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Development of an Interactive Game for Education Regarding Sexually Transmitted Infections

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Abstract

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Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Sexually transmitted infection (STI) prevalence rates are increasing in the United States and globally. Education has been found to be an important strategy for increasing STI testing and treatment rates among sexually active young adults. The goal of this project was to develop an interactive educational game suitable for young adults to decrease the social and economic burden of STIs. The health belief model informed the project. A moderated usability evaluation was conducted using the concurrent think-aloud technique. The participants ($N = 5$) were a purposive sample of professionals who played the interactive game and then completed Schnall, Cho, and Lie's Health-Information Technology Usability Evaluation Scale instrument. The findings revealed the necessity of (a) an introduction screen, (b) a reward system for correct answers, and (c) avatars, while also highlighting that (d) the effect on indicator value bars is difficult to understand and (e) the timer led to a feeling of being rushed. The Cronbach's alpha for the participant group was 0.798, the subscale "Perceived Ease of Use" achieved an alpha level of 0.815, and the subscale "Perceived Usefulness," 0.762. Refinements to the game based on these data might help to ensure that use of the interactive game contributes to social change by increasing knowledge of STIs in the young adult population.

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Dedication

I would like to dedicate this project to my family, all of whom have supported my educational journey for the past 17 years. Many hours have been dedicated to achieving this goal; which meant less time to spend with them. I am blessed beyond measure to have their continued love and support, which I could not live without.

David Arrington, you encouraged me every step of the way and kept our household and finances in order, so I could fulfill our dreams.

My first born, Jeffrey Mason, may you rest in peace, my sweet child; Momma misses you so much and will always remember your strength and protective nature. Brian Mason, for being strong, handsome, and having dreams of your own. I know you will accomplish them, because you are more capable than you ever imagined!

Mom, Carol Johnson, you taught me what it is to be a woman and encouraged me to pursue my dreams, even though it cost us precious time together. I love you so much!

Dad, Jim Johnson, you traveled to attend my first graduation and told me how proud you were of your baby girl. Oh, how I wish you were here now to see this last one! Rest in peace, my precious daddy. I love you and miss you every day.

My sweet nephew, Sam Goodman, may you rest in peace; you encouraged me to finish my project in one of the last text messages I received from you. I miss you so much and I will always remember the love and laughter you brought into my life.

My grandchildren, River, Rider, Maely, Gracyn, and Everleigh. I always tried to spend a little extra time with you because I wanted to know your wonderful spirits; I'm sorry if it wasn't enough. Where do you want Mimi to take you now? I have the time.

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My husband, David Arrington, I acknowledge you for all the times you told me
"you are capable of obtaining this goal," followed by "now get in there and do it". I love
you dearly, and I am grateful we crossed paths when I was not looking for someone,
which proves that God truly does have a plan!

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Section 1: Nature of the Project

Introduction

Contemporary nursing encompasses more than providing patient care at the

bedside. Nurses are responsible for improving patient care delivery systems in order to

promote better patient outcomes; decrease the cost of health care; and provide a safer

environment for patients, families, employees, and populations (Finkelman & Kenner,

2009). To improve health care outcomes, nurses need to translate evidence into practice,

which requires effective leadership (Hyrkas, 2010).

Sexually transmitted infections (STIs), which Healthy People 2020 (2015)

identified as a significant health problem in the United States, provide an opportunity for

nursing leaders to translate evidence to improve nursing care and patient outcomes. The

Centers for Disease Control and Prevention (CDC) provides national data and statistics

for three common STIs--chlamydia, gonorrhea, and syphilis--with syphilis being reported

as a primary, secondary, or congenital type (CDC, 2018b). The rates of cases reported in

2017 for all three STIs increased from the previous year by 6.9%, 19.6% and 10.5%

(primary and secondary), and 43.8% (congenital), respectively (CDC, 2018b). The

number of chlamydia cases reported in 2017 was a little over 1.7 million, making it the

most common notifiable condition in the United States (CDC, 2018b). The rise in STIs

illustrates the scope of the problem confronting nurses and other health care providers in

the United States.

The incidence of STI cases is higher for young people between the ages of 15 and

24, and this population is at highest risk for more serious health consequences from STIs

(CDC, 2018b). Research supports educational interventions to increase knowledge regarding STI prevention and treatment options (Moore & Smith, 2012: Royer & Zahner, 2009). Also, research supports web-based education as a successful strategy for improving health care outcomes (Evans, 2010; Shegog et al., 2014).

Problem Statement

STIs affect an estimated 1 million people each day around the world (World Health Organization [WHO], 2018). More than one million U.S. young adults aged 15-24 years of age were reported to have chlamydia infections in 2016-2017 (CDC, 2018b). The number of gonorrhea cases for men and women aged 15-24 years continues to be higher when compared to other age groups in 2016-2017 (CDC, 2018b). In addition, more than 500 million people are estimated to be infected with genital herpes simplex virus worldwide (WHO, 2018). Genital human papillomavirus (HPV) is the most common STI in the United States with a reported 80 million Americans currently infected, which is approximately one in four persons (CDC, 2018a). Chlamydia, herpes, and HPV often occur with no symptoms, so it is not uncommon for them to go undetected and undiagnosed (WHO, 2018). Yet, Wolfers, de Zwart, and Kok (2011) found that 33% of young adults age 16 to 25 ($N = 756$, $N = 1302$), in the Netherlands believe STIs present with symptoms. This belief presents a problem for identification, treatment, and prevention.

Generally, people are unable to identify risk, especially when the risk is personal. In a study of HIV infection and attitudes about preexposure prophylaxis (PrEP), Whiteside et al. (2011) reported that participants perceived their risk for infection to be

lower than their actual risk. Similarly, even with reported risky sexual behaviors, participants in Wolfers, et al. (2011) study perceived their risk for STIs to be minimal. Finally, about 44% of participants ($N = 2,058$) in another study believed washing after sex prevents STIs and 38% indicated that oral contraceptives protect against STIs (Wolfers, et al. 2011). Overall, these findings suggest sexually active adults continue to engage in risky sexual behaviors without appreciating the real risk for harm and the probability of harm to their sexual partners.

In addition to a lack of knowledge about their risk level, individuals may be reluctant to be tested for STIs because of shame. In terms of university students, young women are reluctant to seek STI testing for reasons including embarrassment, denial, and being asymptomatic (Backonia, Royer, & Lauyer, 2014). This reluctance to seek STI testing leads to increased risk for serious disease and additional STI exposure to sexual partners (Backonia et al., 2014). Researchers have found education is an important strategy to increase the number of sexually active adults who seek STI testing and treatment (Backonia et al., 2014). Education may increase knowledge and diminish the stigma of STIs, resulting in the potential alleviation of serious complications associated with undiagnosed individuals. The knowledge gap in STI diagnosis and treatment is the lack of perceived risk for infection and personal harm. In addition, there is a lack of knowledge regarding appropriate strategies to prevent STIs (Backonia et al., 2014). For the DNP project, I sought to deliver an innovative evidence-based education program to fill the identified gaps in young adults' STI knowledge related to risks, detection, testing, treatment, and prevention.

Purpose

The DNP project involved evaluating the development of an interactive game designed for STI education. I collaborated with a computer gaming design professor and professional colleagues to develop the interactive gaming education. Final analysis of the evidence gathered for the project supported the usability of the beta version of the game, the ongoing iterative design of the game, and its ability to accomplish the objects set forth in the initial design. The goal of the project was the ongoing design and development of an educational tool suitable for teens and young adults to decrease the social and economic burden of STIs among this group of individuals.

Practice-Focused Question

Will the STI education interactive game be usable and meet the stated design objectives?

Nature of the Doctoral Project

The health belief model (HBM) is an intrapersonal theory of individual characteristics and behaviors, more specifically individuals' knowledge, beliefs, personality traits, and skills (Hodges & Videto, 2011). Deavenport, Modeste, Marshak, and Neish (2010) used the HBM to identify characteristics of Hispanic women related to the decrease in mammogram screenings. They determined the health beliefs of the women in the study were related to the reasons why they either did or did not get mammograms (Deavenport, et al., 2010). The Use of the HBM also assists researchers in obtaining data related to the population's perceptions of benefits and barriers to health care interventions (Deavenport et al., 2010). Once this key information is identified,

intervention programs can be designed to assist the population to improve access to care and increase health care outcomes.

The HBM is a value expectancy model; a presumption is that if an individual is convinced of the need for a health care intervention, he or she are more likely to utilize it than if he or she perceived no benefit (Deavenport et al., 2010). I determined that the HBM was appropriate for this project because of my focus on young people's health behaviors that lead to STIs and the risks associated with contracting a STI. Education may have a positive impact on this population's behaviors and result in a decrease in the incidence of STIs.

Once the changes have been made to the interactive game, further research would be conducted to determine efficacy of the game and game play satisfaction levels. Data collection for future efficacy research would include a questionnaire to evaluate stakeholder participants' current knowledge of and perceptions of risks regarding STIs. The same questionnaire would be used for the pre and posttest administration. The scores would be analyzed to measure the differences in STI knowledge pre and postintervention.

Game play satisfaction levels would also be measured in future research to determine stakeholder participants' satisfaction with the interactive gaming education modules. It would be necessary to determine if the stakeholder participants were satisfied with the intervention, if they believed it was of value to them, and what, if anything, could be done to improve their satisfaction level. This information would be utilized by

the design team when developing higher levels of game play and modifying the game for different age groups.

Significance

Stakeholders

The stakeholders identified for the project included a gaming and design professor, university health services personnel, university administration, the DNP student, the local health department, and community health care providers. Each of these stakeholders had a vested interest in the project because they are invested in the health of the community and some of them helped design and build the web-based game. The finished product will be included in the design teams' academic and professional portfolios. If proven effective, other stakeholders will utilize the game to improve sexual health in this community.

A large stakeholder group that advised the team for development of the interactive game is a large local organization. The organization is made up from members of the community who are employed by various businesses and entities, such as the Department of Human Services, Kid's First, the local Health Unit, local government agencies, local health care facilities, and the local university. Such stakeholders offer unique perspectives when topics that affect the community are being presented and discussed (Laureate Education, 2011). The recommendations of this local organization were beneficial to the success, design, and implementation leading to the development of the interactive game.

The possible impact the project may have on the university and the community includes safer sexual practices in young adults. Improving sexual practices may lead to many other improved health care outcomes in this community. These could include decreased incidence rates of STIs, decreased incidence of pre-marital pregnancies, decreased health care costs associated with STIs, and a healthier young adult population.

Contributions to Nursing Practice

STIs are a significant health problem in the United States with reported health care costs estimated at $16 billion with 20 million new STIs reported annually (CDC, 2018b). Worldwide, STIs impose a significant burden in terms of morbidity and mortality and have a negative impact on reproduction and child health with 499 million new infections of curable STIs reported annually (Villagas et al., 2015). Successful implementation and positive outcomes of the pilot study may improve the university health population's attitudes regarding STI prevention, detection, and treatment.

Collaborating with the health care providers in a university setting to affect positive change would be an asset to further implementation of evidence. The university students could be the participants in efficacy research of the game, once the usability evaluation is complete and modifications have been made. This specific group of students would represent the target population, not only in age, but also in geographic location. The interactive gaming education for STIs, if proven effective in the university setting, could be disseminated to other arenas.

Summary

Interactive gaming education for STIs is an innovative idea for STI education to ultimately be introduced to college students. The purpose of the interactive-gaming education program is to promote sexual health of individuals in a targeted population. The objectives of the game are for the learner to

- recognize symptoms of STIs,

- understand the importance of getting tested for STIs,

- understand the risks associated with engaging in unprotected sex,

- recognize the major risk factors that lead to having unprotected sex, and

- understand the importance of disclosing sexual health information with potential sexual partners prior to engaging in sex.

Further research will include an impact evaluation of the interactive gaming education to serve the purpose of answering vital questions about the short term and long-term progress of the program such as whether or not it leads to an improvement in short term changes in behavior (i.e., increased condom use and testing) and decreased incidence of STIs (Hodges & Videto, 2011). A process evaluation would be used during the pilot study to determine feasibility with a group of stakeholders mentioned in the "Significance" section.

The HBM was the framework for the project. I used a usability instrument that has known validity and reliability (Schnall, Cho, & Lie, 2018), along with a short set of questions related to the specific original objectives (see Appendix A). The DNP project strategies were to (a) inform the ongoing development of the STI education game, (b)

develop culturally informed prevention interventions (see Villegas et al., 2014), (c) promote abstinence, (d) promote condom use, (e) promote monogamous relationships, and (f) raise awareness of the link to alcohol and other drug use to high risk sexual behaviors.

The STI interactive gaming education was provided for the five stakeholder reviewers. A design team member and I were present as the stakeholders played the interactive gaming education. Our goal was to take notes and to view the reactions of each participant as they encountered the scenarios and made decisions while playing the game. The stakeholders were also asked to complete the usability questionnaire after they had finished playing the STI educational game. I used the evaluation to determine if the game had met the planned goals and what action could be taken to correct any problems identified.

Education via technology is not a new idea. Mevissen, Ruiter, Meertons, Zimbile, and Schaalma (2011), used a web-based STI-risk communication intervention to promote condom use. They used a 5-point Likert scale to measure health beliefs. They determined that the intervention was effective to increase perceived susceptibility of STIs in this population of heterosexual young adults (Mevissen, et al. 2011). The interactive gaming education technology is innovative and brings exciting new educational opportunities to the health care arena, which can be tailored to teach health care-related subjects to diverse populations.

Section 2: Background and Context

Introduction

The DNP project involved the development and planning of a quality

improvement project. I collaborated with the practicum setting, the computer gaming

design professor, and my colleagues on the university campus to develop the interactive

gaming education. After project completion, final analysis of the evidence indicated to

the team what changes needed to be made to the game to improve usefulness. The goal

of the project was to develop an educational tool suitable for teens and young adults to

decrease the social and economic burden of STIs.

Practice-Focused Question

Will the STI education interactive game be usable and meet the stated design

objectives?

Concepts, Models, and Theories

Researchers use the HBM to predict health behaviors by focusing on an

individual's attitudes and beliefs (McEwen & Wills, 2014). Rosenstock, one research

scientist who was initially involved in creating the HBM in the 1950's, (as cited by

McEwen & Wills, 2014) stated that if people fear disease, they will be motivated to

change their behaviors. The four constructs that support this model are perceived

susceptibility of the health problem, perceived severity, perceived benefits, and perceived

barriers (McEwen & Wills, 2014). The interactive gaming education provided education

regarding the susceptibility to STIs and possible consequences to health if left untreated.

In addition, the game provided education regarding the benefits of abstinence and safe

sexual practices, including monogamous relationships and condom use.

Usefulness was measured by the participants after playing the interactive gaming education to determine if the game was easy to learn and easy to use. The concurrent think aloud (CTA) technique was used to test usefulness by using two qualitative parameters, which are utility and usability (Bergstrom, 2013). Utility testing is performed to determine if the system does what it is intended to do, whereas usability testing is performed to determine if the users can operate the system efficiently (Nielson, 2017).

Relevance to Nursing Practice

Nurses are well-suited to deliver quality education to patients. Patient education and disease prevention are core competencies outlined by the Institute of Medicine (IOM) report *Knowing What Works in Health care: A Roadmap for the Nation* published in 2008 (Finkelman & Kenner, 2009). The report calls for the use of evidence-based practice to improve quality of care and health care outcomes. Nurses provide direct care to patients, which means they have unique insight on the needs of society. They are called upon by society to use research to increase their knowledge and then use the knowledge gained to improve population health (Finkelman & Kenner, 2009).

Local Background and Context

STIs are classified as a disorder with residual trending, which means contributing factors are known, but no specific effective methods of control have been established (Friis & Sellers, 2014). Health care providers are required to report new diagnosis of chlamydia, gonorrhea, and syphilis to the CDC for data collection and reporting purposes (CDC, 2018b). Knowledge of the geographic characteristics of a disease can help

researchers identify high-risk regions and provide important data for interventions needed in those areas (Friis & Sellers, 2014).

The data provided by the CDC for STIs is detailed by specific states and counties. The surveillance data for 2017 indicates higher incidence rates for chlamydia in the U.S. South (560.4 cases per 100,000 population) when compared to the Northeast (483.3 cases per 100,000 population). Gonorrhea incidence rates were also higher in the South (194.0 cases per 100,000 population) when compared to the Northeast (129.6 cases per 100,000 population; CDC, 2018b). Similarly, syphilis incidence rates were also higher in the South (9.7 cases per 100,000 population) when compared to the Northeast (8.0 cases per 100,000 population; CDC, 2018b). For all three reportable STIs, the rate of infection in 2017 was highest in young adults (CDC, 2018b).

Role of the DNP Student

I wrote the proposal for the project and conducted the usability testing with five stakeholders. My interest in sexual health education is largely due to the increasing incidence rates of STIs in the southern region of the United States (CDC, 2018b), which is where I live and work. My Walden practicum experience was in the University Health Services on the same university campus where the project was conducted. This exposure led to my discovery of the severity of the STI problem in the region and the lack of effective educational methods available.

My role for this project was to provide learning objectives to the gaming and design professors during development of the interactive gaming education. I was the lead investigator and conducted research to develop and support the project design and testing

of the game. Once the game was developed and ready for testing, the lead gaming professor and I sat beside each participant as they played the game. We both wrote down the information each participant verbalized while playing the game. The team used the information to develop themes.

The usability evaluation provided data that the team used to inform appropriate updates to the interactive game, making it ready for research to determine the effectiveness of the educational intervention.   Future research will be conducted to determine efficacy of the game in the young adult population. Statistical analysis will be performed to compare pre and posttest differences, which will help to alleviate the potential for me to perpetuate bias into future efficacy research results. The gaming and design professor and colleagues were given complete control over the technological design of the game. Therefore, I introduced no bias into the usability evaluation.

Role of the Project Team

The project team included the DNP student, an assistant professor from the Art and Design Department, an adjunct faculty member from the Gaming and Design Department, a programmer, and three Gaming and Design Department artists from a university located in the southeast region of the United States. The project team's role for the project was to develop the interactive gaming education designed to teach basic facts about STIs and improve students' knowledge, perceptions, and behaviors regarding their sexual health. The team focused on developing a game that would be fun and engaging for students.

I met with the design team to discuss the development of the interactive gaming education. I provided the approved premise and the interactive gaming education objectives to the design team, along with sample questions for the pre and posttest STI knowledge questionnaire. The design team provided me with a preliminary outline of their design for the STI game, how it would be created, and what the gameplay would look like for the stakeholders involved in the usability evaluation.

Section 3: Collection and Analysis of Evidence

Introduction

STIs are a significant health problem in U.S. young people aged 15-24 (CDC, 2018b) and there is evidence supporting the need for educational interventions to improve knowledge and perceptions of risk regarding STIs (Mevissen, et al., 2011). The interactive gaming education developed for this project is an interactive technology-driven game designed to educate this population while providing entertainment. The realistic aspect of the video increases the humanness of the game and allows the player to identify with the characters. It is through this interactive involvement that players are drawn to and immersed in the environment in which they are participating (Silverman, 2003).

The environment for interactive games in general should be designed to promote movement through the game without creating frustration or limiting access to learning activities (Hirumi, 2010). The focus of this project was to perform a usability evaluation to assess the game to determine if it performs according to its intended use and if users can operate it efficiently. The usability evaluation provided valuable information to the design team which we used to make the game more user friendly. Once these modifications are completed, the team will be prepared for the next phase of research, which is to launch the interactive game among college students to determine its effectiveness.

Practice-Focused Question

Will the STI education interactive game be usable and meet the stated design objectives?

The purpose of this project was to develop and evaluate an educational intervention that would be effective to curtail the incidence rates of STIs. I expect that successful evaluation and implementation will lead to the continued development of the game to include four levels of game play. Another expectation is that further research to determine the game's effectiveness will be conducted.

Sources of Evidence

I searched the Cochrane Database of Systematic Reviews, the Cumulative Index for Nursing and Allied Health Literature (CINAHL), Nursing and Allied Health Database, and Medline. Boolean phrases used in each of these databases included *sexually transmitted infections/disease*, *knowledge questionnaires*, and *perceptions of risk*. Further searches were performed using Computers and Applied Sciences Complete. Boolean phrases used in this database included *educational games*, *usability*, *usefulness*, *utility*, and *proof of concept*. I placed the following limiters on the searches: peer reviewed; publication dates of 2009-2018; project populations of adolescents, 13-18 years old, and adults, 19-44 years old; English language; and involvement of human subjects. Government websites were also used to obtain current and relevant data and statistics on STIs.

Usability evaluation is a research method used to test design and functionality of Internet and web-based programs (Nielson, 2017). Wozney, Baxter, and Newton (2015)

used a mixed-methods usability testing design to develop an Internet-based cognitive-behavior therapy program. The usability questionnaire was a 15-item self-report measure adapted from System Usability Scale and Standardized User Experience Percentile Rank Questionnaire (Wozney, et al., 2015). Nine participants reviewed the program and completed the questionnaire to provide feedback on usefulness and utility of the program (Wozney et al., 2015). They concluded that the Internet-based therapy program was easy to use and understand. The data collected during the research led to improvements of the program before the pilot randomized controlled trial was initiated (Wozney et al., 2015).

Yen, Wantland, and Bakken (2010) developed the Health IT Usability Evaluation Scale (Health-ITUES), which includes 20 items. They conducted a cross-sectional study to evaluate a web-based communication system in a large hospital. Analysis of the data provided preliminary evidence of factorial validity and internal consistency reliability of the Health-ITUES (Yen et al., 2010). We customized the questionnaire to adapt to our usability evaluation of the interactive gaming education intervention.

Schnall, Cho, and Lie (2018) assessed the validity and reliability of the Health-ITUES scale. They compared the Health-ITUES with the Post-Study System Usability Questionnaire (PSSUQ), which is a well-validated usability assessment tool (Schnall et al., 2018). Ninety-two adult subjects used a mobile app designed to help with HIV symptom relief and then completed both the Health-ITUES and the PSSUQ (Schnall et al., 2018). Analysis of the data supported that the Health-ITUES has internal consistency reliability in each of its four subscales (Schnall et al., 2018).

Project Design

For the project, I used a moderated usability design with the Concurrent Think Aloud (CTA) Technique. The moderated usability evaluation is a qualitative research method that offers a direct assessment of a system (Bergstrom, 2013). The CTA technique provides participant feedback in real time as it occurs, which helps researchers to understand the thought process of participants as they encounter each task (Bergstrom, 2013).

After giving the game objectives to the participants and educating them on the CTA technique, I provided them with a consent form and gave them the opportunity to ask questions. Once the consent was signed, the participants were placed in front of the computer where the interactive gaming education software was loaded. I reminded the participants to use the CTA technique and reminded them that the evaluation team would be taking notes and would not be answering their questions during the evaluation. They were asked to speak their questions aloud as the questions came into their mind while playing the game. The participants were provided with the following task list to complete while playing the game.

- Talk to Officer Lee and get information about the game,
- talk to Nurse Lopez and get information about STIs,
- visit the Library and get information about STIs,
- buy a condom or get a check-up at the clinic,
- identify how to increase risk, esteem, and satisfaction,
- talk to Ty in the park,

- talk to Cody by the nightclub,

- talk to Cathy by the dorms, and

- talk to Pamela by the bar.

The team leader of the game development design team and I observed the participants silently as they completed each task and took notes of the evaluator's verbal responses. This method provided two perspectives of the testing evaluations during observational analysis of the testing phase. We combined our notes to develop the descriptive data, the CTA themes and comments; and the discussion descriptive data.

Ethical Considerations

I obtained ethics approval from Walden University's Institutional Review Board (IRB; approval #10-29-18-0577112). The Site Agreement and site IRB approval were obtained per Walden University IRB conditions. Walden IRB confirmed receipt and acceptance of documents before any participants were recruited to participate. Permission was obtained from Dr. Rebecca Schnall to use the Health-ITUES instrument (see Appendix B).

Instrumentation

After gameplay, each participant completed the customized Health-ITUES instrument (see Appendix C) in a separate location from where they played the game. The Health-ITUES instrument was a paper document and each participant was provided a pencil with an eraser to complete the survey. All five participants placed their completed surveys in the same clasped envelope. The envelope was not opened until after all five participants had placed their surveys inside to ensure privacy of the participants'

responses. The Health-ITUES is a 5-point Likert scale consisting of 20 items, each item rated from *strongly disagree* (1) to *strongly agree* (5). I measured data to determine impact, perceived usefulness, perceived ease of use, and user control of the game.

Each participant was provided with 15 minutes for discussion of their experience. All five participants took advantage of this discussion time. This provided the opportunity for the team to clarify any comments the participant made during the CTA technique evaluation and gave the participants the opportunity to ask questions as well. Notes were also taken during each discussion as the participants expounded on their experience of playing and evaluating the game.

I analyzed the quantitative data to determine the impact, perceived usefulness, perceived ease of use, and user control of the interactive game for education. The qualitative data were used to identify what design features users struggled with, as this can indicate problematic design areas, and which design features worked well (Budiu, 2017). Careful analysis of both the qualitative and quantitative data informed the design team on necessary changes to make to the game, which we hope will improve its overall utility and usefulness.

Recruitment of Participants

Purposive sampling guided the selection of project participants. Participants were recruited from professional colleagues who are stakeholders in the future success of this project. Demographic data were not collected due to the small sample size. Inclusion criteria included must: be computer literate, be over the age of 18, not be a

student, speak and understand English, and have no prior access to the game. Computer

programmers and/or experts were excluded from the usability evaluation.

Analysis and Synthesis

The DNP student performed thematic analysis to organize the descriptive data

collected during the usability evaluations. For this purpose, the descriptive data included

only the CTA notes. The discussion notes are discussed in section four. Themes were

created based on the data and sorted and recorded in a table format to include comments.

All data were used to assess and hopefully improve the utility of the game.

The DNP student met with the design team to review the CTA notes collected

during the project. The DNP student and design team explored each theme developed

from the CTA notes and compared them with the discussion notes. The design team used

this data to identify any design flaws detected by the participants. The data also guided

the design team to determine changes we would make to the game which we hope will

improve its overall usability.

Each of the four sub-scales, and the overall score from the Health-ITUES was

analyzed for a mean with standard deviation. To determine internal consistency of the

overall Health-ITUES score, Cronbach alpha r was calculated using SPSS with

coefficient expectations of 0.80 to 0.94. The subscales titled "Impact" and "User

Control," both of which had only three responses, did not contain enough items to report

Cronbach's alpha r, so Cronbach's alpha r was performed on two subscales, "Perceived

Usefulness," and "Perceived Ease of Use".

Section 4: Findings and Recommendations

Introduction

The purpose of the project was to develop an educational tool suitable for teens and young adults to decrease the social and economic burden of STIs among this group of individuals. The goal was to create an interactive video game and evaluate its usability in order to inform product design improvements. The usability evaluation game was conducted in a college gaming and design computer lab setting. The qualitative descriptive data revealed design flaws, and the quantitative data supported reliability of the findings.

Findings and Implications

Qualitative Data Findings

The qualitative data collected from the participants using the CTA technique during the usability evaluations revealed eight common themes (see Table 1). At least two of the participants verbalized the comments for them to be classified as descriptive data. Four of the participants completed all tasks on the list, and one participant completed all tasks on the list except for purchasing a condom/getting a checkup at the health clinic. This participant was able to enter the health clinic but was unable to complete the purchase. All five of the participants were able to approach and interact with each character in the game and populate STI information and STI questions. All five of the participants were able to answer the STI questions; however, all five participants had several encounters with the characters before they were able to determine how their interactions in the game affected the esteem and risk indicators. All five of the

participants were unclear about how to make the satisfaction indicator level go up or

down.

Table 1

CTA Technique Comments and Themes

Comments and themes
Is there a map?
Instructions before starting would be helpful.
Some characters provide the information I need to answer the questions.
How do I make satisfaction go up and down?
What am I supposed to do after I receive information from the characters?
Some characters provide information, and some ask questions?
How do I know if I am answering the question right or wrong?
I see there is a timer.

The participants added further qualitative data to the project by participating in a

discussion after they completed the Health-ITUES instrument. Some of these themes

overlap with the CTA themes. At least two of the participants verbalized the comments

for them to be classified as descriptive data. All five of the participants stated that some

type of instruction screen prior to starting the game would be beneficial. Three of the five

participants who asked about a map while engaged in game play stated that they were not

sure if the game really needed a map because they were able to maneuver around the

game easily after a minute or two of game play. Three of the five participants stated that

they did not encounter much information regarding STI symptoms, and one of the

questions on the survey was specific to STI symptoms. Three of the five participants felt

rushed because of the timer. None of the participants realized that the timer paused while

the STI information was being displayed and while the STI questions were being

displayed and answered. Two of the participants suggested providing a choice of avatars

to make the game more personalized to the game player. Two of the participants

suggested a pop-up appear to inform the player if the answer provided was correct, such

as "good job" or "way to go". Three of the participants stated that the game was fun to

play, and three of the participants said the game was easy to use.

Quantitative Data Findings

I collected the quantitative data using the Health-ITUES instrument (Schnall, Cho

& Lie, 2018), a 5-point Likert scale. Mean and standard deviations were analyzed using

SPSS version 24 for all 20 items (see Table 2), and reliability analysis was performed on

two subscales and overall. The subscales titled "Impact" and "User Control," both of

which had three responses, did not contain enough items to report Cronbach's alpha r.

The overall reliability of the Health-ITUES for the participant group ($N = 5$) was $a =$

0.798, which is acceptable. The subscale "Perceived Ease of Use" achieved an alpha level

0.815, and the subscale "Perceived Usefulness" achieved an alpha level of 0.762, which

are both acceptable. I initially expected the reliability scores for the quantitative data

analyzed from the Health-ITUES to range between 0.80 to 0.94. However, according to

Tavakol and Dennick (2011), alpha scores ranging from 0.70 to 0.95 have been reported

as acceptable.

Table 2

Main Respondent Scores on Health-ITUES 5-Point Likert Scale

Item	Question	Mean score	Standard deviation
Impact			
1	I think the interactive-game would help me recognize symptoms of STI's.	2.2	.837
2	I think the interactive-game would help me understand the importance of getting tested for STI's.	4.00	1.225
3	The interactive-game would help me understand the major risk factors that lead to having unprotected sex.	4.20	.837
Perceived Usefulness			
4	Using the interactive-game makes it easier for me to want to learn about STI's.	4.40	.548
5	Using the interactive-game makes enables me to learn about STI's in a fun way.	4.20	.837
6	Using the interactive-game makes it more likely that I will share sexual health information with potential sex partners.	3.20	1.483
7	Using the interactive-game is useful for teaching me about the risks associated with having unprotected sex.	4.00	1.225
8	I think the interactive-game is a more equitable process for learning about STI's than the traditional pamphlets available.	4.80	.447
9	I am satisfied with the interactive-game as an educational intervention for STI's.	4.60	.548
10	I can self-manage my sexual health after playing the interactive-game.	4.80	.447
11	Using the interactive-game increases my ability to discuss sexual health with my primary care physician.	4.20	.837
12	I recognize the need for testing for STI's after playing the interactive-game.	4.80	.447
Perceived Ease of Use			
13	I am comfortable with my ability to play the interactive-game.	4.20	.837
14	Learning to operate the interactive-game is easy for me.	4.00	1.414
15	It is easy for me to become skillful at using the interactive-game.	4.20	1.304
16	I find the interactive-game easy to use.	4.60	.548
17	I can always remember how to long on and use the interactive-game.	4.60	.894
User Control			
18	The interactive-game gives prompts that clearly tell me how to navigate inside the game.	2.40	1.140
19	Whenever I make a mistake using the interactive-game, I recover easily and quickly.	4.00	.707
20	The information (such as on-screen messages) provided with the interactive-game is clear	4.00	1.00

The low mean score for item number one on the Health-ITUES correlates with the qualitative data indicating lack of information on STI symptoms. The low mean score for item number 18 correlates with the qualitative data suggesting the need for instructions prior to game play. The mean score for item number six of 3.2, with a standard deviation of 1.5 may indicate the need for more information regarding the importance of sharing sexual health information with sexual partners.

Recommendations

The project team and I met after the usability evaluations to analyze the data collected and determine how the interactive game would be modified. The goal was to make the game more user friendly and educational to meet the original stated objectives. The qualitative and quantitative data collected during the usability evaluation provided valuable information for the design team which clearly informed the decisions to update and modify design features of the game.

The interactive game was easy to use as indicated by the qualitative and quantitative data provided by the participants. Modifications for the interactive game focused mostly on design features and educational content. These modifications are in the process of being made to the interactive game and would be completed prior to conducting any further research.

The project team are in the process of designing a narrative introduction for the game, which will inform players of what the goals of the game are, prior to beginning game play. This narrative introduction will focus on goals of the game, which would help the player understand how to approach the game rather than exactly how to play the

game. This strategy allows the player to experience the challenge of learning how to play the game while meeting the stated goals. The narrative also includes a note that the timer will pause while knowledge and question pop-ups are being visualized by the game player. This strategy addresses the issue of players feeling rushed due to the time limit. With the pause, players would be able to slow down while reading STI knowledge statements and while answering STI questions.

The project design team are in the process of designing and adding a screen that would pop-up after the STI questions are answered to inform the game player if they answered the question right or wrong. The design team discussed having the pop-ups follow a path to the appropriate level indicator to facilitate the connection between answers and indicator value bars. When the question was answered incorrectly, the pop-up would follow a path and dump into the risk indicator bar, increasing its value. When the question was answered correctly, the pop-up would follow a path and dump into the esteem indicator bar, increasing its value. This strategy would add a reward system to the game play which, according to Lorenz, Gleich, Gallinat, and Kühn (2015), affects the striatal reward responsiveness of the player. This response in the game player would play an important role in keeping motivation high and could also be a critical value for cognitive learning (Lorenz, et al., 2015).

The project design team are in the process of designing a male avatar which would be added to the interactive game, so players could choose characters like themselves prior to game play. This strategy has been proven effective to change health behaviors in target populations, based on the actual-ideal self-discrepancy theory (Jin,

2012). Avatars were limited to male and female subjects for the initial research phase of the interactive-game.

The design team are in the process of redesigning the satisfaction, risk, and esteem indicator labels and color schemes, which would provide the game player with a better representative visual of each indicator value bar. The team is changing the color of the satisfaction value bar to green, the color of the risk value bar to red, and the color of the esteem value bar to blue. Initially, the indicator bars were designed, and the colors were assigned by a design artist who was color blind, therefore the colors were not properly associated with the meaning of each value bar.

The objectives of the interactive game are to educate teens and young adults about STI's, focusing on recognizing symptoms, getting tested, recognizing risks related to unprotected sex, and disclosure of sexual health information prior to sex. The team will add more STI information to the interactive-game, especially education on symptoms of STI's. This strategy will offer game players more opportunities to acquire knowledge prior to engaging with the characters in the game that ask questions.

Contribution of the Doctoral Project Team

The project team was instrumental for this DNP project. This multidisciplinary project was not possible without the expertise and dedication of the Gaming and Art Design Team. I have no knowledge of how to design and create a video game, therefore collaborating with the local technology gaming and art professionals was necessary to establish a successful partnership.

The Gaming and Art Department of this university located in the Southeastern United States have dedicated the last two years to the design and build of the interactive game. There continued support will be instrumental moving forward to the next phase of the project, which is to test the game in the college student population. I am grateful for the professional and personal relationships that have formed as a result of this collaborative and multidisciplinary project.

Strengths and Limitations of the Project

I used a purposive sampling method to select participants for the usability evaluation. Five participants were scheduled for the game evaluations, although three people were unable to come as scheduled on the day of evaluations. The project team recruited three faculty and staff members from the university. Although these participants were recruited on the day of the evaluation, they were still purposive in selection. The five participants included a faculty from the university art department, a university library staff member, a registered nurse from off campus, an administrative assistance from the university, and a construction worker from off campus. Each participant was provided with a twenty-dollar Domino Pizza gift card after they completed the entire process of the evaluation, which they had no knowledge of prior to completing the game evaluation. Although the participants were a small purposive sample, the sample is a strength of the project. All participants effectively applied the CTA technique while playing the interactive game and provided positive and negative feedback, which helped the team identify design modifications which we hope will improve the usability and utility of the game.

A challenge of the project was completing the build of the game. The design team worked on the game in their free time and have received no compensation for their contributions as of this date. The DNP student acknowledges the dedication of the design team and recognizes their commitment in creating the interactive game.

Section 5: Dissemination Plan

Translating evidence regarding STIs has enhanced nurses' scientific knowledge about the importance of education and prevention strategies to decrease STI prevalence. These findings led me to the idea of using interactive gaming education to increase knowledge regarding STIs. Successful implementation and positive evaluation of this practice change could lead to a decrease in the prevalence of STIs and cost of care associated with this health care issue. Sadovszky, Draudt, and Boch (2014) conducted a systematic review of Level 1 articles to explore the effectiveness of behavioral interventions to promote condom use. They determined that behavioral interventions do promote condom use, which leads to decreased incidence of STI's. Sandovszky, et al., (2014) reported that future development of technology driven behavioral interventions was needed, including research to determine efficacy.

After I graduate with my DNP degree, I will pilot test the interactive game to determine the effect of this interactive game on STIs in college students. The participants will complete pre and posttest questionnaires and a proof of concept survey. I will perform a comparative analysis of test scores to determine if the game was effective to increase knowledge of STIs in this population. The premise for future research is the game will increase young adults' knowledge regarding STIs and will help them to manage their sexual health in a constructive manner. This type of behavior change could lead to decreased incidence rates of STIs in young adults.

The goals for dissemination of this project are to generate interest from other professionals who specialize in STIs and technology. I will submit abstracts of the

project to various organizations. Some organizations I have considered include the

National Sexual Health Conference, National Sex Ed Conference, Conference on

Adolescent Health, American Nursing Informatics Conference, American Medical

Informatics Association Clinical Informatics Conference, Global Nursing and Health care

Education Conference, and Public Health Informatics Conference. This is no way

excludes any other organizations, as I am interested in disseminating this project to as

many of my colleagues as possible, in order to recruit other professionals. I will search

for appropriate grants to write and submit to support the ongoing development of the

game and expenses related to dissemination. The project design team will develop further

levels of game play to increase the time players can spend enhancing their knowledge of

STIs. Other experts may be recruited to augment the progress of the STI interactive

game project.

Analysis of Self

My journey started in May 2001 when I decided to go to nursing school. I

worked as a certified nursing assistant full-time while completing all the prerequisites for

nursing school, and then for 2 years while I was earning my Associate Degree in Nursing

(ADN). I immediately transitioned into a Registered Nurse to Baccalaureate of Science

in Nursing (RN-BSN) program, while continuing to maintain full-time employment as a

registered nurse in an intensive care unit. Once I completed the BSN program, I

immediately applied for and was accepted into a Master of Science in Nursing (MSN)

program with a focus on nursing education. I graduated with my MSN and began

educating nursing students. After several years of working as a professional in a

university setting, I decided that it was time to complete my educational journey and work towards a doctoral degree. I applied for the DNP program at Walden University and was accepted.

When I earned my first nursing degree, my ADN, I said to myself and others, "wow, I can't believe how much I didn't know." And again, I made this statement after earning my BSN and MSN. I have heard other people say, "I almost earned my PhD/Doctorate, but I didn't finish my project." I could not fathom why someone would dedicate so much time, energy, effort, and money to such an endeavor, and then quit before completing a simple paper. Well, I now realize there is nothing simple about the doctoral paper/project. During this journey, I have often thought of how much my understanding of the struggle to achieve success has changed. I have gone from being "bright-eyed and bushy-tailed" about the prospect of becoming Sherri Arrington DNP, RN, to "I don't think I can do this"! In the end, I know I can do this, and "I can't believe how much I didn't know."

I have learned that I possess the knowledge needed to approach other professionals and that I have the confidence required to ask for partnerships. I have learned that in order to achieve success, it is acceptable to seek guidance, and constructive criticism is my friend. This project development and usability evaluation has allowed me to discover new knowledge and, most importantly, gain new friendships, which I pray will last a lifetime.

Summary

I write this summary with enthusiasm, as I look towards the future with an excitement that overwhelms me. Seventeen years ago, when I started my educational journey, the reality I now live in was an unknown dream. I knew I wanted to do something worthwhile, but I could never have imagined something as great as this project. I belong to an elite group of individuals who have the desire to create something worthwhile. Something great that will impact millions of people and improve health care outcomes in the public health sector.

The usability evaluation conducted during this project provided the data the team needed to make design modifications to the interactive game. The quantitative data and qualitative data aligned with each other to support the needed modifications. STIs are a serious public health concern in all regions of the United States and globally (CDC, 2018b; Healthy People 2020, 2015; WHO, 2018). Effective educational methods are needed to decrease prevalence and incidence rates of STIs and to improve the health of the nation's young people (Marek, et al., 2011). This game can be modified for use with all age groups and could be introduced into the adolescent population if proven effective in the teen and college populations.

My goal is to continue working with the project design team to develop games suitable for different age groups. Testing would be conducted on the different interactive game designs to determine efficacy. The outcome I am seeking for the future of this project is that all students will be playing these interactive games in school and the social and economic burden of STIs will be minimized.

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Appendix A: Mission Statement, Goals, and Objectives of Interactive Game-Based

Education Program

The purpose of the interactive-game-based education program is to promote sexual health of individuals in a targeted population. Collaborate with community non-profit health care providers to provide effective evidence-based interventions focused on improving sexual health knowledge and sexual health practices to prevent the spread of infection and improve health care outcomes.

_____
Goals
Increase knowledge of STIs regarding signs and symptoms, prevention, testing, and treatment options

Improve perception of risks for STIs associated with risky sexual behaviors.

Increase utilization of prevention methods for STIs (i.e., abstinence, condom use, etc.)

Increase testing for STIs in at risk individuals.

Increase number of individuals who share sexual health status with sexual partners.

_____
Objectives
The prevalence of STI in the university population will decrease 5% in 2019 when compared to 2018.

Learners will report an increase in knowledge regarding STI signs and symptoms, testing procedures, treatment options, and prevention methods immediately after completion of the interactive-game-based education module.

The number of learners reporting increase level of perception of risk for STI will increase by 25% immediately after completion of the interactive-game-based education module.

The number of learners reporting utilization of prevention methods (i.e., abstinence, condom use, etc.) will increase 20% in 2019 when compared to 2018.

The number of learners seeking testing for STIs will increase

The number of learners reporting they have or will share sexual health status with partner will increase by 25% in 2019 when compared to 2018.

Appendix B: Permission to Use Health-ITUES

RE: Request for permission to use Health-ITUES

Schnall, Rebecca <e-mail address redacted
Mon 10/15/2018, 2:10 PMSherri Arrington;[e-mail address redacted]

You absolutely have my permission to use the instrument. Please cite the paper in any future publications.

Best wishes on your work!

Rebecca Schnall, PhD, MPH, RN-BC
Mary Dickey Lindsay Associate Professor
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School of Nursing
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NY, NY 10032
Phone: [redacted]
Email: [redacted]

Appendix C: Customized Health-ITUES Instrument

I used Schnall et al.'s (2018) Health-ITUES instrument for my doctoral project

STRONGLY AGREE 5 4 3 2 1 STONGLY DISAGREE

Impact

1. I think the interactive-game would help me recognize symptoms of STI's.
2. I think the interactive-game would help me understand the importance of getting tested for STI's.
3. The interactive-game would help me understand the major risk factors that lead to having unprotected sex.

Perceived Usefulness

4. Using the interactive-game makes it easier for me to want to learn about STI's.
5. Using the interactive-game enables me to learn about STI's in a fun way.
6. Using the interactive-game makes it more likely that I will share sexual health information with potential sex partners.
7. Using the interactive-game is useful for teaching me about the risks associated with having unprotected sex.
8. I think the interactive-game is a more equitable process for learning about STI's than the traditional pamphlets available.
9. I am satisfied with the interactive-game as an educational intervention for STI's.
10. I can self-manage my sexual health after playing the interactive-game.
11. Using the interactive-game increases my ability to discuss sexual health with my Primary Care Physician.
12. I am able to recognize the need for testing for STI's after playing the interactive-game.

Perceived Ease of Use

13. I am comfortable with my ability to play the interactive-game.
14. Learning to operate the interactive-game is easy for me.
15. It is easy for me to become skillful at using the interactive-game.
16. I find the interactive-game easy to use.
17. I can always remember how to log on and to use the interactive-game.

User Control

18. The interactive-game gives prompts that clearly tell me how to navigate inside the game.
19. Whenever I make a mistake using interactive-game, I recover easily and quickly.
20. The information (such as on-screen messages, etc) provided with the interactive-game is clear.