Custom researcher-made video game as research instrument: how *One Night Away* was made to elicit social discourses around health

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Fig. 1. Screenshots of 3 scenes of One Night Away: menu, interaction with 'mad' NPC, talk with 'robot' NPC.

***Abstract* — Entertainment games are a cultural device, capable of give rise to innumerable meanings concerning the life and social practice of the players. In order to analyze the consumption of meanings of health by players, we created the first-person game *One Night Away* as a research instrument to be used in empirical studies, to elicit health discourses and add validity to the research. The main goal was to create a virtual world to be recognized as a game by the participants, full of unusual mechanics regarding health. On this paper, we present the steps to develop such game, using Unreal Engine 4, its starter content, assets available for free, animations and characters from the Mixamo site, and tutorials made available on YouTube. This methodology made it possible to create the game without any contribution from a proficient programmer.**

Keywords - research instrument, game design, meanings of health, Unreal Engine 4, video game, digital game

I. INTRODUCTION

Entertainment digital games comprise an increasingly relevant cultural environment, and each game is capable of fostering a rich production of meaning among its players, meanings that concern different aspects of the players' life and social practice.

Health is one of the domains where such meanings arise. In itself, health is a socially relevant topic and it is present in all entertainment media, in different formats. However, health can have multiple meanings and it is not always clear which meaning is being present in each circumstance. Since, due to their nature, containing text, imagens, animations and interaction, games involve several concurrent ways to present health, they can be a fertile ground to investigate how the different health senses emerge from their use, even without the intentionality of their creators, the game designers.

In order to study the meanings of health in digital games, we started a research regarding the multiple perspectives of these meanings.

This work is based on the Social Discourses Semiology (SDS), a theoretical perspective focused on investigating the 'meanings' produced in media. It states that meanings are socially produced, circulated and are consumed. Therefore, production, circulation and consumption are different perspectives to study the production of meaning [1].

In a previous work, we investigated the health meanings in games through the production perspective, studying the meanings of health in the game design and storytelling of BioShock (BS) and Deus Ex: Human Revolution (DEHR). At the time, we concluded that health meanings can emerge from both fictional dimension and from the rules and game mechanics, since both dimensions take part in an intertwined and complementary process [2].

The next research step is to study health meanings from the consumption perspective, analyzing the health meanings produced by players. This second step started with analysis of videos recorded by Brazilian youtubers, who spontaneously spoke about health during their gameplay. We concluded that such youtubers were able to produce new meanings of health, interweaving meanings produced in the actual physical world with those produced by the fictional worlds in the games, including their rules and procedures [3].

The game analysis of BS and DEHR had shown us how games usually represent health, while the gameplay video analysis has shown us how it is possible to talk about health during gameplay.

The third step, presented in this paper, was the development of a simple game as a research instrument to be used during the consumption research, when players will be recruited to talk about health in a game context.

The idea of using a game as a means to conduct research can be related with the field of Media Ecology. Under its principles, the media structurally influence human beings' practices and perceptions. Moreover, they extend some human capabilities, at same time that dampen some others. This way, when a new medium enters some culture or society, it initiates transformations that affect the audience, but also the previous media [4].

The ways digital games bring previous media like text, images, and animations, combining them with rules and mechanics is unique and already changed they players' understanding of those media. As McLuhan famous statement, "The medium is the message"[5] suggests, the act of playing a game about health's different aspects is, in itself, a way to elicit new meanings in the players, perhaps deeper than those obtained through conducting a single interview.

With such understanding, the game *One Night Away* was developed as a virtual world to be recognized by participants as a game, rather than responded to as a form of test. It is simpler and not as challenging as a typical commercial game, but it successfully highlights rules and mechanics related to health. This research instrument will be played by research participants, who will be asked to speak during gameplay, as youtubers usually do. The gameplay will be recorded and the participants will be interviewed to report the recent experience.

II. Related Work

Digital games as educational tools have been subject of analysis and discussion in a number of publications by many authors. However, there are few studies describing specifically the use of digital games as a research instrument.

In order to discover similar studies in Brazil, we did a search in the Proceedings of SBGames, the largest academic game conference on Latin-America [6]. It included full and short papers written in English and Portuguese from 2006 to 2018, using the words "tool", "*ferramenta*", "instrument", "*instrumento*", "research", "*pesquisa*", "method" or "*método*". The proceedings of the years 2004, 2005, 2008 and 2009 were not available. Among the results obtained, only one article presented a limited approach on the theme, describing the development and use of a gesture based interaction game as a hand tracking evaluation tool [7].

As this paper is part of a research in the communication epistemic area, we also did a search in the proceedings of Intercom, the biggest Brazilian Congress on Communication Sciences[8], specifically, in the works presented in the Game Research Group, from 2016 (year when the group was created) to 2018. We obtained one paper regarding the use of the *CosmoCult Card Game* [9], [10], describing how the game was used as a playful, intense, and immersive way of eliciting cultural consumption and global elements in the subjects' lives.

A search using the words "game", "research tool", "research instrument", and "method" was also conducted in the proceedings of the Digital Games Research Association Conference (DiGRA), the Games for Health Journal, and the databases from Springer and Jstor. Two papers were found in the proceedings of DiGRA regarding the same card game development as a tool for examining game mechanics and representational elements from a values perspective [11], [12].

Among the results obtained in Games for Health Journal, there was no paper regarding the use of a game as a research tool.

From the results obtained in Jstor database, two papers were found addressing games as a research method. One paper describes the process of adapting a focus group discussion tool into a board game as a method to ease girls' discomfort discussing menstruation [13]. Another paper describes a complex simulation method combining agent-based model, role-playing game (RPG), and geographic information system in a synergetic way [14]. The RPG was a boardgame useful to elicit representations from the participants, mapping behaviors, and strategies during play.

From the Springer database, we found papers regarding digital games development as research instrument. The game *LiverDefence* has been employed in a psychological study focused on exploring the effect of perceived control over gameplay on players' emotions. In playing *Space Fortress* [15], [16], subjects provided data on the acquisition of cognitive skill in a complex but well controlled environment. *Gs Invaders* [17] is a computer game-like test developed as a measure of cognitive processing speed, also in a well-controlled environment.

The Entertainment Computing Journal published a special issue "Video Games as Research Instruments" in 2011, presenting 7 research reports and technical notes [18]. The paper from Matias Kivikangas et al. [19] presented the development of a game and research methods to study emotional responses to a virtual character.

One Night Away is a digital game developed as a research instrument. As the board game presented by Freeman et al. [13], this digital game intends to elicit discourses. The main difference is that these discourses will emerge in a virtual world context, and not in the actual real world.

The game's features were not designed to test the subject's skills, but to make subjects recognize the virtual environment as a game, and its rules and mechanics as discourses representing health.

The closest initiative to this research was presented by Matias Kivikangas et al. [19], because it is about a game specially developed for the research, that allows players to make self-reports of game events without disturbing gameplay.

III. Background

We adopted SDS as a science that studies social phenomena as phenomena of production of meanings, considering that meanings are plural, dynamic and constitute each communication situation. In this perspective, what matters is the process, not the structure [20].

Our SDS approach postulates that any object can be endowed with changing meanings, that these meanings are produced in a circuit by different subjects and that this circuit is formed by processes of production, circulation and consumption of meanings [21]. Thus, the game we created was not conceived as a tool to teach health concepts, but as an activator of the productive circuit of health meanings to elicit health speeches during their use by players, due to its intrinsic characteristics as media.

One Night Away is a serious game created by a researcher, not a game developer. With this in mind, we elected some health topics to be addressed by the game and we searched for game design methods and resources intended for beginners.

A. *Health meanings*

From the previous research results [2], we selected some game features related to health to be highlighted in the game development:

- Avatar attributes;
- Health and power measures in the Head Up Display (HUD);
- Health effects provided by the consumption of substances, foods and beverages;
- Dehumanization of people with poor mental health (‘mad’ characters as dehumanized enemies);
- Health as a commodity;
- Mechanistic metaphor of health (the body as a machine and health as the perfect functioning of this engine).

Due to the time and technical limitations of the game development, some health topics have not been addressed because they would require a higher development investment.

We decided that the features above would not be presented on *One Night Away* in the same way they were presented in BS and DEHR. The first person shooter games (FPS) usually repeat the way these features are presented to the player [22], who can recognize them as a naturalized ‘language’ of games. As the main research instrument goal is to make the player talk during gameplay, we choose to create new rules and procedures so that the game would confront the player with some unexpected mechanics. The main purpose was to foster the player’s ability to identify similarities/differences between these features in games and health issues in their physical life. Among other choices in the game’s design, we replaced the traditional health and mana bars found in many games for other systems inspired by human necessities.

The game also allows collecting items similar to the items we could find in BS and DEHR, such as food, beverages, medicines, and cigarettes; however, the effects of using these items were made more similar to the effect of these substances in the real world.

B. *Narrative design tools for game design*

Although the game design is simple, in comparison to games as BS and DEHR, we followed some guidelines to enhance gameplay [23], [24]. We avoided long monologues, dialogues and texts on screen for messages to the player. We designed the visuals trying to be consistent with the social and cultural setting, aware that many things will be missed by players. We choose a very simple linear story structure, bearing in mind that complex structures would require work beyond our ability.

A very useful guideline was to make extensive use of sound effects. This was pointed out as an economic and potent option for building atmosphere in a subtle way. Adding sound effects has made the game gain more detail that potentially feeds directly into the imagination of the player [23].

C. *Descriptive method of mechanics*

This project did not receive any contribution from a proficient programmer, so we searched for tools designed to ease the game development for beginners.

Serious games have arisen in the most diverse fields, but despite their dissemination, there is not a consolidated methodology for their creation yet. In addition, there is not a consolidated way of describing their functioning other than discursive texts.

To describe the game design during the development, we choose to apply one proposal of accessible conceptual tool for the development of serious games, called MAVOC (*Mechanics: Agent-Verb-Object-Complement*) [25]. It is a method for creating serious game mechanics which is formal, synthetic, and easily understandable. It also allows a more procedural representation, resembling the internal logic systems of a game, but still understandable to the beginner.

D. *Game Engine, tutorials and assets*

To create this game, we searched for game engines regularly used to create FPS AAA games, available for free, offering a complete technology for building games and with resources that made it possible to develop a game without programming knowledge.

We choose Unreal Engine 4 because it scales from indie projects to high-end blockbuster releases. It also includes a large number of video tutorials and documentation, ready-made game templates, samples, and content. Unreal also provides the Blueprints Visual Scripting system, based on the concept of using a node-based interface to create gameplay elements from within Unreal Editor. Using this system, designers are able to use virtually the full range of concepts and tools generally only available to programmers [26].

We consulted the videos from the YouTube channel *Virtus Learning Hub / Creative Tutorials*[27] with a library of free courses that are easy to follow. The main sources were the courses *Unreal Engine 4 Beginner Tutorial Series*[28] and *Creating A Survival Horror Game - Unreal Engine 4 Course*[29]. Other tutorial sources were used to script two other gameplay elements: the dialog [30] and the hit reaction system [31].

For constructing the terrain, we used the default starter content from Unreal template, with textures and materials for grass, mud and rocks. For 3D grass, trees, rocks and lake water, we imported the “Open World Demo Collection” and “Water Planes” demos from Epic Games’ “Learn” tab.

For creating the NPCs, we used a character and animations from the Unreal template and a character and animations imported from the Mixamo website.

The audio used was obtained from the template starter content and the website www.freesound.org.

IV. GAME DESIGN

The MAVOC method recommends splitting the game design into key steps: game objectives, high concept and mechanics' description.

These steps helped to make clear what kind of game we were developing, but it was not a structure planned out in extensive detail before we started the Unreal editor. The Blueprints Visual Scripting system was useful to create a prototype to test and easily edit each game mechanic described by MAVOC.

This choice was inspired by an article about the development of *What Remains of Edith Finch*. There, the creative director from Giant Sparrow explained how they choose a different approach to development, concluding that "it's easier just to start building prototypes and figure it out from there" [32]. He explained that it is easier to figure out many issues inside a game using the prototypes as tools to consider the issues and discuss them.

A. Game Objectives

The game's objective is to elicit discourses about health from research participants without interrupting the player's engagement with the gameplay. The game features must connect with the previous research results from the health meanings analysis about BS and DEHR.

B. High Concept

To create the high concept, we used the *Game Apparatus* model from the *Model for Relational Analysis of Games* (MoRAG). The Game Apparatus model organizes the experiential aspects of games in four major categories: Texts, Systems, Infrastructure and Environment [33]. Each category guided the features of the game, also limited by the available features on the Unreal Engine 4, tutorials, and assets:

- Texts – The character awakes on an outdoor place and starts to collect items to survive and explores paths through a forest to find out what needs to be done. The character (as the player) doesn't know what they are supposed to do and have plenty of items to collect. They can find two NPCs in this way: a troubled NPC that is possible to punch and a robot NPC, with whom is possible to have a conversation.
- Systems – The game is played from first person perspective. The system messages appears in text (the avatar's reaction to using items, and the ending dialogue), images (3D dark forest environment, emissive color for collecting items, measures for hydration, hunger, stamina, body temperature, and batteries) and audio (avatar steps, collected items, using items, full inventory, pain, cough, pleasure, environmental sounds and a sound track during conversation).
- Infrastructure – Single player game for windows PC. The player controls keyboard and mouse. The gameplay and player voice are recorded using Windows 10 Screen Recorder.
- Environment – the game can be recognized as a first-person game with realistic graphics, sharing some similarities with commercial games.

C. MAVOC (Mechanics: Agent-Verb-Object-Complement) description

The MAVOC describes the mechanics that will be programed during game development. This method borrows the grammar rules to describe these game mechanics: the actions are described by fully-capitalized verbs and the items by capitalized objects. As in programing languages, the braces are used to group statements and declarations. An asterisk indicates the mechanics that are a single irreducible unit. The failures' consequences are written preceded by the expression "**>>>failure:**" and the success' consequences by the expression "**>>success:**". This method's purpose is not to reproduce all the details from a programming language, but only to be a quick tool to game projects [25].

```
EXPLORE Outdoor level{

   DECREASES Body temperature -10/sec{
      FIND Coat {
      APROACH Coat
      *OVERLAP Coat
      >>success: Body temperature elevates to 100% and stop
      >>>fail: the avatar freezes to death
      }
}

   DECREASES Hydration -2/sec {
      DRINK Water {
         OVERLAP Water bottle
         ADD to the Inventory
         >>>fail: Inventory is full
         *CTRL + CLICK on Water bottle
         >>success: Hydration +50, Bottle counter +1
         >>>fail: Hydration decrease to death
      }
      IF Bottle counter = 3, Character stops to urinate
      DRINK Alcohol {
         OVERLAP Alcohol bottle
         Add to the Inventory
         >>>fail: Inventory is full
         *CTRL+CLICK on Alcohol bottle
            >>success: Hydration -20, Stamina -20, Nutrition +10, Alcohol bottle counter +1
      }
      IF Bottle counter = 3, Character can't run
}

DECREASES Nutrition -1/sec{
      EAT Food {
         OVERLAP Apple {
         ADD to the Inventory
         >>>fail: Inventory is full
         *CTRL + LEFT CLICK on Apple
         >>success: Nutrition + 20
```

```
        }
        OVERLAP Chips {
        ADD to the Inventory
        >>>fail: Inventory is full
        *CTRL + LEFT CLICK on Chips
        >>success: Nutrition + 50, Chips counter +1
        }
    >>>fail: Nutrition decrease to death
    }
    IF Chips counter = 3, Character can't run
}

TAKE Medicines {
    OVERLAP Medicines {
    ADD to the Inventory
    >>>fail: Inventory is full
    *CTRL + LEFT CLICK on Medicines
    >>success: Medicines counter + 1
    }
IF Medicines counter = 2, Character can't run
IF Medicines counter = 3, Character die intoxicated
}

SMOKE Cigarettes {
    OVERLAP Cigarettes {
    ADD to the Inventory
    >>>fail: Inventory is full
    *CTRL + LEFT CLICK on Cigarettes
    >>success: Stamina -25, Cigarettes counter +1
    }
  IF Cigarettes counter = 2, Character cough, reduces 50% run speed
  IF Cigarettes counter = 3, Character cough, can't run
}

USE Flash lights {
    OVERLAP Batteries {
    ADD to the Inventory
    >>>fail: Inventory is full
    *CTRL + LEFT CLICK on Batteries
    >>success: Batteries measure + 25
    }
    TURN ON Flash lights {
    *PRESS F key to turn on
    *PRESS F key to turn off
    >>>fail: Batteries measure is empty
    }
}

RUN {
    *PRESS Shift key + directional key to run
    >>success: Stamina measure -15/sec
}

TALK to the robot {
    APROACH Robot
    PRESS "T" key
    *LEFT CLICK on Dialog option
}
 }
```

V. GAME SYNOPSIS

The game has only one level and it is an outdoor environment at night time. The terrain provides some paths that pass near campfires with supplies and leads to the place where the final conversation of the game takes place. (Fig. 2).

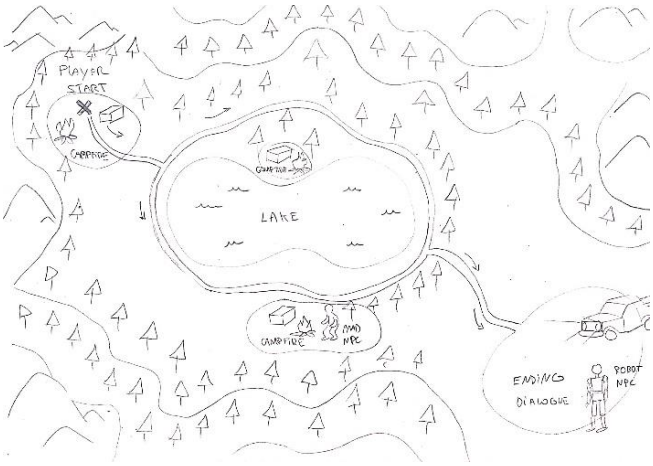

Fig. 2. Draft terrain before 3D modeling

The player starts in a campfire and receive the first objective "Find a coat to stay warm…". The next instructions are "Find food and water to stay alive", "Press 'Shift' to sprint" and "Press 'F' to toggle flashlight". The HUD shows bars representing measures for hydration, hunger, stamina, body temperature, batteries (Fig. 3), and an inventory with 5 item capacity with the instruction "Press CTRL to use item" (Fig. 4). The player does not receive any other objective and is free to explore the terrain.

Fig. 3. Detail showing bars representing measures for hydration, hunger, stamina, body temperature, and batteries

Fig. 4. Detail showing the inventory filled with 4 items

The level has three places where items can be found. These items are water, alcoholic drinks, apples, chips, medicines, cigarettes and batteries (Fig. 5).

Fig. 5. One of the campfire spots with items available for collection

Some items are necessary to keep the avatar alive and others only produce useless effects. Items can also produce side-effects that mimic real life, with expected limitations. Thus, after drinking three water bottles, the avatar has to stop to urinate; after eating three packs of chips, the avatar will have a stomachache and be unable to run; alcohol blurs their vision and reduces their running speed. There is no observable effect on taking the first medicine blister, but the avatar dies intoxicated by the third one; taking cigarettes makes the avatar cough and after the third package the avatar is unable to run.

We assumed that people smoke or drink alcohol for some pleasure. So, despite of being harmful to the avatar, after using the items “alcoholic beverage” or “cigarettes” a pleasure message “I feel better now” is shown.

In order to use these items, first the player collects them in the inventory. After that, they have to click on each one to use it. To simplify the game, the items go to the inventory automatically when touched, but the inventory only holds up to 5 items, forcing the player to use items to be able to collect new ones.

In one spot, there is one NPC who appears to be ‘mad’, i.e. in a manner that conforms to typical (and sometimes problematic) video game representations of insanity or mental illness. He behaves in a strange way, gesturing while saying "No!" and moaning (Fig. 6). This NPC does not interact with the player, but the player is able (but not forced) to kill this NPC. This situation was designed to create an opportunity to the participant talk about mental health, enemies, and the choice of killing characters.

Fig. 6. ‘Mad’ NPC

Stimulating discussion about the metaphor of the body as a machine is challenging, because it is a complex, but highly naturalized, way we understand health. One hypothesis was to create a complex system to simulate the avatar’s health. However, trying to translate the health to a computer system would reinforce the machine metaphor, as a computer is also just a machine. So, we choose to add text messages about the character’s feelings, such as “I’m feeling so lonely and scared” because this type of emotion is not commonly found in FPS games and may be somewhat disruptive of the perception of the player’s avatar as a simplistic system that predictably responds only to consuming food and substances with no wider feelings or context. Additionally, the game’s ending is a short conversation with a robot. We inserted this to broaden the discussion about the metaphor of the body as a machine (Fig. 7).

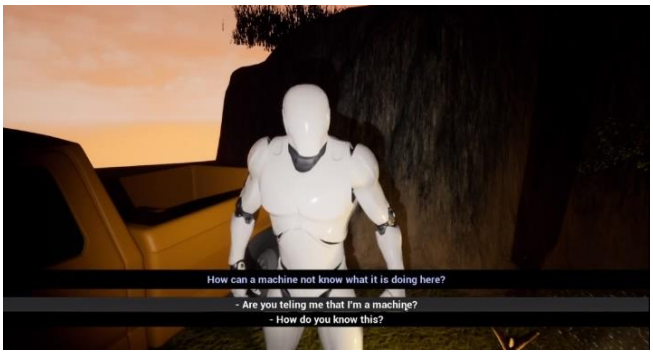

Fig. 7. Scene during the ending dialog

The robot NPC is intentionally one of the default assets from Unreal, reminding the player that they are inside a designed virtual world and to interrupt the suspension of disbelief. In the conversation, the robot states that the avatar is a machine too, and discusses the difference between a machine and a human being. After the conversation ends, the game returns to its menu screen.

Designing this game, we intentionally avoided creating a challenging FPS that imitates BS or DEHR, but instead created a mysterious virtual world that was designed specifically to elicit discourses from participants in shorter game sessions.

VI. Limitations and future work

This game as a research instrument has some limitations and, as such, it will be used in combination with others research methods, such as interviews. BS and DEHR are complex games, producing meanings of health by rules, procedures, storytelling etc. The game *One Night Away* is a shorter and simpler game experience and it cannot produce meanings of health in the same complex and entertaining way the AAA games do. This game, developed as a research instrument, will be used as a complementary research step among other steps. On the other hand, AAA games have challenging goals not specifically related to health, and recording their long gameplay could tell us less about health meanings and more about game evaluation itself.

Compared to the use of commercial games for testing, *One Night Away* produces shorter experiences that may stimulate responses that are significantly more focused on health issues and that potentially will make it easier for participants remember and talk about how they consume meanings of health while playing games.

BS and DEHR have deep worlds and narratives, with a general focus on technology, divided social class system, conspiracy elements and political dimensions that are part of the thematic core in these games. Each of these themes can also be seen as directly related to collective health issues. This complexity cannot be addressed by *One Night Away* and should be explored during interviews with participants.

VII. Concluding Remarks

There are plenty of accessible resources available to make game design an activity possible for beginners with no programing knowledge. Researchers can appropriate such resources, including technologies, tutorials, assets, plug-ins, etc., to create more games as research instruments. These custom-made games can be viewed as a complementary research technique alongside other established methods, and there is significant opportunity for further development and research into specific game design choices and their impacts on players. These choices are likely to affect the quality of research outcomes, and so further study of this approach will assist in maximizing the potential of games as research instruments.

Additionally, the use of games introduces the potential for comparatively simple implementation of quantitative and qualitative data sets in tightly controlled scenarios. Games have many existing systems built in for checking the number of times actions have been tried, objects looked at, etc., and so even these seemingly advanced statistical approaches are within the reach of beginner developers.

This study has demonstrated that games have strong potential as research instruments. Further studies may be able to confirm whether the context of playing a game changes a participant's experience of taking part in a test, and whether this change elicits additional insights beyond, or in comparison to, existing formalized research methodologies.

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