"But do they like it?"
Participant satisfaction and gameplay experience of a public health videogame intervention in adolescents

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Abstract— Participant satisfaction and experience can impact the effectiveness of a given intervention. The purpose of this mixed methods study was to explore adolescents' satisfaction and gameplay experience with a videogame intervention aimed at reducing HIV-related risk**.** Satisfaction and gameplay experience data were collected from adolescents who played the *PlayForward: Elm City Stories* videogame as part of a randomized controlled trial. Quantitative and qualitative data were collected using in-person interviews following six weeks of gameplay. Gender differences were evaluated. Three hundred and thirty-three participants were enrolled in the study and six-week data were available for 267 participants, of whom 133 (50%) played *PlayForward* (50% girls; 11-14 years; mean age 12.9). They generally reported high levels of satisfaction with their gameplay experience. Exploratory analysis of gender differences revealed girls were more likely to report that they would play the game again or would tell their friends to play the game, while boys felt more connected to their characters in the game. A videogame intervention that is both effective and well liked is essential to best affect health outcomes.

Keywords—adolescent, videogame, intervention, satisfaction, HIV, risk reduction

I. Introduction

Participant satisfaction and experience are critical components of intervention and program success (1-3) and have increasingly been viewed as an important outcome (4). Collecting data on participant satisfaction contributes to the improvement of the quality, integrity, and relevance of prevention programs, especially among high-risk populations (5). A recent systematic review demonstrated consistent positive associations between patient experience and intervention effectiveness for a range of conditions and diseases (6).

Serious videogames, or videogames developed for purposes other than entertainment (7), are increasingly being used as delivery tools in health promotion and risk prevention interventions, and have been shown to increase knowledge and affect behavior change in youth and adults (8-10). However, a major challenge to the field of serious videogame interventions is the need for more evidence-based development and evaluation of their impact on health outcomes (11). One component of evaluating these interventions includes capturing data on participant satisfaction and gameplay experience.

The purpose of this mixed methods study was to determine the level of player/participant satisfaction and gameplay experience with a risk reduction and HIV prevention videogame intervention, *PlayForward: Elm City Stories* (*PlayForward*) using both standardized assessments and qualitative interviews. *PlayForward* is a 2-D graphic novel style interactive videogame that focuses on adolescents acquiring and practicing skills to reduce risk behaviors and gain knowledge and healthier attitudes and intentions with the ultimate goal of HIV prevention. The impact of *PlayForward* on at-risk adolescents was recently rigorously evaluated through a full-scale randomized controlled trial and demonstrated a significant and persistent positive effect on behavioral antecedents/health outcomes such as sexual health attitudes and knowledge that are critical to behavior change

(10). The current study evaluated the important component of likeability and acceptability of the *PlayForward* intervention and provides valuable information regarding how this videogame intervention and future ones may be further developed to have their greatest impact. To our knowledge, this is the first study to evaluate participant satisfaction and gameplay experience related to a videogame intervention focused on risk reduction and HIV prevention in adolescents. It also examines how satisfaction and the gameplay experience are associated with the impact of the game. Its findings make an important contribution to the field of serious games and their applications to health. These findings provide insights and experience on the value of collecting participant satisfaction data and the potential for these data to enhance the efficacy of a videogame intervention.

II. METHODS

A. Participants and Recruitment

A total of 333 adolescents, aged 11-14 years, from after-school, school, and summer youth programs were enrolled in a randomized controlled trial to play either the iPad-based videogame *PlayForward* or a set of attention/time control games played on the iPad (12). Participant recruitment was achieved by distributing flyers, recruitment cards, and information sheets in partnership with the program's leadership. Inclusion criteria for the trial were that adolescents were English-speaking and between 11 and 14 years old. Adolescents who participated in the randomized controlled trial provided written informed assent and their parents or legal guardians provided written informed consent. Participants were reimbursed with gift cards for completion of assessments. The Yale University School of Medicine Human Investigation Committee approved the research protocol.

B. The Intervention

PlayForward is an interactive, role-playing videogame designed for adolescents to gain behavioral skills and knowledge needed to make good decisions related to sexual risk, substance use, and other risk behaviors prevalent during adolescence. The game comprises five skill-based highly interactive ''mini-games'' including *Me Power* (*Aspirational Avatar*), *Refusal Power*, *Know Power*, *People Sense*, and *Priority Sense*, and 12 challenges or story narratives embedded within the *PlayForward* game (12). In the game, the player guides their *Aspirational Avatar* (13), or virtual character that they have created, that encompasses their future hopes, dreams, and aspirations, through middle and high school, while negotiating challenges that require them to make decisions that have both short and long-term effects on the future. As the game progresses, the player can see how each decision affects his or her *Aspirational Avatar*'s life, and can subsequently go back in time, change the decision, and see how a different action might lead to a different outcome. *PlayForward* allows adolescents to experience negative consequences related to risk behaviors in a safe, virtual environment, while giving them the tools to acquire and practice skills needed to avoid or reduce the risk behaviors in real life.

The game was produced with extensive involvement from adolescents in the community as well as with input from experts in the fields of HIV prevention, adolescent development, community health, health behavior, health psychology, and both serious and commercial videogame designers. The game was developed in an iterative fashion, guided by a process that incorporated the use of behavior change manuals (13). As part of this process, formative research was conducted with urban, minority youth to ensure that the content, artwork, and storylines of the game were authentic and resonated with our target population (14, 15). The videogame incorporates evidence-based concepts from prominent behavior change theories, including self-efficacy, social norms, message framing (16), and delay discounting. Participants randomized to *PlayForward* played the game over a six-week period onsite at their youth program.

C. Data Collection

For the randomized controlled trial, a range of outcomes including sexual health attitudes, knowledge, intentions, and risk behaviors associated with HIV infection were collected using standardized assessments at baseline, six weeks, three months, six months, 12 and 24 months (10). In order to examine participant satisfaction and game "likeability," both quantitative and qualitative data were collected at the end of the six weeks of gameplay from the participants who were assigned to play *PlayForward*.

Quantitative Player Experience Assessment. Quantitative data were collected at six weeks, immediately following gameplay completion, using an assessment tool that was developed specific to *PlayForward,* with input from serious and commercial videogame designers. Participant satisfaction and gameplay experience were assessed using 12 Likert-type questions (Strongly Disagree, Disagree, Agree, Strongly Agree, Not Sure) such as "I enjoyed playing the game" and "I felt connected to my character in the game." Responses were *a priori* collapsed into two levels (Agree vs Disagree); likewise, responses indicating uncertainty (Not sure) were grouped with the Disagree responses, thus rendering the categorization conservative. Those who responded in such a way that indicated satisfaction were labeled "satisfied" and otherwise were labeled "not satisfied."

Qualitative In-person Interviews. As a way to capture more in-depth data on our participants' satisfaction and gameplay experience of *PlayForward*, 10-15 minute in-person interviews were conducted with 83 participants after completing the standardized assessments at the six-week interval. The qualitative, structured interview guide was developed in an iterative process with input from our interdisciplinary research team. Domains related to gameplay that were explored included favorite/least favorite parts of the game, lessons learned from playing the game, relating the game to real life, and defining the game goals. When needed, probes were used to encourage clarification and evoke greater detail into participants' responses. Interviews were

audiotaped, professionally transcribed, and reviewed by a member of the research team to ensure accuracy.

D. Data Analysis

Analyses were completed on both the gameplay experience assessment data and through semi-structured, qualitative in-person interviews. Analyses of the health outcomes data including sexual health attitudes and knowledge are described elsewhere (10). Descriptive statistics were generated to assess overall player experience and participant satisfaction. Chi-square tests were used to compare player experience and participant satisfaction between male and female participants and all p values < 0.05 were considered statistically significant. All analyses were performed using SAS® v9.3. Gender differences were examined to compare participant satisfaction and gameplay experience.

Differences in scores in the sexual health attitudes and knowledge were compared between satisfied/not satisfied responders to the questions above using longitudinal mixed-effects models. Changes in these outcome measures from baseline to 12 months were assessed in repeated measures models (with unstructured covariance), with the assigned baseline values, satisfaction status, gender, age (younger=11-12 years old; older=13-14 years old), study time point, and satisfaction status*time interactions used as covariates. Least squares (LS) means and standard error were plotted for each secondary outcome at each time point. Statistical analyses were done using SAS version 9.4 (SAS Institute Inc., Cary, NC, USA).

For the semi-structured in-person interviews, a three-person interdisciplinary research team composed of individuals with expertise in minority adolescent research, qualitative methods, and health behavior conducted the analysis using the principles of grounded theory, including the constant comparative method (17) and developing codes in a step-wise fashion (18). Each team member coded the interview transcripts in sets of five transcripts until a comprehensive code structure was created that captured all data concepts. The team met regularly to negotiate code structure and discuss themes as they emerged from the transcripts. Once the team finalized a code structure, each team member independently coded the transcripts using Atlas.ti (version 7.5.3) to facilitate data organization. To ensure consensus, each team member systematically reviewed one other member's codes and all discrepancies were resolved.

III. RESULTS

A. Participants

The current analysis uses assessment and qualitative interview data collected immediately after six weeks of gameplay for participants who were randomized to the intervention arm of the trial. Of the 333 participants enrolled in the study, six-week data were available for 267 participants, of whom 133 (50%) were assigned to the intervention arm. Of these 133 participants, on whom the current study is based,

50% were girls, aged 11 to 14 years (mean age 12.9 years), 47 (35%) self-identified as black, 47 (36%) as Hispanic/Latino, 16 (12%) as biracial, 16 (12%) as other, and 6 (5%) as white. Qualitative data were collected from in-person interviews on 83 adolescents (53% girls).

B. Participant Satisfaction/GamePlay Experience

Quantitative Assessments: Total Cohort (Table 1). Of the 133 participants, 88% of participants felt responsible for the choices they made in the game, 79% felt that they would make decisions in life like they made them in the game, 79% of participants enjoyed playing the game, 84% liked the way the game looked, and 64% said that they would play the game again. Our findings revealed that 80% of participants felt the game was challenging, and 59% were frustrated with the game. Sixty percent felt connected to their character in the game, and nearly half (49%) of all participants felt connected to other characters in the game. Sixty-three percent of participants said that they would tell their friends to play the game. Sixty-four percent of participants talked with other participants in the study about *PlayForward*, with 84% discussing the game at least twice.

Quantitative Assessments: Gender Differences (Table 1). Notably, there were gender differences worth highlighting. While girls reported that they would be more likely than boys to play the game again (72% vs. 55%, p=0.04) and to tell their friends to play the game (71% vs. 54%, p=0.04), boys reported feeling more connected to their characters in the game than girls (60% vs. 39%, p=0.01). There were trends towards girls enjoying playing the game more than boys (86% vs. 73%, p=0.06) and boys being more frustrated than girls playing the game (67% vs. 51%, p=0.06).

Quantitative Assessments: Association Between Health Outcomes and Satisfaction. There was an improvement is sexual health attitudes in participants who reported that they: 1) would make decisions in life like they made them in the game but this was only seen in boys (boys: LS means difference 0.86, 95% CI 0.13-1.58, p=0.02); 2) liked the way the game looked but this was only seen in older participants (older: LS means difference 1.46, 95% CI 0.57-2.35, p=0.002) and 3) felt frustrated with the game but this was only seen in older participants (older: LS means difference 0.8, 95% CI 0.16-1.44, p=0.015). There was an increase in sexual health knowledge in participants who reported that they felt connected to other characters in the game but this was only seen in boys (boys: LS means difference 1.37, 95% CI 0.44-2.31, p=0.004) and in younger participants (younger: LS means difference 1.53, 95% CI 0.58-2.48, p=0.002).

Qualitative Interviews. Participant satisfaction and gameplay experience of the videogame intervention were cataloged into the following categories: *Enjoyment, Engagement, Impact,* and *Preference over Traditional Class Curriculum.*

Enjoyment. Participants described their favorite parts about the game, which included finding clues, completing levels, playing mini-games (13), experiencing specific story scenes, and having the ability to cause positive change for their

character's future. For example, one participant described his favorite part of the game as playing the mini-game, *Me Power,* which allowed the player to develop an *Aspirational Avatar* over the course of the game. The *Aspirational Avatar* embodied the player's future aspirations, dreams, and goals:

> *I liked the personal section where you had to like design, well, design what you liked about yourself. (boy, 13)*

Another player described playing the mini-game, *Know Power,* as her favorite part about the game. In *Know Power*, the player discussed topics regarding alcohol, drugs, and sex with other characters in the game and could choose to "battle" with a character if she believed the character's facts were wrong. Excelling at *Know Power* provided her with self-confidence about knowing her facts:

> *My favorite part was when we had to like talk to the person and then tell them why they were wrong, like discussing with the person. And I was good at that. (girl, 13)*

For many participants, having the ability to create positive change for their characters was cited as their favorite part about playing the game. At the end of each game play session, the players were able to view their *Epilogue* to see how changing their characters' choices affected their futures. As one participant described:

> *My favorite part was at the end when we got to fast forward our life and to see the changes that I actually made. (girl, 12)*

Engagement. Overall, participants described a high level of engagement in the game. Nearly all participants were able to correctly describe the goal of the game when asked, which indicated that the player understood the purpose of the game. Participants cited goals such as changing their characters' future for the better, helping their characters make better choices, and to learn about the consequences of making poor decisions as an adolescent. Some participants cited a goal of the game as affecting specific behaviors in themselves outside of the game. For example, one participant stated that the goal of the game was "to keep you protected from drugs and STDs (sexually transmitted diseases) and HIV and to always wear a condom."

One important aspect of engagement is *immersion,* which is often accomplished by using realistic graphics or having the player identify with characters or character traits in the game (19). The majority of participants described their gameplay experience as feeling authentic and relatable, and that they were able to translate what they experienced in the game into their own life experiences. Participants provided many examples of how the game paralleled their own lives, which included the experiences of peers, themselves, and their parents. For example, one participant described how an instance of peer pressure in the game mimicked his own experience of witnessing others being pressured into using drugs:

> *Yeah, like in the game…the kid was being pressured to use drugs so it's kind of like real life because sometimes you see people trying to do that. (boy, 14)*

Another participant described her personal experience of having to deal with peer pressure, which is similar to a scene in the mini-game, *Refusal Power,* where the player had to use her refusal skills to refuse someone who wanted her to go upstairs at a party:

> *The one where they were at a party and somebody wants to go somewhere with you. That happened to me. Somebody like they wanted to do something and I didn't want to and I didn't know how to say "no" but I kept saying "no" in different ways and eventually they backed off. (girl, 13)*

Several participants described scenes from the game that reminded them of situations involving their family members, such as using and selling drugs and drinking alcohol. Other participants stated that the storyline in the game about the character having unprotected sex and becoming pregnant strongly resonated with them because either their mother, sister, cousin, or brother had a baby as a teenager and they had witnessed firsthand the difficulties associated with being a teenage parent.

Impact. After gameplay had ended, participants that were interviewed were able to provide examples of how they were impacted by the game, including what they had learned or how they had benefited from playing the game. The most common responses included, 1) increased knowledge about sex, drugs, alcohol, HIV/STDs, 2) learning how to choose healthy behaviors, such as waiting to have sex, using a condom, and to avoid drinking alcohol, 3) increased social skills, such as choosing low-risk friends, and 4) increased future orientation, such as better decision making related to future outcomes. The following are examples of what participants stated they learned from playing the game:

> *That STDs and HIV are invisible. And that an STD like herpes can't be cured but can be medicated. (girl, 14)*
> *Not to do drugs and not to have sex at our age and not to make the bad decisions first and then try to change them later. (girl, 13)*
> *What not to do in life and how to make good decisions…What friends influence you to do bad things. What friends influence you to do good things. (boy, 13)*
> *Not let friends influence your decisions because it could affect you later in life. (girl, 13)*

The majority of participants believed that playing *PlayForward* would help them make better decisions regarding drugs, alcohol, and sex in the future. Participants cited having more knowledge, knowing healthier behaviors, understanding consequences, and being more future-oriented because of their experience playing the game. For example, one participant described how playing the game changed the way he thought about having sex for the first time:

> *I don't want to get like STDs and I'm pretty sure I wouldn't be ready to be like a father or anything like that. (boy, 14)*

Another participant explained that she believed playing the game would help her make wiser decisions in the future regarding drugs and alcohol:

> *I do think that I can make better decisions. Not that I've made any decisions yet but I think that instead of thinking about using them or taking them I would think wiser I should say. Yeah, wiser. (girl, 12)*

Preference Over Traditional Class Curriculum. Nearly all participants preferred the idea of playing the videogame to attending a traditional class on the same topics in school. Participants described the videogame as more interactive, less awkward, and more engaging than taking a class. For example, one participant explained why he preferred to learn through gameplay:

> *When you are playing a game you're learning something, actually learning something, because you get to read it. Because…when I read something, I remember it. So it's better for me to play it, read it, and download it in my head. (girl, 13)*

Another participant emphasized how being able to experience consequences through gameplay had much more of an effect on her than having a teacher explain what might happen anecdotally:

> *Because you're not just talking about it, you actually see the consequences. It takes you and you really see the effects of it, to just talk about it and saying it's going to happen but not seeing the reactions of it. (girl, 14)*

One participant discussed the preference of playing a videogame over the potential embarrassment of asking a teacher a sensitive topic in front of peers, only to be laughed at:

> *Because it would be embarrassing if you ask like the person teaching you the question… and then in the end a student laughs at you or something. (girl, 12)*

Although nearly all participants preferred playing the videogame to a traditional class, a few participants noted the importance of having a teacher available to answer questions and provide feedback.

IV. DISCUSSION

PlayForward: Elm City Stories was developed as an intervention for adolescents to reduce behaviors that increase their risk of HIV infection. While our data indicate suggest that mediators of behavior change are significantly impacted in participants who played the game as compared to the control group, a critical component of evaluating *PlayForward* is also assessing participant satisfaction and gameplay experience for the purposes of improving the intervention outcomes and program implementation beyond the randomized controlled trial. Overall, participants reported a high level of satisfaction with the intervention, as indicated by the reports of their gameplay experience. The majority of participants reported enjoying playing the game, and two-thirds of participants stated they would play the game again. This finding suggests that the game may have high replay value, giving the player increased exposure to the intervention and additional opportunities to reinforce behavioral skills and knowledge learned in the game each time it is played. Participants also reported liking the way the game looked (2D, graphic novel style), and felt connected to their character and other characters within the game. Feeling connected to the characters in the game may have been why the majority of participants felt responsible for the choices they made in the game and why they stated they felt that would make decisions in life like they made them in the game. These findings also highlight the importance of developing a videogame intervention that resonates with the targeted population so that the in-game experience is translatable to real-life situations.

Although most participants reported that they felt the game was frustrating and challenging, we believe these to be positive findings, as these two components have been found to be essential for overall game experience to be effective. Although often labeled as "negative experiences" in game research, in-game frustration and challenge are essential in order for the overall game experience to work (20). There is evidence from prior work that frustration and tension contribute to the challenge of a game and are critical for the effectiveness of the overall game experience (21, 22). These findings are reinforced with two-thirds of participants stating they would tell their friends to play the game, suggesting that although the gameplay might be viewed as challenging and frustrating, participants saw the value in playing the game.

Important gender differences were also noted. While girls were more likely than boys to report that they would play the game again and to tell their friends to play the game, boys were more likely than girls to feel connected to their characters in the game. Our findings suggest that while the game may have higher replay value for girls, boys may have been more invested in their gameplay experience because they felt more connected to their characters. In addition, we were able to demonstrate that changes in our targeted health outcomes were specifically associated with different aspects of the reported gameplay experience and in specific sub-groups based on age and gender.

The literature regarding participant satisfaction and gameplay experience related to evidence-based videogame

interventions is sparse. The nature of "fun" has been noted as one of the many open questions in need of serious videogame intervention research (23). In addition, conceptual models of how serious videogames engage players are needed to create better videogame interventions that not only educate and influence behavior (24), but that players also find enjoyable and immersive. To our knowledge, this study is the first of its kind to explore participants' experience of an evidence-based HIV prevention intervention videogame for adolescents. This study provides valuable data to the expanding field of videogame interventions, especially in the field of sexual health. We believe that individuals working with adolescents will benefit from this research by providing them with a model of an evidence-based videogame intervention for HIV prevention that was both engaging and enjoyable to adolescents. This study also provides valuable insights into collecting data on participant satisfaction and gameplay experience, which is essential to inform successful acceptability and implementation of health-based videogame interventions. Videogame research studies should consider collecting these data when evaluating their interventions in order to not only demonstrate efficacy but also acceptability.

There are several limitations to this study. First, these results represent participants' experiences and perceptions of the videogame intervention, and while there is solid evidence that participant satisfaction with an intervention is tightly linked with the efficacy of the intervention, we cannot conclude from this study that satisfaction will necessarily increase the likelihood of behavior change. Second, assessment and qualitative interview data was not collected on all participants who completed game play. This was not due to loss of follow-up or attrition but rather because the window to collect six-week follow-up data was narrow (two weeks). Due to school and after school programming schedules, including holiday breaks, we were unable to collect data on all participants at the six week time period. In addition, we collected qualitative data from semi-structured interviews until saturation was reached and no new themes emerged. Third, it should be noted that the majority of participants in this study were young, minority adolescents from urban schools and after-school programs that were randomized to participate in a trial. Their experiences and perceptions may not be representative of all young adolescents and may not be generalizable to other populations. Finally, while the analysis of gender differences was considered exploratory and hypothesis-generating, we find these differences to be compelling, given that prior research on gender differences in gaming suggest that boys are more likely than girls to play role-playing games and to play a wider variety of genres (25). However, it should be noted that the study was not powered to detect the observed differences between boys and girls. Any such differences would not meet criteria for statistical significance if adjustments to account or multiple comparisons were made. Further work with targeted hypotheses and in larger samples may be warranted, including research to better understand which components of this videogame intervention were more appealing to boys versus

girls, and why boys felt more connected with their characters than did girls.

Despite these limitations, this study provides important information regarding participant satisfaction with the gameplay experience of the prevention videogame intervention, *PlayForward: Elm City Stories*. It also offers insights into how the gameplay experience may interact with the overall impact of the game and how focusing on specific aspects of the gameplay experience may increase the overall efficacy of the game, particularly for certain sub-populations. Enjoyment, engagement, impact, and preference over traditional class curriculum are important concepts to consider when evaluating participant satisfaction of an experiential intervention such as a serious videogame. As serious videogame research continues to evolve, it is essential to examine participants' perceptions of their gameplay experience and collect data on intervention satisfaction. A videogame intervention that is efficacious but also liked by its audience will undoubtedly have the greatest effect on desired health outcomes.

TABLE I. PARTICIPANT SATISFACTION, GAMEPLAY EXPERIENCE AND GENDER DIFFERENCES

Question	Week 6 Interview			
	Female	Male	Total	p-value
Felt responsible for the choices they made in the game. N (%)	55 (84.6%)	61 (91.0%)	116 (87.9%)	0.26
Would make decisions in life like I made them in the game. N (%)	52 (80.0%)	52 (77.6%)	104 (78.8%)	0.74
Enjoyed playing the game. N (%)	56 (86.2%)	49 (73.1%)	105 (79.5%)	0.06
Liked the way the game looked. N (%)	55 (84.6%)	56 (83.6%)	111 (84.1%)	0.87
Would play this game again. N (%)	47 (72.3%)	37 (55.2%)	84 (63.6%)	0.04
Found the game was challenging. N (%)	49 (75.4%)	57 (85.1%)	106 (80.3%)	0.16
Was frustrated with this game. N (%)	33 (50.8%)	45 (67.2%)	78 (59.1%)	0.06
Felt connected to their character in the game. N (%)	25 (38.5%)	40 (59.7%)	65 (49.2%)	0.01
Felt connected to other characters in the game. N (%)	36 (55.4%)	43 (64.2%)	79 (59.8%)	0.3
Would tell their friends to	46	36	82	0.04

Question	Week 6 Interview			
	Female	*Male*	*Total*	*p-value*
play this game. N (%)	(70.8%)	(53.7%)	(62.1%)	
Talked with other participants in the study about the game. N (%)	42 (64.6%)	41 (61.2%)	83 (62.9%)	0.68

*P-value from Chi Square for trend

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