclusive design approach to the design of the IIS meant that users with disabilities needed to be involved and considered from the beginning of the process. The Emoti-Chair was originally designed for Deaf users [see 14] and having users with motoric disabilities respond to the Emoti-Chair as a possible output system for the IIS continued the process of inclusive design. It is also important to ensure that inclusive practices are used for the remainder of the system. In the focus group, participants were asked to examine the IIS and respond to the system interface, hardware and cybersex scenarios in order to make recommendations for future designs. In addition, they were asked to imagine how they could use the IIS to satisfy their own intimacy and sexuality needs.

Sexuality, cybersex and intimacy can be a difficult and sensitive topic to discuss. Combining this topic with the common attitudes and mitigating issues that were expressed by a majority of the focus group participants provided an opportunity to understand them from the point of view of individuals and with respect to the specific design considerations of the IIS. While there is considerable literature regarding the issues surrounding sexuality and PWD, how technology can overcome some of these issues and specific design recommendations for technology-mediated sex and intimacy remains limited.

As a result of the focus group data, the design recommendations which provide future directions for the IIS and could be considerations for other inclusively designed, technology-mediate solutions are:

1) Independent operations and agency are necessary so that PWD can independently control the environment and their actions within that environment.

2) Curatorial flexibility is a priority so that bodies and features do not have or require standard forms and can be modified (e.g., musculature, appearance, modes of movement, etc.). Pre-conceptions of beauty should not be imposed by the system.

3) Add features such as temperature and more realistic graphics to increase realism and intensity. These features should be harmonized with the tactile display.

6 LIMITATIONS

The topic, the group setting and the exploratory nature of the study restricted the number of people willing to participate. As a result, we can only report participant reactions as an early case study without allowing for generalizations regarding attitude or interest in using IIS. However, participants did seem to express some commonly held beliefs, attitudes and desires as well as unique ones that can informed further development of IIS. In addition, there was only one male in the group which is not representative of the population. Gender differences in expressions of intimacy/cybersex needs and attitudes towards virtual environments are well known and having a mixed-gender group may have caused discomfort and withholding of opinions. Future studies could attempt to have single gender groups as well as mixed groups in an attempt to moderate this effect. Ensuring that non-normative gender perspectives, people with a variety of disabilities including multiple disabilities, and older adults are also actively sought could help to ensure that a broad range of perspectives are included. In addition, it may be beneficial to interview individuals rather than discuss the topic of intimacy and cybersex in a group.

As there were only four participants, there was a limited range of experience with sex/intimacy, in general, and virtual worlds, and cybersex, in particular. Some of the comments and discussion evolved from the novelty and inexperience of individuals. However, this commentary is important as the inexperienced user with disabilities will likely be a common user type in the IIS. Provisions and support for this user type is thus critical to the success of IIS. However, more participants, particularly those with more experience with cybersex would allow a broader range of comments and discussion and would bring a longitudinal perspective. Further studies seeking those with longer term cybersex experience are planned.

Finally, a major limitation is the use of short duration scenarios rather than allowing full exploration of the IIS environment. A next step in the development of IIS is to allow users to freely experience it. However, this first step offered important design insights so that the system could be improved.

7   CONCLUSION

Attitudes towards sex and disability seem to suggest that it is an important aspect of people's lives but a negative connotation and assumptions by others towards PWD can prevent individuals from realizing their full sexual desires, fantasies and expressions. Regarding attitudes towards the cybersex and the IIS interface, positive and negative aspects were identified. Positive aspects included being able to explore sexuality in a safe space, realize fantasies, and have independent control without caregivers. Some negative evaluations of the IIS associated with the diminished realism or cartoonish quality of visuals appear to be optimistically mitigated by anticipation that improved graphics processing capabilities are on the horizon. They can see where this is going and expect that an IIS system will become more effective when able to incorporate these improvements. Such improvements could include more visual and auditory realism, adding emotions and tactile stimulation to the experience, and being inclusive as a default position.

8   ACKNOWLEDGMENTS

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