Design, Develop, and Evaluate a Collaborative Serious Game to Enhance 18-24-year-olds' Sexual Communication and Negotiation Skills on Safer Sex and Condom Use

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Abstract

The aims of this study are threefold. First, the study aims to understand the main reasons that stop 18-24-year-olds from communicating condom use and safer sex. Based on findings supported by empirical studies in the literature and interviews with sexual health researchers in Canada, this study describes how a collaborative serious game integrates the principles of serious games with practices of safer sexual communication and negotiation. Finally, it includes an analysis of how 18- to 24-year-olds report practicing safer sexual communication and negotiation skills through participation in the collaborative serious game and what insights (a) 18-24-year-old participants and (b) sexual health experts share about the game that can inform future design iterations of this game. Forty participants aged 18-24 played the game and reported enhanced communication and language skills, raised awareness and reduced stigma around safer sex communication and condom use. The potential of the game in enhancing the participants' language skills (i.e., learning the language such as words, phrases, expressions) of communication and negotiation showed the highest frequency. Language skills and communications skills together comprised 28.5% of the overall feedback. The second most frequent theme was about the efficiency of the game in normalizing conversations around sex and condom use and removing the awkwardness around such topics. The game seemed to allow participants to practice dialogue and scenarios that extend beyond what they experienced in formal sex education in school. Participants also provided a range of recommendations for the next iteration of the game. To design the serious game, I followed a process of Design-Based Research (DBR) (Anderson & Shattuck, 2012) model and followed the four phases of DBR proposed by Reeves (2006). The study's findings aid other researchers in the field and offer insights to enhance sexual health education. With the increasing STIs in Canada, COVID-19's

impact, and young people's reliance on online resources for answers, this research is timely. Moreover, the study contributes to the scarce research on collaborative serious games to improve 18-24-year-olds' sexual communication and negotiation skills. Limitations and implications of the design and of the game, as experienced by participants are discussed.

Keywords: safer sex communication, condom use, collaborative serious games, 18-24-year-olds, qualitative study

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Chapter 1: Introduction

Sexual communication between sexual partners has been found to predict condom use and safer sex among adolescents and young adults (Widman et al., 2014). Evidence suggests that when young people aged 12-23 can communicate and negotiate about condom use and safer sex, they are more likely to have safer sex. One way to practice communication and negotiation strategies is through simulated situations in educational video games, also called Serious Games (SGs). Although SGs have been widely used to teach various sexual health issues (Arnab et al., 2013; Fiellin et al., 2017), to date there does not seem to be any research on designing and evaluating a Serious Game with a focus on sexual communication and negotiation strategies in dyadic contexts.

What is a Serious Game?

Various definitions have been proposed for the concept of Serious Games. Serious Games were originally defined by Clark C. Abt (1975) as games that have "an explicit and carefully thought-out educational purpose and are not intended to be played primarily for amusement" (p. 9). In this study, SGs refer to "a mental contest, played with a computer in accordance with specific rules, that uses entertainment, to further government or corporate training, education, health, public policy, and strategic communication objectives" (Zyda, 2005, p. 26). Collaboration is defined as "a coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem" (Roschelle & Teasley, 1995, p. 70). The concept of a collaborative SG is emphasised in this study because for a SG to be similar to the dyadic nature of sex, the game has to involve collaboration in decision making. Safer sex in this study refers to sexual activities which reduce the risk of contracting the

human immunodeficiency virus (HIV) or other sexually transmitted infections and include non-penetrative as well as penetrative sex with a condom (Richardson, 1990). Given the increasing rate of STIs in Canada (Public Health Agency of Canada, 2017), lack of digital interventions for sexual communication, and the tendency of 18-24-year-olds to use online resources to answer their questions (Charest & Kleinplatz, 2021), this study reports on the design and evaluation of a collaborative serious game in which 18-24-year-olds practice communications skills known to predict safer sexual decision making (Widman et al., 2016). To ensure clarity and understanding of the terminology used in this study, a comprehensive list of all keywords and terms is provided in Table 1, along with their definitions.

Table 1
Definition of Terms and Keywords

Term	Definition
Serious Game	A mental contest, played with a computer in accordance with specific rules, that uses entertainment, to further government or corporate training, education, health, public policy, and strategic communication objectives (Zyda, 2005).
Collaborative Learning	A coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem (Roschelle and Teasley, 1995).
Collaborative Serious Games	Combination of single player games (fun, narration, immersion, graphics, sound), multiplayer games (concurrent gaming, interaction) Serious Game design (inclusion of learning content, adaptation & personalization) and collaborative learning (communication and social skills) (Wendel et al., 2013).
Safer sex	Safer sex in this study refers to sexual activities which reduce the risk of contracting the human immunodeficiency virus (HIV) or other sexually transmitted infections and include non-penetrative as well as penetrative sex with a condom (Richardson, 1990).
Sexual Communication	Sexual communication is the means by which individuals come to select potential partners for sexual relations, and through which the meanings, functions, and effects of sexual relations are negotiated (Metts & Spitzberg, 1996).
Sexual Negotiation	The process of discussing and reaching agreements on sexual activities with a sexual partner (Davies & Weatherburn, 1991).
Sexual Language skills	In this study sexual language skills refer to the ability to use appropriate and effective language including words, phrases, and expressions to communicate about sexual topics with a partner.

Fun & Engagement in Games	An activity that gives us enjoyment and pleasure and gives us doing (Prensky, 2001).
Debriefing	A phase to make a connection between experiences gained from playing the game and experiences in real-life situations (Peters & Vissers, 2004).
Sex Positive	Sex-positive approach emphasizes the pleasurable, rewarding, and nonprocreative aspects of sex (Williams, et al., 2013).
Transferability	The extent to which the measured effectiveness of an applicable intervention could be achieved in another setting (Wang, et al., 2006).
Agency	The satisfying power to take meaningful action and see the results of our decisions and choices (Murray, 1997)

The Target Audience of the Game

Several factors should be considered when deciding on the right age group for a specific sexual health education topic. First of all, Canadian adolescents typically begin dating around ages 12 to 14 and twenty-seven percent of teens are sexually active at a mean age of 15 years (Frappier et al., 2008; Smith et al., 2022). However, since any likelihood of marriage is a decade or more away for most 12- to 14-year-olds, adolescents view the early years of dating as primarily recreational (Sawyer et al., 2018). In emerging adulthood (18-24), dating is more likely to take place in couples, and the focus is less on recreation and more on exploring the potential for emotional and physical intimacy (Arnett, 2000). Romantic relationships in emerging adulthood last longer than in adolescence, are more likely to include sexual intercourse, and may include cohabitation (Collins, 2003). Thus, as explorations in romance in emerging adulthood tend to involve a deeper level of intimacy, emerging adulthood (18-24) is a critical period and requires a particular sexual health attention.

Secondly, risky behaviours like unprotected sex and having multiple partners increase as adolescents grow. According to the 2015/2016 Canadian Community Health Survey (CCHS) (Rotermann & McKay, 2020), about 2.2 million 15- to 24-year-olds in Canada (or more than

half, 54.1%) reported having had sexual intercourse (vaginal or anal) in the past 12 months. Overall, 59.6% of survey respondents reported ever having had sex, but for some it was not in the past 12 months. Among those aged 20 to 24, 78.3% reported that they had experienced intercourse, which is higher than the percentages for 18- to 19- (57.6%) and 15- to 17-year-olds (23.3%). The likelihood of having had intercourse in the past 12 months also increased with age. At ages 20 to 24, 71.5% of survey respondents reported having had sex in the past 12 months, compared to 52.4% of 18- to 19-year-olds and 20.6% of those aged 15 to 17. Also, the likelihood of using a condom decreased with age, from 79.9% among 15- to 17-year-olds to 55.1% among 20- to 24- year-olds. These numbers suggest that as young people get older, they are less likely to use a condom, which explains the high rates of STIs for the age group of 18-24 (Public Health Agency of Canada, 2018). Together, this evidence suggests that 18-24-year-olds may benefit from sexual health education.

Further, it is vital that we understand the trajectories of sexual risk behavior for different demographic groups. For example, in the 2003 Youth Risk Behavior Surveillance System high school survey, African American students were found to be more likely to have had sexual intercourse and to report a greater number of sexual partners, yet were more likely to have used a condom during last sexual intercourse, compared with White students. Fergus, Zimmerman and Caldwell (2007) found that African American youth engaged in more sexual risk behavior in ninth grade compared with White students, which suggests that African American youth may also experience an earlier sexual initiation than their White peers. The researchers found, however, that White students had a faster rate of growth in sexual risk behavior during high school than did Africa Americans, leading to their eventual surpassing of African American youth by the time they reached young adulthood. Studies in Canada have also shown that

different factors such as religion (Nzioka, 2001) culture (Omordion et al., 2007) and race (Clarke, 2010) affect Canadians' sexual behaviours, their initiation, their frequency and their rate of growth or change. Therefore, this variability should be viewed as falling along a spectrum of sexual behaviour, including risky behaviour, through adolescence into young adulthood.

Given (a) the wide social and cultural diversity of the Canadian youth population (Statistics Canada, 2019), (b) evidence that condom use decreases as teens grow into young adults (Bolton et al., 2010) and (c) the prevalence of STIs among young adults, the focus population of this study is 18-24-year-olds. There are three reasons for this choice. First, the decrease in condom use and rise of STIs for young people aged 18-24 indicates that there may be a health benefit to an educational intervention that supports safer sexual decision making. Second, we can assume there is a variety of sexual experience at this age that may be explained, in part, by different life experiences and different social or cultural determinants of sexual behaviours. Although the complex social and cultural determinants of sexual behaviours are not the focus of the current study, previous research provides a strong foundation for this assumption (Flynn et al., 2010). Plus, as the meta-analysis by Widman et al (2014) shows, communication about condom use with sexual partners seems to be a strong predictor of condom use. Third, 18-24-year-olds have legally reached the age of maturity (18-year-old) and can therefore consent to participation in a serious game focused on sexual health. Given that this study develops and evaluates a serious game, the ethical choice for this work was to develop the game for 18-24 year-olds who could legally consent to participate. Given the sensitive nature of the topic, it was decided to learn first from these young adults' insights through the initial design based cycle of research.

The study by Widman et al. (2014) includes younger adolescents, older adolescents and adults – and although it would have been ideal to include younger participants to participate as well, ethical and logistical constraints (e.g., a global pandemic, restrictions on research in schools due to the pandemic, plus the sensitive nature of the topic) meant that I invited only 18-24-year-olds who could, themselves, consent to participate in the research study. Although there are many other variables that contribute to the decisions of older adolescents and young adults to stop using condoms, sexual communication about condom use is among the predictors.

Purpose of the Study and Research Question

Previous literature has demonstrated that increased levels of declarative knowledge like facts, names, lists and organised discourses (Smith & Ragan, 1993) do not automatically lead to changes in attitudes or behaviour (Abel & Fitzgerald, 2006; Davies & Weatherburn, 1991; Vaughan et al. 2000). Skill acquisition, particularly of sexual communication and negotiation skills, is the most vital element in successful sexual health interventions (Johnson et al., 2002; Johnson et al., 2015; Pedlow & Carey, 2004; Robin et al., 2004; Walters & Laverty, 2022; Widman et al., 2016) and can address the needs of 18-24-year-olds in Canada (Charest & Kleinplatz, 2021; Walters & Laverty, 2022). Sexual health researchers and educators suggest that high quality prevention programs should include communication training (Johnson et al., 2015; Metts & Fitzpatrick, 1992;). Games and serious games, in particular, have been shown to be effective in developing communications skills and changing attitudes (Bogost, 2008; Gee, 2007; Shaffer, 2005), which means there may be a way to support the development of sexual communication skills through games. Collaborative serious games, in particular, have been applied with good learning impact to different subjects and skills including the development of communicative skills (Fu et al., 2009; Grossard et al., 2017). However, to date, I am aware of no

collaborative serious game designed with a focus on safer-sex practices that promotes safer sexual activities, communication and negotiation, and condom use.

The increasing rate of STIs among 18-24-year-olds in Canada (Haddad et al., 2019) warrants new research focused on solutions. Given the pervasive presence of digital technologies in the lives of 18-24-year-olds (Wavrock et al., 2021) and the potential of serious games to support communications skills, the current study explores both what it takes to design a serious game focused on healthy sexual decision making and on how 18-24-year-olds who play the game evaluate its strengths and limitations. The purposes of this thesis are therefore to (a) design a collaborative serious game to develop 18-24-year-olds' safer sexual communication skills and (b) to understand the players' experiences of the game. The research is guided by two questions:

- How does a collaborative serious game integrate the principles of serious games with practices of safer sexual negotiation?
- How do 18- to 24-year-olds report practicing safer sexual communication and negotiation skills through participation in the collaborative serious game and what insights do (a) 18-24-year-old participants and (b) sexual health experts share about the game that can inform future design iterations of this game?

This doctoral thesis starts with a description of the context of the study. In this section I discuss the findings and current situation in Canada in terms of STIs and condom use. In the literature review section, I explain key concepts and connect them to previous relevant works. Next, I identify the gaps in the literature to which the study responds. After stating the research questions, I present the theoretical and epistemological perspectives undergirding this study, outline the study's design, and explain the methods of data collection and analysis. I continue with results, discussion, and conclusions of this research.

Current Data on Sexually Transmitted Infection

Sexually transmitted infections (STIs) pose a significant risk to the health and well-being of 18-24-year-old Canadians (Choudhri et al., 2018; Public Health Agency of Canada, 2017). In Canada, STIs continue to be on the rise (Haddad et al., 2019). A look at the current situation in Ontario regarding the rate of condom use, STIs, and unintended pregnancy shows the necessity and importance of these topics to be addressed. Regarding STI rates, data from one study in Ontario on different age groups within 15 – 60+ show that infectious syphilis has increased 50% from 2010 to 2015 and chlamydia has increased 17% (Choudhri et al., 2018). Three age cohorts (20 – 24, 25–29 and 30–39) had the highest rate of infectious syphilis among both males and females. Likewise, most cases and the highest rates of chlamydia were found among those 15-29 years of age however, rates were increasing faster over time as age increases. (Public Health Agency of Canada, 2017). Most cases of gonorrhea were found among those 20-29 years of age which corresponded to the highest rates reported (Public Health Agency of Canada, 2017). Among 18-24-year-olds and adults, there was a 188.8% increase in rate of congenital syphilis cases and reported rates of gonococcal infections in 2018 were highest in the 20- to 24-year age group (Public Health Agency of Canada, 2018).

Lower rate of condom use in 18-24-year-olds can partly explain the higher rate of STIs in this age group. Data from Statistics Canada (2009) show that 32% of young adults between the ages of 15 and 24 had not used condoms during the last time they had intercourse. A more recent study published in 2022 shows 35% of people aged 18-24 never used condoms in their 10 most recent experiences of intercourse (Fetner et al., 2020). There are likely many reasons for this – including the fact that at this age, the contraceptive pill is more often used as contraception among 18-24 year-olds who are in a committed relationship (Bolton & Mckay, 2010).

Access to sexual health services

Gilbert et al. (2020) assessed COVID-19 pandemic impacts on accessing needed sexual health services, and acceptability of alternative service delivery models, among sexual health service clients in British Columbia, Canada. They surveyed 1,198 respondents with the median age of 32 years and reported 706 (59%) needing any sexual health service since March 2020; of these 706 survey participants, 365 (52%) did not access needed services and 458 (66%) had avoided or delayed accessing services. Such evidence, which suggests a decline in access to contraceptives, STI testing, abortion and other reproductive services across the country, further reinforces the importance of promoting alternative sexual behaviours such as outercourse practices and protecting themselves from STIs.

Sexual Health Education

Approaches to sexual health education that focus on the provision of information and facts may not lead to practical outcomes (Allen, 2001; Abel & Fitzgerald, 2006). These programs may increase adolescents' and young adults' scientific knowledge or declarative knowledge (Anderson, 1982) about sexuality, but leaves them with gaps between what they know, and what they apply in their real life (Abel & Fitzgerald, 2006). Declarative knowledge is a sort of knowledge that could be defined as 'knowing-what'. This type of knowledge includes facts, theories, and names (Anderson, 1982). Levels of declarative sexual knowledge among adolescents and young adults has increased in Canada (Kumar et al., 2013), but the 2,561 new HIV diagnoses in Canada of which 24.8% being among male and 16.7% among female within the age group of 20-29 (Haddad et al., 2019) suggest that raising declarative knowledge is not enough to enhance safer-sex practices. In Canada, Milhausen et al. (2013) collected data from 653 Canadian university students between December 2012 and January 2013 and reported that

rates of condom use are low among Canadian university students and that many students are likely at high risk for STIs. In 2020, only around 30% of 18-24-year-olds reported that they always used condoms in their past 10 intercourse experiences (Fetner et al., 2020). The persistence of high rates of STIs, low condom usage rates, and high-risk behaviors among Canadian university students and 18-24-year-olds in general, despite increased levels of declarative sexual knowledge, points to the need for more comprehensive sexual health education programs that focus on practical application and behavior change.

Sexual communication has been increasingly recognized in health behavior theories as a predictor of condom use behavior (Noar, 2007). The empirical literature largely supports the association between partner sexual communication and condom use (Noar et al., 2006; Sheeran et al., 1999; Widman et al., 2014). Sexual communication for adolescents and young adults is getting more attention and many sexual health intervention programs for youth between 12-24 have been focusing on communication skill building as key program components (Noar, 2007; Widman et al., 2016). Among the topics that partners can discuss before sex, such as talking about past sexual partners or STIs history, evidence suggests that talking about condom use before intercourse is a better indicator of condom use during sex (Widman, et al., 2014). Noar et al. (2002) surveyed 625 university students aged 18-22 and proposed that the most effective training for young adults is to practice negotiation on condom use. For example, 18-24-year-olds need to talk about when is the best time to talk about using a condom and learn practical strategies for having those conversations with a sexual partner. Although this is an evidence-based practice and has been recommended as an important strategy for supporting behavioural change (e.g., Mackay, 2004) it is not clear that opportunities to practice the negotiation of condom use occurs universally in mandatory sexual health education classes in Ontario (Wood et

al., 2021). After school, recent evidence suggests that most adolescents and young adults aged 18-24 may be getting their information about sex from pornography or from websites that may or may not provide information about how to communicate in healthy ways with their sexual partners (Charest & Kleinplatz, 2021). For older adolescents and young adults aged 18-24, an openly accessible serious game designed to support sexual communication strategies might be of value, particularly since they already may be using the Internet for information about sex.

Serious Games and Sexual Health Negotiation

The potential of Serious Games (SGs) for creating collaboration and competition and for offering a virtual world where players can interact with other players or virtual characters can develop players' communication skills (Bogost, 2008; Gee, 2007; Romero et al., 2015; Shaffer, 2005). Games can offer a pleasurable environment in which learning happens through doing, collaboration, and experience (Salen & Tekinbaş, 2008). In these games, players are encouraged to take risks, explore and try new things in a safe environment. Given the effectiveness of learning and developing skills through games in other areas of healthcare such as childhood obesity (Dias et al., 2016), dengue fever prevention (Buchinger & da Silva Hounsell, 2014) health behaviour change (Baranowski et al., 2008) and autism (Grossard et al., 2017), it is logical to hypothesize that serious games have the potential to support sexual health skills development as part of a comprehensive approach to sex education (Clarke et al., 2012). Several studies have been conducted to explore the efficiency of SGs on sexual behaviors of adolescents and young adults (Brown et al., 2013; Chu et al., 2015; Fiellin et al., 2017; Hieftje et al, 2016). The results range from showing that SGs are effective in increasing sexual knowledge (Chu et al., 2015) to delaying initiation of sexual activities (Downs et al., 2004). Although safer sex practices require communication and negotiation between two partners (Noar, 2006), most SGs designed to teach

safer sex focus on a single player (e.g., Chu, 2015; Downs et al., 2004). These games may increase knowledges, but in practice, as successful sexuality education programs have shown, adolescents and young adults need to learn how to communicate and negotiate about sex (Widman et al., 2016). Single player games that do not equip players to negotiate choices with a partner, communicate preferences, or to navigate complex topics such as consent may therefore be of little use in changing behaviours—even if they increase knowledge. Collaborative educational environments, on the other hand, in which all the participants work together as a team to maximize the team's utility and share the outcomes (Zagal et al., 2006) have been shown to support development of collaborative skills (e.g., Hannig et al., 2012). However, there does not seem to be any collaborative SG for sexual health education.

Although digital interventions have been designed for smart phones, and computers to promote sexual health education around the world (Clarke et al., 2012; Guse et al., 2012; Peskin et al., 2014; Widman et al., 2016), there seems to be a research gap on this issue in Canada. Searching the keywords of canad* AND "sexual health" AND "digital intervention" OR "computer-based intervention" OR "digital games" OR "serious games" in Canadian journals such as the Canadian Journal of Public Health and Canadian Journal of Human Sexuality did not return any studies focusing on digital interventions for safer sex negotiation in Canada. In the context of SGs, I found no study of that focused specifically on helping 18-24-year-olds to learn the essential collaborative skills necessary for promoting sexual negotiation skills. In this study, I therefore designed a collaborative serious game to address this important educational need.

Chapter 2: Review of Literature

To understand how collaborative serious games can prepare 18-24-year-olds to use gain sexual communication skills, literature in a variety of domains needs to be considered. First, I discuss the gap between sexual knowledge and practice and the importance of communication in condom use and the current situation in Canada regarding condom use. Understanding the concept of game is significant as serious games are built on the potentials and principles of games. Because it is of central importance to this study, I also review the literature on serious games in sexual health education. Importantly, I discuss collaboration in the context of serious games, paying particular attention to sexual health with an example of a collaborative serious game. Game design frameworks and models for serious game design are reviewed and discussed with elaboration on their limitations for the design of the game in this study.

Sexual Knowledge/Practice Gap

Since the emergence of sexuality education, there has been growing concern about the extent to which adolescents and young adults put their learning into practice in real world contexts (Allen, 2001). Safer sexual outcomes do not seem to be enhanced by the provision of declarative knowledge alone (Abel & Fitzgerald, 2006; Helweg-Larsen & Collins, 1994). Studies that have explored different sexual health education programs have shown this gap. Abel and Fitzgerald (2006) studied the effectiveness of a programme in New Zealand that focused on negative consequences of sexual intercourse and found that although this program educated its participants about condom use, it was not successful in enhancing communication skills. Further, the study did not consider the contexts in which sex happened.

In theory, it is thought that information-based sex education should equip individuals with the tools to decide whether to practise safer sex or not. However, Allen (2001), after

conducting a mixed-method study about how young adults (aged 17-19) conceptualised sexual knowledge, reported that they privilege the knowledge obtained from practice over knowledge gained from sources like sexuality education, which leads to sexuality education messages being disregarded. The practical difficulties of operationalising sexually safe decision making in real life is extremely complex. Even the intention of having a safer sexual practice is not always predictive of behaviour (Noar & Willoughby, 2012). Substance use, passion, trusting that their partner is safe, the type of relationship (committed or one-night stand), and preferences of their partners were reported to be deciding factors in condom use. Manning et al. (2009) found evidence of direct connection between the quality of the relationship (self- disclosure, feelings of enmeshment and love, and relationship salience) and higher sexual risk of not using condoms consistently. This finding was explained by the ways that people do not consider previous sexual interactions and ignore the probability of having STIs from their past relationships. The fact that both partners are involved, makes decision making more complex (Moore et al., 1996). The context of the situation and the nature of the relationship (committed dating versus a hook-up) affect safer sex communication and negotiation abilities (Aggleton et al., 1998). Milhausen et al. (2013) surveyed 653 Canadian university students and reported that female students in a more committed relationship had lower odds of condom use compared to females in a hook-up sort of relationship which puts them (women in a more committed relationship) at a higher risk of STI contraction due to lower rate of condom use.

For 18-24-year-olds, this evidence shows that a constellation of factors contributes to decisions about whether to use a condom or not with a sexual partner. In the next section, I review evidence of condom use in the Canadian population in various types of relationships, including committed relationships.

Condom Use in Canada

Despite growing concerns about the rise in sexually transmitted infections (STIs), general incidence of condom use is low among adults in Canada (Milhausen et al., 2013). In his study of condom use in Canada, Milhausen et al. (2013) found that just under a half (47.2%) of 653 participants (18- to 24-year-old university students) reported using a condom during their last penile-vaginal sexual encounter. They also found that Canadian university students (18- to 24-years-old) report that pregnancy prevention is the most frequently cited reason for using condoms. This suggests that pregnancy may be more impactful than the risk of contracting an STI on condom use decision-making. In another study, Bolton and McKay (2010) found that condom use drops when women in dating relationships begin using oral contraceptives. Pregnancy risk among women in dating relationships is a greater concern than STIs, at least in part because there is an assumption of monogamy, which plays an important role in young women's decision to discontinue using condoms (Fetner et al., 2020). Fetner et al. (2020) surveyed a very diverse group of 400,000 participants to understand condom use in penile-vaginal sexual intercourse among adults over the age of 18 in Canada. Although a large majority (87%) rated their sexual health as good, very good, or excellent, a large number of respondents in all age groups reported zero condom use over the past 10 times engaging in penile-vaginal intercourse. On average, participants used condoms 3 out of 10 times, with men having higher rates of use (3.5) than women (2.5). Older age groups are increasingly likely to report never using condoms, relative to younger groups. In the age group of 18-24, around 30% reported that they always used condoms in their past 10 times of intercourse experience, close to 40% said they sometimes used condoms and around 35% said they never did. They also reported that those who used other forms of contraception were less likely to use condoms than those without other

forms of contraception. Single people, whether dating or not dating, are both more likely to use condoms and to use them more frequently than people who are married or living together in a relationship. Most participants (82%) believed they have no risk of contracting a sexually transmitted infection in the next 6 months. They also reported that those with informal or formal sex education are significantly less likely to never use a condom than those who have had no lessons.

Despite the sexual health benefits of condom use (Stover et al., 2017), this review of the literature on condom use in Canada shows us that the rate of condom use among 18-24-year-olds is low, in part, because use of oral contraception may be perceived as all that is needed in a committed relationship. It seems there is a need for education among 18-24-year-olds about the fact that contraception for pregnancy prevention does not necessarily protect them from STIs. Further, it is important for 18-24-year-olds to know that being in a committed relationship is a predictor of not using condoms, and that the decision to go condom free should be made with full consideration of both partners' past exposure(s) to sexually transmitted infection.

Safer Sex Communication and Negotiation

Safer sex communication and negotiation on condom use has been shown to have the highest impact on the probability of condoms being used among adults and young adults (Allen et al., 2002; Noar et al., 2006; Sheeran et al., 1999). In a meta-analysis, Sheeran and colleagues (1999) studied more than 40 psychosocial predictors of condom use. Their findings support that social interaction and preparatory behaviors correlate more to condom use than other factors, including condom use intentions, knowledge, and attitudes. A second meta-analysis also confirmed the significant overall relationship between communication and condom use and

uncovered several elements that moderated this connection, including communication (Noar et al., 2006).

A more recent study about communication and condom use confirms previous studies and adds that consistent communication with sexual partners (at least once with every partner) can increase safer sexual behaviors (Saftner et al., 2019). Among 739 participants, almost 50% of sexually active Indigenous youth in Canada who reported consistent communication with their partners about STI prevention had greater odds of condom use (Saftner et al., 2019). There are also several studies showing that youth who report communication with their sexual partners have more consistent condom use (Amialchuk & Gerhardinger, 2015; Johnson et al., 2015; Kenyon et al., 2010; Salazar et al., 2004; Sales et al., 2012). These findings demonstrate an association between communication and condom use, with youth who engaged in more sexual communication with their dating partners reporting more condom use in their sexual encounters (Widman et al., 2014). This suggests that communicating with a sexual partner is a critical determinant of safer sexual behavior.

As noted previously, among the topics that partners can communicate about before sex, like talking about past sexual partners or STIs history, talking about condom use is a better indicator of condom use (Amialchuk & Gerhardinger, 2015; Widman et al., 2014). However, conversations about sexual issues are not always easy. Around 50% of adolescents and young adults report they have not discussed condoms or other important safer-sex topics with their partners (Ryan et al., 2007; Widman et al., 2014). These topics are sensitive and can be embarrassing for those who are in the first stages of learning how to develop and keep intimate relationships for the first time (Collins et al., 2009). Negotiating over sex can be in contradiction

with cultural norms for indirectness about sexual behaviors (Metts & Spitzberg, 1996; Tolman, 2005).

These results suggest that training that is specific to communication about condoms would help youth best (Widman et al., 2014). Discussion of how to bring up the topic of condoms, when to introduce the topic, and what condom negotiation strategies (Noar et al., 2002) used in response to pressure not to use condoms (Oncale & King, 2001) could be extremely useful topics in trainings (Widman et al., 2014). Constant condom use even in committed relationships needs training as well. The dyadic nature of sexual relationships requires cooperation or agreement between partners, which make inter-personal skills essential for youth negotiation training programs (Pedlow & Carey, 2004).

Communication between partners about condom use is the most highly correlated factor in association with condom use (Sheeran et al., 1999). Empirical evidence largely supports that partner communication may explain or mediate condom use-related behaviors (Salazar et al., 2004) which can lead to HIV and STI prevention. Sales et al. (2012) found that increased partner communication frequency partially mediated the effect of an individual-based HIV prevention intervention on increased proportion of condom use, as well as consistent condom use among African American females. Donné et al. (2018) exposed 24 college students to an educational safer sex video followed by a conversation on safer sex with a partner of their choice. They reported that this strategy significantly improved intentions to have safe sex and to discuss safe sex with a sexual partner and with friends.

The body of literature largely supports the impact of communication practice on safer sex behaviours and makes a clear correlation between sexual communication between dating partners and more condom use in sexual encounters, particularly when the topic of discussion is

about condom use. Considering the embarrassment and sensitivity connected to such topics, training that is specific to communicating about condoms is most needed. Games have recently attracted attention as effective interventions to educate safer sex practices through simulated experiences.

The Concept of Game

Games can be played in different forms and platforms on computers, game consoles, mobile phones, and also outside digital worlds without any physical objects such as cards, boards, dices, etc. Understanding digital games cannot happen without understanding the essence of games in general. In his book, *Homo Ludens*, Johan Huizinga (1938) describes play as the primary and necessary condition for the development of culture. He then offers several definitions of what playing is, including activities that are free, distinct from ordinary life as to locality, time, and demands. Playing with dolls, for example, is a playful activity that has no rules or time limitations. Games, however, have rules. Huizinga also claimed that games are connected with no material interest. Huizinga's key contribution made to game studies is the concept of the *magic circle*, which is the physical or mental space in which the given rules of a game apply. The magic circle gives meaning to the rules and goals of a game, which are meaningless outside of it. Roger Caillois echoes Huizinga's work and argues that games are either rules or make-believe, meaning it is accompanied by a special awareness of a free unreality (Caillois, 2001), for example when children role-play certain traits of another identity. By "free unreality", Caillois means that the players are aware that they are engaging in a fictional world, and that the rules and norms of the real world do not necessarily apply. This sense of "free unreality" allows players to explore new identities, experiment with different social roles, and engage in imaginative play. In his book 'Man, Play and Games' Caillois looks at two opposite

sides of games: Paidia and Ludus. Paidia is unstructured free play that is open to different ways of enjoying an activity. It can be playing with a toy or playing in a house made out of cardboard boxes. Ludus, on the other hand, has rules, limits, instruction, points, losers and winners. It is organised and has objectives. Recent researchers have also defined and explored games. McGonigal (2011) points out that all games share four similar elements: a goal, rules, a feedback system, and voluntary participation. Schell (2008) defines a game as "a problem-solving activity, approached with a playful attitude" (p. 47). The interactivity and engagement that games provide stimulates the mind to generate positive emotions and experiences (Chen, 2007), which holds great potential for learning. Salen and Zimmerman (2004) added an important element to the definition of games: it has a quantifiable result which clearly distinguishes games (Ludus) from free play (Paidia).

In recent years, researchers and educators have shown great interest in the potential of the use of serious games (Backlund & Hendrix, 2013; Gee, 2008; McGonigal, 2011; Shaffer, 2005). Gee (2008) argues that "good video games recruit good learning and that a game's design is inherently connected to designing good learning for players" (p.1). He argues that people primarily think and learn through experiences they have had, not through abstract calculations and generalizations. People store these experiences and use them to solve problems in new situations. Gee posits that video games offer players experiences and offer learning as a form of pleasure and mastery. Shaffer (2005) also states that video games present players with simulated worlds, which do not just try to build facts or isolated skills but embody particular social practices. He states that games bring together ways of knowing, ways of doing, ways of being, and ways of caring, the situated understandings, effective social practices, powerful identities, and shared values that make someone an expert (Shaffer, 2005, p. 8). In his book 'Persuasive

Games' Ian Bogost argues that video games can create a new form of persuasion and argumentation through blending rhetoric and procedure, which he calls procedural rhetoric: "the art of persuasion through rule-based representations and interactions rather than the spoken word, writing, images, or moving pictures" (2008, p.ix).

Green and Kaufman (2015) studied cognitive, social, emotional, and motivational effects of video games to support the idea that video games increase problem-solving skills, evaluate options, formulate plans, and consider changing strategies and/or goals before proceeding with an alternative plan, which are cognitive effects of video game playing. In terms of social effects of video games, they posited that online video games can encourage cooperation rather than competition. Regarding emotional effects, they found that video games have high *flow* effect because gamers get fully engaged in an intrinsically rewarding activity. Games keep players in their zone of proximal development, give them immediate and tangible feedback, and reward continual effort (Vygotsky, 1987).

Considering the potentials of play and game in creating experiential, simulated, and problem-solving learning environments and their cognitive, social, emotional, and motivational effects, video games can be exploited in a purposeful way to target educational content, commonly called Serious Games.

Serious Games

Interest in using games to educate, motivate, and change behavior has rapidly increased, and has been applied by civic leaders, health and human rights advocates, educators, gamers, and researchers (Ritterfeld et al., 2009). Ben Sawyer was one of the first scholars in the field who facilitated the use of games for learning and for attitude and behaviour change. The idea of using games to deal with serious matters has led to coining the term "Serious Game" (SG), first

introduced by Sawyer and Rejeski (2002). However, using games beyond entertainment made the term difficult to define: games, by nature, are fun and not serious (Newman, 2004). Sawyer defined Serious Games as “any meaningful use of computerized game/game industry resources whose chief mission is not entertainment” (Sawyer, 2007). Michael Zyda, a SG developer, had a similar definition: “A mental contest, played with a computer in accordance with specific rules, that uses entertainment, to further government or corporate training, education, health, public policy, and strategic communication objectives” (Zyda, 2005, p. 26). In practice, scholars often ignore this contradiction and focus on the advantage of serious games because although focused on serious topics, they can also be fun, engaging, purposeful, meaningful and at the same time educational (Ritterfeld et al., 2006). Serious Games have been applied in a wide variety of different fields including medicine (e.g., Beale et al., 2007; Roubidoux, 2005); military training (e.g., Schneider et al., 2005); education (e.g., De Jean et al., 1999; Habgood, 2007; Johnson & Wu, 2009; Nelson, 2007; Rankin et al., 2006; Squire et al., 2004), and language learning (e.g., Janebi Enayat & Haghighatpasand, 2019).

Connolly et al. (2012) examined 129 papers reporting empirical evidence about the educational effects of computer games and serious games. They revealed that playing computer games is linked to a range of perceptual, cognitive, behavioral, affective and motivational impacts and outcomes. The most frequently occurring outcomes and impacts were affective and motivational followed by knowledge acquisition/content understanding. Although the papers were limited by the time period of their publications (2004-2009), Boyle et al. (2016) updated the systematic review of Connolly et al. and found many more papers reporting empirical evidence of the positive outcomes of playing games (512) than the previous review (129) in similar outcomes.

In general, this body of evidence suggests that serious games can afford knowledge acquisition, content understanding and skill development. These outcomes are typically attributed to the designed gaming elements of serious games which, when done well, can be experienced as fun, engaging, purposeful, meaningful and motivational by those who play them. In education focused on health promotion and risk prevention, serious games may offer unique and promising benefits.

Sexual Health Serious Games

There has also been some research carried out in the realm of SGs for sexual health education. Arnab et al. (2013) designed a serious game called PR:EPARe (Positive Relationships: Eliminating Coercion and Pressure in Adolescent Relationships) to educate teenagers about the consequences of coercion and pressure in relationships. Intervention Mapping (Bartholomew et al., 1998) and Learning-Game mechanics (Lim et al., 2013) were used to design the game. The authors integrated explicit content and scenarios into the structure of the game facilitated by a teacher within a classroom setting. The consequential exploratory learning activities in gameplay support learning through communal discourse and debriefing. PR:EPARe is designed for teachers to role-play, discuss, and debrief topics of positive relationships and become better informed of students' coercive acts and pressures. The results demonstrated a significantly greater psychological preparation to coercive situations from both coercer and coerced perspectives for the game group over time. However, the efficiency of this game is highly dependent on the teacher's skill and knowledge in sexual health education.

PlayForward: Elm City Stories, developed by play2PREVENT®, is another videogame intervention designed to educate minority youth in schools to avoid engaging in behaviors that put them at higher risk for the human immunodeficiency virus (HIV) and other sexually

transmitted infections (Fiellin et al., 2017). Players (n=333, aged 11 to 14) in the game experienced how their choices would affect their future and then were able to go back in time and change their choices, creating different outcomes. The primary expected outcome was the delay of initiation of vaginal or anal intercourse at 12 months post-baseline. Secondary outcomes were sexual beliefs and attitudes towards condom use, sexual health knowledge about HIV/AIDS, STIs, drug use and risk behavior knowledge, and sexual intentions to have oral, anal, or vaginal sex in the next year, as well as their intention to be abstinent in the next year and their intention to use a condom if they did have sex in the next 3 months. Conducting a randomized controlled trial, outcomes were assessed at 6 weeks and at 3, 6, and 12 months after randomization and data were collected face-to-face by research staff. Overall, there were no differences in rates of delaying initiation of intercourse and in intentions to delay the initiation of intercourse in the PlayForward versus the control groups. However, over the 12-month follow up the PlayForward group demonstrated an increase in sexual health knowledge and improved more positive attitudes and willingness about condom use compared to the control group (Fiellin et al., 2017). The strong point of this study was that the intervention was built on a solid foundation of well-established theories of social learning theory, self-efficacy, message framing, and delay discounting but these theories apply most specifically to behavior change. Although it is meant to prepare the teenagers to engage in risky behaviors, it does not consider the dyadic nature of sexual relationships. This study did not offer a game design model, nor did it create a new one for their game design. The game was comprised of five minigames related to different skills and knowledge that players needed to engage in risky behaviours, but they did not mention the logic of the games from game design perspective or the game mechanics they used. Also, the minigames did not seem to be integrated well to form an enjoyable flow, which is the

distinguishing element of games compared to other digital interventions. In their evaluation, the authors did not measure and report the playability and enjoyment of playing the game, either. It is not clear whether this game could be modified for older teens and young adults, but their minigame model and findings offer promising directions for the design of a serious game that could meet the needs of older youth.

Ndulue (2021) developed a persuasive game (as defined by Ian Bogost) to educate African youth to abstain from sex, use condoms during sex and run occasional blood tests. The game was embedded in a story in which the players had to defeat 10 sexually transmitted diseases (STD) in 10 levels to free their entire clan from all 10 STDs. Each level contained important information about the defeated STD such as how they are transmitted, how to prevent them, their symptoms and how to manage or treat the infection if applicable. The game seemed to be heavily knowledge-based and similarly to other works, did not consider the complexity and dyadic essence of sexual interactions. However, in contrast to previous similar interventions that were unable to show significant positive growth in intention and attitudes of the players, the results of this study showed a significant positive change in STIs knowledge, attitude, intention, and self-efficacy of the participants against risky sexual behaviors after playing the game (Ndulue, 2021). It might originate from the fact that all the pre-post tests were taken before and after playing the game using self-report questionnaires rather than retrospective self-reports on what teenagers did or did not do during a particular post-game time frame.

Considering the fact that sexual health discussions are for safer sexual relationships and that these skills can be learned (Hargie, 2010), interpersonal activities such as role-plays, computer interventions, virtual decision-making, and mobile interventions are potential interventions to target interpersonal trainings for condom negotiations (Noar et al., 2010; Noar &

Willoughby, 2012). Technology-based interventions can be extremely well-matched for these purposes. Widman et al. (2016) developed ProjectHeartForGirls.com, a web-based, interactive sexual health program to promote sexual communication skill building alongside other key theoretical factors known to enhance safer sex practices. Although this is not considered as a game and is more of a digital intervention, it is the closest example for safer sexual communication practice through computers. In the communication skill building section of their intervention, the users could practice sexual communication and refusal skills, including negotiating abstinence, and condom use. They implemented this aim through a role-playing and feedback activity in which the participants practiced the desired communication skills by listening to a scenario, providing a response as if they were in the situation by recording their voice, playing back their response, and completing a self-feedback assessment (Widman et al., 2016). Although this activity tried to provide a practicing context for the players, it fell short in creating a dyadic environment for the users. Given the dyadic nature of sexual relationships, this feature seems to be vital in any virtual or face-to-face intervention to promote sexual communication. Collaborative video games are assumed to have the potential to provide this environment. However, there seems to be no digital interventions such as digital games, online programs or documents that specifically address this topic.

Designing SGs to motivate healthy sexual behavior change is increasingly attracting the attention of researchers in sexual health. Scenario based games like '*ProjectHeartForGirls.com'* can provide realistic and practical information that can develop real-life skills instead of declarative knowledge through providing facts. Although they are successful examples of SGs in sexual health, like many existing SGs they use a single-player mode. In order to enhance their efficacy, interpersonal communication needs to be integrated into the games.

As explained above, previous empirical studies have shown evidence for the important role of interpersonal communication in health effects (e.g., Frank et al., 2012; Van den Putte et al., 2011). Implementing interpersonal communication for safer sex communication in serious games and reflecting the dyadic nature of sexual relationships in a collaborative serious game is a strategy that has not been explored before. Collaborative SGs have shown to be effective by providing a more realistic context by considering the dyadic and complex elements involved in sexual interactions and interpersonal communications.

Collaborative Serious Games

Collaborative learning is currently being used in schools today in various forms, like joint problem solving in teams, debates, or other team activities. Roschelle and Teasley (1995) defined collaborative learning as "a coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem" (p. 70). Collaborative learning aims to make learners interact in particular ways to prompt certain learning mechanisms (Wendel et al., 2013). Forums, wikis, online chats and emails are tools that have been used to run collaborative learning activities with the help of internet and computers (Larusson & Alterman, 2009). In cooperation, on the other hand, "partners split the tasks, solve sub-tasks individually and then assemble the partial results into the final output" (Dillenbourg, 1999, p. 8). In educational contexts, "[a] learner is held accountable for his or her own learning and is motivated to increase the learning of others" (Olsen & Kagan, 1992, p. 8). In the gaming context, Massively Multiplayer Online Games (MMOG) have been used as tools to create collaborative learning contexts (Lee et al., 2005). Voulgari and Komis (2011) examined elements of MMOGs like integrated tasks, the interactions among players, the groups, the members' characteristics, and the environment. They argued that "features of MMOGs such as motivation,

collaboration, player-control, interaction with others, goal-oriented tasks, progress in the environment, individualized navigation based on the level of the player and his or her choices, very often come up as features of an effective collaborative learning environment" (p. 3).

In the field of education, game designers have mainly worked on single player games since the beginning of SGs (Buchinger et al., 2014; Costikyan, 1998; Liu et al. 2013; Wendel, et al., 2013). However, more recently some researchers have shifted the focus towards the interactions that can be built in SGs. Collaborative learning in SGs combines elements of single player games (fun, narration, immersion, graphics, sound), multiplayer games (concurrent gaming, interaction) Serious Game design (inclusion of learning content, adaptation & personalization) and collaborative learning (communication and social skills) (Wendel et al., 2013). In a study carried out by Fu et al. (2009), it was shown that collaborative activities in SGs seemed to bring about a stronger social presence (i.e., the sense of awareness of an interaction partner) and influence more synthetic abilities. Fifty percent of the students provided logical organization with good connection between ideas (assessed as ‘‘good"), while another 30% provided appropriate structure incorporating a variety of quality sources (assessed as ‘‘excellent"). In another study, Grossard et al. (2017) reviewed the literature on serious games that are used to teach social interactions to individuals with Autism spectrum disorder (ASD) and they found a total of 31 serious games, 15 of which targeted social skills. Seven games out of 15 mainly focused on collaborative skills like negotiation, turn taking, and planning together. These games forced the players to communicate and work together in order to finish the game. The players had to interact with each other in order to complete the tasks (Grossard et al., 2017). They reported that collaborative SGs can support training on many different skills and support interactions in diverse contexts and situations, some of which may resemble real life.

Collaborative games can promote communication skills like social presence, synthetic abilities, negotiation, turn taking, and planning. In the next section, an example of a collaborative serious game can show how such games work and how they can be exploited to resemble negotiation for safer sexual practices.

Escape from Wilson Island: A Multiplayer Collaborative Game

Wendel et al. (2013) presented an approach for designing and authoring multiplayer adventures for collaborative learning to promote social skills like teamwork, coordination, or communication. Four players had to work together to escape an island. Players could only escape together, not one player alone. Each player had one unique tool (axe, map, whistle, hunter's badge) enabling him/her to perform unique tasks in the game which other players could not perform. Some tasks were only solvable if players acted together: Felled palms could only be carried in team (dependent of the size, this required 2-3 players). Herons could only be hunted in team, as they had to be surrounded, which needed at least 2 players but was easier if more players took part in it. Players were also able to communicate with each other via an integrated chat. The results showed that players were able to play collaboratively in a multiplayer adventure, working together to solve the problems as a team. The players also reported enjoying the idea of playing collaboratively in a multiplayer adventure.

A similar scenario could be used for a collaborative SG situated in sexual relationships. Players could be given challenging situations in which they have to communicate to manage the situation safely. Some examples include but are not limited to situations in which none of the partners carries a condom, one of the partners has an STI, one of the partners is insisting on having unprotected sex, one or both of the partners are under the influence of alcohol or drugs, and the partners are in a committed relationship and are deciding on condom use. These

scenarios can be designed and practiced in both committed and one-night situations. The input from the experts about risky situations and relationships and reasons for unsafe sex will determine the scenarios and sorts of relationships. These dyadic challenges could potentially simulate the real-life settings in which both partners have to decide on the best strategy.

Designing a serious game that has collaborative elements and gaming functions for safer-sex negotiation seems feasible but needs a precise plan that follows a well-developed game design model. In the next section I explore three different game design models and conclude with the description of a game design model that is well conceptualised to align with the purpose of this study.

Game Design

Game design can be defined as the formal methods utilized in the specification and planning of a game's content and features (Gunter et al., 2008). The goal of these methods is to maintain enough intellectual control during the development process that an immersive and entertaining game is produced. In the literature, different game-specific methods have been described.

Gunter et al. (2008) developed The Relevance Embedding Translation Adaptation Immersion & Naturalization (RETAIN) model for serious game design and evaluation. This model can aid in the evaluation of how well academic content is immersed and embedded within the game's fantasy and story context. It also reportedly promotes transfer of knowledge and encourages repetitive usage so that content becomes available for use in an automatic way. The RETAIN model emphasises the integration of content and game, but the way to do that is not clearly explained in their study, making it difficult to implement with fidelity.

Amory (2007) proposed a theoretical framework, named GameObjectModel (GOM), for serious games design. It is based on interrelated components (objects) described as abstract interfaces (pedagogical and theoretical constructs) and concrete interfaces (design elements). The model is structured in five spaces: game space, visualisation space, elements space, actor space, and problem space. The main problem with this model is that it does not clearly describe the game and learning aspects of serious games (Arnab et al., 2015).

Arnab et al. (2015) developed Learning Mechanics-Game Mechanics (LM-GM) model. This model supports serious game analysis and design by allowing reflection on the various pedagogical and game elements in a serious game. They claim that these mechanics can help designers to draw the LM-GM map for a game, so as to identify and highlight its main pedagogical and entertainment features, and their interrelations. The LM-GM model aims to address the mismatch between game mechanics and educational components at the design and development level. Although this model can be used as a great toolset for designing serious games, it does not explain how learning material can be naturally and implicitly imbedded inside the game. Designing a game based on the LM-GM model may result in an entertaining game but with explicit learning content that may stop the flow of the game. Also, this model does not provide gaming mechanics for collaborative serious games.

Wendel et al. (2013) designed an approach to game design that integrated the requirements for cooperative working into a Serious Game for collaborative learning. They designed a series of concept ideas for collaborative serious games based on necessary elements for cooperative working proposed by Johnson and Johnson (1994) namely: positive interdependence, individual accountability, face-to-face promotive interaction, social skills, and group processing. They combined these elements with findings of previous works on

collaborative board game design (Zagal et al., 2006) and educational multiplayer videogames (Zea et al, 2009). They used their findings to design a collaborative serious game and observed high level of enjoyment in the players, increased collaborative problem solving and improved communication and social skills among the players. Although the findings of their game are promising, this model does not consider the factors involved in sexual negotiation like profitability, (i.e., wanting to benefit from the opportunity to get involved in a sexual interaction) sought in the interaction of the encounter that can hinder negotiation and collaboration. Among the models of game design described in the literature, only the Wendel et al. model offers a clear description of how to design a collaborative serious game grounded in evidence of dimensions that can support positive learning outcomes. I have adapted the Wendel et al. (2013) model to inform the design of the Conceptual Framework for the development of the serious game (see Chapter 3, p. 35)

In this review of literature, I covered topics such as discrepancy between sexual knowledge and behavior, condom use trends in Canada, importance of communication and negotiation for safer sex, the concept of games and serious games as tools for promoting sexual health, collaborative serious games for sexual education, and principles of game design in serious games for sexual health. Overall, the literature review suggests that serious games have the potential to improve sexual health outcomes by providing engaging and interactive ways to promote safer sex practices and increase sexual knowledge among individuals. The review highlights the need for further research to better understand the effectiveness of serious games in promoting sexual health and the importance of incorporating evidence-based strategies and game design principles into the development of these games.

Chapter 3: Methodological Framework

In this section, I describe my epistemological and axiological perspectives. Next, I explain how situated learning theory guides the design of this study. The conceptual model of collaborative serious game will be also elaborated in this chapter. Then, in the 'design of the study' section, the participants, the four phases of the study, the tools, and the data analysis approaches will be thoroughly described.

Researcher Epistemology

My goal is to gain knowledge about the effectiveness of serious games in educating about sexual health from a pragmatic standpoint, with the ultimate aim of uncovering the truth about their potential and efficiency. Pragmatism is a perspective that is based on action and change and their interactions underpin this research. In contrast to positivism that views knowledge as 'things' that exist in the world for us to discover and show and interpretivism that is more concerned with variables and factors with a subjective perspective (Alharahsheh & Pius, 2020), pragmatism views knowledge as the combination of reflection and action (Biesta, 2010; Dewey, 1931). Knowing and gaining knowledge does not happen inside the human mind but rather in an activity; thus, to know the world, we must interact with it and see how it responds to us (Dewey, 1931).

My axiological value in research resides in creation and practice. A useful research for me is the one that can improve and facilitate teaching and learning through innovative interventions. For me, I see a study is valuable when it is put into practice, in classrooms or as educational tools. In particular, I aim to understand how serious games can be designed to be used in practice, and to identify innovative ways serious games can boost the quality of sexual health education. I use a constructivist learning theory to guide the design and implementation of

an educational intervention. I use the results of each phase to plan and build the next phase. At the same time, I evaluate the intervention's effectiveness using a pragmatic approach, looking at the outcomes and measuring its impact. Beside a robust learning theory, a clear conceptual model is needed to provide the guideline for the design of a serious game.

Learning Theory

In this work, I draw from social constructivism and specifically situated learning (Lave & Wenger, 1991) for the design of a collaborative serious game as it emphasizes learning in authentic situations. Grounded in social constructivism principles, this thesis aims to create an intervention (i.e., a serious game) that encourages learning through the construction of socially negotiated practices. Based on social constructivism, learning is a "social process in which meaning is negotiated, goals emerge from social processes, and success is taken within context" (Young et al., 2000, p. 160). Acquisition of facts and skills does not result in learning in this perspective, but active participation in constructing meaning and understanding through experience. 'Play' in general, enables meaning construction (Vygotsky, 1978). Video games, as a form of play, have the potential to lead to active and critical learning (Gee, 2003). Video games can create everyday life experiences for players (Kebritchi, 2008). Such experiences create a context in which knowledge is built, not transmitted, as an outcome of experiencing and interacting with the environment (Kebritchi, 2008).

According to Lave and Wenger (1991), situated learning takes place when the learner practices learning in a certain environment with its social, physical, and cultural features. Situated learning enables the creation of situations or contexts where the learner can link their learning in the game world to their needs and interests in the real world (Yusoff et al., 2009). This theory is able to help the learners "develop mental models of their experience and relate it

to real life" (Yusoff et al., 2010, p. 10). Gee (2003) argues that games situate meaning in a multimodal space and enable the players to solve problems through embodied experiences. They can create realistic and challenging problems that can provide the opportunity to ground learning in reality (Chee, 2001). As Egenfeldt-Nielsen (2007) noted, ''In today's computer games you are part of a living, breathing, simulated universe with very concrete self-sustaining experiences– getting still closer to reality" (p. 125). Video games can create everyday life experiences for the players (Kebritchi, 2008). Such experiences create a context in which knowledge is built, not transmitted, as an outcome of experiencing and interacting with the environment (Kebritchi, 2008).

As a theoretical framework, situated learning is beneficial for this study because it enables the design of a serious game that can help learners to familiarize themselves with different sexual-related situations in different scenarios and to practice safer sexual negotiations. In this serious game, learning safer-sex negotiation and practices will occur using principles of situated learning and contextualised information through the design of scenario-based role-plays. Learners are encouraged to engage in social interactions, work collaboratively to construct knowledge, and apply their learning in resembled real-world scenarios to solve authentic problems. This approach emphasizes the practicality and utility of knowledge while recognizing the social and collaborative nature of learning.

Conceptual Model of a Collaborative Serious Game

As reviewed in the literature, a game design model with a specific focus on collaborative serious games for sexual health education does not seem to be available; therefore, I decided to adapt a model for the purpose of sexual communication. I found Wendel et al.'s (2013) model to have the potential for this goal and offer enough flexibility to add the sexual context. I adapted

Wendel et al.'s (2013) ideas and incorporated the following features into the game: common goal/success (players can only play together), heterogenous resources (each player has one personality character), collective tasks (tasks are only solvable if players act together:), communication (integrated chat box) and feedback. To add the sexual context, the General Model of Davies and Weatherburn (1991) was used because it proposes a combination of logically distinct factors for a sexual situation in real life. According to their General Model, sexual situations involve (a) two individuals (with their character, background, desires, and needs), (b) interaction, (c) a particular physical context and (d) a particular scenario. The General Model guided to simulate sexual situations in the game, the virtual context (instead of the physical context), the scenarios, characters with specific desires and needs, and the sorts of interactions. The Wendel et al. (2013) model provided the tools for a collaborative serious game.

To strengthen the feedback and communication components of the Wendel et al. model in the game, a debriefing session is added in which the participants share their experiences, learnings and questions with a sexual health expert after playing the game.

Debriefing

Debriefing sessions after playing a game are critical to providing a motivating and safe learning environment and is arguably the most important part of a game-based learning intervention (Crookall, 2010). Jones (1999) asserted that debriefing sessions are "teachable moments" that present in the Zone of Proximal Development (ZPD) to scaffold learning. Mistakes are appreciated as chances for growth through problem solving and debriefing (Jones, 1999). While debriefing sessions are not always an integral part of a game intervention, they can create great opportunities for players to build connections between game experiences and real-life situations (Jones, 1999).

To enhance the efficacy of the game and to exploit the schema that it creates, the game will be followed by debriefing sessions facilitated by a research assistant (RA) with a background in sexual health education. This does not mean that the game cannot be played without a debriefing session supported by a sexual health trainer or teacher. The debriefing will strengthen the feedback and communication aspects of the Collaborative Game Design Model (Wendel, 2013) and enhance the social aspect of the situated learning theory. Figure 1 illustrates the concept map of the proposed model. The outer gray circle is based on the General Model of Sexual Negotiation (Davies & Weatherburn, 1991). The virtual context, characters, scenarios and interaction provide the sexual context for collaborative activities to take place. The design of the core elements and content found in the center of the model is based on the work of Wendel (2013) and were iteratively designed using Design-Based Research (Anderson & Shattuck, 2012; Reeves, 2006).

Figure 1

Concept Map of the Collaborative Game in a Sexual Context

Design of the Study

To research the design of an intervention in ways informed by research on collaborative serious games and sexual health education, and to operationalize this concept map not merely as a digital product but also as a part of rigorous academic research, I followed standards of excellence in Design-Based Research (DBR) (Reeves, 2006). In design-based research, joint development of the theory (through consultation and revision with stakeholders and literature review), implementation of the intervention through formative evaluation, prototyping and cycles of design, summative evaluation of the effectiveness and reflection on the entire study to support retrospective analysis are essential parts of the approach, which also makes it a good methodological fit for a study focused on game development (Kester et al., 2007). In contrast to experimental research models like quasi-experimental designs and true experimental designs which mainly try to predict a phenomenon or explain its causation through controlling certain variables and manipulating others (Creswell, 2012), DBR "usually evolves through the creation and testing of prototypes, iterative refinement and continuous evolution of the design, as it is tested in authentic practice" (Anderson & Shattuck, 2012, p. 3). Design-based research (DBR) aims both to develop effective learning environments and use them in authentic settings in learning and teaching (Sandoval & Bell, 2004). Design experiments in authentic settings are carried out to find out what works in practice.

To design the serious game, I followed a process of Design-Based Research (DBR) (Anderson & Shattuck, 2012) model. The goal of design-based research is to adapt the intervention to make it work better in response to the challenges in education (Reinking & Bradley, 2008). Design-based research allows joint development of the theory, implementation of the intervention, and practice in the field of education (Kester et al., 2007). DBR is an inter-disciplinary research approach that serves both applied and theory-building purposes (Reimann,

2011). This approach encompasses a series of approaches aiming to produce new artifacts, theories, and practices that account for and potentially impact learning and teaching in authentic settings (Anderson & Shattuck, 2012). DBR aims both to develop effective learning environments and use them in authentic settings in learning and teaching (Sandoval & Bell, 2004). Design experiments in authentic settings are carried out to find out what works in practice.

Thus, DBR is a good fit for the design of a sexual negotiation serious game. Each cycle in DBR can guide the researcher to develop the game to result in a functional intervention. Researchers who focus on creating conditions that allow promising interventions to work are consistent with a pragmatic view (Reinking & Bradley, 2008). According to Cherryholmes (1992), to pragmatists, theories must do demonstrable work. They describe how "it is only [by] acting on our beliefs and observing the consequences that we would know whether our beliefs worked" (p. 15). Through this lens, the goal is to ensure the game serves a practical function in sexual education.

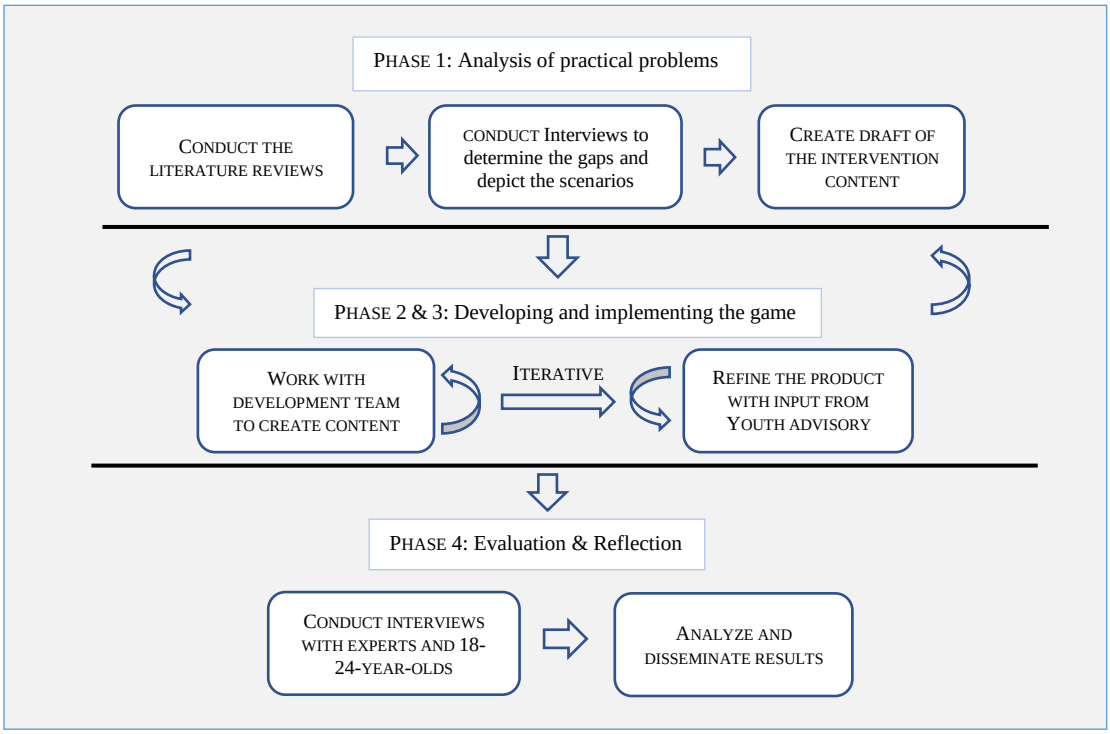
DBR in four phases

According to Reeves (2006) the procedure of DBR involves four sequential phases: (1) the analysis of practical problems using previous literature, shared experience of researchers and practitioners; (2) the development of solutions based on existing knowledge; (3) iterative cycles of testing and refinement of solutions; and (4) evaluation and reflection on the full research procedure that can result in both practical solutions and improved theoretical understandings that could be presented to researchers and practitioners. With regard to the third step, the game is refined and will be implemented again based on the results. This cycle happens several times to meet new needs and issues that emerge during the process (Gravemeijer & Cobb, 2006).

The research progressed through each of four DBR phases. In Phase 1, I conducted a literature review on the factors affecting condom use and negotiation on safer sex. The findings were validated through interviews with top-ranked sexual health researchers in Ontario, Canada. These experts grounded their commentary in their work in Canada and provided additional details to the literature findings by providing specific examples and cases. In the second phase, the prototype of the game was developed in collaboration with game developers, and sexual health experts. In Phase 3, the game was play-tested with the Youth Advisory Board. Their feedback was implemented in the development of the game. In the fourth phase, the game was evaluated by forty 18-24-year-olds and three sexual health experts. This phase is where I used focus group interviews to measure the impact of the game on the players' sexual negotiation skills and to answer the second research question. Phase 4 is followed by my reflection on the research procedure to enhance solution implementation, which is embedded in the discussion part. In the next section, the rationale and the description of each step is explained. Figure 2 shows the phases of the design-based research process that led to development of the serious game.

Figure 2

Intervention Development and Evaluation



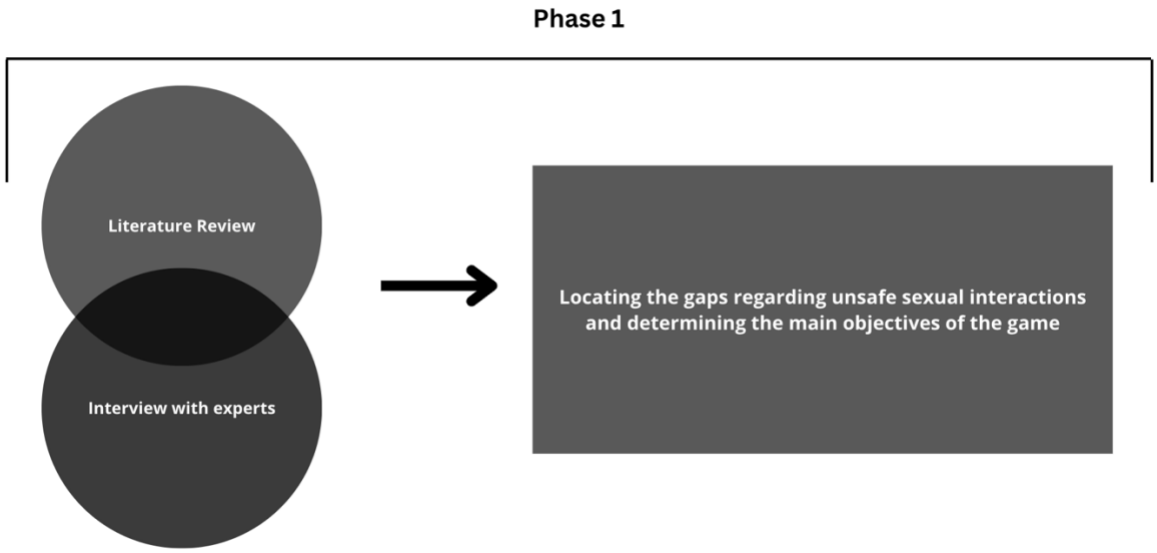
Phase 1: The Analysis of Practical Problems

Following the first step of DBR (Reeves, 2006), a review of literature, and semi-structured interviews with professional health experts were conducted to map out the main factors that lead to un-negotiated and unsafe sexual practices (Figure 3). An initial evidence review has shown the potential starting point for such a game (in the 'context' and 'literature review' sections) but the extensive review of literature helped to clarify reasons for unsafe sexual interactions within the context of Canada. Searches were performed in the following databases: Medline, EMBASE, PsycINFO, ProQuest, and Google Scholar. The Canadian Journal of Human Sexuality was searched separately to look for studies specifically conducted in Canada. Electronic database searches included Boolean searches of various combinations of the following keywords, including Medical Subject Headings (MeSH) terms: condom use, predictors of unprotected sex, determinants of unsafe sex. Searches were carried out by the principal

investigator (PI). Searches were restricted to include only peer-reviewed articles available in English and published between 2000 to 2022. Studies were included if they: (a) examined a predictor of unsafe sexual behaviors; (b) included adults and/or 18-24-year-old participants (c) did not focus on a specific group, gender, region, ethnicity or minority group. While carrying out literature searches, abstracts were reviewed, and full-text manuscripts were retrieved to determine whether inclusion criteria were met. Forty-eight studies were found relevant and were studied closely to develop a general picture of the predictors of unsafe behaviours (Findings presented in Chapter 4). Following the literature review, three expert participants helped to contextualize findings in relation to the context of Ontario, Canada. They also provided insight on (a) the challenging situations for 18-24-year-olds to negotiate over condom use, (b) safer sex and (c) the situations that have the highest chance of unprotected sex to happen. The experts' input informed the design and the scenarios of the game. Findings from the experts' input are reported in Chapter 4. Figure 3 shows the first phase of the study.

Figure 3

Phase 1: Literature Review and Interview with Experts



In alignment with the DBR design of the study, these sexual health experts were recruited as participants through Phase 1 to inform the overall analysis of practical problems (Reeves, 2006). Consultation with these experts was undertaken as an essential methodological engagement with stakeholders from sexual health into the study. Their contributions enabled me (the researcher) to map out a clear picture of the practical problems and needs of 18-24-year-olds in the context of Ontario (Reeves, 2006). The experts were informed of their roles as participants and signed a consent form to participate anonymously in the study. Table 2 shows the credentials and areas of expertise of the experts.

Table 2

Experts' Credentials

Expert	Credentials	Expertise
Expert A	Ph.D.in Education	Canadian sexual behaviour researcher
Expert B	Ph.D. in Applied Social Psychology	Sexual Health Education; Sexuality and relationships researcher
Expert C	Ph.D in Applied Social Psychology	HIV Prevention; Sexual health decision-making and negotiation in newly forming intimate relationships

The recruitment process started once ethical approval was received from the Research Ethics Board of the University of Ottawa. Prior to conducting interviews with experts, I explained the project's objectives and reminded them of the voluntary nature of participation. I took ethical considerations related to the confidentiality and anonymity of research participants. Written informed consent was also received.

Data Collection Tools. Using interviews is a way to learn experts' opinions, which can be useful when trying to better understand a particular topic (Creswell, 2005; Morgan, 1997),

and can produce a rich body of data expressed in the respondents' own words and contexts (Stewart et al., 2007). During the Phase 1 DBR consultation with the three sexual health experts, I conducted interviews (see Appendix A for full interview protocol) with questions focused on the challenges related to negotiation and safer sex for young people in the context of Ontario. The interview sessions took up to 60 minutes, were recorded and transcribed verbatim.

Data Analysis. Analyzing qualitative data requires extracting meaning from text and images in order to form answers to the research questions (Creswell, 2012). The experts' responses in the interviews were analyzed using a thematic analysis. Deductive and inductive coding were implemented in the analysis (Braun & Clarke, 2019) First, interviews (n =3) were transcribed. Then, I used a systematic approach that involved 1) reading and re-reading the transcripts to become familiar with the data; 2) generating initial codes based on inductive reading of participants' responses; 3) developing a codebook based on the codes that emerged from the responses; 4) the coding of each transcript independently by two researchers (PI and one RA) and checking for intercoder reliability; 5) generating and reviewing code reports to identify themes; 6) reviewing, defining and naming themes; and 7) interpreting the responses within and across themes (Boyatzis, 1998; Tolley et al., 2016). Line-by-line coding was done with a supplementary use of Nvivo 11. This software program combines management of nonnumerical, unstructured data with powerful process of indexing, searching, and theorizing (Creswell, 2012). Initial inter-rater reliability showed high agreement (k = 0.84) between the two researchers (Pope et al., 2000). All differences were discussed until full agreement was reached. The codebook for this phase of the study can be seen in Appendix B (Codebook 1). The left column is the themes detected by PI and RA with their definition in front of them. The definitions clarified for the RA to know what to look for in the body of the data. The codes can

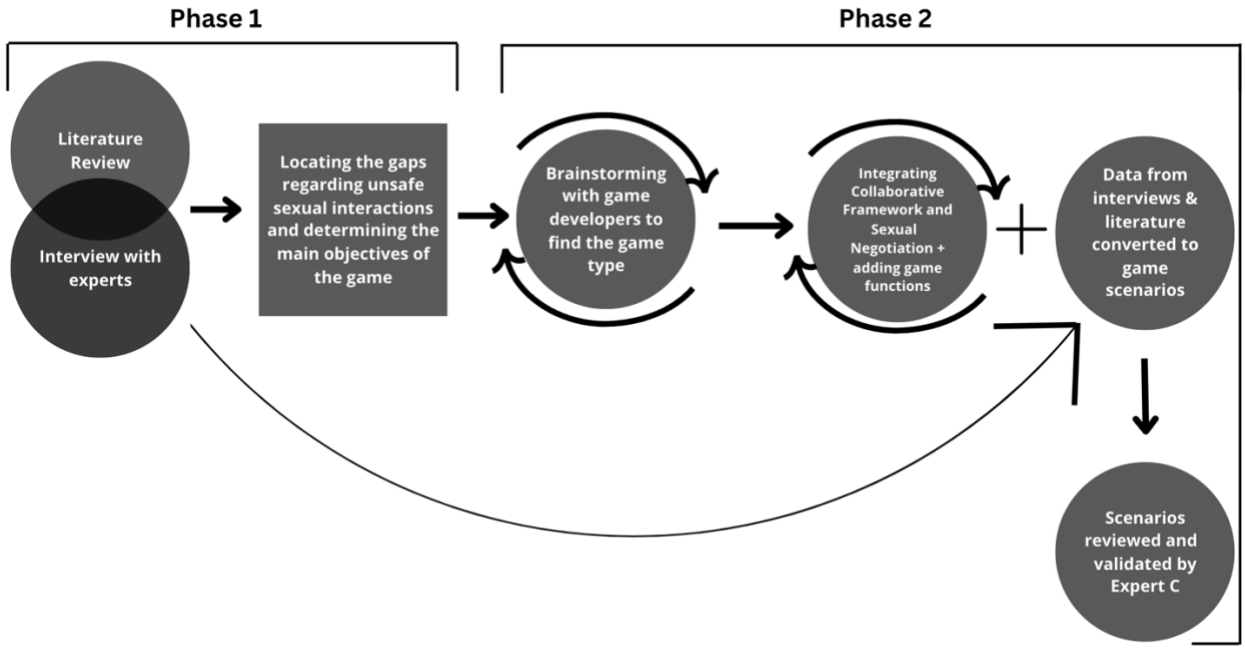
also be used to review the data by other researchers in case of a request for replication of the study.

Phase 2: Designing and Developing the Game

The development of solutions based on existing knowledge happens in the second phase of DBR (Reeves, 2006). As you can see in Figure 4, findings from Phase 1 provided the initial content for the brainstorming sessions with the game developers to progress toward the design of a game with the central purpose of safer sex communication and negotiation. This phase is not recorded and analysed and is not part of the data collection process. The need for 18-24-year-olds to practice negotiation and communication led the team to the idea of a collaborative online scenario-based game that creates a role-playing opportunity for the learners to practice safer sex negotiation. To develop such game, I integrated the Collaborative Game Design Framework (Wendel et al., 2013) with the General Model of Sexual Negotiation (Davies & Weatherburn, 1991) to form a clear map of the game functions that the game developers needed to add to the game (presented in Chapter 4). The in-game situations, scenarios, sorts of interaction and characters in each scenario as requirements of sexual situations (Davies & Weatherburn, 1991) were mapped out and matched with the collaborative gaming functions adapted from Wendel et al. (2013). The stages of the game development involved continuous brainstorming with game developers and the PI. This was repeated in a periodic cycle until a satisfactory result was achieved. Next, the data extracted from interviews with experts were converted into interactive game scenarios. Finally, the scenarios were reviewed and validated by Expert C to be moved forward to the next phase.

Figure 4

Phase 2: Game Development Process



In addition to the three sexual health expert participants who supported Phase 1 of the DBR process, three experts in computer programming and game development also collaborated in this study during Phase 2. Their involvement with the project included consultation and technical development of the serious game. Their work, as outlined in Figure 4, was to apply insights gathered and synthesized during phase 1 of the study to the design of the serious game. The University of Ottawa compensated the game developers through hourly payments, which were made possible by the financial aid provided by eCampus Ontario. Table 3 shows the credentials and areas of expertise of the game developers.

Table 3

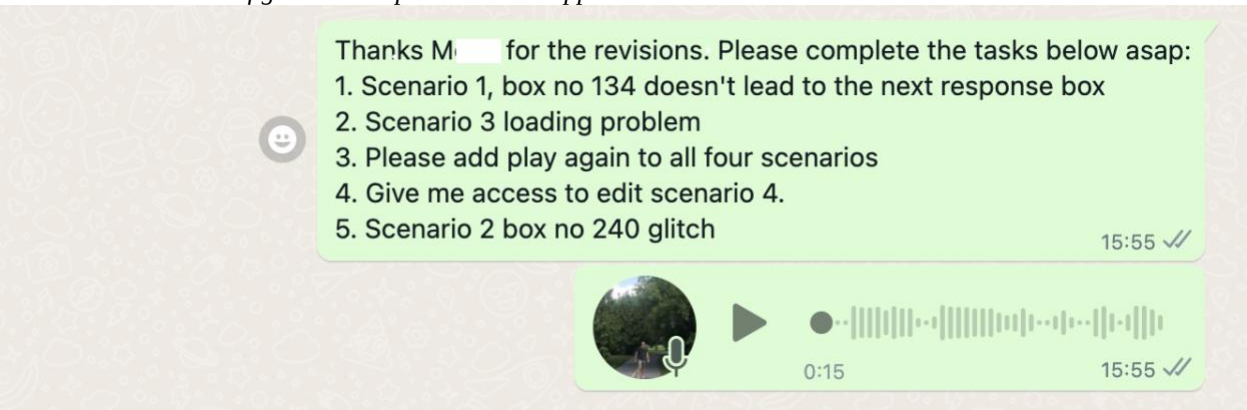
Credentials and areas of expertise of the game developers

Expert	Credentials	Expertise	Recruitment
M.S.	B.A. Computer Programming	Web development, online platform development	Personal Networks
M.A.	M.A. Computer Programming	Game development, visual design	Personal Networks
N.A.	Ph.D Electrical Engineering	Machine Learning, Cloud, Programming	Personal Networks

Data collection Tools. During game development, the process required two rounds of brainstorming, discussion, and progress update sessions with the presence of all three game developers. Beside the brainstorming sessions, there were on-demand and continuous communications with the developers (as a team or one-on-one) through emails, WhatsApp text/voice messages and phone calls. There was no formal interview protocol for these sessions. Instead, the conversations focused on ways to integrate the findings from Phase 1 into the design of the game. Conversations happened either virtually through the Zoom communication tool or face-to-face with game developers and computer engineers (N= 3). Developers were recruited from the PI's personal networks, based on their interests and area of expertise. The discussion and brainstorming sessions took from 15 to 60 minutes depending on the purpose of the meetings.

Data Analysis. The purpose of this phase was to capture insights and key ideas. Therefore, detailed analysis of the scripts was unnecessary. Key insights were noted and used to inform the next phases. As shown in figure 5, often a list of action items was developed and shared with the person responsible for the task.

Figure 5
A task list sent to one of game developers on WhatsApp.

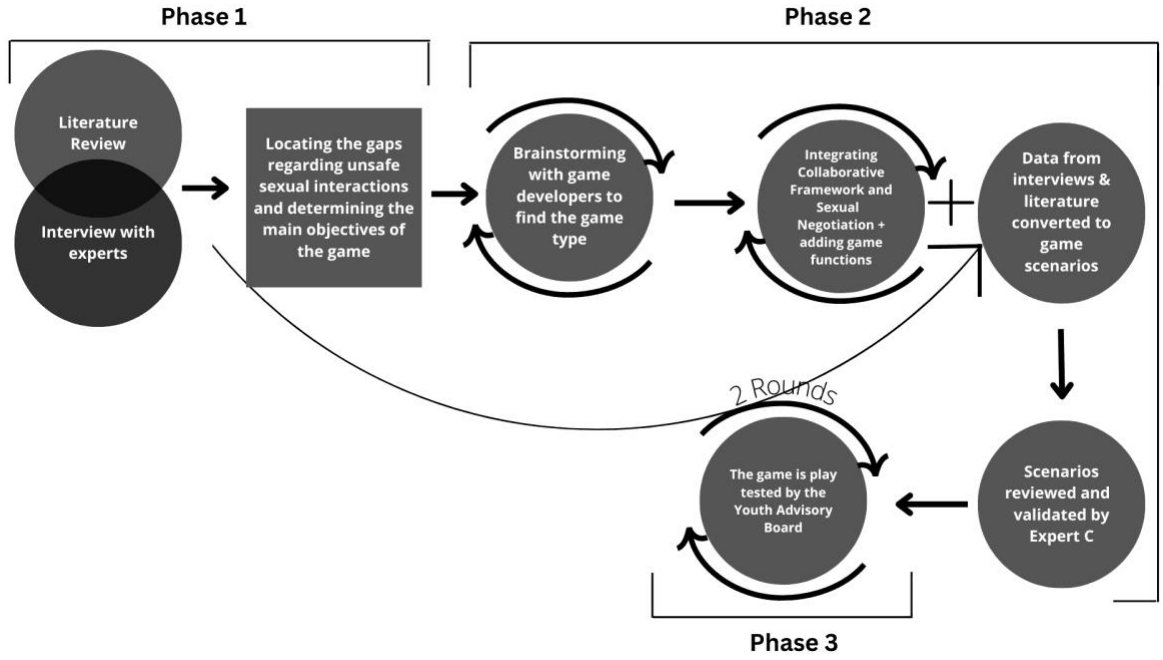


Phase 3: Iterative Cycles of Testing and Refinement

In the third phase of the game development, the game was play-tested by the Youth Advisory Board (TAB) (see Figure 6). The prototype was tested by the YAB to confirm relevance, attractiveness, understandability, and user-friendliness of the game. These criteria come from a paper by Mun and Hwang (2003). Two rounds of focus groups were conducted to further develop, fix the problems, and finalize the game (see Figure 6). An iterative process in periodic cycles allowed for user feedback after each cycle. Edits and revisions of the game were conducted by the PI and game developers between focus group sessions. The YAB was informed of the game revisions which allowed them to systematically review the progress. Although the nature of iterative designs is to be repeated until the expected and satisfactory intervention is created, due to the time and budget limitations of this study I conducted two rounds of focus group meetings, one hour long each.

Figure 6

Phase 3: Play test by the Youth Advisory Board



Participants. Four heterosexual 18-24-year-olds in the Youth Advisory Board (TAB) (n=4), with equal number of men and women were recruited to playtest the game. Members of the TAB were recruited through personal connections. Based on the previous works done in similar areas (Patchen et al., 2020), it was assumed that four young adult participants on the YAB would be sufficient for the provision of adequate and constructive feedback during the game design cycles. I used 'purposeful sampling' (Creswell, 2005) to recruit these participants.

Data Collection Tools. Two separate semi-structured focus group interviews were conducted with the YAB and online through the Zoom online communication tool. Prior to conducting interviews with the YAB, I explained the project's objectives and reminded them that their participation was voluntary. In accordance with ethical practices for conducting research with human participants, the confidentiality and anonymity of research participants was assured. Written informed consent was obtained from each participant. The information letter and consent

form are included in Appendix C. You can see below the questions discussed with the YAB adapted from self-efficacy, enjoyment, learning goal orientation, and the technology acceptance model (Mun & Hwang, 2003):

1. Did you find the game easy to navigate?
2. Did you find the buttons easy to find?
3. Were the text fonts and colors clear?
4. Did you have any problems with getting matched with a partner?
5. Did you see any glitches in the conversations? What were they? (the participants would read the response texts that had a glitch or send a screenshot of it in the Zoom chat box.)
6. What functions would you like to add to this game? What functions are missing?
7. Did you enjoy playing this game? why?
8. Did you have any problems, concerns or issues playing this game?

The YAB also helped with piloting the interview questions with forty 18-24-year-olds in Phase 4 of the study. This enabled me to refine questions, confirm clarity and understandability of the questions, and anticipate and resolve potential problems. The YAB participants received a $40 gift card to compensate for their time and effort. The funding required to compensate the participants was made feasible through the financial assistance extended by eCampus Ontario.

Data Analysis. The purpose of the YAB was to gather quick insights from 18-24-year-olds to inform revision to the game. Data were jotted down in point form and the insights were quickly communicated to the game developers to be integrated into the next revision of the game. Analyses were not conducted on these data because the purpose of the YAB was to motivate to the game mechanics and user experience and scenario content. The problems related to the scenarios were sorted out by the PI during the interviews or immediately after and problems related to the game technicalities such as buttons not functioning, delays in the story progress, players getting kicked out of the game, or players not getting matched up with their peers online were directed towards the game developers.

Phase 4: Evaluation and Reflection

In line with the final phase of DBR (Reeves, 2006) which is evaluating the solutions in practice, the focus of this fourth phase is an evaluation of the affordances of the game in developing the participants' sexual negotiation and condom use in different simulated scenarios. This process is presented in Figure 7 (below). Note that this process builds from phase 3 (play testing) and included game play and focus group interviews with forty 18-24-year-olds plus a final set of interviews with the three sexual health expert participants. Semi-structured focus group interviews were implemented to understand the impact of the game. In Table 4, I summarize the design of the study and the methods of data collection and analysis that were used to address each research question.

Figure 7

Phase 4: Evaluating the Game and Discussing the Results

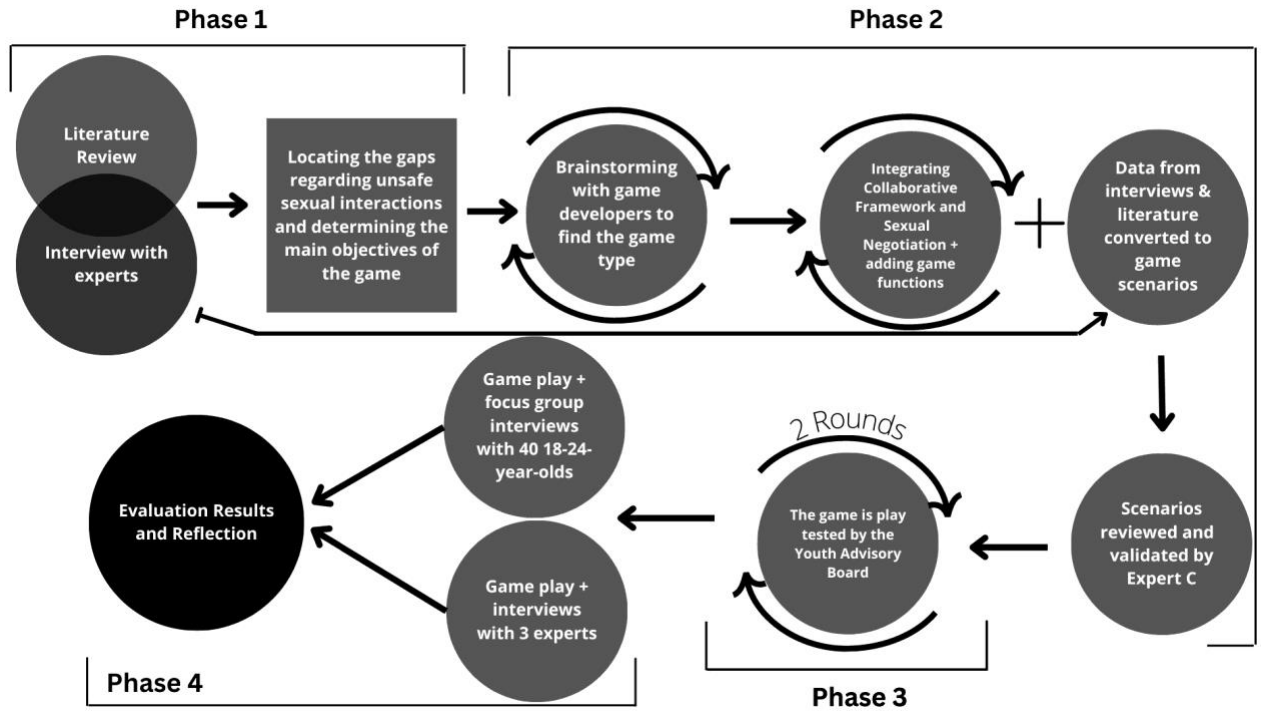


Table 4

Research Questions, Phases of DBR design, Methods of Data Collection and Analysis

Research Question	DBR Phase (Reeves, 2006)	Data & Data Collection Tools(s)	Participants	Data Analysis Method
How does a collaborative serious game integrate the principles of serious games with practices of safer sexual negotiation?	Phases 1, 2 & 3	DBR 1: Semi-structured interviews	DBR 1: Three sexual health experts	Thematic analysis of the experts' responses by two researchers
		DBR 2: Brainstorming sessions with game developers	DBR 2: Three game developers	No specific data analysis technique used. the ideas were noted and shared with all team members.
		DBR 3: Semi-structured focus group interviews	DBR 3: Four 18-24-year-olds	Data were jotted down in point form and the insight were quickly communicated to the game developers to get integrated into the next revision of the game
How do 18- to 24-year-olds report practicing safer sexual communication and negotiation skills through participation in the collaborative serious game and what insights do (a) 18-24-year-old participants and (b) sexual health experts share about the game that can inform future design iterations of this game?	Phase 4	Interview with 18-24-year-olds about their learning experiences after playing the game	40 18-24-year-olds aged 18-24	Thematic analysis of verbatim transcribed semi-structured focus group interviews by two researchers
		Interview with experts about the educational potential of the game on safer sexual negotiation	Three sexual health experts	Thematic analysis of verbatim transcribed semi-structured interviews by two researchers

Participants. During Phase 4, two groups of participants contributed to the evaluation of the serious game. First, the sexual health experts who provided commentary and

recommendations during Phase 1 of the study were invited to review the completed game. Expert C in phase one opted out and was replaced by an expert with an MSc in Family Relations and Applied Nutrition (sexology). The second group of reviewers during Phase 4 were 18-24-year-olds (n=40). A total of 21 young men and 19 young women, between the ages of 18-24, who lived in Ontario were recruited through social media networks. Demographic information is provided in Table 5 for all participants.

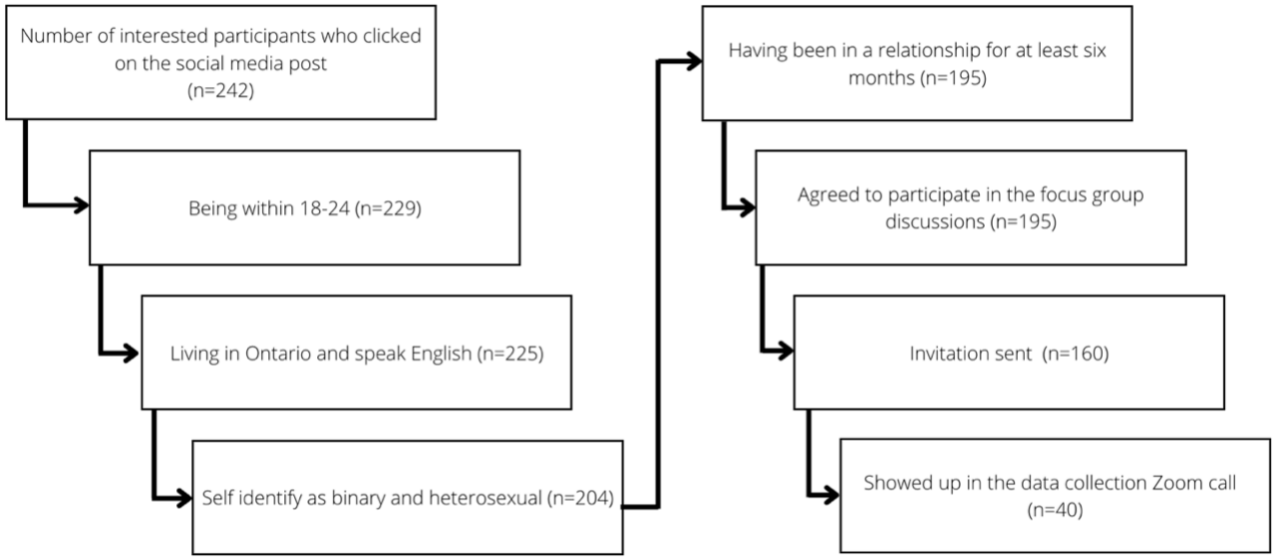
Table 5.
The position of the participants in different groups, their pseudonyms, gender and age.

Group 1	**Group 2**	**Group 3**	**Group 4**	**Group 5**
Date data collected	**Date data collected**	**Date data collected**	**Date data collected**	**Date data collected**
March 29, 2022	**April 04, 2022**	**April 12, 2022**	**April 26, 2022**	**April 28, 2022**
Ally (F, 22)	Brett (M, 20)	Nur (M, 22)	Sara (F, 22)	Jordan (M, 24)
James (M, 18)	Bill (M, 21)	Maison (M, 19)	Jennifer (F, 21)	Mathew (M, 22)
Daniel (M, 19)	Silvi (F, 22)	Arian (F, 21)	Dan (M, 20)	Morgan (M, 21)
Eve (F, 21)	Dana (F, 23)	Pal (F, 18)	Beny (M, 19)	Silvi (F, 19)
John (M, 22)	Joy (F, 21)	Jodie (F, 23)	Saeed (M, 20)	Jess (F, 18)
Trista (F, 23)	Lina (F, 19)	Liam (M, 20)	Maryana (F, 19)	Alex (M, 22)
Doug (M, 20)	Robin (M, 20)	Mino (F, 21)	Pineapples (M, 20)	Ahmmad (M, 24)
JJJ (M, 23)	Perry (F, 19)	Andy (M, 20)	Sandi (F, 19)	Val (F, 20)

In alignment with evidence that 18-24-year-olds may not use condoms during sex (Fetner et al., 2020), focus group participants were included if they self-identified as having been sexually active within the last six months and who reported that they have been in their current sexual relationship for at least six months. The inclusion criteria to be in a dating relationship tries to address inconsistent condom use within what individuals consider as close, on-going relationships, versus one-night or other uncommitted relationships (Misovich et al., 1997). For some young women, a sense of trust, intimacy, and commitment that had developed within the relationship is the main reason for discontinuation of condom use (Bolton et al., 2010). Also, many 18-24-year-olds are not educated about the necessity of STI testing before discontinuing condom use (Bolton et al., 2010). Heterosexual participants were recruited because this group (aged 15 or older) forms the highest percentage (89.3%) among different sexual orientations (Statistics Canada, 2018) and accounts for more than 50% of all HIV infections in Canada (Public Health Agency of Canada, 2017). Regarding the sample size in qualitative evaluation, researchers are divided. Charmaz (2006) suggests the number of 25 for smaller projects; Ritchie et al., (2003) state that qualitative samples are usually under 50; Green and Thorogood (2009) state that "the experience of most qualitative researchers is that in interview studies little that is 'new' comes out of transcripts after you have interviewed 20 or so people" (p.120). Creswell (2012) also recommends 20 to 30 individuals in order to develop a well-saturated theory (i.e., it provides enough information to elaborate all of the complexities of a theory). It was concluded that 40 is a good number to extract sufficient themes to provide support for the findings of this study. The participants were recruited through social media, mainly Twitter and Facebook. There was a link connected to the social media post that would link the interested participants to a google form. Overall, 242 interested participants clicked on the link and initiated the registration.

During the registration process, a logic function was applied, which automatically prevented participants from proceeding with registration if they did not meet the criteria for each step in order to avoid collecting unnecessary personal information. Not being within the age group of 18-24 automatically stopped 13 potential participants in the first step. Not living in Ontario excluded three and not speaking English excluded one more potential participant. Not self-identifying themselves as Cis-gender and heterosexual stopped nine and twelve more potential participants to continue the registration. Not currently being in a relationship excluded nine potential participants. All who said they were in a relationship also said that they have been in that relationship for six months. They were then asked if they agreed to participate in the focus group discussions after playing the game. One hundred ninety-five participants who reached this stage of the registration agreed to participate in the focus group discussion. At this stage, they were asked to share their names (or pseudonyms) and email addresses for further arrangements. An instruction email with an invite link to a Zoom meeting and a consent form attached was sent to 40 successfully registered potential participants at a time. As illustrated in Figure 8, in every round, more than half of the participants did not show up. The reason for the high dropout rate is not clear but it could have been that the participants had not read the instructions well and had completed the form not knowing that a further discussion was needed. The sensitivity around sexual topics could have discouraged some others to participate in the study. The invitation process was stopped as soon as 40 participants successfully completed the evaluation. Those who participated in the study received a $40 gift card to compensate for their time and effort. The funding required to compensate the participants was made feasible through the financial assistance extended by eCampus Ontario. Figure 8 shows the recruitment and registration process of these 40 young adult participants.

Figure 8. Recruitment and Registration Process



Evaluation process. During this DBR phase, the players played the game for 30 – 40 minutes. They were given 5 minutes to create an account and login. They were asked to use a pseudonym as their name in the game. The players were matched randomly in the scenarios and since they used pseudonyms, they would not know if they were playing with a male or a female player. The game roles were not gender specific so playing as a man or a woman would not cause any problems. The players played each scenario two to three times and for around 5 to 10 minutes with one online partner. The PI would announce the end time of each scenario and ask the participants to play another scenario. The players would be matched with a new online player every time they played a new scenario. The game experience was followed by a 30-minute debriefing session facilitated by the PI and a research assistant (RA) who had a background in sexual health to discuss the choices the players made in the game. The debriefing session is not an integral element of playing the game of this study, but it was added to realize the social element of social-constructivism learning theory that this study follows. The game can be played with no further debriefings or discussions, but previous studies have shown that debriefings can

provide great opportunities for players to link the game experiences to similar situations in real-life (Jones, 1999). The RA had a Masters in Family Relations and Human Development specializing in Human Sexuality and was present to answer the participants' sexuality questions. Finally, the players participated in a 30-minute semi-structured focus group interviews facilitated by the PI to share their thoughts.

Focus group interviews were conducted through Zoom online communication platform in five groups of eight participants (refer to Table 5). Zoom allowed the participants to be involved in the discussions with their videos off and their names hidden or changed, if they wanted to. Interviews were recorded for transcription and data analysis. End-to-end encrypted meeting mode established trust relationships between meeting attendees and increase the security of the meetings. The focus-group format had been piloted on Zoom with the Youth Advisory Board during Phase 3. The piloting also enabled me to refine questions, confirm clarity and understandability of the questions, and to anticipate and resolve potential problems (Creswell, 2012). Similar to previous phases, prior to conducting interviews with experts and 18-24-year-olds, I explained the project's objectives and reminded them that their participation is voluntary. I took ethical considerations related to the confidentiality and anonymity of research participants. Written informed consent (Appendix C) was obtained. The participants were informed that the meeting would be audio recorded. To secure the confidentiality of the data, the recordings were saved on the researcher's storage and then transferred to encrypted external hard-drive (see ethics section). The participants played the game with the nicknames they chose, and they were assured that their data would be anonymous. Given the sensitivity of the data, high levels of storage security were established. All the recorded data were transferred to an external hard-drive password protected using *StorageCrypt* encryption program. Only the researcher had access to

the password and the storage. Following the conclusion of the study, the data will be archived for a period of 15 years and then deleted securely and confidentially.

After the completion of the debriefing focus group sessions with the 18-24-year-olds, three sexual health experts were also invited to play the game and share their insights in separate meetings about the educational impact and efficacy of the game. The reason to include experts in this phase as well was to receive professional feedback about the efficacy of the game from researchers who have been actively involved with the sexual education and behaviours of 18-24-year-olds. Two of the experts are the same experts as in phase one (Table 2). Expert C in phase one opted out because of shifting priorities and responsibilities and was replaced by an expert with an MSc in Family Relations and Applied Nutrition (sexology). Having a new expert could actually strengthen the study as they would be able to evaluate the game with fresh eyes and without any background about the game design process.

Data Collection Tools. Bordia (1997) showed that computer-mediated communications takes longer and encourages the participants to produce more ideas than face-to-face group interactions. Online synchronous approaches offer text-based chat rooms, instant messenger protocols, and videoconferencing (Stewart & Williams, 2005; Stieger & Gortiz, 2006). Conventional face-to-face focus groups may naturally discomfort young people due to different reasons such as personal organization, access to transport, and the confidence to meet strangers (Fox et al., 2007). According to Kitchin (1998) online communication is less hierarchical than face-to-face interactions, which might enhance sense of freedom, sense of control and ease in online settings (Fox et al., 2007). Joinson (2001) found a correlation between the sense of freedom and increased disclosure related to sensitive topics in adults. Fox et al. (2007) had similar findings for the youth. Given the popularity of the Internet as a powerful communication

tool among the youth (Pastore, 2002) and the sensitivity of the topic, online synchronous sessions seemed to be a reasonable way of collecting data.

Data Analysis. From each focus group interview, two files of data were extracted: a transcription file and a chat records file except for two groups with no chat conversations. Thus, overall eight files were used to extract the themes for analysis. The participants' (experts and 18-24-year-olds) responses in the focus groups were analyzed by the PI using a thematic analysis similar to the phase 1 of the study. Insights by these two groups of participants were analysed separately but followed the same methods.

First, interviews were transcribed. Then, I used a systematic approach that involved 1) reading and re-reading the transcripts to become familiar with the data; 2) generating initial codes based on inductive reading of participants' responses; 3) developing a codebook based on the codes that emerged from the responses; 4) the coding of each transcript independently by two researchers (PI and one RA) and checking for intercoder reliability; 5) generating and reviewing code reports to identify themes; 6) reviewing, defining and naming themes; and 7) interpreting the responses within and across themes (Boyatzis, 1998; Tolley et al., 2016). Line-by-line coding was done with a supplementary use of Nvivo 11. This software program combines management of nonnumerical, unstructured data with powerful process of indexing, searching, and theorizing (Creswell, 2012). In this phase, inter-rater reliability showed the agreement of $k = 0.73$ between the PI and the RA.

The fourth phase of DBR (Reeves, 2006) is a reflection on the full research procedure, which is embedded in the discussion section of this study. The final game product was analysed in regard to the conceptual framework adapted from Wendel et al. (2013) and combined with the General Model of Sexual Negotiation (Davies & Weatherburn, 1991). Each feature implemented

in the game is discussed from the perspective of the elements in the conceptual framework: communication, collaboration, common goal, feedback, interaction, virtual context, characters and scenarios.

Roles in Different Phases of the study

To clarify the PI's evolving role and its connection with different participants and collaborators throughout the study, this section provides a synthesis. Figure 9 demonstrates that in Phase 1, the PI conducts literature reviews, interviews participants, collects data, and analyzes it to inform Phase 2. In Phase 2, the PI liaises with game designers, content writers, and content validators. In Phase 3, the PI facilitates conversations with the YAB to identify and communicate game problems to developers. Finally, in the last phase, the PI conducts interviews, collects and analyzes data, and synthesizes findings for presentation. Different roles in this study are also defined in Table 6 for better understanding. Figure 9 shows PI's roles in different phases of the study in relation to the collaborators and participants.

Figure 9

PI's Roles Compared to other collaborators and Participants

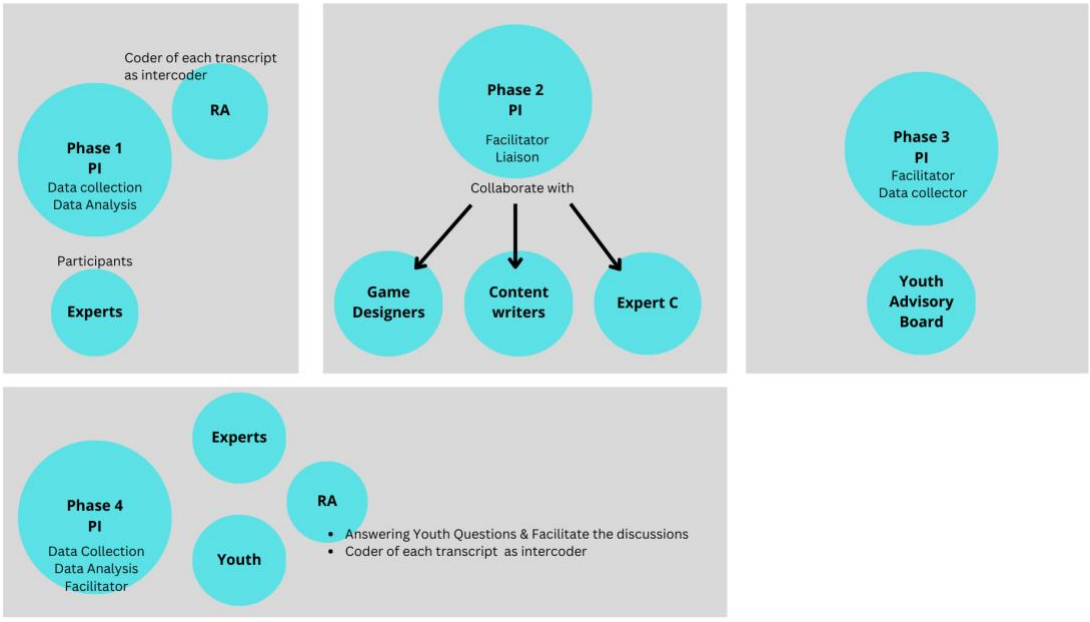


Table 6
Clarification of Roles and Tasks in Different Phases

Role	Phase	Tasks
PI	1, 2, 3, 4	data collection, analysis, facilitation, synthesis & writing
3 Sexual health experts	1	providing insights on gaps in 18-24-year-olds sexual health
RA	1	intercoder
3 Game developers	2	brainstorming and developing the game
RA	2	write the content of the scenarios
Expert C	2	validate the content
Youth Advisory Board	3	test the game
RA	3	facilitator, intercoder
40 young adult participants	4	evaluate the game
3 sexual health expert participants	4	evaluate the game

Ethical Considerations

An essential ethical component is ensuring approval from the University of Ottawa Research Ethics Board and securing participant consent. I ensured the quality and integrity of my research by obtaining informed consent throughout the consultation and data collection process. Prior to conducting interviews with experts and 18-24-year-olds in all four phases, I explained the project's objectives to the participants and reminded them that their participation is voluntary. I provided them with an overview of the research plan and took ethical considerations related to the confidentiality and anonymity of research participants. Written informed consent for phases 1, 2, 3 and 4 (Appendix C & D) were obtained from the 18-24-year-olds and expert participants. The players played with the nicknames they chose and were assured that the

interviews were anonymous. All players were allowed to keep their cameras off and use a nickname during the online interviews. Given the sensitivity of the date, high levels of storage security were established. All the recorded data were transferred to an external hard-drive password protected using *StorageCrypt* encryption program. Only the researcher had access to the password and the storage. Following the conclusion of the study, the data will be archived for a period of 15 years and then deleted securely and confidentially.

Presenting Findings

Findings will be presented in two chapters: chapter 4 and chapter 5. In chapter 4, I will explain how a collaborative serious game integrates the principles of serious games with practices of safer sexual negotiation, which answers the first research question. In chapter 5, the results from focus group interviews with experts and 18-24-year-olds will be presented in order to understand the efficiency of the game in enhancing the 18-24-year-olds' safer-sex communication and negotiation skills and aspects of the game that need further development for future iterations, addressing the second research question.

Chapter 4: Game Development Results

The purpose of this chapter is to answer the first research question: How does a collaborative serious game integrate the principles of serious games with practices of safer sexual negotiation? In this chapter, I will explain how the findings from the literature review, data from the experts, Wendel's Module of collaborative game design framework (2013) and General Model of Davies and Weatherburn (1991) informed the design and development of a serious game with the purpose of enhancing safer sexual communication and negotiation skills.

Findings from the Literature

As explained in chapter 3, an extensive review of literature was conducted within 2000 to 2022 to elucidate the factors contributing to unsafe sexual interactions in the Canadian context. Studies were included if they: (a) examined a predictor of unsafe sexual behaviors; (b) included adults and/or 18-24-year-old participants (c) did not focus on a specific group, gender, region, ethnicity or minority group. The importance of communication and negotiation skills have been found to be a critical predictor of condom use and safer sex behaviours in 18 papers (Table 7). Arousal was another predictor of unsafe sexual behaviours reported in 10 papers (Table 7). Although substance use as a determinant of unsafe behaviour was found in 10 papers, there were studies that reported no difference in the sexual behaviours of substance and non-substance users (Hensel et al., 2011; Smith et al., 2010). Similarly, Scroggins et al. (2021) refuted previous studies that had reported alcohol use as a predictor of risky behaviours. Therefore, communication skills, and arousal were considered as the main factors and guided the interviews with the sexual health experts. Table 7 shows the summary of the findings from the literature review.

Table 7 *Summary of the Findings from the Literature Review.*

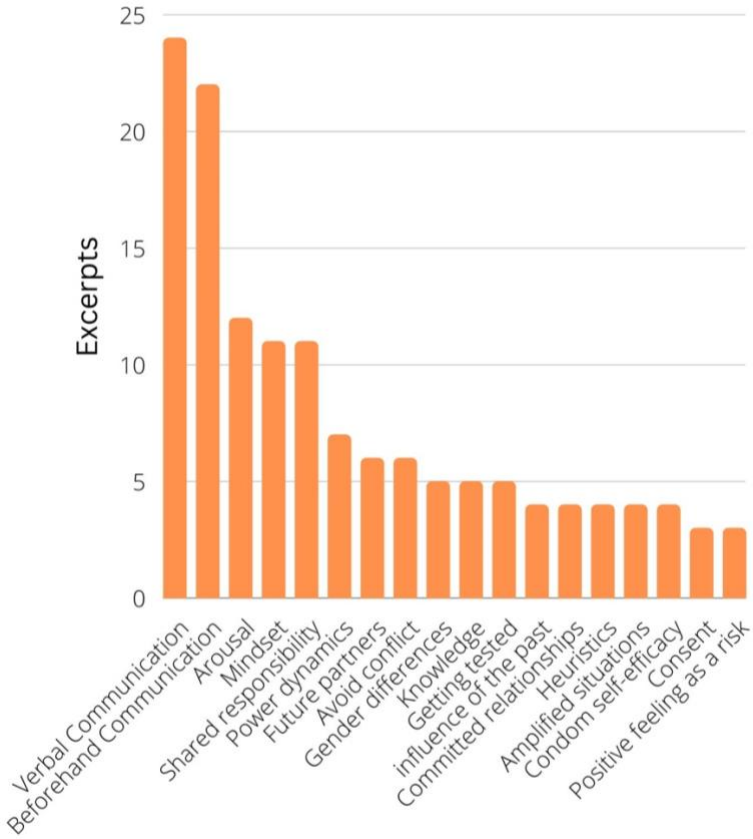
Predictors of Unsafe Behaviours	Number of Papers	References
Lack of communication skills	18	Amialchuk & Gerhardinger, 2015; Collins et al., 2009; Donne et al., 2018; Johnson et al., 2015; Kenyon et al., 2010; Noar et al., 2002; Noar et al., 2002; Noar et al., 2006; Noar, 2007; Oncale & King, 2001; Pedlow & Carey, 2004; Ryan et al., 2007; Saftner et al., 2019; Salazar et al., 2004; Sales et al., 2012; Tolman, 2005; Widman et al., 2016; Widman, et al., 2014
Arousal	10	Ariely & Loewenstein, 2006; George et al., 2009; Macapagal, et al., 2011; MacDonald et al., 2000; Norris et al., 2009; Prause & Lawyer, 2014; Simons et al., 2015; Skakoon-Sparling et al., 2016; Strong et al., 2005; Wolfs et al., 2019
Substance use	10	Anderson & Stein, 2011; Bellis et al., 2008; Boone et al., 2013; Hensel et al., 2011; Schumacher et al., 2018; Smith et al., 2010; Smith et al., 2010; Walsh et al., 2014; Walsh et al., 2014 ; Wu et al., 2009
Alcohol use	6	Chung et al., 2018; Davis et al., 2009; Henges & Marczinski, 2012; Rehm et al., 2012; Scroggins & Shacham, 2021; Shuper et al., 2017

Findings from the Experts

To check these findings from the literature review and to develop a deeper understanding of the causes of risky behaviours, and to create a detailed picture of what is specifically needed in the context of Canada, I conducted three semi-structured interviews with three sexual health researchers in Canada (see Table 2, p.42). The data from the interviews were transcribed verbatim and analyzed thematically by the PI. The codes applied to these interviews were member checked by the RA. As shown in figure 10, communication and negotiation were confirmed by all three sexual health experts as the most crucial factor related to condom use and safer sex practices.

Figure 10

The Frequency of Each Theme from Interviews with Experts



The importance of communication and negotiation in safer sexual behaviours is largely supported by the previous literature as well (Noar, 2002; Noar, 2006; Noar, 2007; Widman, et al., 2014; Widman et al., 2016;). Overall, verbal and non-verbal communication was mentioned more than 46 times by all three sexual health experts. Verbal and non-verbal communication is defined as words, facial and body expressions that could be used as communication tools for safer sexual behaviours. The idea of 'in advance communication and preparation for sexual interaction' was mentioned 24 times and the theme of 'the skills and words needed to have conversations about condom use, form of sexual interaction, and time of sexual interaction' was mentioned 22 times by all three sexual health experts. The experts of this study stated that the conversations around safer sex and planning condom use must happen in advance before young adults are in sexual situations and feel aroused (12 times), as it will make it substantially more challenging to negotiate condom use. Having the right mindset about condom use and STI testing and the shared responsibility in having a condom or bringing up the topic was mentioned 12 times each. Figure 10 shows the frequency of each theme as curated across all interview transcripts.

The experts had a consensus on the fact that communication skills are underdeveloped for some young adults and that they don't exactly know what to say or what to show when they are in situations that can lead to risky interactions. Expert A stated that "the person who is going to negotiate the condom use or who is going to initiate the condom use has to be very prepared to do that." It was also mentioned by all three experts that many of the young adults are not aware that they need to bring up this conversation and talk about it in advance not when they are in the middle of it: "negotiating and talking about condom use [should happen] before you get to that part. So not talking about it in the middle, but doing it beforehand and talking about your

boundaries. Expert A said “one of those strategies to give to people before they sort of find themselves in a situation is to initiate and talk about condom use before sex is really has started at all.” Expert B emphasized on preparing the young adults to plan in advance and get ready for a safe sexual interaction by talking about it and discussing that with their partners long before they are in the sexual situation:

> It doesn’t happen necessarily in the moment. Right. It’s sometimes it’s the stuff leading up to it. It’s who is going to get the condoms. It’s having those conversations beforehand. And then, like, I don’t know if you could have a scenario where it’s like talking about those things outside of the bedroom, like maybe in a walk in the park or something, like what kind of things are you comfortable with? What do you want to do? How are we going to do this, building up the comfort and communication outside of the bedroom so that when they get into the bedroom, it’s a little bit easier to enact those boundaries.

Expert C also attached importance to the idea of planning on having a condom in advance and the importance of promoting a positive attitude about carrying condoms among the young adults:

> Try to say to young men that it showed that you were sophisticated if you had a condom and that you were you're pretty unsophisticated if you didn't have one. Right. The moment came and you didn't have a condom, that meant you're not a very sophisticated guy. A guy should be prepared for those kinds of situations.

The second most frequent keyword that emerged through the coding analysis was the concept of ‘sex positive’ language in sex education. The experts were of the belief that “the conversation has to be positive” as mentioned by Expert C which means it has to stress consent and pleasure rather than fear and shame and it should talk about aspects of sex like love, care, pleasure rather than STIs and pregnancy. This theme was mentioned 22 times. Below you can

see an excerpt from Expert A explaining how positive terminology should be promoted and included in safer sex communication:

> That's what your script is around; it is around telling the other person that you're interested in, that you like them and you want to respect them and you want them to be comfortable that once you've got that kind of conversation rolling, then it's going to be so much easier to talk about condoms. And that can be in the context of I want us to take care of each other.

Expert C also explained the importance of a caring language in making safer sex conversations more successful:

> And I think it's more about what it's about care, right? As much as it is about safety. It's I care about you. And I want us to take care of each other. And that usually makes people feel good to hear that. Right. And if you can make people feel good, then that's. That gets you halfway there.

The concepts of 'arousal' as one of the main obstacles on the way of negotiating over safer sex, the 'mindset' of carrying condom when you think there might be a chance of sex happening and 'shared responsibility' in bringing up the conversation around condom use were mentioned 12, 11, 11 times respectively. The experts mentioned that "when you're in the middle of a sexual interaction, it can be harder to kind of stop and negotiate condom use at that time" (Expert A). This is in line with the previous theme that conversations around condom use should happen beforehand rather than when sex has already begun:

> When they are in an arousing situation, when you're thinking about condom use, that it's going to be harder to think rationally. I think that knowing that is important so that you can be prepared and plan early so you don't let it be. (Expert C)

In this study the theme of ‘mindset’ is attached to any kind of attitude or mindset that would stop the partners to carry, use, or talk about condoms. The experts were concerned that in many situations the attitude that ‘having condoms is equal to having sex’ or ‘carrying condoms means the expectation of sex’ is the main reason for not having it and talking about it:

> A lot of people don't want [to] negotiate condom use because they're worried that the other person will think that either you don't trust them or that or that, that you're not trustworthy. And so they're worried that if they if I say something like, hey, we should use a condom or like. That that that shows that that they don't trust that person or, or that they've been sleeping around or that they think the other person has been sleeping around and that now they're now they're risky. (Expert B)

Expert C had a similar concern related to carrying condoms by women and the wrong expectations that might be connected to that:

> A lot of heterosexual women don't want to bring up condom use because they don't want to they don't want to give give their partner the wrong impression that something is a sure thing or that there's expectations where they they don't want to have those expectations, which is like a whole other problem. (Expert C)

The theme of ‘alternatives to intercourse’ was brought up 10 times by the researchers. They mentioned that people need to know that sex is a broad term and “it’s a myth that sex is just intercourse” (Expert C). Experts C and B looked at alternatives like mutual masturbation or oral sex as strategies to avoid unprotected intercourse and to de-escalate the risks when the partners are not ready for intercourse, are under the influence of sexual arousal, do not have condoms with them, or just as a different way to enjoy from sex:

> Give them some information about oral sex and manual stimulation, about pleasure and these other things that make those things sound appealing, like there's other things you can do that are really fun, that feel good for people. You know, people with their last oral sex experience, like 90 percent said it was pleasurable or something like that. Like there's that that information is out there and giving them some kind of like, yeah, people like this. There's evidence for this. Your peers are doing it, too. And it's a less risk for getting passing STIs. There's no risk of pregnancy. You have lots of options. Sex is a broad definition. It's not just about penis, vagina, intercourse. Like there's lots of cool things you can do. (Expert C)

Expert B offered a similar idea:

> For people who are under the influence of sexual arousal or substances or both, that can be very challenging to be like, OK, well, I'm going to walk away from this completely. Instead, we were like advising people to like, well, then do something less than just have oral sex. Just have just give them give the person a hand job. Do something so that you engage, you still get the sexual gratification, but you're de-escalating your risk. (Expert B)

There were less frequently mentioned themes which were still considered in the content development process. Power dynamics, for example, as a determinant of condom use was mentioned seven times by different experts. As Expert C expressed her concern about the importance of power in bringing up condoms:

> For young women, if they don't feel like they have that power in a relationship, they are less likely to even initiate condom negotiation. So, they feel like there's a situation where they can't actually do this, whether they want to or not. If they don't feel like they have

> that autonomy in that relationship, then they don't feel safe enough to start bringing that up.

Not talking about condoms because it may cause conflict or stress, and how different genders look at condom use differently were each mentioned six times by the experts. About avoiding conflict, Expert B said, “people who expected that the hypothetical partner was not interested in condom use were less likely to suggest using condoms because they didn't want to have to deal with an argument” and pertaining gender differences in condom use negotiation Expert A said:

> Young men are just sitting back and waiting for their partner to suggest condom use, which I feel like is kind of rude. But they are just kind of like sitting back and they're fully prepared to use a condom as long as their partner suggests it.

Other low frequent themes were about lack of knowledge (mentioned by 5 participants across all interviews), getting tested (mentioned by 5 participants across all interviews), influence of the past (mentioned by 4 participants across all interviews), risks of committed relationships (mentioned by 4 participants across all interviews), heuristics (mentioned by 4 participants across all interviews), amplified situations (mentioned by 4 participants across all interviews), condom use self-efficacy (mentioned by 4 participants across all interviews), consent (mentioned by 3 participants across all interviews), and positive feeling as a risk (mentioned by 3 participants across all interviews).

As said, although these themes were mentioned less frequently than others, they were still included in the scenario creation process as they provide really important and nuanced perspectives on safer sex communication. The definition of each theme can be found in the code book 2 in Appendix E. In total, the literature review (4 themes) and the experts (18 themes)

generated 22 themes with communication and in advance preparation themes being the most important, according to the three expert participants. In the next step, I needed to develop a solution for the diagnosed problems.

Building the General Structure of the Game

Following the second step of DBR (Reeves, 2006), which is to develop solutions based on existing knowledge, I used the data from the literature review and themes from the semi-structured expert interviews to form the general structure of the game. The highest frequency of the themes around communication and negotiation and the experts' strong emphasis placed on the importance of communication skills in condom use which were in accordance with the existing evidence in the body of the literature convinced us that an online scenario-based role-playing game would be the proper type of game for the purpose of this game. Several brainstorming sessions were conducted between the PI and game designers in order to decide on the game genre. Several ideas were discussed during the brainstorming sessions. One was developing a strategic game in which the players manage a college campus. The players have to address different sexual health questions of the characters in the game. This would limit the game to knowledge provision rather than enhancing their skills such as sexual communication and negotiation. The second idea was visualizing different sexual scenarios and having the players to lead the characters to the end of the story. Visualizing sexual scenarios would make the game pornographic and cause discomfort in the players. Also, this was not collaborative and would need a team of graphic designers which was beyond the budget of this study. The third idea was providing the participants with a sample role-play scenario in text and then asking them to practice that in pairs in a free chat format. Although this could provide a practice context for the players, we decided that conversations could deviate from a focus on negotiation, which

would reduce its pedagogical impact. Also, it would be quite impossible to evaluate the end point of an open scenario and provide a relevant response. The final conclusion was an online role-playing scenario-based game that could simulate the dyadic nature of the sexual interactions that happen between two people, based on situations described in the literature and by the sexual health experts (see figure 13, p. 79).

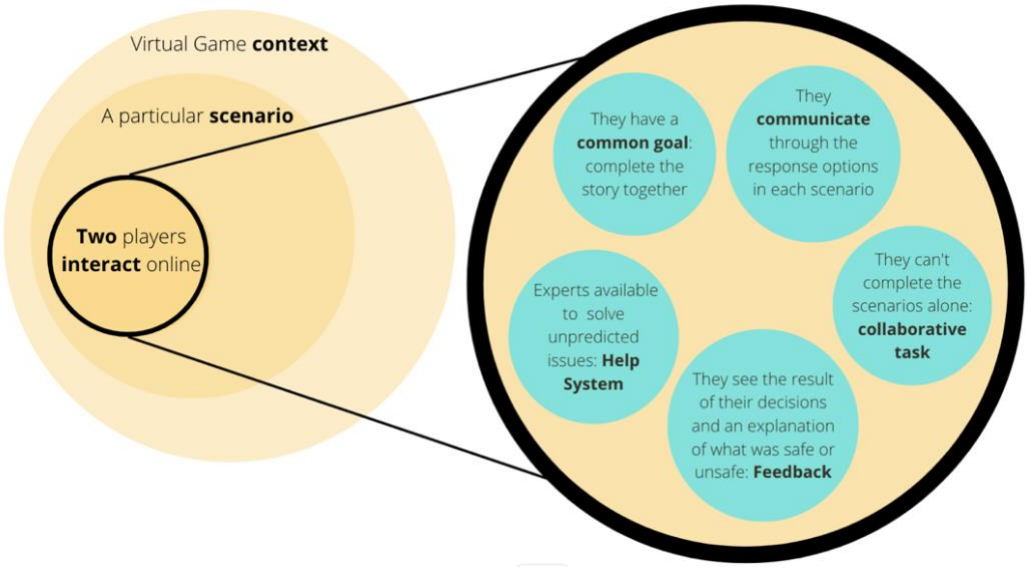
To create situations that require negotiation, each player is paired up online with another player. The game assigns players random roles, such as being either pro- or anti-condom use, or pro- or anti-STI testing, which can influence their gameplay strategies and outcomes. By playing different roles, players can gain a new perspective on the conversation and practice viewpoints that they may not typically hold. Players select from a list of scripted communications and taking turns, they unfold a story with the choices they make in the game. They play in turn with two to three choices in each turn and rehearse different sexual situations. Although graphics are limited and game mechanics such as a rewards system, levels, and points and actions such as moving, shooting, running and driving are not a part of this game, the role-playing design still aligns with the definition of a serious game in that the players are in “a mental contest” using “a computer” following “specific rules that uses entertainment”, to enhance different topics such as health. (Zyda, 2005, p. 26). To have the entertainment element in the game, we added the story element that the players unfold together using the choices they have in each scenario. Playing with a real person instead of computer and having control over the scenarios were considered as elements that could realize entertainment in the game. There is no “win” or “lose” concept in the game as the focus is on collaboration rather than competition. However, the debriefing box at the end of each scenario tells the participants if their conversation was safe and healthy or risky and unsafe. This element of immediate feedback is also an important characteristic of serious games (Zyda,

2005). In case of risky results, the players are encouraged to play again and try a different path. Every scenario can be played in several ways and have several endings including safe and unsafe results. This can also be entertaining for the players to explore different decisions and see how the story would unfold and end based on their decisions.

I named the game Rehearsed and developed it on a domain that I purchased with this name: Rehearsed.ca. This name is picked from a quote from expert A: “So they need to be able to rehearse for themselves what they're going to say to the partner”. In the past tense, Rehearsed suggests that the negotiation skills have been practiced but “ed” as short also reads for education – so there is a double-meaning to the use of the word rehearsed. An online role-playing game could help us create scenarios in which two players would need to rehearse a simulated situation and try to reach an agreement in terms of their sexual interaction. Although players can play the game any time online, we decided to add a debriefing session to this research study a) to realize the social element of social-constructivism learning theory that this study follows; b) to increase the learning efficacy of the game (Jones, 1999) and c) to enhance the Feedback and Communication elements of Wendel et al’s (2013) model.

Figure 11

Diagram of How the Principles of a Collaborative Serious Game are Integrated with Practices of Safer Sexual Negotiation



To develop such game, a collaborative game development model was needed (Figure 11). Recall that the conceptual framework for the game design was described in the methodological framing of the study (Chapter 3, Figure 1). In this section, and situated in the pragmatist perspective, I describe how this conceptual framework was operationalised. Wendel's (2013) Collaborative Game Design Framework (among other frameworks discussed in the literature review) was applied as it had clearly delineated the components of an engaging collaborative game, had provided instructions of how to implement them, and was adaptable. This last feature allowed us to take the elements that would accommodate safer sex negotiation practices within the game. These elements are: Common Goal/Success, Heterogeneous Resources, Collaborative Tasks, and Communication. We removed 'Refillable personal resources', 'Collectable and tradable resources', 'Trading system', 'In-game Help System' and 'Scoreboard'. However, instead of 'In-game Help System' we provided live assistance through Zoom communication platform and instead of 'Scoreboard' we developed written feedback in pop-up boxes at the end

of each scenario. The written feedback boxes were a paragraph long and would explain why a scenario has gone right or wrong and how it could be managed better. Although the game can be played without live assistance through Zoom communication, this aspect was also added for the research study for two ethical reasons. It was an ethical choice to ensure that if the game raised questions for research participants, that a research assistant with a background in sexual health would be on hand to answer them. Second, we considered this as an extra benefit or reward for participation in the study to give participants free access to an RA who could respond with reliable information. Plus, as noted above, the RA also facilitated the debriefing sessions that aligned, theoretically, with the social constructivist framing of the research.

In order to integrate the principles of a collaborative serious game with practices of safer sexual negotiation, I used the General Model of Sexual Negotiation (Davies & Weatherburn, 1991) to simulate sexual situations inside game. Thus, Wendel's (2013) model informed the general structure of the game and Davies and Weatherburn's (1991) General Model of Sexual Negotiation guided the structure of the scenarios in the game (Figure 12). The General Model proposes a combination of logically distinct factors for a sexual situation. It involves two individuals, interaction, a particular physical context and a particular scenario. The physical context is converted to a virtual context in this game. The General Model guided to simulate sexual situations in the game scenarios: the virtual context (instead of the physical context), the scenarios, characters with specific desires and needs, and the sorts of interactions. As illustrated in figure 12, the game is comprised of four scenarios and each scenario includes characters, a virtual setting, and interaction between the characters. The content of each scenario is the direct or indirect reflection of the data from the experts and the literature review. Inside each scenario, there are collaborative tasks, common goals, heterogenous resources, communication, and

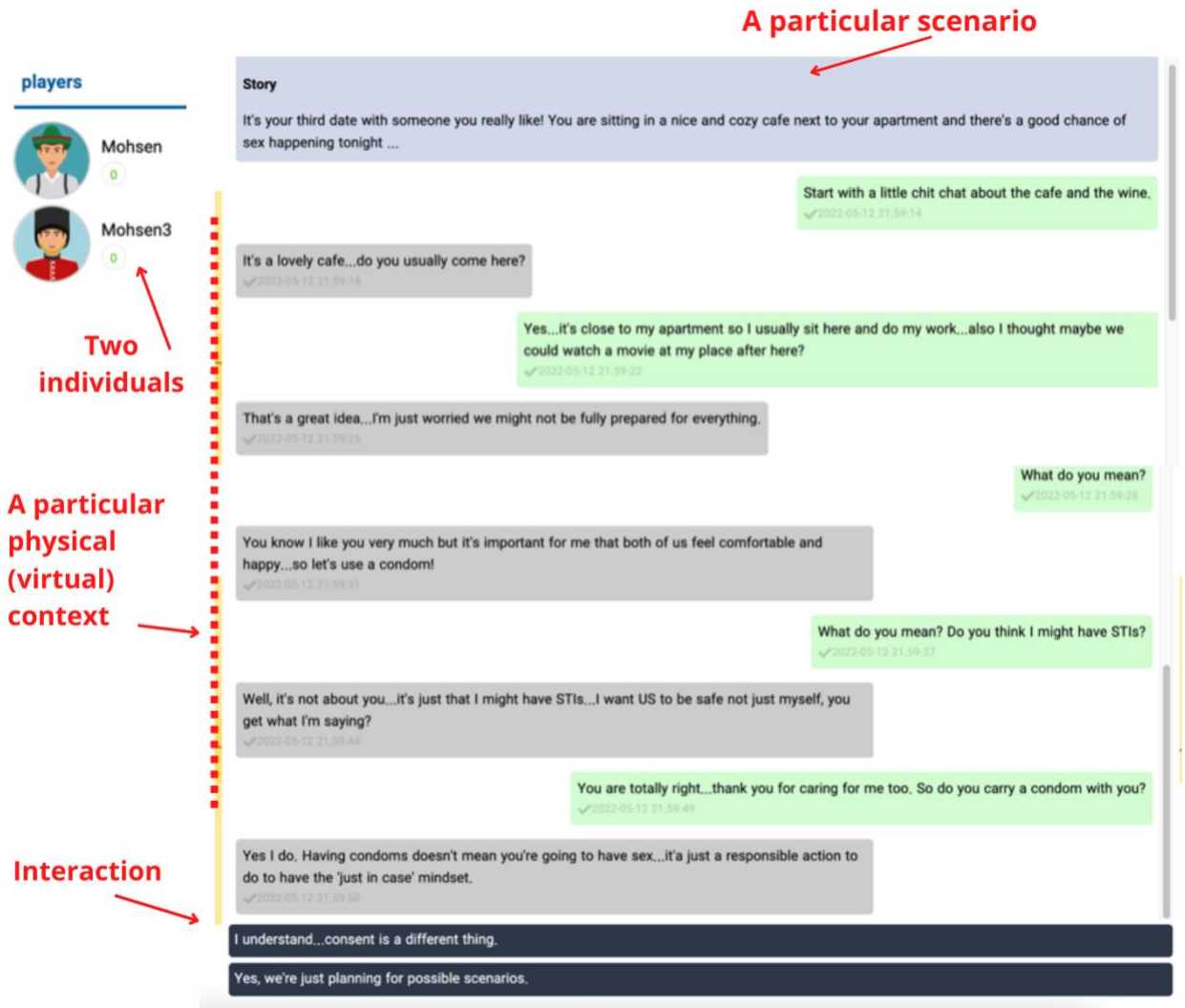
feedback. The help system is provided online through Zoom communication software. The game is developed and now running on Rehearsed.ca.

Developing the Content of the Game

To develop the content of the scenarios, we turned all the concerns pointed out by the experts as the possible causes of having risky sexual behaviour into interactive role-playing scenarios. The themes were directly or indirectly embedded in the game scenarios. The game is comprised of four scenarios in an interactive-story mode. Interactive story realizes communication, collaboration and common goals functions of Collaborative Game Design Model (Wendel, 2013) and all four elements of General Model of Sexual Negotiation (context, interaction, characters, and scenario). Interactive story can also simulate real-life circumstances through providing different endings based on the choices that the players make. The players form and lead the story together which means whatever decision one player makes, changes the options that the other player can have and choose from. While Wendel's model provided the tools for a collaborative serious game, the General Model of Davies and Weatherburn (1991) was used to add the sexual context. Figure 12 shows the elements of the General Model of Davies and Weatherburn (1991) in the game.

Figure 12

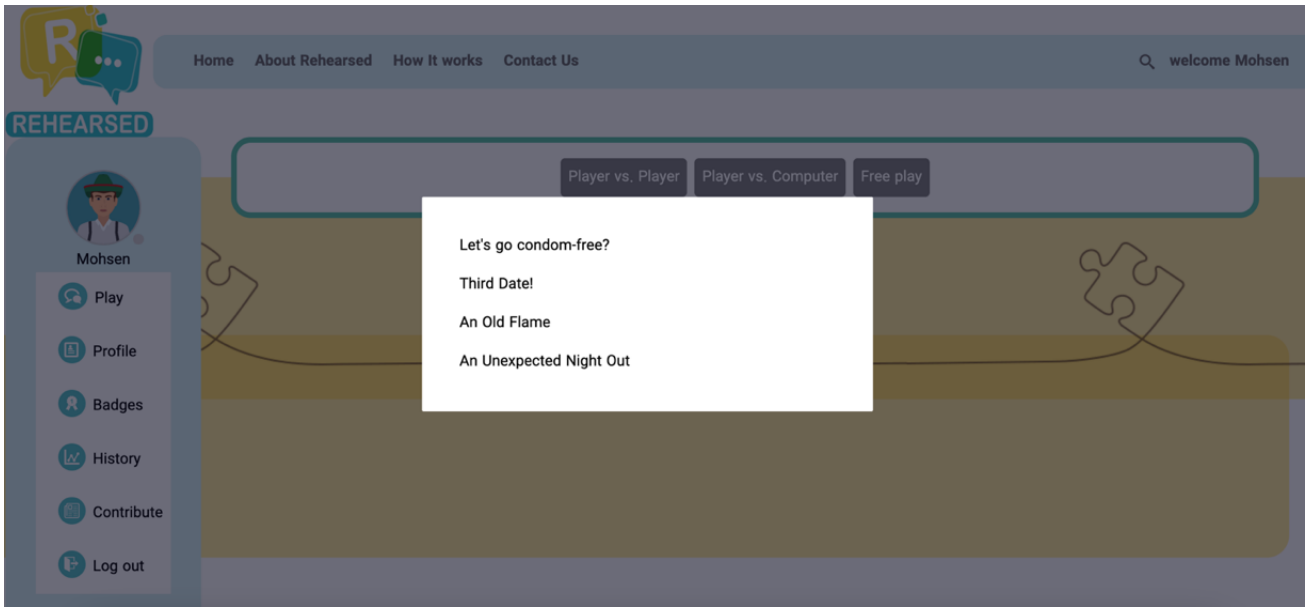
The Elements of the General Model of Davies and Weatherburn (1991) in a Collaborative Scenario



After the first prototype of the game was created by the game designers and the option of adding scenarios to the game was made possible in the game, the themes and concepts extracted from the interviews with experts were converted into role-playing scenarios in the game. Overall, four main scenarios were created: ‘Let’s Go Condom-Free’, ‘Third Date’, ‘An Old Flame’, and ‘An Unexpected Night Out’. (Figure 13).

Figure 13

The Game Scenarios



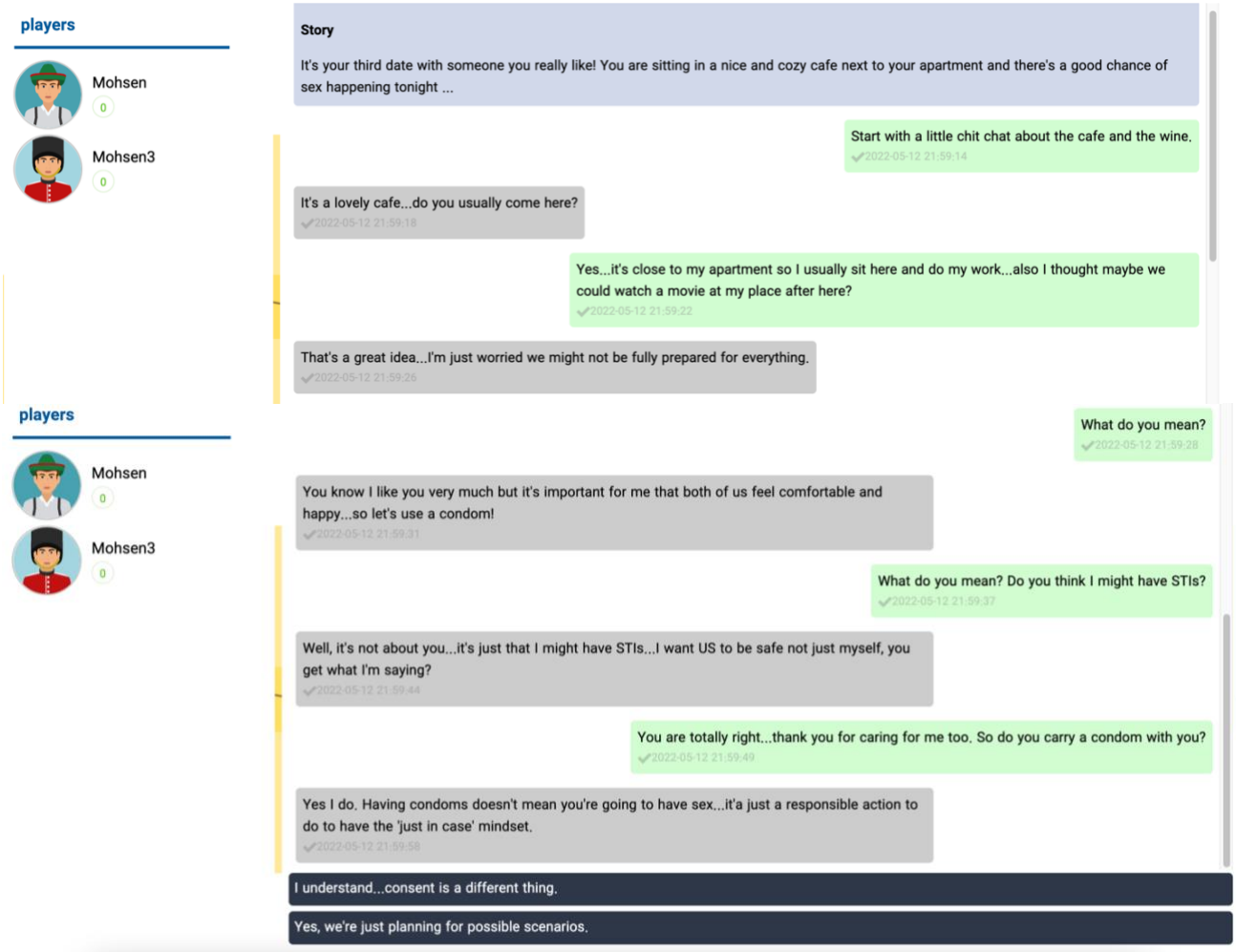
Each scenario included 100-200 responses to lead the story. The structure of the game was formed in a way that the players had choice in the story of the game and were able to form the story together. Every choice that player A makes, changes the options that player B has. There is no “success” or “failure” concept in the game as the goal is to encourage the players to explore different paths. A feeling of “failure” would make the players to look for the safest choices to win a scenario and get the highest scores or rewards, but as a serious game, the goal is to make it easy to select from a range of choices freely and see the results. All scenarios end in a safe or an unsafe way and an immediate feedback in a debriefing box tells them how things went

in terms of their negotiation and decision making. Participants are encouraged to play again and explore different choices.

As noted, the concepts from the literature review and interview with sexual health experts

Figure 14

Third Date Scenario Screenshot



were converted to game scenarios. As an example, the idea of 'bringing up the conversation about condom use' was converted into 'Third Date' scenario. It is important to point out that within each scenario more than 20 themes and concepts extracted from interviews with experts were integrated. Figure 14 is an example of a scenario that includes six themes.

The themes integrated into this scenario include:

- Talking about condoms beforehand and outside the bed: “sending like sexy text messages with a partner like early in the relationship before you actually meet up and be like by the way, like condoms?” (Expert C);
- Positive language, showing affection and care: “I might have STIs … I want US to feel safe and happy” (Expert A);
- Shared responsibility: “it's not just one person's responsibility, it's two peoples’ responsibility. There's two people who are going to have sex instead of putting all the pressure on just one person” (Expert B);
- The stigma of talking about condom: “a lot of people don't want negotiate condom use because they're worried that the other person will think that either you don't trust them or that or that, that you're not trustworthy” (Expert B);
- Having an ‘in case’ mindset: “you have to make sure you have a condom in your bag, in your bedside table so that you don't have to in the moment be like, oh, shoot, I wasn't ready” (Expert C); and
- The idea that carrying a condom is not a consent: “so if you say I want to use a condom and the other person says, yeah, we should use a condom, that's not consent to sex” (Expert C).

This scenario provides one possible path through the game. The players can play again and try a different route, where they will face other themes and concepts. This example shows how the interview themes were converted into game scenarios.

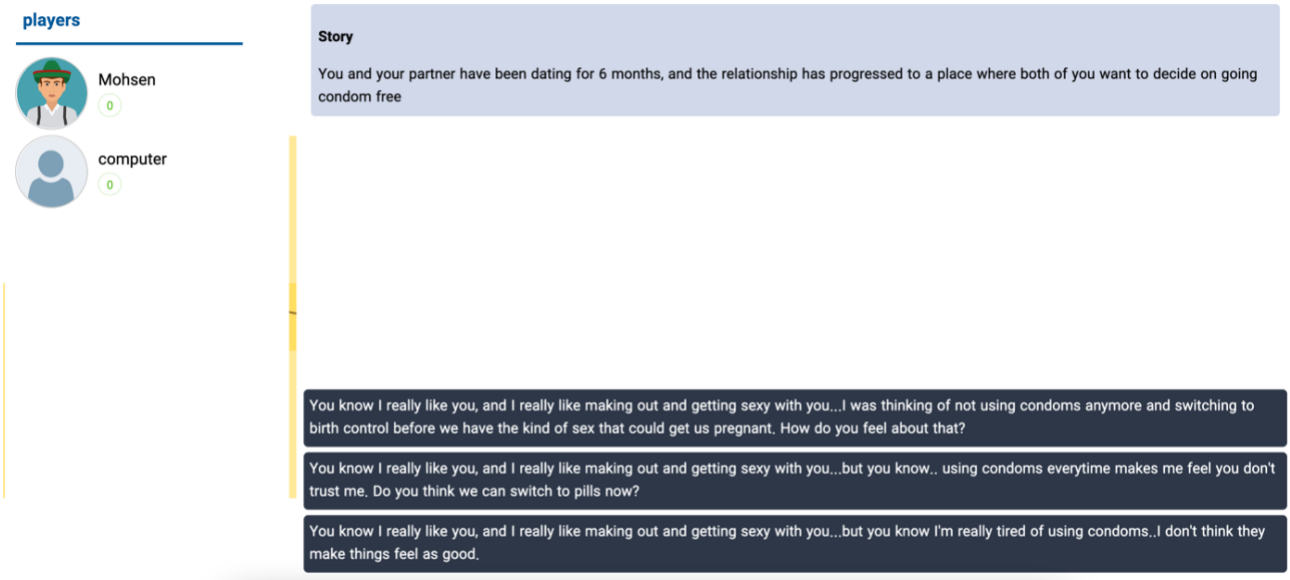
As noted in Figure 13, the game includes four stories. The stories were designed and developed iteratively to align with evidence of important communication practices extracted from the literature review, and interviews with sexual health experts. The stories are the

reflection of all the ideas and concepts expressed by the experts. The first story is called “let’s go condom free” (Figure 15) which challenges the players about making the decision not to use condoms after being in a committed relationship for six months. This story starts with this introduction: “You and your partner have been dating for 6 months, and the relationship has progressed to a place where both of you want to decide on going condom free.”

The purpose of this scenario is to inform the 18-24-year-olds about how to go about using

Figure 15

Screenshot of "Let's Go Condom Free" Scenario

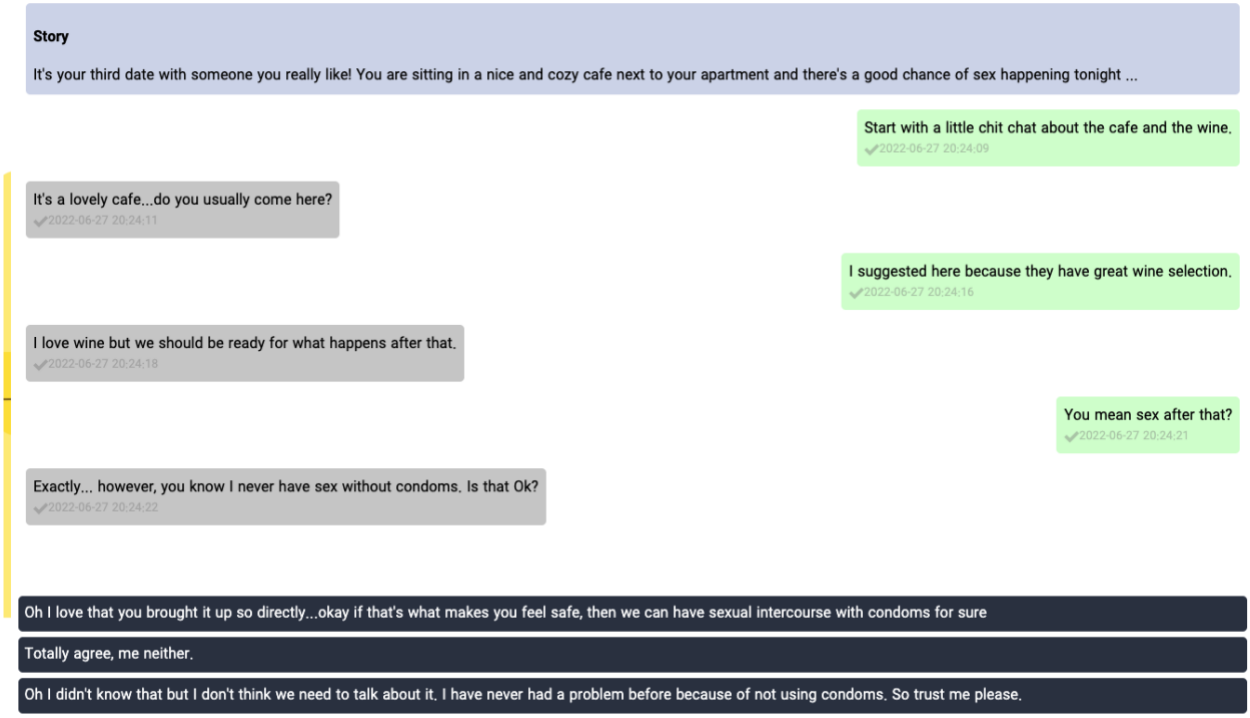


and not using condoms when they are in a committed relationship and what are the right steps like talking to a health care provider and getting tested for STIs before going condom free. They also learn the words and turns of phrase to use when their partner insists on ditching condoms for a number of reasons: because they love each other, they should trust each other, because they want a different feeling during sex, or because this is a way to move forward in their relationship.

Featured in Figure 16, the second scenario is called “Third Date” and it takes place inside a café in which the two players are led to talk about condom use during their third date before they get in a situation that talking about it gets difficult mostly because of the arousal influence. The conversation, as shown in the figure 16, begins with small talk but then, after the player chooses the starting conversation, progresses to options about purchasing condoms. The players are expected to learn the importance of, and how to talk about, condom use in advance, language they can use for speaking with partners who are resistant to condom use, and the shared responsibility of both partners to plan for it in advance.

Figure 16

A screenshot of "Third Date!" scenario

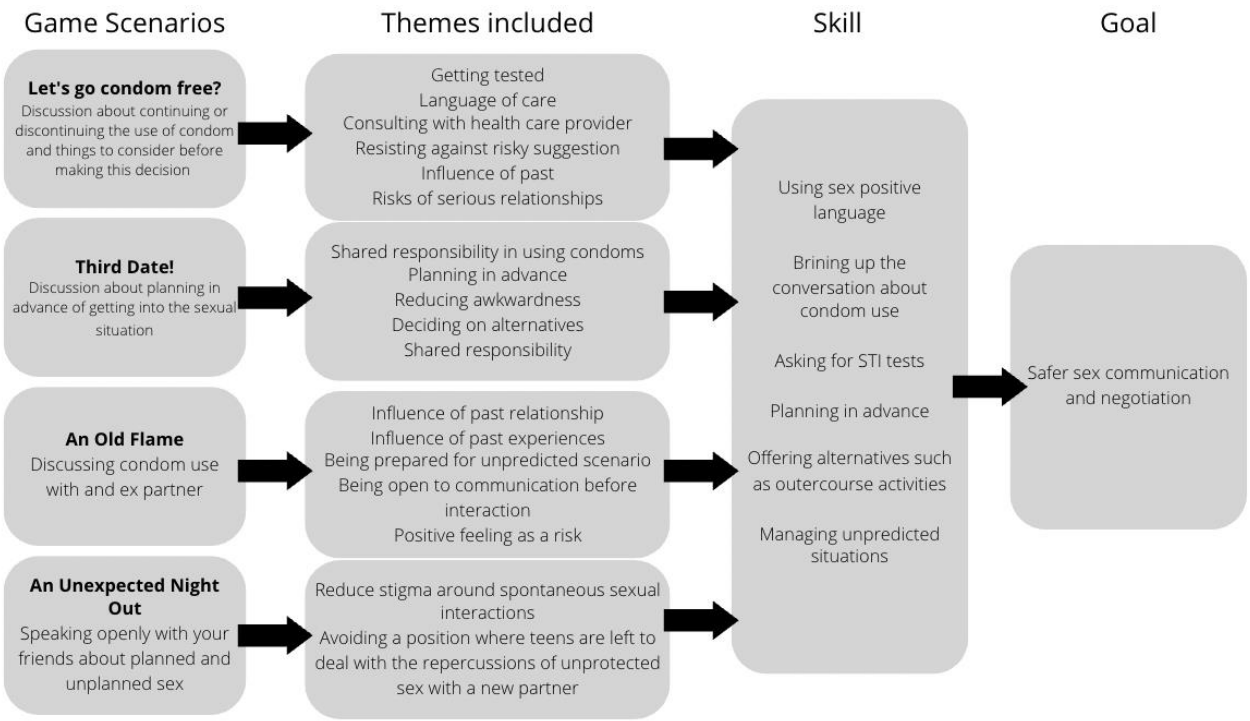


The third scenario is called “An Old Flame” and this is about two ex-partners who see each other accidentally at a party. This situation is planned to simulate unexpected situations for the players and the risks of previous experiences and familiarity with the potential sex partner.

They are expected to learn the importance of talking about condom use and not getting carried away with their emotions. The fourth scenario is called “An Unexpected Night Out” and is developed to prepare the players for unexpected situations and the importance of having strong heuristics, which is defined as the ability to make decisions and make judgments quickly and efficiently. Figure 17 shows the four scenarios, the themes included in each of them, the skills expected to be enhanced and the final learning goal which is safer sex communication and negotiation skill.

Figure 17

Scenario Contents and Learning Objectives

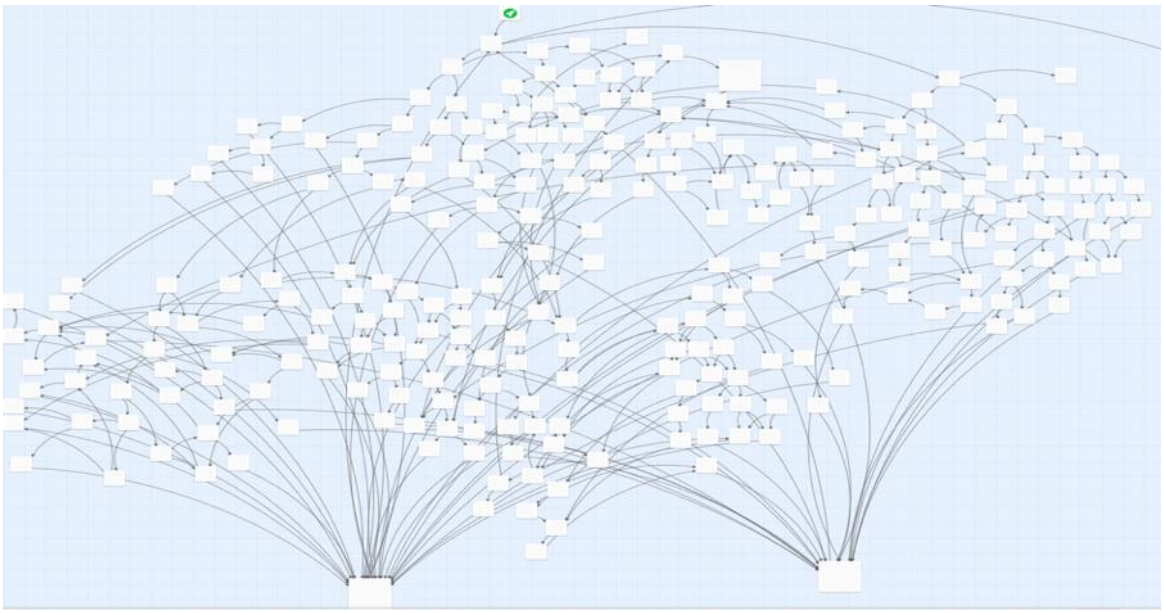


The progression of the game and the route they take is in the control of the players to decide how to continue and finish it. Each scenario has between 100 to 200 decisions to make, and these decisions make the story of the game in an interactive format. Figure 18 is an example of the complex decision tree constructed for each scenario. This decision tree is for the “Let’s go

condom free" scenario. The decision each partner makes affects the choices the other partner has and can then make. So, the story is formed collaboratively, and the ending of the scenario is the result of the decisions both partners have made. Figure 18 shows the decision tree structure of one of the scenarios in the game. Twine, which is a free and open-source tool for making interactive fiction in the form of web pages, was used to develop the first scenario (Figure 18). As you can see, the decision trees became very complex in Twine and converting them to Rehearsed.ca was a very frustrating process and would take extra time to convert the scenarios from Twine to Rehearsed. Also, this would always need the team of the game developers to convert the scenarios from Twine to Rehearsed. Thus, we built our own and very simple scenario creation function on the website (Figure 19) so that the scenario writers could write scenarios on Rehearsed without the need of a game developer. The other three scenarios were created in the game using the scenario creating function on Rehearsed.ca (figure 19). Having a built-in scenario creation function was a fundamental part of the game design process as this facilitated and expedited the scenario creation and allowed us to create longer scenarios with a minimum of errors and glitches. The codes are written in PHP language and standard format of Laravel framework and uses openswoole library as its server backend. The database used in this web application is MariaDB. The game section exclusively uses WebSocket protocol for communication implemented using socket.io JavaScript library. All of above technologies are open source and well documented. The source is readable for any Laravel developer who is familiar with WebSocket and OpensWoole. Rehearsed.ca is running on a server with CentOS 7 on ComputeCanada server and is capable of moving to any other docker host in a matter of seconds.

Figure 18

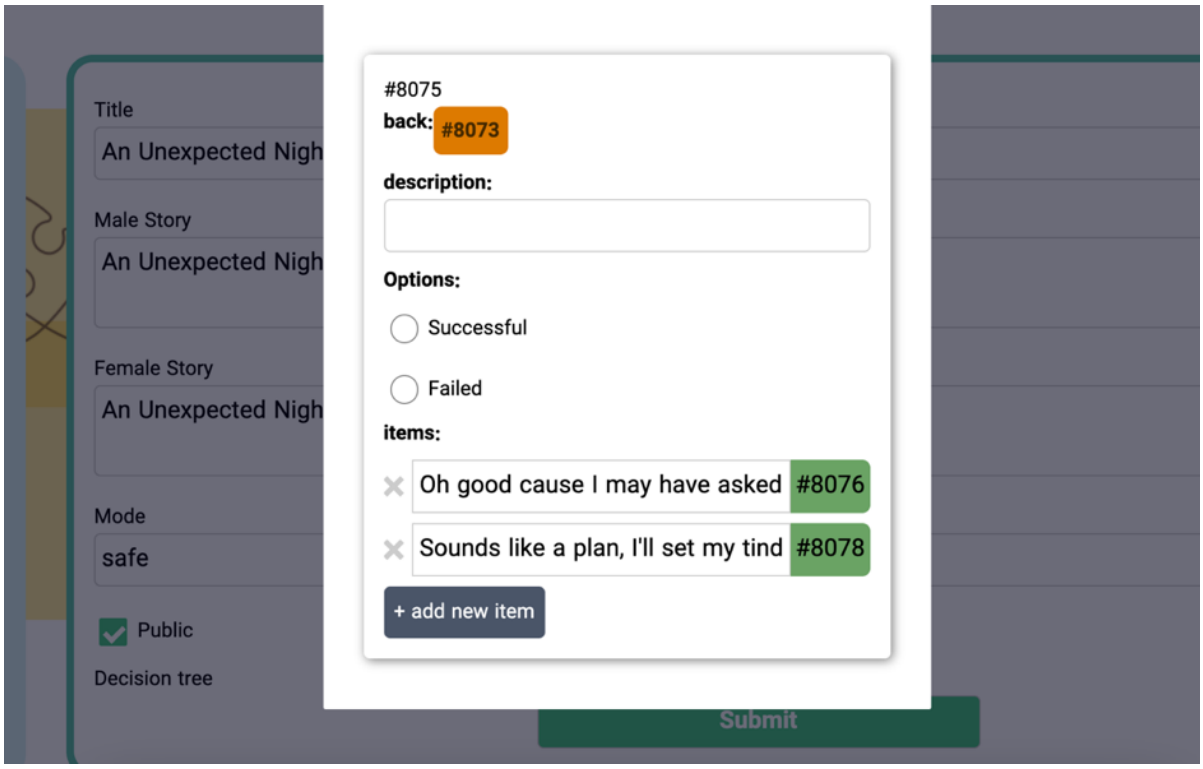
Decision Tree Created by Twine Program



Each scenario starts with a short introduction and ends with a debriefing box (Figure 20). At the end of each scenario a debriefing box pops up to provide immediate feedback for the players about their decisions. These pop ups provide the sexual health information and logic

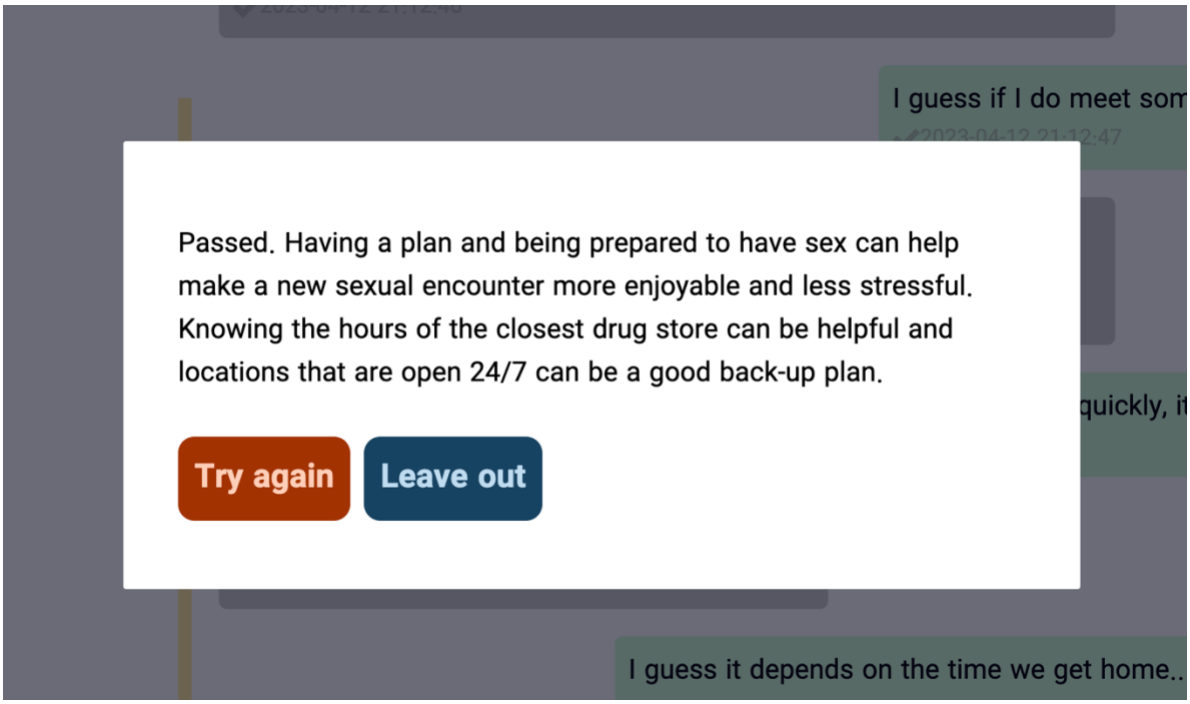
Figure 19

Scenario Creation Built in Rehearsed.ca



behind the better decisions and encourage participants to play again and take a different path. Figure 20 shows one of these debriefing boxes.

Figure 20.
Debriefing Box at the End of a Scenario



To strengthen the feedback aspect of the game, the game session was followed by a 30-minute debriefing session facilitated by an RA with a Masters in Family Relations and Human Development specializing in Human Sexuality. The purpose of having the debriefing session was a) to enhance learning by exploiting the context that was created by the game for the 18-24-year-olds to ask their questions and share their thoughts and concerns related to their sexual health; b) to ensure the social aspect of social-constructivism learning theory that this study follows is realized and c) enhance the quality and efficiency of the learning experiment as reported by previous studies (Crookall, 2010; Gee, 2008; Jones, 1999). This is important to note that playing Rehearsed.ca does not need the presence of a trainer or teacher but having them available during

game play can improve the efficacy, in part, because the scenarios may evoke more questions for young adults that are not addressed by the verbiage in the scenarios.

Play-testing

After the first prototype of the game was developed and the content of the scenarios were closely reviewed and confirmed by Expert C, the Youth Advisory Board play-tested the game in two 30-minute rounds and shared their thoughts about the playability of the game and understandability of the scenarios. Most of their comments were about technical glitches in the game and reports about the responses that would not make sense throughout a story. The feedback was noted and shared with the game designers and scenario writers to get resolved. This cycle happened two times as the types of comments and suggestions pointed out by the play-testers seemed to reach the point of saturation after the second play-testing session. It was then concluded that the game was ready to be evaluated by a larger number of 18-24 year old participants (n=40) to share their thoughts about the efficacy of the game. The result of the thematic analyses of the 40 participants' suggestions and responses in the real situation of the game are provided in the next chapter.

Chapter 5: Game Evaluation Results

In this chapter, I provide analyses that will inform understandings of the second research questions: how do 18- to 24-year-olds report practicing safer sexual communication and negotiation skills through participation in the collaborative serious game and what insights do (a) 18-24-year-old participants and (b) sexual health experts share about the game that can inform future design iterations of this game? In this chapter, I report results from the third step of the DBR (Reeves, 2006) method: evaluation research of the solutions in practice. The results of this study are divided into two main sections. In the first section, forty 18-24-year-olds (recruitment and registration process explained in Chapter 3) were interviewed in separate focus group discussions (protocols and questions asked listed in Appendix F) and in the second section three sexual health experts were interviewed in semi-structured one-on-one interviews (protocols and questions asked listed in Appendix G). The data from these two sections are presented separately here.

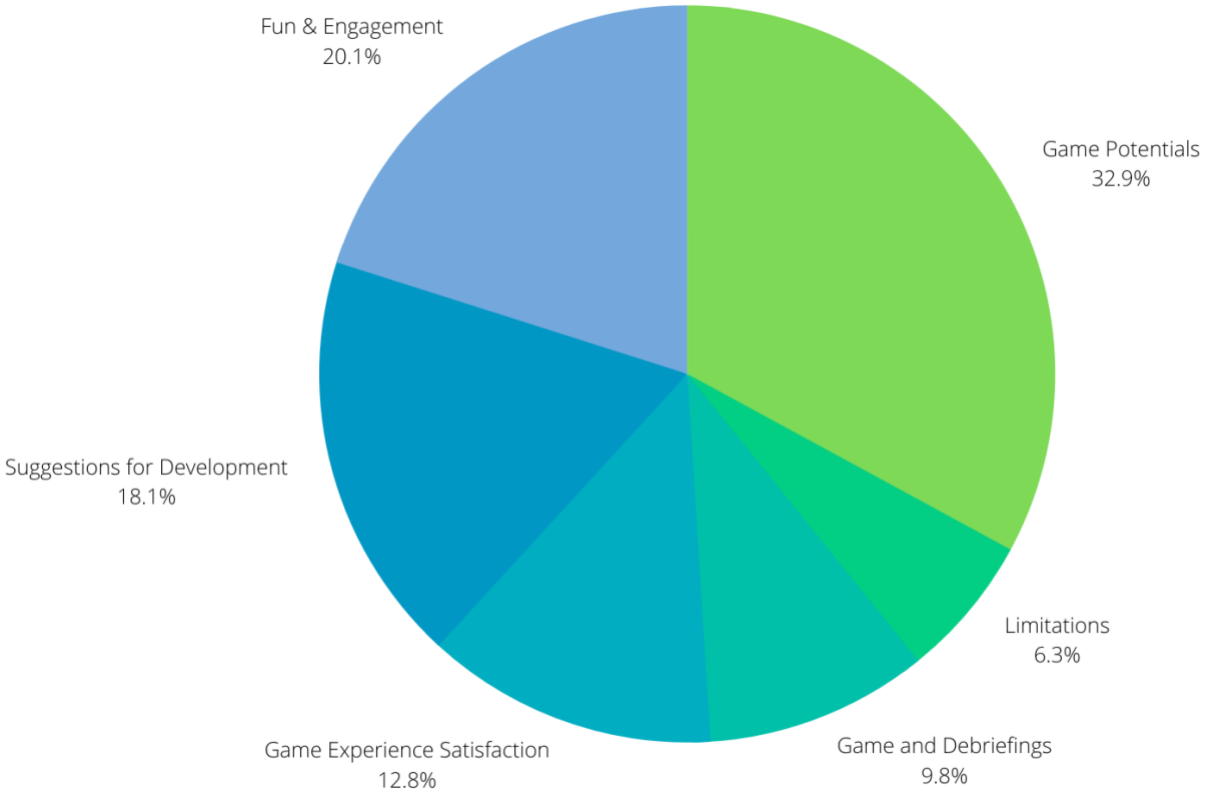
Data From 18-24-year-olds

The purpose of the focus group interviews with the 18-24-year-olds was to understand (a) their perception about the efficacy of this game for safer sex communication skills and (b) their insights that can inform future design iterations of this game. The PI and an RA transcribed and then analyzed the interviews using verbatim thematic analysis (Miles et al., 2018). I start with themes related to the ‘Serious’ dimension of the game with a concentration on learning outcomes and then proceed to the ‘Gameplay’ dimensions which investigate the fun elements (Alvarez & Djaouti, 2011). Together, they can show us how the principles of serious games are integrated with safer sexual negotiation content. All participant quotes were transcribed verbatim. This was to ensure accuracy and to respect the diverse ways of expression of all participants.

Overall, the total of 40 participants were divided into five groups and were interviewed in five separate sessions. The participants logged into the game with a nickname, got matched up with another participant and played all four scenarios in the game. The play time was approximately 30 minutes, and it was followed by a 30-minute debriefing session led by the PI and an RA.

Figure 21

Distribution Percentage of Each Theme



As presented in Figure 21, six main themes were constructed from the analysis of the focus group transcripts and chat files: ‘Game Potentials’ (158 references distributed across multiple participants in the corpus of data), ‘Fun and Engagement’ (80 references distributed across multiple participants in the corpus of data), ‘Game and Debriefings’ (39 references distributed across multiple participants in the corpus of data), ‘Game Experience Satisfaction’

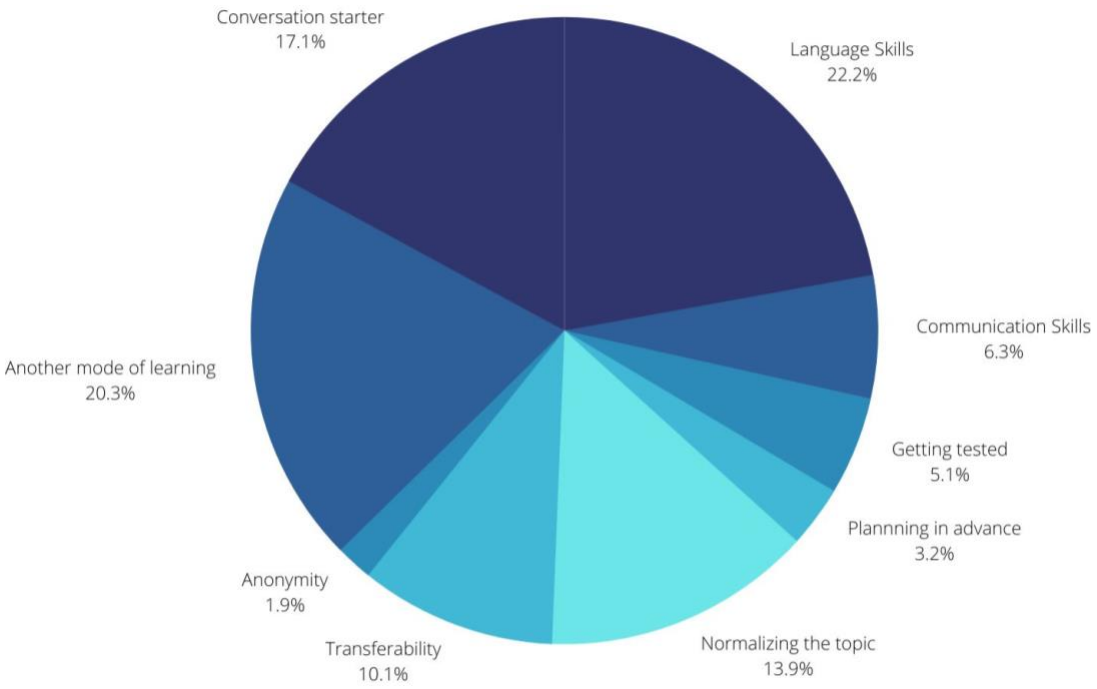
(51 references distributed across multiple participants in the corpus of data), ‘Suggestions for Development’ (72 references distributed across multiple participants in the corpus of data) and ‘Limitations’ (25 references distributed across multiple participants in the corpus of data) which made the total of 425 references. You can find the definition of each theme in the code book 2 in Appendix E. Figure 21 shows the distribution percentage of each theme from the total of 425 references.

Game potentials

The theme of game potentials focuses on the skills, knowledge, and attitude changes that were reported by the participants and other advantages that the game had. Overall, 158 references from multiple participants in different groups were connected to this theme. This theme is divided into nine sub-themes of ‘Language skills’, ‘Communication skills’, ‘Conversation starter’, ‘Planning in advance’, ‘Getting tested’, ‘Anonymity’, ‘Normalizing the topic, ‘Transferability’, and ‘Another mode of learning’. The distribution percentage of each theme can be seen in Figure 22.

Figure 22

The Themes Connected with the Potentials of the Game



As you can see, the potential of the game in enhancing the participants' language skills (i.e., learning the language of communication and negotiation) shows the highest frequency. Language skills and communications skills together comprise 28.5% of the overall feedback. The game as another mode of learning compared to textbooks, PDFs and other non-interactive platforms stands second.

Language Skills. Learning words and phrases related to safer sex communication emerged as the most frequent theme in the all five focus-groups. This theme was mentioned 35 times by multiple participants in three out of five groups and in four out of eight chat files. The players found the game efficient in giving them what they needed to say in the situations that they rehearsed in the game. As Beny (all names are pseudonyms) explained in the interview "[the game] serves as a lead on how to go about having this conversation as it might be difficult finding the right words" and Dana confirmed that "it's more practical in the sense that you can see what words people use." Jodie also stated that "so it's like you know some parts of the game are great in a sense they give you the actual words and tools and phrases to say in those

conversations." Brett said he learned how to put words together so that he doesn't sound untrustworthy: "I actually learned how well to arrange my words, so I don't come off as not being not trustworthy." Pal suggested it helped them how to manage an awkward situation: "I think it kind of helps you to plan out on how to say in an awkward situation." It seems the game was able to enhance the participants' language skills and provide them with some words and phrases they could use to manage the challenging sexual situations.

Normalizing the Topic. The second most frequent theme was about the efficiency of the game in normalizing conversations around sex and condom use and removing the awkwardness around such topics. This theme was mentioned 22 times and by multiple participants in all five groups. Liam, one of the participants, mentioned that "it gives courage and information on how to start the conversation." Eve acknowledged Liam and added that "it's not too scary to talk and be open with your partner." In terms of mitigating awkwardness, Jess explained how this game shows that such conversations don't have to be awkward: "this shows some like how it could kind of be done and it shows them that it doesn't have to be awkward." Ali looked at it from another perspective. He didn't say the game removed the uncomfortable feeling but helped him to accept that this is a necessary conversation despite being uncomfortable: "I think also learning that it's okay to have uncomfortable conversations, sometimes life is awkward." Jodie thought that the exposure to different scenarios would help in normalizing such conversations. Sara believed that everyone should get used to such conversations and how being used to them can help to remove the awkwardness:

> Opening up these discussions, I think is a good idea, and like just trying to normalize it, as you know, something that should be done and that would be great and it's like something that I've noticed even like with my own partners like sometimes I've opened

> up these conversations and I'm used to having them and I've had a partner say like Oh well, that was awkward but it wasn't awkward to me because I'm used to it, but it was awkward for them, because they're not used to having this conversation and that's just I guess interesting to see how how much like people might not be used to it.

Maison agreed with Sara and added that the game could enhance their ability to ask the sexual questions that they had never shared because they felt awkward about them:

> Yeah I agree it does help to break down some like the barriers of standing up and asking the teacher or something which can be very awkward for students and can deter people from asking those questions.

The participants also agreed that the game raised awareness about getting tested, communicate around condom use and risks of unsafe sex specially if both partners are unaware of the risks: "the game is engaging and encourages you to be open and warns about the dangers of unsafe sex, even if you are both on the same page."

Communication Skills. The idea of enhanced communication skill after playing the game was also seen when the participants were asked about the skills they learned through playing this game. They mentioned "ways to speak", "how to navigate that discussion", and "learning how to navigate convos (conversations) about it more than 13 times by multiple participants across the interviews. Jodie stated in the chat box that:

> I think if you had to put a pin on it, it would just be how to have a sexual health conversation or how to have a conversation about condom use or sexual health testing that would be the exact skill that you would gain from this game.

Sara stated that after playing the game "they could learn how to get out of manipulative situations" and Lina thought the game "gives a good basis on how to perhaps formulate a

conversation." Silvi found the conversation around condom use and planning for sex useful: "You know whether or not they brought the condom and whether or not they were going to have sex afterwards and the negotiation that happened there like that's that's a good." These comments are positive signs that the game could somehow reach its main goal which was enhancing the communication skills around safer sex.

The Game as a Conversation Starter. Another function of the game noted by 27 multiple participants in three groups was its potential in facilitating the discussions after the play experience. Lina thought "the game is a great conversation starter." Sara confirmed Lina's idea and added that "the game helps make scenarios and sex topics relatable/accessible and is a starting point to open up discussion in a classroom." She thought "without the game, trying to open a discussion could be too dry and not engaging." Mino also found the game as a facilitator of further discussions: "discussion and review helped more and was made much easier by having something specific to be reviewing." Charles considered the teachers as well. He said "the game does need to go hand-in-hand with discussion. I think it also gives teachers something to talk about in these classes because I imagine they sometimes struggle to talk about it and navigate where to start." Trista suggested the game holds potential as a classroom-based resource: "I think paired with discussion, this is a great resource for teachers to begin conversations with their students." Eve put this idea beautifully: "the game engages you, then the discussion hammers it out." Jodie saw the benefit of the discussions in having both genders involved: "discussion has the benefit of having the opposite sex present and hearing their perspectives." It seems there was a general agreement on the potential of the game to set up a meaningful context for further discussions and elaboration on what happened inside the game.

Although the learning impact of the game was reported to be enhanced together with the discussions, Arian and 12 other participants shared the idea that although the debriefing was an added value, the game alone would still be a good source of knowledge for those who are not using it in a classroom context or do not have access to group discussions: “if it was just itself, it would be a fun and interactive way to learn for teenagers.” The game was mentioned to be a good resource even if further group discussions are not available.

Getting Tested. Like Jodie, eight other participants also came to understand the importance of getting tested for STIs. Jeana found “how to get tested and nudge my friends or peers to practice safe sex” as the skills she learnt. Arian talked about how he learned if you love someone you should get tested: “[the game made me] feel like you know I trust you and I love you, but I want us both to kind of get tested for each other sake.” One of the participants, Alex, stated that he would book a test right after the interview: “I will book a test like tonight, so we know we are safe in some regard.” The game seems to have been able to raise some awareness in regard to STI testing before discontinuing the use of condoms.

Planning in Advance. Planning in advance for the sexual interaction, planning for purchasing a condom and carrying it was another skillset that was considered necessary by the sexual health experts. Multiple participants in different groups mentioned this theme five times that they actually learnt and became aware of the importance of planning due to this game. “making plans wayyyy in advance like wayyy in advance”, “the pre-discussion” and “it's good to negotiate before sex” are three excerpts from the interviews. After playing ‘The Third Date’, one of the players showed his learning in this way:

> It's going to kill the mood, if you got to go to the convenience store, right? and like that's always been like my mentality like if it's open if it's right there, why not right? but I think

> it's probably more beneficial just have them around, even if they're not doing anything. (Jodie)

They mentioned that the game was successful in teaching them to have the "just in case" mindset and have to be ready in advance and before it really happens: "But like you know, like the game it literally said, like you never know what's gonna happen" (Joy). These are important quotes as they show that the game made them think about unpredictable situations and be prepared for it in advance.

Transferability. Multiple participants in four out of five groups mentioned 16 times that it was good that they were exposed to different scenarios before they happen in real life and it could be "good reference points for first time real life scenarios" (JJJ), and that the game "prepares them for real life" (Brett) and "it would've prepared some people for the tough conversations" (Maryana). As the answer to the question of "do you think this game could help you for future real-life scenarios?" Joy said "for sure. I think I would have made fun of it at the time, but it would stay in the back of my mind for future scenarios!"

Anonymity. It was also mentioned by three participants in two groups that the anonymity adds to the effectiveness of the game:

> It was a good idea for a game. I think that this game will be an effective tool for teachers and learners, it takes the "awkwardness" out of frank, face-to-face conversation about sex and the anonymity aspect makes it a lot easier to engage in open communication. (Andy)

Another player, Pal, thought that it helps the player to build confidence in the game by playing against anonymous players before they face real people in real life: "some players might gain more confidence from communicating with an anonymous person before talking to actual partner."

Another Mode of Learning. Participants described the game as "another mode of learning," a concept that included ideas such as 'different sex education experience,' 'engaging content,' and 'in-depth and extensive content'. This code was identified 32 times in the dataset. Participants were asked how their previous learning experiences related to sexual health differed, if at all, from what they experienced during the game. In response, some participants said the game was more "realistic and scenario based" (John), the game "engaged both parties' opinions" (Sara), and it covered scenarios that would not usually get covered in sex education classes (Maryana). Perry and Matthew also compared their previous experiences in sex education with the game experience and said: "I don't think the sex ed classes go over potential dialogues that we may experience in person, but the game does" and "the game recreates more realistic scenarios in comparison to textbooks or in class videos which usually don't go into in-depth scenarios." Another participant, Pineapples, compared the game with sexual education textbooks: "textbook gives a very general list for any situation, while this game is much more situation specific, which teaches us how to adapt, rather than follow a set of rules." Pal thought the game could present the information in an easier way for players to understand: "playing this game is like the information has been digested for players." Other players suggested the game is "less embarrassing than coming to the front of the room to share ideas" (Morgan), and "more fun and educative" (Andy). Arian suggested the game is "more humane and less embarrassing approach to learning about sex education" whereas others suggested the game is "far more interactive" (Ahmmad), and "feels more personal" (Eve).

Nur, a participant who said he had a great sex education in Toronto district school board and had a "decent … understanding of things [sexual health]" shared his evaluation of the game and compared it to conventional resources:

> I did appreciate how realistic and like meaningful these conversations could be, right? because even though they're short, they did have a lot of context that that could give you even more context, and I feel like in that sense it's very beneficial. … A lot of people enjoy the textbook thing but why, why would you [read textbooks], if you can do this [game], right? and you can play a game and decide what you want to learn.

Peter shared his understandings of the potentials of the game as: "I thought the game has the potential to change some ideas on the sex education curriculum, and the methods of learning in this topic. It is a good start to a bigger outcome." The final excerpt of this section is from Ally, a 22-year-old girl who thought 1 hour of playing this game was better than all sex education she ever received in high school: "what's ironic about that [the game] is that this is more success than what I ever got in high school. Like, just from playing this game! Like, are you kidding me?"

Comparing the game with conventional sex education resources, some participants found the game more engaging, detailed, thorough, realistic, and contextualized in a story which could enhance learning and understanding compared to isolated information in textbooks. Some who reported receiving a good sex education even suggested that the game could add to the quality of sex education programs. So far, I have presented the data from the 18-24-year-olds pertaining learning impact (seriousness) of the game. In the next sections, you will read more about the gameplay dimensions of the game.

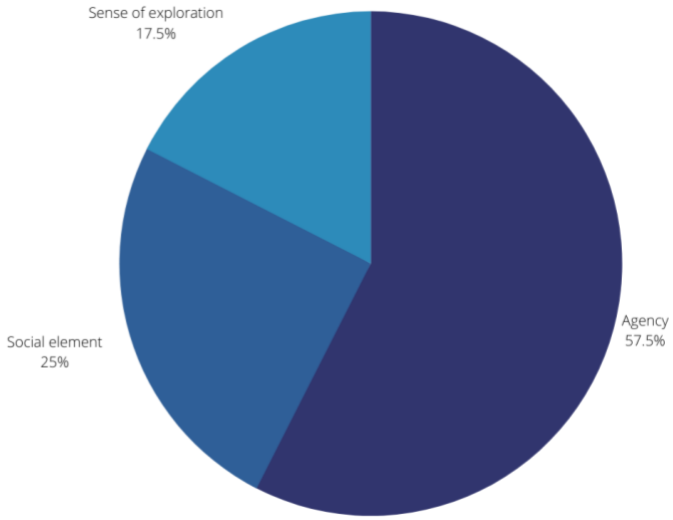
Fun and Engagement

After investigating the 'Serious' element of the game that focused on the learning outcomes, I proceeded with exploring the 'Gameplay' dimension which focuses on the playful

aspects of it (Alvarez & Djaouti, 2011). During the focus group interviews, participants were asked what they found fun about playing the game.

Figure 23

Elements of Fun Mentioned by the Players



The participants' responses about what they found fun in playing this game were coded in the three themes of 'Agency,' defined as giving the participants a sense of self-determination over their decisions and having the power to control the story (Mitgutsch, 2011), 'Sense of Exploration,' defined as exploring the interactive story feature of the game, and the 'social element' of the game, which refers to the way participants play against another human rather than the computer. Eighty references were found related to these three themes distributed in all five groups. Figure 23 shows the share of each theme in percentage. As you can see, Agency with 57.5% stood first in terms of making the game fun for the players. Social interactions and the sense of exploration were the second and third important fun elements respectively.

Agency. Participants seemed to appreciate the way the game gave them the power to lead their own story in a way that most interested them. Sara stated that it was fun because she could make her own story: "the ability to choose kind of like make your own story that is really

interesting and the fact that they get feedback on it." She liked how she could change the story and see the result of her choices. Joy shared the same idea. He found that this game gave him the power and courage to try things that he would never try in real life: "It was entertaining to choose dialogue that does not fit what I may say in real life, and to see the reactions of that." Nur also acknowledged that being able to lead the story makes it fun and entertaining: "I think the most interesting and most fun part about the game was multiple chance of it, like multiple endings." Matthew found the element of interactive storytelling as the fun of the game: "the game was fun because it provided the element of storytelling where you can choose your pathway."

The design of the game intentionally included scenarios meant to be experienced as fun or even dramatic by the participants. Options like: "Are you breaking-up with me?" or "Oh yeah I have my toothbrush with me" as an answer to "are you prepared for tonight?". These options seem to have worked and appealed to the players. Several players said it was fun "to choose the rudest path." Ahmmad said, "I did a bad response run for the fun of it quite enjoyable." Similarly, Mino said, "I was tempted to do a bad response but someone did it with me before I got the chance -- it was very entertaining to shut someone down with sex ed lol" (Mino). Ally described her experience with these situations very nicely as she was playing against her sister:

> Yeah I feel like having different options was really funny like my sister had a couple of options that were like really toxic, so it was definitely really funny where she's just like, 'are you breaking up with me' and I was like 'oh wow okay!' So yeah there were a few options in there that were actually hysterical … it was interesting to be able to pick different options that maybe would help mitigate that instead of just like us, just going through it so that you can actually figure out what to do about it.

Several participants mentioned that the debriefing boxes were helpful. Brett, for example, said: “the choice of words for me, I loved it, also the comment at the end of each game enlightens me more.” JJJ also liked that he was able to play again and try a different path: “I think replaying allowed us to pick some of the more interesting/risqué options.” For Morgan, it was interesting that she could still get surprised by different answers even in the fourth round of playing the game: “I think it was interesting to be on the 4th round of the scenario and still get different answers/question.” Arian shared a similar idea: “each scenario being very re-playable with a new pathway every time as well as the fact that it seemed very real.”

Being able to lead the story seems to have made the game very appealing to the participants. They also mentioned that this function allowed them to try different paths each time they played a scenario without being too much concerned about the outcomes. They wanted to see how the story would lead if they selected a different option, which would provide different learning opportunities related to safer sex communication. They enjoyed the funny responses in the game and also found the debriefing boxes at the end of each scenario helpful and enlightening.

Social Element. This theme is connected to keywords related to this feature of the game that allowed playing against other human players instead of the computer. Ten participants found this a reason for having fun. Ahmmad, as an example, said: “I think having a human aspect is definitely fun compared to just talking to a computer.” Pal confirmed this idea and said: “most interesting part is that we get to communicate with a real person.” Daniel also shared a similar idea: “I liked trying out different scenarios that are possible and doing the activity with another human made the activity more engaging.” Peter thought that this social interaction could even enhance learning:

> The platform to have a social interaction emphasizes how much information and why we should retain because a lot of people prefer private lessons. This feels more like an actual conversation so you're more likely to really absorb what you're talking about.

The idea of having live conversation was planned to simulate the dyadic nature of sexual conversation and make it as realistic as possible. Beside the learning affordances of this function that the participants mentioned, it could also make the game more fun and engaging.

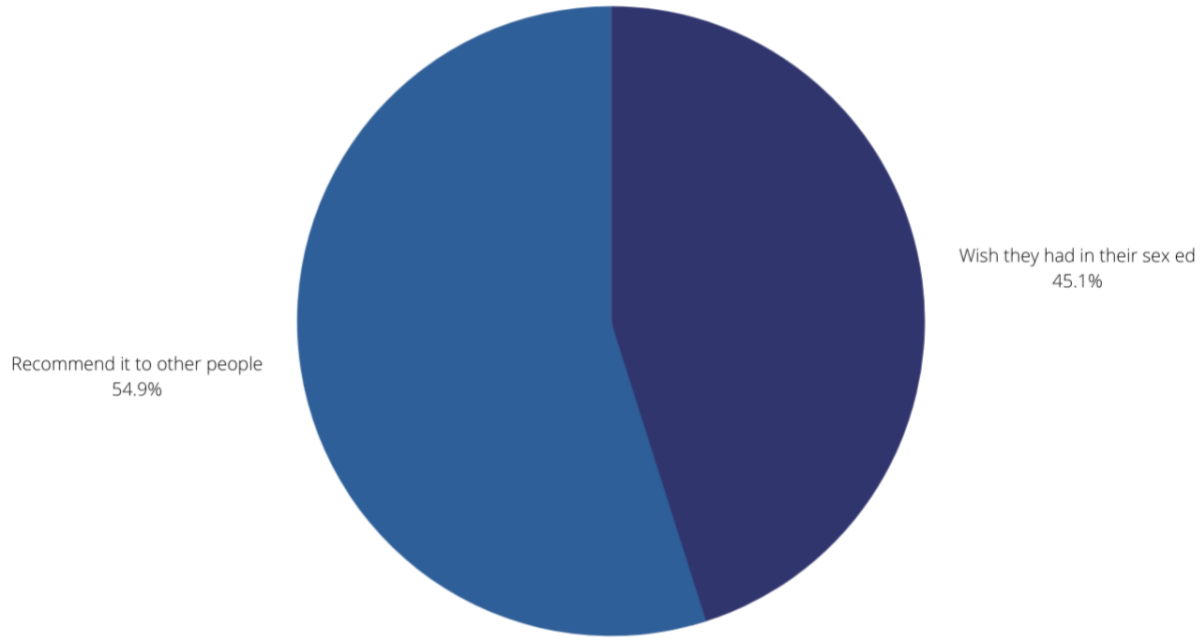
Sense of Exploration. The theme of "sense of exploration" as fun was also reported by seven participants in three different focus groups. I defined this theme as the idea of exploring different options and scenarios to see what they bring. It was mentioned by seven participants in three different groups. Morgan liked the game because she didn't know what would happen next: "It was interactive and explorative, u didn't know what was coming." Maison said he was curious to see what other scenarios include: "I was just curious. I was curious to see how these different scenarios play out." He asked for more scenarios because he thought it would encourage other players to go and check out other scenarios. As there was more than one way to complete a scenario, they were interested to see how other paths would end.

General Game Experience

To get the general idea of if and how the participants found their experience satisfying and useful, they were asked whether they wished they had access to the game in their sex education classes, and whether they would recommend the game to other people. As you can see in Figure 24, 54% (n=28) said they would recommend it to other people and 45% (n=23) said they wish they had it in their sexual health programs at school.

Figure 24

General Game Satisfaction



Twenty-eight participants in four different groups said they would recommend the game to people in their social network, and especially to those in their families or communities who are between 13-18 years old. Maison said, “I would probably definitely like I have a younger brother I would probably get him to play it just good idea.” Some other excerpts are as follows: “Yeah, someone like my little cousin who is 15 and navigating all this stuff” (Charles), “I would recommend to my lil sister and her friends” (Sara), “I’d recommend it to more introverted people who struggle with getting that in-person experience”, “the younger kids in my community since I know that speaking sex is "taboo" in a lot of their households” (Ahmmad). The funniest comment came from Andy who said he would share it with “My brother: I’m not ready to be an uncle!”

Twenty-three participants in four groups pointed out that they wish they had access to this game in their sex education. Micheal said, “this game would have enlightened me up, knowing about safe sex” and Pal thought the game could have dramatic impacts on people’s

lives. “It would’ve changed some people's life to have that.” Charles and Lina found this game more effective than their learning from their sex education teachers. Charles said, “but there’s some awful health teachers out there, so this would have been better than some of the Sex Ed I had for sure” and Lina said: “I think it would have been cooler than listening to a teacher.” Ahmmad echoed their ideas and stated that, “it was a lot more informative than what we did there [at school]” followed by immediate confirmation by Sara saying, “yeah something like this would've been very useful.” Maison thought it would make his sex education more interesting. “Um this would have been definitely interesting if I had (it) when I was doing my sex ed in high school and even in elementary.” These comments can imply that the game was generally received well by the young adult participants.

Limitations

Twenty-five comments related to the limitations of the game are divided into four themes of ‘The scenarios get repetitive’, ‘Some scenarios are not for my age’, ‘Some scenarios do not fit under 18’, ‘Transferability to real life situations’ and ‘Other limitations’.

Figure 25

Limitations of the Game

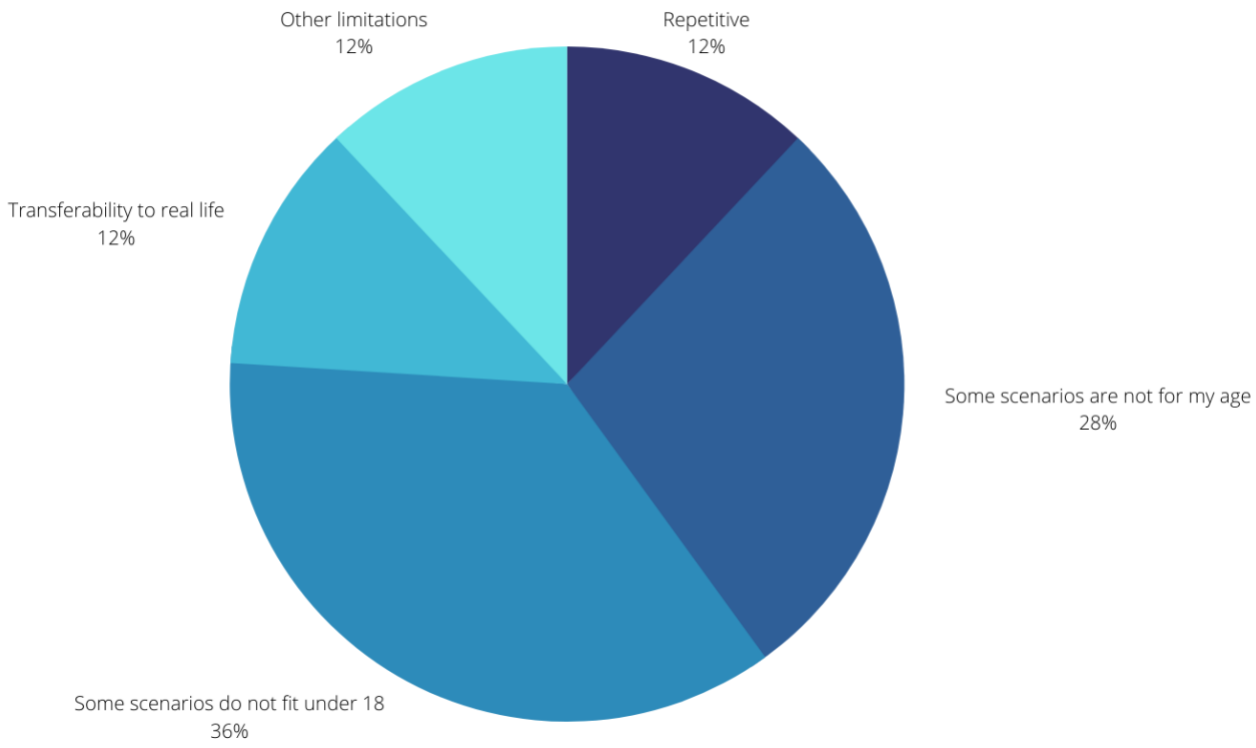


Figure 25 shows the share of each theme in percentage. Thirty-six percent found the scenarios not suitable for under 18-year-old teenagers, 28% thought they were too old for this game, 12% thought the scenarios would get boring after playing it more than one time, 12% stated that the game situations would not get transferred to real life skills and another 12% touched on a range of ideas related to long paragraphs and awkward responses.

It was mentioned three times by three participants in two groups that scenarios would lose excitement in the second or third round of playing it. Joy said that “it felt a little repetitive after the second attempt” of playing a scenario. Seven participants in four groups mentioned that the scenarios would not help them in their age (over 18) and they were too old to learn them.

Ally seems to be confident of her abilities and believed younger teenagers with some social challenges might benefit more from the game:

> I definitely think that this would be beneficial, I think it would be more beneficial to start younger than 15 because I'm not gonna lie to you by 18 usually some of this stuff has already happened for some people, and so, if you're not getting in there, like soon enough and you're already like somebody who's insecure, or like very prone to peer pressure or whatever when you're young and a teenager in high school. (Ally)

Bill, Joy, Mino, and Sara also confirmed this idea that they had learned most of the content in the scenarios due to their sex education or lived experiences. When Mino was asked about what he learnt today from the scenarios, he answered: “None because I’ve learned most of the information but if I was 15 it would’ve been much more effective than my sex ed class.” Sara had a similar answer: “None because I knew them from experience or personal education.” Maison and Nur explained how knowing the content made the scenarios boring for them:

> And I have personal experience, but after like the first couple of messages I could almost kind of read exactly where it was heading what was going to happen, I already had an idea okay there's probably gonna end this way, based on the options given. (Maison)
>
> Like it was very informative, and I did find myself reading it, but I was reading it quite quickly enough skimming through it, because I already knew. (Nur)

The critical comments suggest that the current game scenarios may not be beneficial for players over 18 years old, as they do not appear to provide any new information or skills. However, it is possible that the game could still be valuable for younger age groups. Further research could investigate the effectiveness of the game for younger age groups to gain a clearer

understanding of its impact. This would enable content developers to improve the design of the scenarios and tailor it more effectively to the needs of its target audience.

There was a heated discussion about the appropriateness of the scenarios for under 18-year-olds. Nine participants in four groups said that the same content would be “a little bit mature” for younger ages. Doug said that “I don't know just the way that they talked about the getting tested it felt a little unnatural it doesn't feel like a conversation that a teenager could reasonably have.” Nur also mentioned that the conversations were “too straightforward for the younger generation.” Maison said that the scenarios needed some tweaks if they were going to be used by under 18:

> Yes, like if you're talking about bars in Ontario at least 19 year olds aren't really or 18 year olds aren't really going to a bar, but if you're talking about like maybe like if they're going out on a date to a movie or something that might relate more to them. (Maison)
>
> I definitely think there, it is important to bring these conversations up, but I feel like there's maybe a smoother more tactful way to go about it somewhere that kind of fits into the way teenagers typically behave. (Doug)

JJJ also thought some of the scenarios were too direct and would make the teenagers nervous to have such conversations for the first time. Pal also thought that the game would make them uncomfortable: “this could help but I think some of us might feel weird to play.” Charles responded to their comments and said:

> I agree. And I feel like it definitely makes you think about your responses a little more thoughtfully. It’s important to use frank language sometimes too, instead of euphemisms. That way you learn the proper language and way to express how you feel. However, I can

see a group of teenagers using this in health class and laughing about it, not taking it seriously, or being embarrassed to admit they're learning.

Maison and Nur believed that the scenarios needed some tweaks to be played by younger teenagers. For example, younger teenagers cannot go and date in a bar and it needs to be changed to a 'house party' context.

Three participants had this concern that the scenarios may not get transferred to real life situations when they face them: "the scenarios not formulated in a very realistic way and not being relatable to real life situations" (Sara) "I don't know I don't know how well does it really translate to any scenario that teenagers might be facing and I don't know how well using some of these" (Doug), "I think it gives them a basic understanding, but when you're in the moment, often times you ignore those basic thoughts" (Ahmmad).

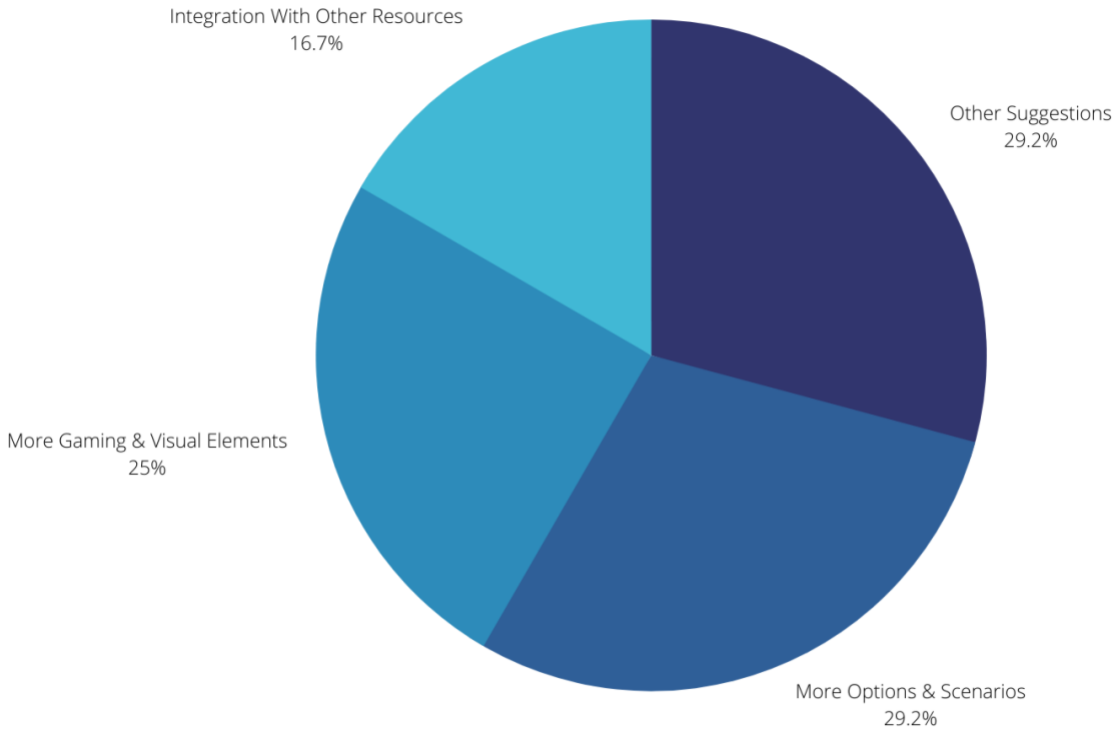
Other limitations were mentioned by only one participant. They are listed as "some paragraphs being too long" (Ally), "being boring when you pick the safest option" (JJJ), and "some options not being exciting or interesting" (Maison). There were, overall, 25 comments related to the limitations of the game and its scenarios.

Suggestions for Development

When invited, the 18-24-year-old participants offered 72 suggestions across the corpus of the data to develop the game further. Analysis of their responses answers the third research question: what insights do participants share that can inform future design iterations of this game?

Figure 26

Suggestions Made by the 18-24-year-old participants



As can be seen in Figure 26, the category of "Suggestions" is divided into four themes: 'More Options and Scenarios', 'More Gaming and Visual Elements', 'Integration with other resources' and 'Other suggestions'. Twenty-five percent of the suggestions provided focused on the need to develop more gaming and visual elements. Nearly 17% of the suggestions focused on the ways that the game, if integrated with other resources, could become more widely used. Twenty-nine percent of suggestions focused on the need to develop more scenarios and to further extend the options available within existing scenarios. Nearly 30% of suggestions were grouped into the "other" category as these touched on a range of ideas related to free chat, mini quizzes, fact presentation, and leaving the game option.

More Options and Scenarios. The majority of the suggestions were around including more options into each scenario and more scenarios to the whole game platform. Asking for

different options and scenarios was requested more than 21 times and in four groups. Some participants wanted a more complex platform with more options and more challenging topics (Morgan & JJJ) and some participants listed the topics that they thought would be helpful to practice. Representative suggestions include “house parties” (Ali), a scenario about “talking with parents” (Joy), “a visit to a health care provider” (Lina), “a scenario about first time sex” (Jordie), “a scenario for non-sexual intimacy” (Andy), “a scenario where you're talking about sex with friends” (Sara), “adding more humour” (Trista), “adding more drama to the storyline of the scenarios” (Masson), and “ adding more unexpected situations” (Nur).

More Visuals and Gaming Elements. This theme was detected in three groups and 18 times overall. Arian and Sara suggested more photos and images to be added to the game scenarios to make it less “text heavy.” Morgan suggested adding silly avatars and animations to the scenarios. Lina and Pal suggested more graphics and artistic elements. Mathew suggested “background music and sound effects when the players press buttons.” Jordie thought having the option of sending emojis would make it better. Mino and Robin suggested more “appealing colors.” Robin also suggested adding a point system and a way to spend those points in order to encourage and motivate the players to keep playing. Arman and Arian suggested “a typing indicator” so that they know their partner is there and choosing an option.

Integration with Other Resources. Twelve participants in three groups suggested that adding links to the options would be helpful for them. Arian, for example, said: “I think providing a clickable link and more information regarding that would've been helpful.” Dan also wanted “links to websites for services mentioned in the game.” Pertaining the ‘getting tested’ scenario, Jodie thought of a way to make testing easier through the game: “one thing that might

help with improving uptake for testing would actually just be including resources into the game for ways you can get tested." He continued as:

> So you can say things like Oh, you can get tested at your family doctor and you know your family doctor will have a confidential discussion with you about this because that's also super important when it comes to sexual health.

Maison also wanted more resources related to STIs. He said when he was in high school they told them a lot about STIs but they never gave them resources. He said he had to find the resources on his own and that this is not something that every teenager would do. Finding clinics for STI testing, in particular, is difficult. So, he thought having links to websites, clinic locations, or related organizations would be very helpful for the teenagers.

Other Suggestions. Having the typing option instead of choosing from the prompts was mentioned by ten participants in three groups. Participants indicated that they did not like the pre-typed responses and wanted to take charge of their responses through typing. They thought "free chat would be the most effective given a goal to roleplay" (John) or "giving the players options to type a response once in a while" (Bill). Manuel suggested that "a debrief/chat with the partner after the conversation" would make it more interactive. Among the other options were the idea of "having more detailed description of each scenario" (mentioned two times) (Trista & John), "the conversation exchange happening more slowly instead of instant response," "having the option to leave the game if a person was uncomfortable with the conversation" (mentioned two times) (James & Saeed), "having a mini quiz at the end" (Jenny), "having some information about STIs beside the roleplaying element" and "making the conversations more implicit for the teenagers" (JJJ). Maison also suggested that an anonymous Q&A in the game

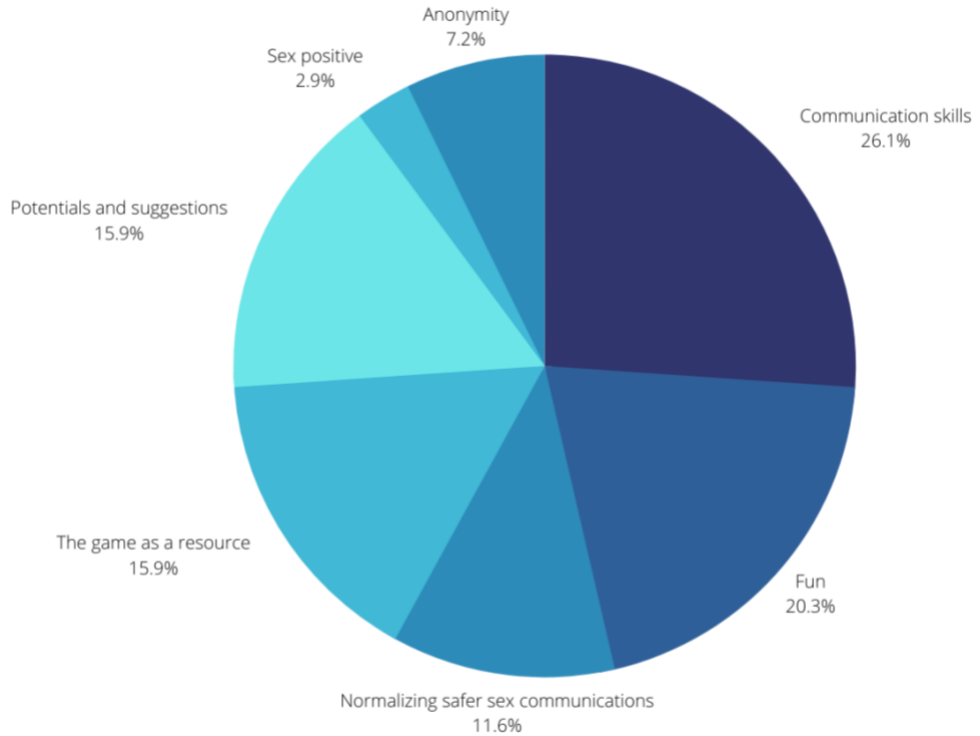
with real sex expert would help the players ask their questions and build their knowledge. There were overall 21 ‘Other Suggestions’.

Data from Experts

Three separate semi-structured interviews were conducted with sexual health experts. The experts played the game for 30 minutes and then shared their thoughts and opinions about the game in the next 30 minutes. The meetings were transcribed and thematic analysis (Miles, Huberman, & Saldaña, 2018) was used to identify the experts’ insights on the learning effectiveness of the game. The following seven themes emerged from the data: ‘Communication skills’, ‘Fun’, ‘Normalizing safer sex communications’, ‘The game as a resource’, and ‘Potentials and suggestions.’ Figure 27 shows the distribution of each theme in percentage.

Figure 27

Insights from the Experts



Just over 26 percent of the comments were about the advantage of the game in enhancing the communication skills; approximately 20% were about the fun and interaction features of the game; 15.9% were about the game as a resource, 15.9% about potentials of the game and suggestions that could develop the game further; 11.6% of the comments were about how the game could remove the awkwardness around sexual conversations; 7.2% about the anonymity advantage of the game as it could reduce embarrassment in playing it; and just under 3% about the content being in line with sex positive approach.

Communication Skills

The total of 18 references from the experts were linked to the potentialities of the game in enhancing the communication skills of the players. Two of the experts were of the belief that the game can provide the models of communication that young people need to practice as he said, “the main value of the game is it's providing those role-play examples” (Expert A). Expert B shared a similar idea and said:

> I think there's you know some practical applications which is nice. They're learning facts and they're making that connection between like how do I do that and also like giving them some specific phrases and communication skills that they could, you know, take back with them and like oh in that game I learned you can say this when someone says this. I mean they may not take specific things but they put like they might think back and be like oh, I remember in that game and it always kept coming back.

Expert B believed that the scenarios have the potential to be transferred to real life scenarios:

> Having some specific phrases, they could use or even just practicing it and you know with this kind of back and forth manner they could potentially take some of those things and have them in their back pocket for when they have those conversations down the

> road with partners so there's that component, I think that you know, has potential to increase their communication skills.

Normalizing the Conversation

All three experts found the game able to normalize discussions and communications around safer sex and condom use. The experts mentioned eight times that this game could help to remove the awkwardness connected to sexual health communications and educate young people about how to bring up the conversation about condom use. Expert A stated that "[the game] can increase comfort levels and being able to talk about condoms." He noted, "I see the game more specifically focused around increasing comfort levels and providing kind of rehearsal skills for actually talking about it." Expert B also explained how this game can normalize conversations around sexual health between partners:

> It's like making it normalizing the idea that conversation and asking people about condom use or asking people about STI testing is a normal is a normal thing and that's something that we should be doing it's not it's not bad it's not something to be embarrassed about; it's just like part of sexual health, just like you know we take care of the rest of our health, this is one way we take care of our sexual health and that we take care of the sexual health of our partners as well, and we help to take care of the sexual health of our part.

Expert C also confirmed this potential of the game. She said:

> It's an interesting way to kind of get people to start those conversations are see how the conversations can go to maybe be more comfortable and maybe and see how to start them, because I think the biggest one of the issues is the awkwardness that comes with having these conversations.

In regard to testing, Expert A was of the belief that getting the young people to get STI screening is a huge challenge and exceptionally difficult. He said “seeing testing being discussed in the game may not by itself, lead to more testing but it's it's it's making students aware that testing is one of the factors that's part of this whole.”

Anonymity

One expert found the idea of the players playing against each other anonymously very helpful. She explained how this feature can remove the embarrassment connected to these topics and how such feelings can hinder discussions around it in the classroom. She also found the ‘texting’ format of the scenarios interesting as many young people are frequently using this feature of their phones these days:

> You have to you know I'm finding this even with my youngest son in grade six now and there's just so much like kind of embarrassment and you know there's lots of laughter and everything but it's hard sometimes to take in some of the information or some of the skills when you're too stressed in an environment. I think that this can potentially give students the opportunity to take some of the stuff from the lesson and apply it, right? And you know it's practicing skills which I think is another key component in a lot of curriculum as well, right? Just practicing communication skills in a way that doesn't force them to do it with their classmates out loud in a place that potentially can lead to shame and embarrassment. I like that, umm, but yeah it kind of in that same vein of you know, taking away the awkwardness of being in class with other people and trying to talk out loud like it can it provides a place to talk about these things in a way that could actually come up in their lives right, because this could that they may very well have conversations about condom use over text or over, you know, another kind of like texting

> platform messaging platform and so it's very applicable to the lives of young people doing it in this format, and I think that yeah it can take away some of that shame and embarrassment piece.

The Game as a Resource

All three experts saw this game as a good resource for young people to learn about sexual health and mentioned that 11 times. Expert A believed that "it's something that a teacher can encourage students to go and try out." Expert B also believed that it could be a great resource as homework for students to go home and do as well. Expert B compared it with the classroom context and said:

> Some sex education classes can be a little dry and maybe they're not paying as much attention because they're like well this seems more like the biology lesson than something I need to think about for like my own health and well-being. But when you're making the link between relationships and connecting with another person and your own health and well-being and what you can do in that, in terms of like using condoms, for example, or you know I don't know if you have other types of like scenarios around barrier use.

The experts also saw it as a good "jumping off base" resource to be followed by group discussions in the class:

> I feel like this could be a good model to use to start a conversation in a class and go through the options as a group. Or, as like partners face to face, because you get that practice to and then the teacher can kind of debrief and go over it with the students and ask their opinions, like okay what worked in the scenario and what didn't.

Fun

Only one expert (Expert B) talked about the fun aspect of the game. Keywords related to this theme were found more than 14 times in her transcript. She mentioned that “she could see teenagers having fun in it,” “laughing while playing it,” “it's cute I can see it being very engaging,” “it's just engaging them in a different way,” and “it provides interaction with anonymity.” Playing the ‘Third Date’ scenario, she said:

> This is awesome it was really funny. I think, I think that young people would have a blast kind of doing this as a way to. Just think about some of the things that they learned, it makes it fun. Because it's nice to have lessons where they've got you know all these facts coming at them where they've got discussion, but then like being able to just you know Practice those skills in a fun way, I think.

She also found the interaction with another human as another fun element:

> I think the anonymity, but also, knowing that there's a real person, on the other end makes it fun, but it can you know, makes it easier to be like oh i'm practicing with a person here like this is, this is not just a computer like this is someone who's thinking about these things with me and I think it, you know, create some more realistic way of thinking about it as well.

Potential and Suggestions

In order to answer the third research question, I asked the experts to share their insights about how this could develop further. Similar to the ideas of many of the 18-24-year-old participants, the experts also thought that adding more responses and options to each scenario would be a great improvement. Expert A, for example noted, “if I was going to offer any kind of suggestion for improvement, one of them might be to the more you're able to increase the number of responses that a person can get.” This expert also suggested that the players should

have the option to add their own responses. For example, if there are three responses from which to choose, the player could also add a response of their own if they want to respond in a way not represented by the pre-constructed replies.

The second expert suggested more scenarios could be added to the game. She suggested topics like consent, sexual boundaries and needs, safer sex alternatives, and scenarios for 2SLGBTQ+ orientations. She also emphasized that adding more responses and options would improve the game. She thought the general structure of the game was good and it just needed more expansion:

> If they're still you know, there still seems to be quite a breadth in there, which is really nice and even expanding that even more like I think you know that's the only thing I would add to it is keep going with it because I think it would be a really great structure.

The third expert emphasised the need for more elaboration on the topic of non-monogamous relationships. She said maybe people don't want to be in an exclusive relationship, so they should know the risks and how they can manage that. She also talked about the concept of consent and how people may say yes but their facial expression and body language says the opposite. She thought having a game mechanic or visual element that could include non-verbal elements would add a lot to the quality of the game and its learning efficiency related to consent. She also suggested adding more scenarios related to precautionary acts when sharing sex toys or acts that teenagers may think a condom is not needed like oral sex. The experts had overall 11 suggestions.

Sex Positive

Sex positive content related to sexual health education means educating people about healthy sexual behaviours through the perspective of pleasure and providing healthy strategies to

enjoy sex and stay safe and healthy instead of condemning sex and only talking about risks and disease related to that (Williams et al., 2013). All three experts found this game to be sex positive. As Expert A noted “it's not saying don't have sex it's saying use condoms. In that sense, I think it fits in with the sort of modern comprehensive sexual health education.” Expert B also found this platform having a sex positive lens:

> You know it's not creating a judgment for people actually having sex right? it's not saying don't have sex; it's about here's how to communicate and here's some things you can do to make sure that when you do have sex, It's you know, keeping each other as well as possible and making those decisions together, so I think that you know, making sure that those things are incorporated as a key piece of having a sex positive lens.

Not condemning sex and advising communication before sex has made this game a sex positive resource that could encourage the 18-24-year-olds to follow the recommendations made in the game. Providing alternatives to unprotected sex can be considered more valuable specifically during times such as the Pandemic when limited accessibility to sexual health clinic can cause inaccessibility to condoms and other contraceptives.

Chapter 6: Discussion

Rehearsed.ca is a serious, collaborative online game designed to operationalize what sexual health researchers have been writing about and recommending for years: that young people need opportunities to practice communication and negotiation strategies that enable them to advocate for their own, and for their partner's sexual health. Following a design-based research methodology, the first results chapter provided a detailed account of the processes used to plan for and design the game. In the second results chapter I report my analyses of insights gathered from 40 participants aged 18-24 who played the game, and then agreed to talk about the pros and cons of the game in a focus group conversation. Three sexual health professionals also played the game and shared their insights on the learning impact of the game in separate semi-structured interviews. In this discussion, I provide a systematic analysis of the evidence that has enabled me to respond to each of the two research questions that framed the study:

- How does a collaborative serious game integrate the principles of serious games with practices of safer sexual negotiation?
- How do 18- to 24-year-olds report practicing safer sexual communication and negotiation skills through participation in the collaborative serious game and what insights do (a) 18-24-year-old participants and (b) sexual health experts share about the game that can inform future design iterations of this game?

The 'How' of Designing Rehearsed

First, through a process of design-based research, this research study has shown that it is possible to design a collaborative serious online game that puts 18-24-year-olds in practice scenarios with a potential partner. Still, questions remain relating to how *does* a collaborative serious game integrate principles of serious games with practices of safer sexual negotiation?

What important insights were constructed through the first phase of this study? As described in Chapter 3, the process of integration was iterative and moved through 4 phases. Consistent with Reeves' (2006) method of design-based research, the first phase included a review of literature that resulted in insights about the characteristics of interpersonal negotiations in sexual situations. The findings from the literature review were validated by three sexual health researchers. They also added depth and details to the findings from the literature. Partners' communication and negotiation on the use of condom and other safer sex practices was found to be the main predictor of condom use and a healthy sexual interaction (Amialchuk & Gerhardinger, 2015; Widman et al., 2014).

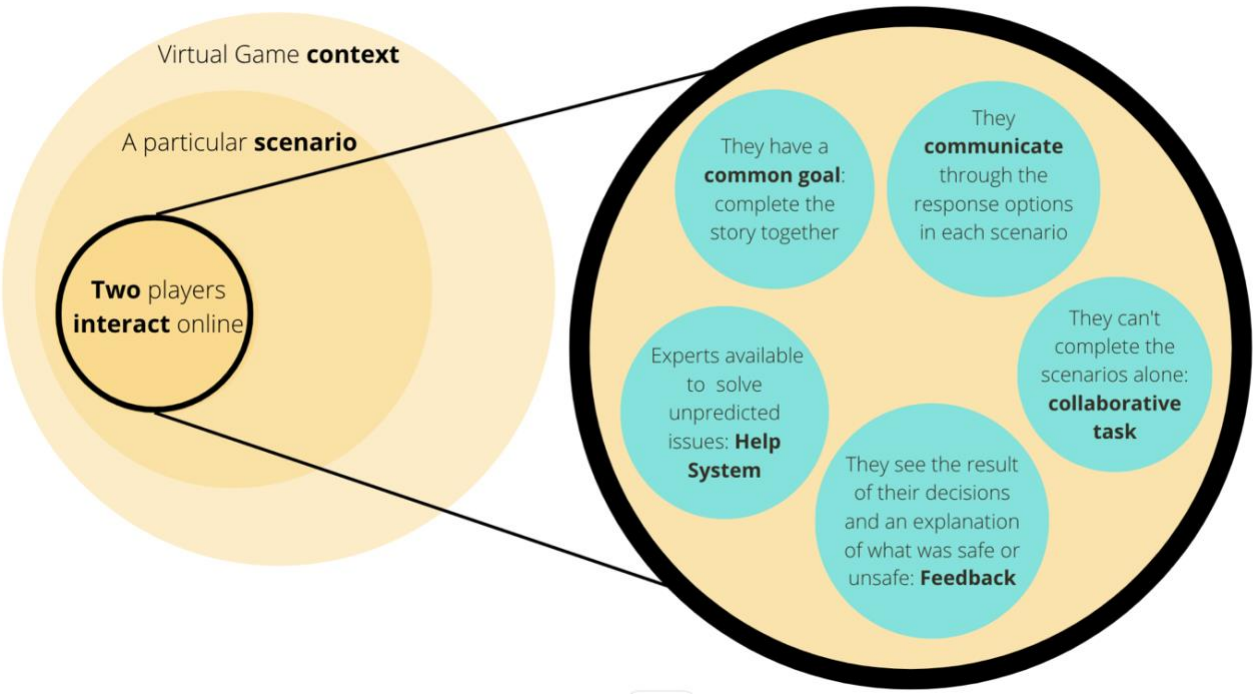
To realize this objective in the game, I reviewed principles of serious games in search of an approach that could accommodate a communicative serious game. Wendel's (2013) model of collaborative games generated the idea that a collaborative role-play game that required participants to make decisions as they negotiated through a range of scenarios with a partner could align with foundational principles of game design while preparing players to use communication strategies and information supported by research evidence and expert insight. In particular, the game was designed to adhere to five out of nine principles of collaborative games proposed by Wendel et al. (2013): common goal/success, collaborative tasks, and communication, feedback and help system. This model was integrated with four principles of the General Model of Sexual Negotiation developed by Davies and Weatherburn (1991): two individuals, interaction, a particular context and a particular scenario.

Figure 28 shows the emergence of these two models in the game. The yellow circles represent the General Model of Sexual Negotiation, and the green circles represent collaborative game design. The integration of these two models formed the design of Rehearsed.ca. As this

model shows, the game creates **a virtual context** for each **pair** of players to **communicate** a particular **scenario** and reach a **common goal**. They cannot play or finish the game without **collaboration** and will receive **feedback** at the end of each scenario to understand the results of their decisions. Communication was developed through online role-play interaction in the game scenarios and was enhanced through the debriefing sessions. The collaborative task involved working together to create a story, with the plot being determined by the choices made by the other player. Feedback was added through debriefing boxes at the end of each scenario and in debriefing sessions. Help system was provided through Zoom chat system and by the PI and the RA. The pairs had one common goal of completing a story together and seeing the result of the decisions they made together.

Figure 28

Integration of Game Model with Sexual Negotiation model



Scenarios were created based on the insights gathered through the review of literature and were shared with three experts in sexual health for critical review. Once vetted by experts, the

three scenarios were programmed, which together included four scenarios, and 37 possible outcomes. Two cycles of pilot testing with four 18-24-year-olds, followed by revisions based on their feedback prepared the game for the evaluation phase.

Whilst the feedback from the 18-24-year-olds and the experts showed us that the result of this combination was successful, integrating all elements of collaboration explained by Wendel's model (2013) would increase the fun aspect of the game. Refillable personal resources, collectable and tradable resources, and a scoreboard are the functions that we decided to remove from the game due to the amount of workload and budget it would require. The participants also mentioned adding a scoring system in order to enhance the fun aspect of the game. Future iterations can include these elements to see how, if at all, they increase the experience of fun in the game (Thompson et al., 2007; Thompson et al., 2010), although additional research will be needed to determine how or to what extent these "fun" elements interact with the serious, learning focus of the game.

Besides the two models, there were three other key elements that helped us to achieve the end product. Having sexual health experts in the team, iterative brainstorming with game developers, and play-testing with the target audience, the Yough Advisory Board (YAB). Experts were involved three times in the study: before starting the game development to understand the needs, before launching the game to confirm the content and structure of the game, and at the end of the study when the game was completely created to receive their feedback on the game. Reflecting on the game progress now, I can affirm a more frequent engagement of the experts into the game development could have produced better results. The game developers got involved as soon as the data from the experts were analysed; however, the experts did not participate in the brainstorming sessions with the game developers. One reason

was the tight schedule of the experts that discouraged me to reach out to them for more meetings, but the solution would be having another team of sexual health experts, including sexual health educators and researchers, only for the purpose of the game development. Having their insights throughout the game development process could increase the impact and efficacy of the game.

The regular meetings with the game developers were crucially necessary and helpful. The game developers would send regular updates of the game, and after play-testing sessions with the developers, list of the needed updates would be developed for them to work on in the next step. This cycle happened more than 20 times until the minimum viable product (MVP) was agreed by all to be ready to get tested by the Youth Advisory Board (TAB). The YAB included two young women and two young men aged 18-24. The players played and tested the game two times and provided their feedback. Most of their comments were about the technical glitches in the game. This was another lesson learned from this study. I believe having more rounds of play-testing with more members would provide me with more valuable feedback. I could have received most of the feedback that I received from the study participants if I had a larger and more diverse YAB in the play-testing stage. As another note, involving the target audience in the brainstorming sessions with the game developers would also add to quality of the final product.

Rehearsed.ca was a multidisciplinary project that differed from an entertainment-only videogame as its goal was to achieve a meaningful personal change in safer sex communications. Therefore, a balance was needed between “fun-ness” and “serious-ness.” (Thompson et al., 2007; Thompson et al., 2010). I had a good team of “fun-ness” professionals (artists, game designers, computer programmers) as well as “serious-ness” professionals (sexual health experts). However, I think these two teams needed more interactions and integrations. I worked as a

liaison between these two groups but having them all working in one team along with the target audience might have led to a more effective intervention.

Identified Tensions

The process of design was not without tensions. These tensions were fundamentally important for my own learning and for the development of a game that, to the extent possible, was able to reconcile some of them in its content and structure. One of the main difficulties was the fact that a sexual situation in real life is dynamically constructed by the individuals involved (Davies & Weatherburn, 1991). In Rehearsed.ca, the interactions were necessarily scripted. Players had to select from a range of options provided. Although some players suggested that free-chat would have been preferred, this option would have reduced the game's capacity to model or scaffold language for young people who, as many other participants reported, found it very useful to be given the words that enabled them to engage in conversations about condom use. A free chat mode would potentially increase the players' sense of autonomy, but it could also diminish the educational value of the game. Further, from a technical perspective, measuring what the players have said in a free chat mode to provide immediate feedback would require a high-tech artificial intelligence which was beyond this project's budget and scope. The only solution was meeting it half-way by providing a variety of response choices so that a limited simulation of the real-life sexual scenarios is created, and immediate game feedback would be achievable.

Furthermore, in real-life, the perception of the roles of self and others may change (Davies & Weatherburn, 1991) but what Rehearsed.ca has offered is a context to 'negotiate' safer sex by the answering of carefully worded prompts in the context of an interview, which is not what happens in real-life. We tried to compensate for that through a process of insistent

negotiation, agreement and compromise, and the occurrence of unsafe sex as the result of decisions made by individuals in specific, simulated circumstances. Therefore, the players were encouraged to play each scenario more than once, try different options and were randomly given different roles (pro-condom and against-condom).

Davies and Weatherburn (1991) defined context as the physical place that sex happens. They argue that the physical context imposes certain constraints on activity. “The context itself may also carry information about unsafe sex. ‘Jack- off parties’, etc. are attempts to provide contexts where safer sex is explicitly condoned and encouraged” (p.117). However, mirroring that in the virtual context of the game would be impossible as there cannot be any physical sexual interaction in an online game. We could only partially realize that through the descriptions of where sex would happen (bedroom, apartment in front of the TV, etc.). Even visualizing these contexts through graphic designs was not a feasible solution as it could have made the game very pornographic. This may have caused discomfort and embarrassment for the players. As another solution, we tried to provide different sexual contexts in the game. Having more contexts in the game was asked for by both the 18-24-year-olds and experts. This could help in training the 18-24-year-olds for a variety of contexts, including uncommon ones, so that they would become familiar with contexts that may carry information about unsafe sex. In future iterations of the game, innovative game mechanics could be implemented to make a safe ending very difficult in contexts where the probability of unsafe sex are very high.

According to Davies and Weatherburn (1991), in a sexual interaction, the likelihood of an act occurring is highest if both participants expect it to happen, low if they both expect it not to happen and when there is discordance, the likelihood of occurrence will be negotiated. They write:

> One way in which this negotiation can be resolved is to invoke a rule that any act not wanted by one of the participants does not occur: a form of veto. Otherwise, it might be that the wishes of the powerful partner will predominate: a form of tyranny. It is unlikely wishes of the powerful partner will predominate: a form of tyranny. It is unlikely that one form of decision-making always obtains. (p.118)

Given these tensions related to power, the solution for Rehearsed.ca was to merge the tensions articulated around negotiation that can occur within a couple, with the element of collaboration put forward by Wendel's (2013) model of collaborative games. In Reahearsed.ca the contexts and scenarios work only collaboratively. The players cannot make decisions individually or impose their decisions. There are many endings in the game where sex does not happen because one of the players does not agree, or even the partners decide to discontinue their relationships as they feel they think differently. This design decision, which emerged from this identified tension, provides a new contribution in serious gaming for sexual health as previously developed games are played solo like PlayForward: Elm City Stories (Fiellin et al., 2017) and SwaziYolo (Lukhele et al., 2016).

It should also be noted that sexual interaction is not a simple and predictable interaction and usually involves many factors such as age (Fetner et al., 2020), personality traits (Miller et al., 2004), race and social class (Ickovics, 2002), religion (Francis et al., 2019) education and parental factors (Haglund, 2010), the state of the relationship (Ewing & Bryan, 2015; Protogerou & Turner-Cobb, 2011) and relationship power (Altschuler & Rhee, 2015). Reflecting all these factors into the game takes a tremendous amount of time and technical development. Rehearsed.ca initiated a kind of sexual health education that shifts from the dissemination of

information to the processes of verbal and particularly non-verbal communication as recommended by previous studies (Davies & Weatherburn, 1991; Noar, 2007; Widman, 2014).

Davies and Weatherburn (1991) suggested sexual health programs to be constructed in a way that makes "the occurrence of safer sex more likely, more logical and more consonant with the emergent logic of the session" (p.121). Rehearsed achieved this through integrating sexual scenarios with collaborative game elements such as common goals, communication, and collaborative tasks (Wendel et al., 2013). The idea of "the emergent logic of the session" was portrayed through interactive story element. One partner's decision would change the responses that the other partner would have. This interaction would continue until a decision is made including but not limited to protected or unprotected intercourse, an outercourse practice, postponing sex to after getting-tested or a break-up. Besides having a sexual negotiation and a game design model, developing an educational intervention needed to be grounded in an educational theory and implement its principles as well.

Building the Game on a Theoretical Foundation

Rehearsed.ca is theoretically supported by situated learning and the major assumptions of Social Constructivism. These major assumptions are that (1) learners construct their learning based on prior knowledge and experience: the scenarios were frequently mentioned as a means to create the schema for players to develop their understanding during group discussions.; (2) learners need to be involved and active through the learning process: when playing the scenarios in Rehearsed.ca, the players make decisions and co-build the story in the process of playing the game, so they are actively involved in the learning process; and (3) learners construct their learning by interacting with their environment: they players are constantly engaged with and

exposed to multiple sexual situations that affect their decision making (e.g.,. information, attitudes, skills) (Sara & Guay, 2014).

Being supported by situated learning, Rehearsed.ca emphasizes learning in simulated and meaningful situations, in certain environments (scenarios) with social and cultural features (Lave & Wenger, 1991). Through interactive scenarios, Rehearsed.ca provides situations that engage the learners in realistic, problem-centered activities that supports the learning objective to be developed (Lave & Wenger, 1991). The interactive stories visualize situations or contexts where the players can connect their learning in the game world to their needs and interests in the real world (Yusoff et al., 2009). As John, one of the players said, the game was more "realistic and scenario based" when he compared it to his textbooks on sex education. Perry also explained that "the game recreates more realistic scenarios in comparison to textbooks." Although the game is designed for over 18 and these players were also over 18, they still compared the game with their sex education at school. This shows that Rehearsed has the potential to be used beside existing learning materials at school as well. Situated learning is said to be able to help learners "develop mental models of their experience and relate it to real life" (Yusoff et al., 2010, p. 10). This idea was mentioned by multiple players 16 times that they could somehow see the game as a good preparation model for future real-life situations: Joy, as one example, said: "I think I would have made fun of it (the game scenarios) at the time, but it would stay in the back of my mind for future scenarios!" Other proofs are: "good reference points for first-time real life scenarios" (JJJ), "[the game] prepares them for real life" (Brett) and "it would've prepared some people for the tough conversations" (Maryana). Through creating realistic and challenging problems Rehearsed.ca seems to have been able to provide the opportunity to ground learning in reality (Chee, 2001).

Evidence of Impact of the Design

According to Institut national de santé publique du Québec (INSPQ), (Palluy & Laverdure 2010), interactivity, active and situated-learning, repetitive feedback and individualised accompaniment through learning are recommended as exemplary practices when it comes to sexual health education. Experts and 18-24-year-old participants validated the presence of all these elements in Rehearsed.ca. Almost all of the participants confirmed interactivity of Rehearsed.ca. As one example, Morgan said “It was interactive and explorative, u didn't know what was coming.” The players were actively involved in the learning process and it was realized through interactive story element: “making your own story that is really interesting” (Sara). They would constantly receive feedback in three different ways: 1) the response they would get from their partners; 2) the debriefing box in the game at the end of each scenario telling them what went right or wrong; and 3) the focus group discussions after the game. The debriefing and discussions sessions after playing the game provided the individualized accompaniment as many participants asked their private questions in the chat box.

The 18-24-year-olds expressed that playing this game could impact people’s lives as they would have made different decisions if they had played this game earlier: “[Rehearsed] would’ve changed some people's life if they had that” (Pal). They also thought it could be a great supplement to what their teachers and textbooks had to offer. Excerpts from the 18-24-year-old participants can confirm this idea: “this would have been better than some of the Sex Ed I had for sure” (Charles), “I think it would have been cooler than listening to a teacher” (Linda), “it was a lot more informative than what we did there [at school]” (Ahmmad). These comments reaffirm that Rehearsed.ca with adapted scenarios for under 18 could be used at schools as well.

Kirby et al. (2009) suggested that an effective sexual health intervention should focus on (a) specific behaviors, (b) give clear messages about them, and (c) especially address situations that might lead to them. The scenario of '*Let's go condom free',* for example, embeds all three of these recommendations made by Kirby et al. (2009). The specific behavior that this scenario focuses on is the 'use of condoms in committed relationships.' It gives clear messages about condom use by recommending talking to a health care provider before going condom free and especially address situations that might lead to them by showing in the story how partners might not feel comfortable or trusted because of using condoms and ask for not using them anymore. Evidence of the scenario's impact on planned behavior was articulated by Alex, who, during the focus group conversation said: "I will book a test like tonight, so we know we are safe in some regard." Chee (2001) argued that knowledge and skills situated in realistic situations provide great opportunity for serious game design. He added that experiencing concrete situations creates the context to ground learning in reality. It may be that for Alex, this combination of knowledge, skills and a realistic situation experienced through a game enabled him to decide to take a concrete action to protect his and his partner's sexual health in real life. This addition of learning into meaningful "real-life" (virtual) situations is referred as authentic learning (Howland et al., 2011). There is a strong social stigma connected to STI testing (Wong et al., 2012) and a broad spectrum of individual, societal, and health system factors that may influence health-seeking behaviors (Barth et al., 2002). The experts explained that a game alone may not be able to increase its rates, but Rehearsed.ca could raise awareness about STI screening and give them what they needed to know about its necessity. This finding suggests that the game can be an effective context for emphasizing the importance of this sexual health practice. Although more research is needed to investigate this particular outcome of the game, it seems promising that

after playing the game, participants expressed an intention to take this important sexual health action.

The debriefing and group discussion sessions after the game, which were designed to invite commentary based on the scenarios they played in the game helped the players construct their learning by interacting with their environment and the previous experience. Vygotsky's social constructivism views learning as a social construct mediated by language via social discourse, stressing the primary role of communication and social life in meaning formation and cognition (Boudourides, 2003) and emphasizes learner's co-construction of knowledge (Taylor et al., 1997). These foundational theoretical principles informed the design of the game and was even acknowledged by the participants as well that Rehearsed.ca was able to create a nice context for them to collaborate through co-construction of different scenarios and ask their questions and discuss their challenges. As one of the participants, Eve, said: "the game engages you, then the discussions hammers it out." This idea was mentioned 26 other times by other players. As another example, Sara said "the game helps make scenarios and sex topics relatable/accessible and is a starting point to open up discussion in a classroom." Mino also found the game as a good context builder for further discussions: "discussion and review helped more and was made much easier by having something specific to be reviewing." As reported by the 18-24-year-olds themselves, it can be claimed that the theoretically informed dimensions of the game could support learning. Rehearsed.ca seems to have been able to provide the learning context for further discussions facilitated by the educators or trainers to co-construct the knowledge.

Discussion sessions also provided great opportunities for the players to make connections between game experiences gained and real-life situations (Hromek & Roffey, 2009). The

debriefing sessions were led by an RA with a background in sexual health education. By looking at the chat history of the players, she posed questions for the players to encourage deeper thinking and stimulate discussions so that the players built new knowledge through social interactions on the foundation that the game had created. As an example, if a scenario has failed because of one player not agreeing to get tested before discontinuing of condom use, she would ask questions like ‘why is getting tested important?’, ‘why some people would not get tested before going condom free’ or ‘what are the risks of not getting tested when deciding on condom use.’ Ke (2009) argued that as much as the context and the content of a game may be directly connected to its success as a learning tool, the pedagogical competences of the educators who include any game in their lessons is also important. To this point, the effect of the facilitator in this study when the post-game discussions were being conducted cannot be neglected. As Sitzman (2011) pointed out, an educational game must not stand alone but should be included in a context with other learning assets (e.g. discussions, conversations, and activities). Although the unique contribution of the discussion sessions to the overall impact of the game experience was not measured in this study, the participants’ insights regarding discussions as a way to “hammer out” understandings is an important finding with pedagogical implications for classroom-based or community-based sexual health educators. When playing the game, there may be multiple levels of impact that can emerge from the collaborative negotiations between the players that are necessary to complete each scenario within the game. Furthermore, these impacts may be reinforced and amplified through follow-up discussions among the players after the game is over. These discussions may focus on what the players enjoyed or didn't enjoy about the game, but they may also delve into deeper issues related to collaboration, communication and negotiation,

or problem-solving that arose during gameplay. Future research could measure the relative importance of each component to players' learning outcomes.

Importantly, participants did mention that the game alone would be a good source of knowledge for those who do not have access to other learning assets or when teaching sexual topics is not easy when the students are learning from home and are not comfortable discussing their sexual questions with their parents sitting next to them. Participants indicated that the game, even with no further discussion opportunities, is still a fun and interactive resource that can be used to learn about safer sex negotiations. These participant comments align with previous findings that computer interventions are capable of impacting theoretical mediators and behaviors in ways that are similar to communications delivered by human experts such as health educators and counselors (Noar et al., 2010).

Besides being educationally effective, a serious game needed to be fun and engaging to satisfy the gaming side of it. The reports from the participants showed how Rehearsed.ca integrated sexual health topics with the elements of fun in a game. From the perspective of the students, there were several reasons for the participants to have fun playing the game. The first element of fun was Agency. The participants liked the interactive-story feature of the scenarios and the fact that they could decide how to steer the story. They enjoyed having different options and choices and multiple endings for one story. Gee (2003, 2004, 2005) identified agency and interaction (feedback for the actions of a player) as two of the fundamental principles of good games. The experts also found Rehearsed.ca able to engage the players and help them laugh and have fun while learning

The second feature was the Social Element. The 18-24-year-olds expressed numerous times that they liked playing against another human instead of a computer. The social element is

identified as crucial to enhancing fun and engaging the other players as they are going through the same experience (Mitgutsch, 2011; Salen & Zimmerman, 2004). Social interaction is also one of the important indicators of learning engagement developed by Jones et al. (1994). The experts also expressed that the human interaction element can make this much more interactive and engaging for players as they know they are playing against another real player instead of the computer. It seems the game was successful in engaging the players through collaboration and social interaction.

The third fun element mentioned by the 18-24-year-olds was the Sense of Exploration. They enjoyed the unexpectedness in each scenario even after playing it for several times. They said they were curious to play again and play different scenarios to see what they bring out to them. It is in line with previous findings that if players feel that their actions can change the game, they may play it multiple times in order to enjoy discovering the consequences of their decisions and the construction of their own knowledge (Gee, 2003).

The scenario-based nature of the game has provided a smooth integration of sexual health content with interactive elements of an online serious game. The participants of this study found this game a better alternative to conventional approaches like videos, textbooks, and lectures. As Van Eck (2006) explained, learners need to get situated in complex information management and decision-making situations where resources are drawn for the purpose of doing. He found role-playing and adventure games the most suitable types for such targets. The participants also reported that the scenario-based feature was more realistic and could cover the scenarios that were not usually covered in their sex education classes.

The authenticity of the learning experience is one of the principles of a socio-constructivist educational model and is a recommended practice in sexual health education (Sara

& Guay, 2014). Corti (2006) argued that authenticity and realism in serious gaming are essential to knowledge transfer in real life. This may explain why some participants suggested that for them, practicing sexual communication topics through a collaborative serious game seemed more effective compared to conventional approaches. Some 18-24-year-old participants also stated that the game was more practical and gave them more details in dealing with sexual interactions compared to what they had in their textbooks. Other participants mentioned that the game would give them words for specific situations. Given previous research that has shown how feeling embarrassed to ask for a condom, finding oneself in a spontaneous situation (Skakoon-Sparling et al., 2016), and not knowing what to say are common barriers to condom use (Noar, 2007; Widman et al, 2014), this participant insight is especially important. Evidence from this study suggests that access to discussion of how to bring up the topic of condoms, when to introduce the topic, and what condom negotiation strategies to use through Rehearsed.ca may lower barriers to essential sexual health knowledge. These details are missing in the majority of sexual health classes, as reported by the participants, but they reported learning about these details numerous times in their evaluation of the game.

The majority of the participants found Rehearsed.ca more fun, more educative, less embarrassing, more personal and more interactive than conventional sex education they received at school. These reports can show that presenting sexual topics through a serious game platform has worked well and has provided an engaging, real-like, and interactive experience for the players. The learners having control over the game and its story is one of the elements of engagement (Gee, 2007). As Sara said, “the ability to choose your own story is really interesting.” This function of the game was mentioned as interesting 23 times by the players and can be one of the reasons they found Rehearsed.ca more engaging than what they did at school.

Stapleton (2004) explains how a game can make learning more centered around students compared to teacher-centered approaches in the classroom:

> The locus of control is typically afforded to players in games and teachers in schools. Accordingly, it is predominantly the player, as learner, who directs activity in games and it is predominantly the teacher who directs activity in the classroom. Games, therefore, present a learner-centered approach to learning, whereas traditional education presents a teacher-centered approach. To use a metaphor, if learning is understood as a journey, a learner-centered approach is where a learner is in charge of driving a vehicle, and a teacher-centered approach is like catching public transport, with the teacher being the driver. (P. 2)

As the players in Rehearsed.ca have control over the story of the game and they develop the story together, this explanation can justify why they preferred playing the game over their conventional approaches. Previous studies also reported that players of serious games seem to be more intrinsically and extrinsically motivated (Bailey et al., 2010) and interested in learning through games than learning via conventional methods, as long as the challenge in the game is feasible (Bourgonjon et al., 2010; Squire, 2005). Although this study did not measure learners' motivation or preferences in relation to the topic and design of the game, it may be important to consider that for young people, sexuality is an exceptionally pertinent subject (Daneback et al., 2012) that may generate a strong desire in individuals to learn more about it in preparation for their future. (Magee et al., 2012). This may have put them in a particularly advantageous mindset for learning the language and strategies that the game was designed to scaffold. Future research on the learning impact of the game should include measures of motivation in relation to the topic and in relation to games as learning tools.

Consistent with the main learning objective of the game being enhancing communication and negotiation skills around safer sexual interaction, the strong alignment of participant insights suggests that the game, as designed, does seem to scaffold foundational negotiation skills around sexual health decision making and condom use. The majority of the 18-24-year-old participants stated 35 times that the game scenarios could provide them with opportunities to rehearse potentially risky situations before they happen in real life: "[the game] serves as a lead on how to go about having this conversation as it might be difficult finding the right words" (Benny) and that "they give you the actual words and tools and phrases to say in those conversations" (Jodie). They confirmed that they could see the right words and phrases that could help them out in awkward situations. It was also mentioned 13 times that Rehearsed.ca helped them in "learning how to navigate convos (conversations) about it (condom use)" (Silvi). This adds to the previous findings that interpersonal activities such as role-plays, computer interventions, virtual decision-making, and mobile interventions can prepare young people to negotiate condom use successfully (Noar et al., 2010; Noar & Willoughby, 2012).

Bayley and Brown (2015) developed a scenario-based role-playing game to enhance parents' and children communication skills about sexual topics. Their results indicated that a serious game could offer parents the means to reflect on and improve their existing communication skills. Their findings suggest that exposure to and interacting with different role-playing scenarios can enhance players' communication skills. As Bayley and Brown's game was not collaborative in design and was not developed for safer sexual communication, findings from Rehearsed.ca contribute to this field of research by showing how an online collaborative game can integrate sex education content in role-playing scenarios for players to rehearse and practice. For example, after playing the game, some 18-24-year-old participants reported that they

understood how asking for a condom can show love and care for each other and could strengthen their relationship. One participant, Arian, stated that "[the game made me] feel like you know I trust you and I love you, but I want us both to kind of get tested for each other sake." Such reports from participants show that the game could, to some extent, normalize the awkwardness around communication about condom use and alleviate the stigma connected to it (e.g., Wong et al., 2012). After playing the game, some participants reported that they felt more comfortable talking about or bringing up condom use in the future. Some even reported that they felt more courageous and suggested that asking their teachers questions related to these topics might be less scary in future. Others stated that this game could help them break down the barriers of discussing these topics if they had it in their sexual health education classrooms. These findings are consistent with findings from the meta-analysis of Noar et al. (2010) who reviewed 18 articles that had worked on a form of computer mediated intervention (CMI) and reported a significant increase in perceived susceptibility, condom communication, and condom intentions. Results from the development of, and analysis of participants' experiences with Rehearsed.ca align with these findings.

The players also reported the anonymity of their characters in the game a feature that could remove the awkwardness of face-to-face conversations and make it easier to engage in open communication. This finding is consistent with Kirby's (2009) idea that face-to-face interventions such as school-based programs and group-based sexual health promotion are hard to implement and have mixed success and the findings of Birnholtz et al. (2015) that anonymity could enable participants to ask important questions that they would not or could not ask if they were identified to their peers. In particular, such questions may include normatively taboo topics that are uncomfortable or difficult to discuss in identified or face-to-face settings. The

participants also reported that the anonymity allowed them to try different responses in the game and ask their questions in the debriefing section after playing the game. They said that the anonymity of the game would allow the players to try the options that they would never try due to the stigma and embarrassment connected to that (Birnholtz et al., 2015).

There are different arguments about the transferability of serious games to other domains. For example, Gee (2003) argues that knowledge gained by playing videogames is transferable to other domains, while Ravenscroft and McAlister (2006) explicitly state that today's digital games are weak in linking the "game-playing activity to transferable social or conceptual processes and skills that constitute, or are related to, learning" (2006, p. 37). In this study, we sufficed with the 18-24-year-old participants' reports about if and how the scenarios they practiced in the game would help them in similar situations in real life. They stated that "it was a good reference point for similar situations in real life," "it could prepare them for real life," and "it would stay in the back of their minds for tough conversations in future scenarios." There were also some participants who were not sure if playing the game would translate to the scenarios that they may face in real life. As Mitgutsch (2011) stated "the knowledge and abilities learned in games do not always seem to be transferable to real life contexts" (p. 47). Klimmt (2009) also stated that even short-term evidence of changes in the players' habits and routines after playing a game do not guarantee that the players' attitudes have changed substantially. Thus, even the 18-24-year-old participants' reports about the transferability of this game to real life contexts do not assure any similar behaviors, but it is hoped that, as one of the participants said, their learning in this game "would stay in the back of their minds for tough conversations in future scenarios."

In this study, play time and evaluation happened immediately after playing the game and took 90 minutes. Although it can be argued that short play time by the participants, being 1 hour,

could have affected the results, findings of Portnoy et al. (2008) showed that the dose of the intervention (ranging from 1 h for stand- alone interventions to 4–8 h per component in multi-component programs) do not significantly relate to the average intervention effect. Similarly, game play duration, contrary to expectations, do not significantly relate to effectiveness.

Insufficient playing time was previously found as a potential reason for the lack of effectiveness (Rahmani & Boren, 2012), but this was not supported by the findings in one meta-analysis conducted by DeSmet et al. (2015). Future investigations into this game are needed to further explore longer play durations, a follow-up measurement and the long-term impact of the game. In terms of gender and age, previous studies did not report any differences in effect size for mean age or gender (DeSmet et al., 2015; Primack, 2012) suggesting that serious games can support various populations. Although these data would suggest no impact of gender or age in relation to learning outcomes with Rehearsed.ca, the negotiation of safer sexual health practices may be unique because of the ways that social and cultural practices around sex and power may be experienced differently according to the roles prescribed to one's self-identified gender, or in terms of the person's age and lived experience with sexual negotiations. Further study on Rehearsed.ca should therefore explore the ways that gender and age interact with learning outcomes.

In games, beside learning the educational content, game rules and environment need to be learned by players (DeSmet, 2015). Highly immersive games can increase game experience satisfaction but will also increase cognitive load and decrease the performance on the educational task (Petko et al., 2020). When players have to focus on mastering the game requirements, their cognitive resources are divided, which in turn makes it more difficult to grasp the educational content (Schrader & Bastiaens, 2012). Based on participants' accounts that the rules were very

easy to learn in Rehearsed.ca, and that the learning curve was quite low for them, it seems the game, as designed, may have been simple enough to allow most players to focus on the learning, which was, of course, the designed objective.

In 2022, out of 1507 participants aged18-24 in Canada, 5% had no sexual health education and 41% had only a few (one to three) lessons/workshops (Walter & Laverty, 2021). These limitations and the tendency of 18-24-year-olds to seek answers to their questions through online platforms (Charest & Kleinplatz, 2021) makes digital interventions like Rehearsed.ca a necessity. This can also explain why the majority of the 18-24-year-old participants asked for extra resources to be available within the game while they were playing the game. They emphasized having on-demand access to digital resources relevant to the topic of the story and even for links to sexual health clinics that could provide counselling services for them. Further investigations can clarify how, if at all, Rehearsed.ca can provide a means to those who may not have had a complete school sex education such as newcomer youth whose educations have been disrupted, homeless youth who may not be attending school, and youth living with a disability or chronic illness who may have missed periods of schooling as a result (East & Orchard, 2014; Larkin et al., 2017; Maticka-Tyndale, 2008; Schwartz et al., 2014).

Many of the participants found the debriefing sessions after the game very helpful and an opportunity to pose questions in private or public. This explains their needs and willingness to know more and the importance of interventions that can address their needs. The experts found the game to have the potential to enhance the communication skills of younger players as well. They all agreed that the game could reduce the awkwardness around sexual communication and encourage younger adults to become more confident in raising the topic of condom use. Face-to-face interventions such as school-based programs and group-based sexual health promotion are

hard to implement and have mixed success (Kirby, 2009). This partially explains the increasing need for interactive computer-based interventions including video games (Bailey et al. 2010). In future studies, this game can be adapted for 12-18-year-olds and get tested on them to understand its efficacy for younger age groups as well.

Rehearsed.ca was planned to be and was confirmed by experts as a 'sex positive' resource since they believed it is not forbidding sex but giving young adults safe strategies and alternatives to enjoy sex. There were many safer sex alternatives offered to the players in the scenarios in order to maintain a sex positive approach in all scenarios. Pleasure, rather than STI and pregnancy, was the main approach in developing the scenarios. The pleasure connected to outercourse practices (Bakaroudis, 2014) was mentioned and emphasized in order to educate the players about other safe and pleasant practices. Using the language of care and love was offered to the players as a persuasion technique together with other skills like assertiveness and use of direct language.

Regarding the communication skill development, there was a consensus among the experts that Rehearsed.ca can provide the players with effective communication models to rehearse and prepare for real life situations. The experts stated that the players could have some of the words and phrases from the game in their back pocket and use them in the future. The players also thought that the game, as well as educating them about healthy sexual interactions, could offer them new terms and phrases related to safer sex communication and negotiation. As the aim of the scenarios in this study was to expose the players to different sexual situations in which a two-way communication was needed, it can be assumed that playing Rehearsed.ca could enhance communication skills among its players.

Further, and to name the current context in which this game was developed and tested, the global COVID-19 pandemic, showed the necessity of online platforms more than ever (Ali, 2020). Since the beginning of the pandemic, the search for digital interactive or non-interactive resources substantially increased (Ali, 2020; Oducado, 2020). Shifting to online platforms magnified the need for well-developed digital resources (Ali, 2020; Oducado, 2020). Limited accessibility to sexual health clinics, condoms and other contraceptives (Aly et al., 2020) showed knowing about safe and pleasant alternatives an important skillset to have; this was addressed several times in the game. Rehearsed.ca runs on any internet browser, any computer or laptop with access to internet and with minimum technical requirement, which adds a wide accessibility advantage to it.

Future Design Iterations of Reheased.ca

In order to answer the second research question and understand how we could develop the game further for a more productive and fun experience, the participants (experts and 18-24-year-olds) were asked about the elements that they thought could make the game more engaging and effective. The majority of 18-24-year-old participants suggested more scenarios in the game and more options and responses within each scenario. The experts also asked for more scenarios and more responses inside the scenarios. This can be considered as a good sign as it shows that the players and experts liked the structure of the game and wanted more scenarios to play. The request for more responses in each scenario also shows that this feature was appealing to them and they liked the power of building the story together and shape how it goes and ends. They also wanted the scenarios to last longer, which again takes adding more responses to the scenarios.

Consent, safer sex alternatives, sexual boundaries, non-monogamous relationships, safety around sex toys and oral sex, and sexual orientations were among the scenario topics that the experts suggested. In the next phases of the game development, sexual health educators and experts in the aforementioned areas will be recruited to develop scenarios that address the requested topics. Expert C wanted the game to be complex enough to be able to show different body language gestures and facial expressions when saying 'No' to a sexual request from a partner despite verbally saying 'Yes'. This is connected with the idea of consent and shows the complexities in this area. Visual representations like short animations or GIFs might be able to address these details and will be shared with the game developers for possible future inclusion in the game.

Visuals and game mechanics were suggested by other experts as well. They thought more images and visual elements would make the game more appealing to the eye and also less text heavy. Although this sounds like a legitimate request, Sara and Guay (2014) argue that rather than including visual and emotional engagement or immersion that cause extra expenses with no guarantee of extra achievement, authenticity should be promoted through gameplay. Gee (2003) explains that the authenticity of the experience could be enhanced through open-ended quests and a highly responsive environment reflecting "reality". This can be achieved through adding a free chat option, which was actually mentioned by the participants as well. They wanted to be able to send their own responses during the game or move into a free chat mode to discuss the scenario with their fellow player after playing the game. This can also enhance their basic psychological needs like autonomy, competence, and relatedness (Ryan & Deci, 2000). Although this feature was available in the game, it was disabled for the purpose of this study as the

conversations could have gone out of control and in directions not relevant to the topic of this study.

Having a mini quiz at the end of each scenario based on the decisions made, and an anonymous Question and Answer forum inside the game as a chat service with an expert can increase the players interactions with the game and create a stronger engagement compared to a richer visual environment. In the next iterations of the game, adding a proper amount of visual design, an adapted chat function and mini quizzes based on the decisions that the player had made earlier and a live chat or forum with an available sexual health expert will be further investigated. Avatar customization is another element that can be added to answer the players' request and enhance engagement as sexual health education that is individualized to the players' characteristics is argued to be able to create a more engaging learning context (Sara & Guay, 2014).

Background music, sound effects, the option to send emojis, having a point system were among the other suggestions that the participants offered. When considering these suggestions, special attention should be paid to the amount of extraneous cognitive load they may add to the presentation of the content which might disturb the learning process (Sweller & Chandler, 1991). In regard to the presentation of the scenarios, the participants suggested integrating the game with external resources related to the topic. For example, they thought linking responses in the scenarios to websites, clinics, or locations for STI screening would help them have on-demand access to the resources that they may have needed. This suggests a fundamental need for digital resources and the need to know more by the 18-24-year-olds. They thought having on-demand access to resources related to each scenario would give them access to more resources which would make further investigations and explorations of a topic possible.

Limitations of The Game

Some 18-24-year-olds thought the scenarios were repetitive and boring after playing them a couple of times. Although they did not offer any solutions, these feelings may be attributable to the lack of visual effects or other game mechanics such as a points system, which for some players, can be motivating. The short length of the scenarios may have led to detachment over time and thus contributed to attrition. Another reason could be the fast pace of the story. Exchange of responses between the partnered players happens instantly. Ten to twenty seconds delay between the responses could give reflection time to the players, add excitement as they wait for a response and prolong each scenario. Further development of the game followed by play-testing cycles are needed to address this idea.

Another limitation relates to the age of the participants. Ideally, including younger participants in the study would have strengthened its findings. However, due to the challenges of recruiting participants during a pandemic, and the potential benefits of the game for older individuals, we decided to focus on the 18-24 age group. It is important to note that this decision may have influenced the study's findings to some extent, as younger age groups may have responded differently to the game and benefit more from the game. Future research could expand the age range of participants and investigate the impact of the game on a younger age group. Many 18-24-year-old participants found game scenarios irrelevant because they had already lived through similar situations in real life. These participants suggested the scenarios were “too late” for them because they had learned the content through their previous sex education or through life experiences. That said, previous findings have shown that less than 47% of 18-24-year-olds have used condoms during their last penile-vaginal sexual encounter (Milhausen et al., 2013). In a more recent study by Fetner et al. (2020), 35% of the 18-24 participants stated that

they never used condoms in their last 10 times of intercourse experience. There are many reasons for this, including the tendency of young adult couples to use oral contraception once they are in committed relationships. The prevalence of the idea of being ‘too late’ might be because the 18-24-year-old participants who decided to take part in the study had a good level of confidence and self-efficacy in sexual issues. Numbers and statistics show that the content of Rehearsed.ca is still pertinent for the 18-24 age group, although it cannot be ignored that younger participants with less experience in sexual communication with sexual partners may stand to derive different or even greater benefit from participating in this serious game. It is known that negotiation is not, generally, part of the sex education courses offered to students in high schools (Walters & Laverty, 2021) – therefore, we do not know how likely it is for young women and men to learn these types of negotiation practices themselves. However, the participants' feedback on the game was generally positive, with many acknowledging its potentials for younger players. Several 18-24-year-old participants expressed their willingness to recommend the game to younger people within their social circles, including friends, family, and relatives or wished they had it when they were younger. This feedback highlights the game's potential as an effective tool for promoting safe sex practices among younger age groups. Furthermore, the positive feedback from participants suggests that this study could achieve its goal in the developing a platform that has functional capabilities for promoting safer sex practices through a serious game. The platform's design and features may be tailored to suit the needs of different age groups, making it a potentially valuable resource for promoting sexual health education.

The participants were also concerned that the practices in the game may not transfer to real life situations possibly because they are not similar to real life situations or because there are other strong emotions at stake that may stop them from doing or saying what they had learned

and practiced in the game. As much as this comment is legitimate, making an intervention with complete transferability to a real-life context seems very hard or impossible to achieve. As the participants stated, there are so many different factors at stake when condom use is being decided. However, it is hoped that the players carry what they learn in the game in their back pockets and put them into practice when needed. On the other hand, understating the transferability of the game was not in the scope of this study. Future studies can answer how and to what extend this game was successful in helping the players in a similar situation in real life and what elements can be added to enhance the transferability.

Although this study was not targeting adolescents under 18, many 18-24-year-old participants were concerned that some of the scenarios could not be used for people under the age of 18 and needed to be adapted for that age group. They said 'getting tested' or STI screening is a bit unnatural for many teenagers. This can imply that the participants of this study were of the attitude that STI screening is for older ages, for people with multiple partners and or for people with several previous relationships. It is recommended that future interventions for 18-24-year-olds work on this concept and clarify it for them that getting STI screening is for everyone who has been in a relationship and had a risky sexual interaction even once.

The context of '*conversation in a café*' was also reported as not a good fit for teens under the age of 18. It was stated by some 18-24-year-old participants that adolescents do not usually have such conversations in public places. This is a legitimate critique. Small tweaks to the game scenarios are needed before Rehearsed.ca would be appropriate for adolescents under the age of 18. For example, we could change the storyline and scenario context from 'being in a café' to 'being in a house party' or as a 'WhatsApp chat' rather than a conversation in a crowded place.

The 18-24-year-old participants also mentioned that the scenarios were too direct and may cause discomfort or embarrassment among the younger players. Another participant, however, believed that using euphemisms would not give them the appropriate language that they need in real life situations. He was supporting the language of the game. This is an important finding as it can show that the game was able to push the players from their comfort zone and allow them to imagine using language that they have never used or had never known they could use. Previous findings show that using direct language in conversations around condom use or consent is a predictor of actually using condoms (Amaro, 1995; Kelly & Kalichman, 1995; Lam et al., 2004). However, special attention should be paid to the fact that open conversations around condom use and safer sex are more difficult for some groups compared to others. Asian Americans, for example, have been found to be show strong feelings of discomfort in discussing sexuality (Chan, 1990; Chan, 1997; Chin 1999; Ho & Tsang 2000) and women have been found to be using more nonverbal and indirect styles of communication and persuasion than men (LaFrance & Henley, 1997). In the future iterations of the game, different ways of negotiation over safer sex should be included in the scenarios in order to provide and teach a variety of approaches to ask for condom (e.g., purchasing condoms, placing the condom in plain view of one's partner, using emotionally coercive techniques, etc.) and in ways that participants find culturally inclusive or responsive.

Limitations of the Study

There are a number of study limitations, primarily resulting from the 'one sitting' design for the players. The voluntary nature of participation also precluded assessment of what prevented people from engaging; thus, the reasons for what deterred potential users from participating is unknown. The game was designed as a prototype, but the resulting limited

character options, restricted bank of dialogue choices and prescribed gameplay settings reduced the simulative benefit of Rehearsed.ca as a serious game.

Not including the educational needs of other sexual orientations and genders in the game scenarios and not having participants with different orientations in the evaluation phase was the main limitation of the study. However, the limited scope of this study was not meant to exclude. Rather, the focus was on designing an educational video game that was situated in the particular needs of particular groups. The findings from this stage will be used as a guideline for more inclusive scenarios in the game in future phases.

As the second limitation, there might have been mismatches between the content of the scenarios and the age of the participants. With regard to condom use communication skills, 18-24-year-old participants who played the game might have already developed some negotiation skills resulting from their previous sexual experiences and/or sexual health knowledge from school or online recourses. This is a valid criticism and this lack of alignment could have affected the educational impact of the game and the results of the study. Ideally, we would have included a broader range of participants in the play testing phase of the study, but COVID-19 restrictions and a general moratorium on research activities in schools during this time meant there was no way to recruit middle-school or high-school aged participants. The game was therefore tested with 18-24-year-olds who could consent to participate without the need for parental and/or teacher involvement. The potential value of Rehearsed as a serious game that can support negotiation skills of adolescents under the age of 18 should be examined in the future studies.

The third limitation is the scant number of play-test cycles and play testers in Phase 2. Their feedback was mainly about the glitches and technical issues. My presence in the focus

groups as the designer of the game might have caused hesitance in them to share their thoughts about the limitations of the game. There was also a little familiarity between the play-testers and the designer which could have caused biased responses. One solution would be receiving feedback anonymously. Also, more play-testers in each cycle would add more to the quality of the game. Many of the suggestions for improvement were coming from the 18-24-year-olds in the evaluation phase. If we had them earlier, we could have implemented them into the game and evaluate a better product. However, these suggestions will be applied to the next versions of the game that will be developed in the future.

Another limitation is the lack of longitudinal measurement and having a control group. To effectively and clearly understand the efficiency of this game, different quantitative experiments and statistical methods can be implemented in the future. Longitudinal studies can show the depth of the impact of the game on the players' sexual negotiation skills and a control group can clarify the impact of collaboration compared to non-collaborative programs. Also, the 18-24-year-olds and the experts evaluated the scenarios and content of the game rather than the game mechanics. In future studies, the structure and functions of the game can be evaluated by engineers, programmers and game developers to understand how Rehearsed.ca can be developed to achieve a better game functionality.

Conclusion

The aim of this study was to a understand how a collaborative serious game can integrate the principles of serious games with practices of safer sexual communication and negotiation. It also investigated how 18- to 24-year-olds report practicing safer sexual communication and negotiation skills through participation in the collaborative serious game and what insights (a) 18-24-year-old participants and (b) sexual health experts share about the game that can inform future design iterations of this game.

The main contribution of this study was providing new evidence of how a collaborative serious game that creates a virtual context for practicing communication and negotiation skills in sexual partnerships can be created. Integrating Collaborative Game Design Framework proposed by Wendel et al. (2013) and General Model of Sexual Negotiation by Davies and Weatherburn (1991) was the main contribution of this study. The product of this research is an online collaborative scenario-based role-play game that can be played collaboratively by the interested players around the world.

The analysis of the data collected from the 18-24-year-old participants and sexual health experts showed that the 18-24-year-old participants enjoyed the collaborative nature of the game with an interactive-story content presentation mode. They reported enhanced communication and language skills, raised awareness and reduced stigma around safer sex communication and condom use. They mentioned ‘planning in advance’ and ‘communication skills’ as their main learning after playing the game and stated that the game could normalize the topics related to safer sexual communication. They found it fun and interesting, especially because of the social interaction and having the power to lead the story. They stated that they would recommend it to the people they know within their social network. They requested more scenarios and responses

and believed visual and sound effects together with more game mechanics like a scoring system would make it more fun to play.

The sexual health professionals also found this game to have the potential to enhance communication skills related to safer sex negotiation, provide the words and phrases needed for this skill, reduce stigma around sexual communication and raise awareness about different precautionary acts through a sex positive lens and fun and engaging human-vs-human interaction.

The feedback from the sexual health experts and the 18-24-year-olds showed that the game is functional and can have a positive impact on 18-24-year-olds' attitudes, knowledge and skills in terms of sexual health education and safer sex communication. The findings can help other researchers in the field and give insights to develop more complex versions of Rehearsed.ca. This research was timely—considering the rising STIs in Canada including among 18-24 year olds, the need for effective online platforms due to COVID-19 and the tendency of 18-24-year-old participants to find answers to their questions online despite limited interactive resources. More specifically, this study added to the limited research on a collaborative serious game in developing sexual communication and negotiation skills and strategies among 18-24-year-olds.

I personally learned a lot through the process of this study. Theoretically, I developed a deeper understanding of learning theories such as situated learning and social-constructivism and more importantly how to practically implement them in an educational context. I also learned the importance of building a technological tool on strong theoretical foundations and how theories can be used as guidelines for an effective learning tool and experience. Methodologically, I gained a lot of experience and knowledge in receiving ethical approvals, recruitment of the

participants, data analysis and presenting the findings. As it was a multi-disciplinary study with several phases and steps, I developed great leadership skills in managing funds and teams of game developers, sexual health experts, and young adult participants.

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Appendices

Appendix A

Semi-structured Interview Questions for Sexual Health Experts

Phase I: Sexual Health Experts Interview Protocols

Introduction

Hi _____, thank you for agreeing to participate in this interview. The purpose of today's interview is to find out your **thoughts about risky and challenging situations that can affect 18-24-year-olds' decisions on safer sex and condom use, and strategies to manage them.** I will be recording this discussion to ensure I do not miss any of your comments. The information that you provide will be used for the design of a serious game for sexual negotiation practice for 18-24-year-olds in Ontario Canada. Please feel free to be as open and honest as you wish with your responses. Your comments made during this discussion will be kept confidential. Do you have any questions? If not, then let's begin.

- What are the main causes of unprotected intercourse among 18-24-year-olds?
- What are the strategies for 18-24-year-olds to avoid unprotected sex?
- What situations can cause 18-24-year-olds to avoid negotiation over condom use?
- How can a young adult manage a partner who is insisting on not using condoms?
- How can 18-24-year-olds manage 'heat of the moment'?
- How can heterosexual 18-24-year-olds manage "fear of missing out" around sex?
- How can 18-24-year-olds avoid unpredicted/unexpected sex?
- When is the best time to bring up the topic of using condom?
- What are the best safer sexual negotiation strategies?

That concludes the one-to-one interview. Do you have anything else you would like to add at this time?

Thank you again for participating in my research study. If you think of anything else after we "sign off" (since interview may be virtual), please don't hesitate to get in touch with me.

Closing question:

1. If I have follow-up questions, would it be OK with you if I contact you at a later date?

2. Would you like to receive the results of the study?

Appendix B

Codebook 1

Theme	Definition
Condom use self-efficacy	The effect of self-efficacy in condom use on negotiation and vice versa
Arousal	The relationship between sexual arousal and safe behaviours, negotiation and communication
Verbal /non verbal communication and preparation	The skills and words needed to have conversations about condom use, form of sexual interaction, time of sexual interaction, etc.
Tools, alternatives, broad definition of sex	Offering alternatives to sexual intercourse. Defining that sex is not only intercourse. Accepting that "walking away" is not a practical strategy
Consent	The connection between condom use and sexual communication and consent of having sex
Shared responsibility	The idea that both partners are responsibly in decision making, brining up the condom and managing the relationship
Power dynamics	The idea that being in a lower position, having less power, wanting so much to be in the relationship, would make safe decision making more challenging
Mindset	Any kind of attitude or mindset about caring, using or talking about condom that would stop the partners to carry, use or talk about it.
Positive feeling as a risk	The false idea that a familiar person with a positive impression can be a safe sexual partner
Knowledge	False knowledge or lack of knowledge about STIs as a factor in unsafe behaviors
Influence of past	the effect of past unsafe experiences but without any negative consequences on present or future decisions

Pregnancy vs STI	giving priority to pregnancy than STI and planning only based on pregnancy concerns
Getting tested	the importance of getting tested before further decisions about condom use
Future partners	The wrong perception that their current partner is their last partner. Serial monogamy
Gender differences	the way different genders deal with condom use and condom negotiation
Avoid conflict	Not talking about condom to avoid conflict or negative consequences
Risks of serious relationships	the misconception that you can stop using condom if the relationship is serious
Heuristics	Established rules in mind that help you make fast decisions without thinking too much
Amplified situations	when several factors are acting together and make safe decision making more challenging

Appendix C

Consent Form for Participation in Research (Phase 2, 3 and 4)

Design, Develop and Evaluate a Collaborative Serious Game to Enhance 18-24-year-olds' Sexual Negotiation Skills on Condom Use

Principal Investigator:

Mohsen Haghighatpasand
PhD Candidate
Faculty of Education
University of Ottawa
Ottawa, ON

Supervisors:

Michelle Schira Hagerman, PhD
Assistant Professor
Faculty of Education
University of Ottawa
Ottawa, ON

Emmanuel Duplaa, PhD
Professor
Faculty of Education
University of Ottawa
Ottawa, ON

Invitation to Participate: I am invited to participate in the research study entitled *Design, Develop and Evaluate a Collaborative Serious Game to Enhance 18-24-year-olds' Sexual Negotiation Skills on Condom Use* conducted by Mohsen Haghighatpasand in the context of a PhD thesis.

Purpose of the Study: I understand that the purpose of this focus group interview is to understand the players impression about a serious game designed to enhance sexual negotiation on condom use and safer sex.

Participation: My participation will consist essentially of ONE up to 90-minute in-person (phone or virtual, if required) interview during, which I will respond to interview questions and engage in discussion about the topic. The interview sessions have been scheduled for [date, --] in [location] or virtually (Skype or Zoom). The session will be audio recorded, then transcribed verbatim.

Risks: I understand that since my participation in this study may entail that I volunteer some personal information about my past experiences, and this may represent a low risk for me. I have received assurance from the researcher that every effort will be made to minimize these risks by keeping files confidential and maintaining anonymity about person(s).

Benefits: You will not immediately benefit from this study. However, your participation in this study will contribute to the design of a interventions aimed at sexual health, in particular through serious games.

Confidentiality and Anonymity: I have received assurance from the researcher that the information I will share will remain strictly confidential and anonymity will be protected by using file codes and aliases to mask personal identifying information. I understand that the information I provide will be used only for understanding the topic area and may be used as quotes.

Results: The interviews will be analyzed individually and cross-cases. This information will be kept confidential. It will not be associated with or stored with your specific responses and it will

be destroyed once after the 5-year conservation period, which start once data collection has been completed.

Conservation of data: The research data will be stored in password protected electronic files, on a password protected computer and hard copies of information will be stored in a secure cabinet in Mohsen Haghighatpasand's home office. It will be stored for a period of 5 years after the data collection is complete, at which time the data will be securely deleted.

Voluntary Participation: I am under no obligation to participate and if I choose to participate, I may withdraw from the study at any time and/or refuse to answer any questions. If I choose to withdraw, all data gathered until the time of withdrawal will be kept or dismissed as I wish; the kept or dismissed data will be conserved securely with all other project data. I understand that once the coding of the transcriptions of the interview discussion will begin, it will not be possible to withdraw my comments. I may request to see a copy of the transcription of the interview.

Acceptance: I, _____ agree to participate in the above research study conducted by Mohsen Haghighatpasand of the Faculty of Education, University of Ottawa, whose research is under the supervision of Dr. Michelle Schira Hagerman and Dr. Emmanuel Duplaa. I understand that by accepting to participate I am in no way waiving my right to withdraw from the study.

If I have any questions about the study, I may contact the student and/or her professor using the contact information listed at the top of this form.

If I have any ethical concerns regarding my participation in this study, I may contact the Protocol Officer for Ethics in Research, University of Ottawa, 550 Cumberland Street, Room 154, (613) 562-5387 or ethics@uottawa.ca

There are two copies of the consent form, one of which is mine to keep.

_____ _____

Participant's signature Date

_____ _____

Researcher’s signature Date

Appendix D

Consent Form for Participation in Research (Phase 1 – Experts)

Design, Develop and Evaluate a Collaborative Serious Game to Enhance 18-24-year-olds' Sexual Negotiation Skills on Condom Use

Principal Investigator:

Mohsen Haghighatpasand
PhD Candidate
Faculty of Education
University of Ottawa
Ottawa, ON

Supervisors:

Michelle Schira Hagerman, PhD
Assistant Professor
Faculty of Education
University of Ottawa
Ottawa, ON

Emmanuel Duplaa, PhD
Professor
Faculty of Education
University of Ottawa
Ottawa, ON

Invitation to Participate: I am invited to participate in the research study entitled *Design, Develop and Evaluate a Collaborative Serious Game to Enhance 18-24-year-olds' Sexual Negotiation Skills on Condom Use* conducted by Mohsen Haghighatpasand in the context of a PhD thesis.

Purpose of the interview: I understand that this interview aims to understand the challenging situations in which sexual negotiation on condom use might be compromised.

Participation: My participation will consist essentially of Three up to 90-minute in-person (phone or virtual, if required) interview during, which I will respond to interview questions and

engage in discussion about the topic. The interview sessions have been scheduled for [date, --] in [location] or virtually (Skype or Zoom). The session will be audio recorded, then transcribed verbatim.

Risks: I understand that since my participation in this study may entail that I volunteer some personal information about my past experiences, and this may represent a low risk for me. I have received assurance from the researcher that every effort will be made to minimize these risks by keeping files confidential and maintaining anonymity about person(s).

Benefits: My participation in this study will contribute to the design of a serious game aimed at enhancing 18-24-year-olds' negotiation skills. It will also contribute to developing subsequent phases of a PhD thesis project. After the completion of the study, I will be paid or otherwise rewarded (e.g., gift card) an equivalent of 40$ for participating in this research study.

Confidentiality and Anonymity: I have received assurance from the researcher that the information I will share will remain strictly confidential and anonymity will be protected by using file codes and aliases to mask personal identifying information. I understand that the information I provide will be used only for understanding the topic area and may be used as quotes.

Conservation of data: The research data will be stored in password protected electronic files, on a password protected computer and hard copies of information will be stored in a secure cabinet

in Mohsen Haghighatpasand's home office. It will be stored for a period of 15 years after the data collection is complete, at which time the data will be securely deleted.

Voluntary Participation: I am under no obligation to participate and if I choose to participate, I may withdraw from the study at any time and/or refuse to answer any questions. If I choose to withdraw, all data gathered until the time of withdrawal will be kept or dismissed as I wish; the kept or dismissed data will be conserved securely with all other project data. I understand that once the coding of the transcriptions of the interview discussion will begin, it will not be possible to withdraw my comments. I may request to see a copy of the transcription of the interview.

Acceptance: I, _____ agree to participate in the above research study conducted by Mohsen Haghighatpasand of the Faculty of Education, University of Ottawa, whose research is under the supervision of Dr. Michelle Schira Hagerman and Dr. Emmanuel Duplaa. I understand that by accepting to participate I am in no way waiving my right to withdraw from the study.

If I have any questions about the study, I may contact the student and/or her professor using the contact information listed at the top of this form.

If I have any ethical concerns regarding my participation in this study, I may contact the Protocol Officer for Ethics in Research, University of Ottawa, 550 Cumberland Street, Room 154, (613) 562-5387 or ethics@uottawa.ca

There are two copies of the consent form, one of which is mine to keep.

_____

_____

Participant's signature Date

_____

_____

Researcher’s signature Date

Appendix E

Codebook 2

Theme	**Description**
Suggestions for Development	The things the players were needed to be added to the game or having them would make the game even better
General Game Experience	idea of if and how the participants found their experience satisfying and useful
Game and Debriefing	The benefits of having the debriefing session after playing the game
Limitations	The themes related to the limitations of the game. Anything that was mentioned as a limitation of the game
Game Potentials	skills, knowledge, and attitude changes that were reported by the participants
Language Skills	Learning words and phrases related to safer sex communication
Normalizing the Topic	the efficiency of the game in normalizing conversations around sex and condom use and removing the awkwardness around such topics.
Communication Skills	The idea of enhanced communication skill after playing the game and skills learned through playing. The game helps the players to discuss their points related to safer sexual health issues in real life
Getting Tested	Evidence of learning the importance of STI testing by the participants
Planning in Advance	Skills related to planning and communicating for a safe and pleasant sex in advance
Transferability	Evidence that show the 18-24-year-olds can or cannot apply their learnings in the game to real life situations
Anonymity	The advantage of the game in providing an anonymous context for learning and discussing sexual topics
Another Mode of Learning	Ideas such as ‘different sex education experience,’ ‘engaging content,’ and ‘in-depth and extensive content’.
Fun & Engagement	How is playing this game fun? What fun elements did you find in the game? Were you engaged with the content?

Agency	The power to lead the story in a way that most interested the player
Social Element	feature of the game that allowed playing against other human players instead of the computer
Sense of Exploration	the idea of exploring different options and scenarios to see what they bring
Recommend it to other people	Any themes that are about recommending to game to siblings, friends, cousins, etc.
Wish they had it in their sex ed	Comparison with their sex education and the idea that having it would help them in having a better sexual health ed
limitations	Themes related to the limitations of the game
Repetitive	Playing one scenario several times makes it boring
Some scenarios are not for my age	For people who thought they were too old for this game and it's for younger ages
Some scenarios don't fit under 18	The scenarios (happening in a café, for example) is not for a 13 year old teenager
More information in the game	More information is needed in the game (e.g. what is an STI? What are different types)
Suggestions	Ideas for future developments
Integration with other resources	Requests to have other resources integrated into the game
More gaming and visual elements	Requests for graphic representations and gaming functions like scoring system
More options and scenarios	Requests for longer scenarios and more topics
Sex positive	The content is sex positive as it provides ways to have pleasant and safe sex not to ban them from having sex
The game as a resource	The game as a resource for teachers and students to refer to for further reading and other activities
Normalizing the Conversation	the game able to normalize discussions and communications around safer sex and condom use

Appendix F

Focus Group Interview Question for the 18-24-year-olds after Playing the Game

Phase 3

Before conducting this interview, the questions will be shared with the experts in sexual health to determine whether the questions are clearly worded; whether these are the most important questions to ask; whether all of these questions are helpful for the purpose of this study. After receiving their feedback and receiving their confirmation for the final version, the questions will be finalized.

Introduction

Hi everyone, thank you for agreeing to participate in this focus group. As you know, the purpose of this study is to understand whether a collaborative serious game can enhance 18-24-year-olds' sexual negotiation skills in condom use. This focus group is an opportunity for me to learn, from you, about your impressions of the game.

- Did you enjoy playing the game? Why/why not?
- What did you like most? What did you like least?
- Do you think this game is effective in teaching sexual health topics?
- Would you recommend it to any of your friends? Why/why not?
- Do you think this game could help you improve your safer-sex negotiation skills? Why/why not?
- Did you learn any new sexual negotiation strategies? If yes, what strategies?
- What didn't you like about this game? How would you like to change it?
- Do you think this game could help you in real life situations?
- Do you think this game is more effective than what you had at school and your textbooks?

Appendix G

Interview Questions for Sexual Health Experts after They Have Seen the Game Played

Phase 3

Introduction

Hi _____, thank you for agreeing to participate in this interview. The purpose of today's interview is to find out your **thoughts about the limitations and affordances of the serious game used in this study.** I will be recording this discussion to ensure I do not miss any of your comments, and I can report your comments accurately. The information that you provide will be grouped together into themes, and not identifiable to any other participants, so please feel free to be as open and honest as you wish with your responses. Your comments made during this discussion will be kept confidential. Do you have any questions? If not, then let's begin.

What limitations did you see in the game?

- What advantages did you see in the game?
- Do you think this game can develop the 18-24-year-olds' sexual negotiation skills? How?
- Do you think this game can support 18-24-year-olds? How?
- What would you add to the game if you wanted to?
- Would you recommend your patients/relatives to play this game?
- Do you think this tool could be a good complementary source for schools?

That concludes the one-to-one interview. Do you have anything else you would like to add at this time?

Thank you again for participating in my research study. If you think of anything else after we "sign off" (since interview may be virtual), please don't hesitate to get in touch with me.

Closing question:

1. If I have follow-up questions, would it be OK with you if I contact you at a later date?

2. Would you like to receive the results of the study?