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Digital games and the communication of health problems

A review of games against the concept of procedural rhetoric

With the spread of the internet and the availability of computing resources, the use of digital games technologies has grown considerably in areas other than pure pastime (Hainey et al., 2011). Serious games in particular are games designed for primary purposes other than pure entertainment (Susi et al., 2007). In this paper, we focus on the potential as well as the limitations of serious digital games as a medium for communication in the area of public health.

The idea for writing this essay came from a meeting one of the authors had with the communication manager of the Public Health Body (PHB) of one Italian region. According to this manager, the PHB is looking for new and innovative media and languages for communication with teenagers, especially because of the clear limits of other media traditionally used by the PHB, such as paper leaflets or posters. The manager, however, did not mention specific directions or desirable solutions to bridge the communicative gap between the PHB and teenagers in relation to health issues. Our idea is that games in general, and digital games in particular, can be used as effective forms of communication with young people. Digital games can therefore provide a solution for the PHB. In fact, digital games are already an important part of young people's pastimes. They can communicate messages to teenagers in ways that are entertaining and fun. Moreover, the use of digital games has already been recognized as a powerful medium for supporting young people's learning (Kirriemuir & McFarlane, 2004) and as educational tool for healthcare (Papastergiou, 2009).

This paper is a preliminary piece of work with an exploratory scope: the meeting with the PHB communication manager became the instigator for reflecting on the use of serious digital games as a means of communication with teenagers in relation with health issues like alcohol abuse, smoking, and sexual diseases. Indeed, because of their supposed power in shaping and influ-

encing real life practices, we consider serious games an interesting medium for conditioning attitudes and beliefs of young people (Becker, 2011), more than traditional forms of communication based on media such as leaflets (de Freitas & Griffiths, 2008). We believe that our preliminary analysis can lead to a larger research project focused on the introduction of serious games to be used by the PHB when communicating with teenagers.

Following Van Eck's proposal to focus serious game studies "on explanation (why and how they are effective) and prescription (how to actually implement Digital Game-Based Learning)" (2006, p. 18), our research questions are: what kinds of games are really able to significantly influence the real life behaviors of people? If they are influential, are some game genres or game mechanics more suitable than others for communicating health issues?

To begin answering these questions we will review a number of currently released, and available, serious games, including browser games, virtual worlds and more classical 3D engine games. Our review, however, is not just a mere list of games[1]. Rather, we compare these games against the *Procedural Rhetoric Theory* proposed by Bogost (2007). This theory suggests that games can be more effective than other media in persuading people about the merit or flaws of beliefs and attitudes. Games can exercise persuasion provided that the gameplay features a meaningful representation of the enabling underlying procedure. By considering games through the lens of the procedural rhetoric theory we will be able to identify and isolate a number of game mechanics we believe to be suitable for health communication campaigns.

SERIOUS GAMES AND GAMIFICATION

The concept of the "serious game" has only recently entered the vocabulary of educators to identify a game that has an educational purpose (Zyda, 2005; Michael & Chen 2005), even though digital games since their early days have had a close relation with the education and teaching environment .

In the current games market, three types of gaming technologies seem particularly promising for supporting the dissemination of gaming in areas other than pastime:

1. Casual browser games
2. Real time 3D engines
3. Massive multiplayer online environments (virtual worlds)

This distinction is merely analytical, as a single game can feature all three aspects (e.g. *Battlestar Galactica Online*), but often a game specializes in one single aspect (e.g. *Heavy Rain*) or two of them (e.g. *World of Warcraft*). Many of the existing serious digital games are based on one or more of these gaming technologies, but all of them are powerful but not necessary *tools* to build serious games; indeed, it is possible to build a totally engaging serious game without including

1. Nor it is fully exhaustive.

2. The first example of what would later be called a video game was OXO: an electronic version of the game Tic Tac Toe released by A.S. Douglas in 1952 to better illustrate his Ph.D. thesis on human-computer interaction at the Cambridge University. In 1954 physicist Willy Higinbotham at the Brookhaven National Laboratory released Tennis For Two: often cited as the first video game in history, Tennis For Two was an attempt by Higinbotham to raise interest for physic in his students.

in its design any of those aspects[3]. The crucial features of a serious game are the "game mechanics": simple or complex rules that shape the game experience.

The use of game mechanics outside of pure pastime use is the focus of the concept of *gamification*,considered to be the use of game mechanics in non-game situations (McGonigal, 2011). The concept of gamification originates in the areas of marketing, and has often been criticized because of the focus on trying to sell more products through the means of making customers more loyal (Zicherman & Linder, 2010). Furthermore, it has been said that marketing-based gamification might lead to forms of corporate surveillance toward customers through the means of gamified feedbacks (Man, 2011; Schell, 2010). Another form of critique argues that adding game mechanics to any application and pretending it will deliver magic communicative results is a very poor way of using game design for designing non-gaming artifacts (Deterding et al., 2010). Nonetheless, we believe that more critical and sustainable approaches to the concept of gamification are indeed possible, but have yet to be developed, and that the true challenge for media research is to use game mechanics to enhance proper and effective communication strategies. In order to do this we rely on the Procedural Rhetoric theory developed by Ian Bogost (2007).

PERSUASIVE GAMES

In his book *Persuasive Games*, Bogost explicitly states (2007) that his analysis wishes to prove how certain "video games mounts arguments and influence players" (p. viii). The concept that Bogost develops is that of Procedural Rhetoric: "the art of persuasion through rule-based representation and interactions rather than spoken word, writing, images, or moving pictures" (p. ix). Procedural Rhetoric is therefore the art of achieving persuasion by means of procedures, in a situation in which procedures can be easily represented by computerized artifacts. Digital Games are a special type of such artifacts with peculiar characteristics: they are expressive (for instance, in comparison with office computer software), interactive (because they demand that players interact with the game), and immersive (producing a more direct experience for players compared to, say a movie). Hence, argues Bogost, "video games can also disrupt and change fundamental attitudes and beliefs about the world, leading to potentially significant long-term social change" (p. ix).

Procedural Rhetoric is a concept that explains how processes can be used in a persuasive way, especially looking at computers as machines that allow for representations of processes that become persuasive by the means of rhetoric: effective expression embedded in a medium.

Therefore, for Bogost a game is persuasive if it mounts Procedural Rhetoric effective*ly.* Bogost, accordingly to Gee (2004), Johnson (2005), Steinkuehler & Duncan (2008), and Flanagan (2009), in this way emphasizes the idea that the logical framework in which "play" occurs in video games is a communication medium itself. This medium is therefore extremely effective in convey-

3. Examples of this are Mary Flanagan's POX (Flanagan et al., 2011) or Brenda Brathwhite's Train (Pozzi et al., 2010)

ing meaning regarding processes, and in this it is more persuasive than other media, *not only for teenagers but for the human mind in general.* The ultimate asset of gaming as a medium is its effectiveness in letting people focus on models, rules and mechanisms.

This concept of Procedural Rhetoric by Bogost seems very promising for communication of health issues because a number of health problems are related to bad habits: bad behavioral patterns generated by wrong models, inappropriate rules or wrong assumptions (Baranowski et al., 2011). The Procedural Rhetoric of serious games could be very effective in persuasively acting on such elements. We must, however, avoid the thought that very complex social and biological problems related to health issues can be easily solved by a game, or any other single medium of expression (Baranowski et al., 1997).

To explore these ideas further, the first task we want to accomplish with this paper is to review existing examples of how already released and currently available serious games deal with their capacity for persuasion in relation to their audience, according to principles contained in Bogost's theory of procedural rhetoric. Let us look at a number of different types of games in turn, starting with 3D real time engine games.

3D REAL TIME ENGINE GAMES

Games that we list generically under the "3D real time engine games" label are products to be installed on users' computers that rely considerably on 3D graphics to convey important gameplay elements.

Even though many popular commercial games belong to this category, we don't believe that 3D games are particularly suitable for educational purposes. The production of such games requires a very high commitment in terms of working hours, technical expertise, and overall budget—all factors that usually are not fully available to educational game production teams. Even so, here we list some examples of educational games using real time 3D technologies that encountered high levels of success due to good design, good budgets, or, more often, both.

Food Force

With its four million downloads in one year, the serious game *Food Force* by the United Nations World Food Programme represents one of the first and biggest successes in the serious game history. The gameplay wisely mixes different kinds of game mechanics, going from the real time strategy game to the puzzle game, helping to keep casual gamers' attention. The game features a solid storytelling structure and character design that helps players to empathize with the game missions. The longevity of the game is assured by an online chart of the best players and by occasional competitions in which prizes can be won. The attention to the in-game graphics and to the overall quality of the product is very high, demonstrating the expertise of the development team, high respect for the target audience, and the availability of a large budget. Nonetheless, the game mechanics are clearly an oversimplification, and maybe even a distortion, of the mechanics and

procedures that they want to represent. This problem affects many simulation games, and the idea that a serious game should represent a simplified version of reality is one of the most common mistakes in the field. As thoroughly analyzed by Squire (2011), the problem with such games is not the simplification in itself (a model is always a simplification of reality, that doesn't mean it is not useful) but rather that a game's oversimplification (with its underlying mechanics) can change the nature of the phenomenon that it was supposed to highlight.

ICED! – I Can End Deportation

The American serious game *ICED! – I Can End Deportation* uses the immersivity of video games to let the players experience in "first person perspective" (the game view is actually in first person) the issues emerging from what the games producers see as unfair U.S. immigration laws, practices, and deportation policies. *ICED!* uses the mechanic of player frustration in a very clever way. In *ICED!*, in-game frustrations are used to communicate to the players the daily difficulties and injustices that clandestine migrants face in the U.S. Such a strategy is extremely efficient to teach users about legal issues.

The effectiveness can be assessed explicitly and directly from the *ICED!* evaluation method. *ICED!* uses pre-/post- questionnaires to create player awareness about effectiveness of the educational power of the game session. The game requires the players to fill the same 14-item questionnaire about U.S. immigration laws and deportation policies before and after playing the game. The results are then sent to the website of *ICED!* where they are gathered and analyzed by the Education Development Center/Center for Children and Technology (EDC/CCT), as well as showed to the player community. The results of such summative evaluation showed that:

> playing ICED! contributed to an increase in player knowledge about U.S. immigration and deportation policies, and over half (56%) of the respondents in the matched pre/post group indicated that playing ICED! had changed their attitude about the ways in which immigrants are treated in the U.S. (Diamond & Brunner, 2008).

These positive results, in our opinion, are due to the combined use of procedural rhetoric and "simulated" situated learning (Lave & Wenger, 1991).

Eco Warriors

Funded by the Apulia Region (Italy) with contribution from the European Union, *Eco Warriors* has been a success story as well. The approach that P.M. Studios took in order to talk about recycling issues, resulted in a game focused on a science fiction battle between evil forces that want to pollute the planet and a task force of brave warriors (the players) trying to avoid it.

The game is wisely constructed on a "search and collect" mechanic with positive feedback every time an object (rubbish) is collected and put into the right container (recycle bin). Such a game mechanic is an analogy to the real behavior that the game intends to facilitate, thus procedurally helping young kids to remember which rubbish goes in which bin and to make them adopt the habit of recycling.

VIRTUAL WORLDS

Under this label we list examples of games in which the real time, online, social interactions are particularly relevant. Virtual worlds are computer based simulated environments in which groups of people can play collectively, usually impersonating an avatar (the in-game persona). Most virtual worlds are also persistent, meaning that their existence is based on a server independent from the player computers (Castronova, 2005).

WolfQuest

WolfQuest can be considered a big success for public and of science communication *tout court*. This is a massively multi-player on-line role-playing game (MMORPG) where players can play the part of wolves living freely in a virtual mountain environment. The online component of the game lets the players/ wolves gather together to form packs, in which to learn wolf hunting strategies and intraspecific communication.

Even though the developers found out how difficult it was to implement such a virtual world (Schaller et al., 2009), the public became fans of the game in large numbers when it was launched in December 2007. About 4,000 users downloaded the game in the first few hours after the launch, and this number rose to 250,000 in the following 14 months.

With regards to procedural rhetoric, *WolfQuest* forces the players to adopt behavioral patterns of wolves in order to survive. The game elegantly matches the social aspects of wolf ethoecology with the MMORPG-like gameplay. Even though it is still unclear if virtual world guild dynamics can be a good model for human team interactions (see Johnson et al., 2009; Ahmad et al., 2011), we can probably say that simpler group dynamics, like those used in wolf packs, can be effectively taught using MMORPG dynamics. The same could be true also for very simple human health prevention behaviors, like tooth brushing, or washing hands. The gameplay of a health related game could use procedural rhetoric in the same way that *WolfQuest* does, providing reasons, rewards, and consequences of enacting the given behavior in a community of motivated players.

CASUAL BROWSER GAMES

The instant access interface provided by browser games is very effective in minimizing one big risk inherent the medium: the fifth minute defection. If a game asks its users to spend more than five minutes to learn all the basic elements of the gameplay, it is likely to lose a considerable part of them (the so-called casual players) during the early minutes of interaction (Kuittinen et al., 2007). Contrary to what is commonly thought, this phenomenon occurs more often with adult audiences than teenagers, who can generally handle lower and longer learning curves (Juul, 2009). Additionally, casual games, especially those associated with social networks, are used equally by men and women, an issue that doesn't occur in other kinds of video games (Jenson et al., 2007).

So if a serious game intends to involve an adult/non gamer/gender neutral audience, without committing them to a long-term effort, a browser game approach is certainly convenient. Moreover, browser game development is generally less expensive than other forms of video game programming, so these kinds of games are also suitable for low budget productions. One or both of these two conditions (aiming to involve the widest audience possible and low budgets) are generally part of most public health campaigns, so the casual, browser based approach to serious game design should perhaps be considered among the first and main options to investigate further.

Kabul Kaboom

This post-9/11 activist game was released by the artist Gonzalo Frasca to highlight the paradoxical situation that the U.S. army was dropping both humanitarian aid and bombs on Afghanistan territory. The same process was generating two similar but very different mechanics: food fall and bomb fall. The two game mechanics mixed together allows the players to experience directly that, under those conditions, no winning strategy can be achieved.

In terms of health care prevention, game mechanics that highlights situations of stalling or no win conditions in a given setting (e.g. drug addiction, lung cancer) could help teenagers to recognize that situation as non desirable.

Love Bugs Battle

Love Bugs Battle is a game for health that lacks any procedural rhetoric. The idea behind the game is using sexually transmitted diseases (STDs) iconography inside the gameplay of the classic arcade "Space Invaders". Condoms are used in place of the spaceship and little bugs representing diseases such as syphilis or herpes are used in place of the aliens. How this operation should "reinforce the importance of condom usage and safer sex" (Mariestops, 2007) is not clear. Certainly the game does not use procedural rhetoric to achieve its intended goal, because the adopted game mechanic (tower defence) seems to be unrelated to the behaviour that the game wants to facilitate (condom usage).

e-Bugs

City University London's eHealth Research Centre (CeRC) developed the *e-Bugs* game series to improve young people's understanding of the importance of hand and respiratory hygiene and responsible antibiotic use [doing this in a] game platform as an open-source, low-cost, and re-usable framework to promote game development for education and entertainment (Edugames4all, nd).

The project-platform is certainly ambitious, well designed and well developed, especially due to its sustainability over time. However, the games released on this platform until now are not using procedural rhetoric in a consistent way. The game designers rely mostly on storytelling rather than on game mechanics to convey their message (e.g. the importance of hand washing). Nonetheless, we found some exceptions.

Among these, there is *Detective Game* (a game intended for teenagers, still in beta) in which the procedural rhetoric is at work when players are asked to

detect bacteria using the "MV mode" (a sort of Wood's lamp). This gameplay feature is very effective in communicating the existence of an invisible world full of microbes that teenagers must seriously consider for their own health.

Pos or Not

The goal of the game *Positive or Not* is "to allow the HIV community to serve as an awareness and prevention tool for those who are—but who do not believe themselves to be—at risk" (Kff, 2008).This goal is brilliantly achieved by borrowing a famous internet meme (Knobel & Lankshear, 2007) such as *Hot or Not*[4] in order to engage people to play with their own stereotypes. Indeed, the *Pos or Not* gameplay exploits the human instinct to categorize and forces the player to admit how deeply wrong is this action. For instance, it is not possible to decide if a person is HIV positive only by judging her/his face or by knowing a few personal details. Pos or Not is wisely designed in order to force players to see their biases as *results* rather than as *starting points*. In other words, players are forced to play *with* their stereotypes rather than *against* them. During the game the player notices that he/she cannot adopt a winning strategy, and that every turn of the game is entirely based on chance. In this way the player understands that the intrinsic game rules are wrong and that the only way to know if someone is HIV positive or not is to run a dedicated medical test. At this point a higher level of interactivity is reached: the game provides the player with an html form where she/he can insert his/her ZIP code in order to locate the nearest HIV/STD testing site. We judge the game *Pos or Not* to be executing a very neat and effective procedural rhetoric, providing an example to be followed in similar prevention campaigns.

The Great Flu

The Great Flu is maybe one of the most interesting serious browser games released. Presented by the Erasmus MC University Medical Center in Rotterdam, Netherlands, on the occasion of the 2009 Darwin Year celebrations, it is still available online and extremely popular, with more than 400.000 play sessions at March 2011 (Balvert, personal communication).

Aside from its friendly user interface, effective narration, and brilliant aesthetics, the game builds upon good mechanics to convey its core message: information about epidemics, their expansion patterns and measures to combat them. Epidemiology is a subject that seems to fit particularly well with procedural rhetoric, because of its intrinsic procedural basis. A successful play (managing to combat the epidemic) involves the understanding of the virus patterns and characteristics, so the game mechanics' winning conditions and the designers' "serious" *desiderata*[5] coincide in this game.

Power of Research

Power of Research is a EU funded (FP7) serious game that explicitly aims to get younger generations interested in the field of scientific research. The game design of Power of Research tackles one of the most intriguing aspects of gamification: the idea of using real data in order to make people play with them and learn from them. For this purpose, *Power of Research* is extremely innovative,

4. Cfr. http://hotornot.com/

5. Probably for this reason also one of the more significant studies on "serious" application of gaming, relate to an epidemic that broke loose in World of Warcraft on September 13, 2005 (Balicer, 2005). According to Ian Bogost this happens because "the computer magnifies the ability to create representation of processes" (Bogost, 2007).

enabling players to use real up-to-date scientific data streaming directly from major online libraries like PubMed. The issue with the game is that it is too serious! The gameplay is very complex and asks the players to come up with issues and make decisions surprisingly similar to the ones real researchers have to face daily. What leaves us skeptical about this is the huge effort game developers put in to make the game so similar to real jobs, with duties and chores, but without real compensation (wage, publication, academic reputation). The social aspect is present, thanks to a system of in-game reputations, but the feeling is that gaining such an in-game reputation is not enough to get people to undergo the extremely complex in-game tasks. *Power of Research* can be seen as the opposite of *Food Force*: a very deep gameplay, detailing almost every aspect of the subject that it wants to represent, but without any fun. Paradoxically the game ends up working against its own primary goal: to get young people to become fascinated with the world of research. It uses procedural rhetoric to persuade players that doing research is difficult, extremely complex, involves a series of high level skills in different disciplines that are very hard to learn and… that's it. Why should players want to be a researcher (or complete the game)?

During the completion of this article (September 2011) *Power of Research* added a second "action" game to the main strategy game previously described. This new game, named *Hospital*, tries to patch up the flaws of the long-term strategy game with a gameplay that is the complete opposite, and which unfortunately falls into the trap of oversimplification seen in *Food Force*.

Molleindustria

"Radical games against the dictatorships of entertainment": With this subtitle the Italian media researcher Paolo Pedercini (based in Pittsburgh, PA) has been releasing a series of browser games since 2006 that he describes as designed "to re-appropriate video games as a popular form of mass communication….. Our objective is to investigate the persuasive potentials of the medium by subverting mainstream video gaming clichés (and possibly have fun in the process)" (Pedercini, nd). All the Molleindustria games feature a high level of political criticism and irony, but they always build these aspects on solid gameplay, demonstrating a considerable knowledge and respect for the medium.

Regarding procedural rhetoric theory addressing established attitudes and beliefs, two Molleindustria games seem to offer useful insights. The game *Queer Power* intends to challenge homophobic attitudes, and does so with a modified 2D fighting game in which fun is generated by exploring different interactions between the two characters. Pedercini's point is that a more diverse world is a more interesting one: the game mechanics support this statement, showing how the possibility to freely choose male and female sexual partners is more entertaining than to have strictly woman and man only combinations.

The second example is *Operation: Pedopriest,* a game designed to address the overwhelming news of sexual abuse of children inside the Catholic church. Pedercini designed the game mechanic to highlight the core message: we have

a problem with the Church because it firmly states that the ultimate judge for human actions is God, and thus justifies a series of procedures to avoid trials for priests accused of sexual abuses. In *Operation: Pedopriest*, you, as a gamer, are in charge of implementing such procedures of saving priests from the secular judgment. The words used in the game are the same used by the church on a trial: the abusing priest is a "sinner", parents are "witnesses". As theorized by Bogost, the game is extremely persuasive in communicating the Roman Catholic Church's motivations. The only problem with the game is that it is very effective in further convincing people already upset by the Church's attitude on the issue, but it is unlikely to change the mind of users that don't share the same view on the subject.

Philosophy Experiments

This collection of (mainly) text based games on theoretical issues and paradoxes from the *Philosopher* magazine website is a good example of gamification in action. Whether this can be an innovative way of raising interest for the subject or just a simplified substitute for inquiry based learning, it certainly sets the minimum standards for gameplay in serious games (and in their budget!): goal oriented hypertexts, just like the first textual adventures (MUDs), at the dawn of video games. Even though it is probably the more cost-effective way to "gamify" an issue, we think that aside from philosophy students, it is very difficult to keep a user's attention on so much text, especially on healthcare issues.

TWO CLIMATE CHANGE GAMES

To close this review of browser games we present two examples of games on climate change that, despite using the same medium and the same technology, achieve extremely different results due to the implementation of procedural rhetoric in the first, and the total lack of it in the second.

The successful one is BBC's *Climate Challenge* by Red Redemption, 2007. In the game we play the role of the president of the European Nations, who is forced to make a series of decisions in the fields of commerce, industry, and local and national regulations in order to lower the CO2 emissions. *Climate Challenge* wisely asks players to carefully balance factors such as people's approval, and the strong influence of foreign policies. Procedural rhetoric effectively transmits not only the urgent need for CO2emission control, but also the complexity of the industrial, economic and political systems that come into account when addressing possible solutions to the problem of global climate change.

In opposition to this is the approach of the game *Rizk* by Playerthree, 2010.

The Science Museum of London produced a game designed to increase awareness of, and to educate visitors about, the science behind climate change. The set-up is in a world not too different from our own in which a Plant needs resources to grow. But collecting these resources can increase the risk posed to the Plant's wellbeing[6].

The gameplay has nothing to do with climate change. The 'world not too different from ours' is a series of abstract platform levels, the game mechanic is a

6. Cfr. http://www.sciencemuseum.org.uk/ClimateChanging/Rizk.aspx

classical tower defense one, the focus being on growing our own alien creature and protecting it from the threats of other aliens. The absurdity of linking such a context to climate change (and to a serious institution like the Science Museum) is evident. Interestingly enough, on the developers' website *Rizk* is not described as a serious game but as a standard free browser game.

We now summarize the outcome of our review/analysis with a table that shows the specific details for each game and highlight the degree to which the game embodies a procedural rhetoric.

Name	Category	Budget	Intended audience	Mounts procedural rhetoric effectively?	Game genre
Food Force	Real time 3d engines	High	Primary school	No	Real Time strategy, platform game, puzzle game. NOTE: The game suffers of oversimplification.
ICED!	Real time 3d engines	Medium	Teenagers	Yes	Role playing game
Eco Warriors	Real time 3d engines	Medium / Low	Primary school	Yes	Seek and collect game
WolfQuest	Virtual worlds	Medium	Primary school and teenagers	Yes	Role playing game.
Kabul Kaboom	Browser games	Low	Everyone	Yes	Modified 2D shooter.
Love Bugs Battle	Browser games	Low	Everyone	No	Tower defense game.
e-Bugs	Browser games	Low	Primary school	No	Adventure gameNOTE: even though the main gameplay is based on interactive storytelling, a glimpse of persuasive rhetoric can be found in a specific action of the game.
Pos or Not	Browser games	Low	Everyone	Yes	Dicothomic hypertext.
The Great Flu		Medium	Teenagers and adults	Yes	Turn based strategy game.
Power of Research		High	Young Adults	No	Turn based strategy game (original game), and role playing game (Hospital add on).
Queer power		Low	Adults	Yes	Modified 2D fighting game.
Operation: Pedopriest		Low	Adults	Yes	God game (choice probably driven by a further finesse of the author).
Philosophy Experiment		Low	Adults	No	Multiple-choice hypertext.
Climate Challenge		Medium	Everyone	Yes	Turn based strategy game.
Rizk		Medium	Primary school	No	Tower defense game.

CONCLUSIONS

The foundation for this paper came from a discussion with the communication manager of a Public Health Body of an Italian Region, who wanted to identify new media for communication with teenagers about specific health issues. Beginning with this challenge, and based on our existing knowledge of gaming, we felt these games might provide a possible solution. So we reviewed a number of serious games with the goal of possibly identifying certain aspects and game mechanics that can be used for healthcare prevention campaigns. We have analyzed sixteen examples of serious games with consideration of the Procedural Rhetoric theory developed by Bogost in order to understand how game mechanics use procedural rhetoric effectively and therefore identify game mechanics suitable for the PHB's communicative goals. The main outcome of our review is a synthetic table that shows which games use the Procedural Rhetoric and which mechanics support this process. In particular, what our review suggests to us is the understanding that the relationship between game mechanics and their effectiveness in promoting procedural rhetoric has to converge on a reasonable combination that effectively represents the off-game processes that it wants to connect to.

From this perspective, in order to evaluate the best rhetoric with which a possible PHB project should be promoted, the important issue is to understand how particular unhealthy behaviors take place in order to design a game that is able to reply to off-game processes at the rhetorical level, rather than relying on a completely faithful or oversimplified version of the off-game world.

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