Studying Responses to Norm Violations Using Computer Games

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Abstract

Even though following norms is a sign of proper conduct within a society, there are studies showing that norm violators are afforded and perceived with more power than norm abiders. This paper describes a video game research tool created to understand the *When*, *Why* and *How* of these findings. Within our configurable resource-management first-person multiplayer game, players can follow or violate norms during resource collection and transactions. Additionally, one player, the leader, is responsible for taking or giving power to other players, while distributing resources and selecting the following leader. We conducted an experiment with 20 participants to verify if the implemented tool was consistent with previous findings. Subjects played the leader role, interacting with two confederates, a norm violator and a norm abider. We measured power perception and affordance given subjects' game actions and survey answers, finding results that contradicted prior studies: only 35% of subjects selected the norm violator as leader and most subjects favoured the norm abider compared to the norm violator during resource distribution. We realized that the scenario of our experiment was unbalanced - the norm violator's behaviour was extremely selfish compared to the norm abider. Still, we noticed that some participants perceived the norm violators as more skilful and, therefore, more worthy of power.
Keywords: Power, Social Norms, Norm Violation, Computer Game, Multiplayer

1. Introduction

Social norms guide the behaviour of individuals in a community, being "generally accepted ways of thinking, feeling, and behaving that people agree on and endorse as right or proper" [12]. Yet, there are exceptions - the norm violators. A norm violation is "a behaviour that infringes one or more principles of proper and acceptable behaviour" [18]. One would expect that an individual who breaks the norms would lose influence within a community, however recent findings say otherwise. There are studies [18, 20] indicating that norm violators are perceived as more powerful than norm abiders, and can even be afforded more power. Typically, research methods, used to study social norms, present decreased ecological validity or restrictions in the reproduction of specific situations in the real world. We believe that using computer games for research is the answer to these problems.

Computer games are useful for studies in the field of psychology since they allow the recreation of unethical situations impossible to simulate in the real life, can be distributed on a large scale and are usually easy to configure. Nevertheless, researchers should consider using games with higher ratings of engagement and immersion for their experiments, providing that an accurate representation of the physical world within the game will increase the ecological validity of the experiment. Higher immersion can be accomplished, for example, with rich graphics, a first-person perspective and realistic animations and expressions within players' avatars.

Then, in this paper, our goal is to create a video game to address the following research question: *When, why and how norm violators gain or lose influence?* Our intention is to implement a computer game tool that allows researchers to further investigate how humans respond to norm violations and in what situations they afford power to individuals who break the rules.

Given the mentioned problem, we divided the document into the following five sections. Initially, we provide a background on norms and power, discussing the benefits of using video games in research during related work [Section 2]. Then, we present the requirements and concept of our norm-violating game [Section 3], followed by its implementation [Section 4]. After this, we move on to the evaluation [Section 5] of the implemented tool, focusing on the methodology and the results. We are concerned with the fact that findings within the game context may not be in line with previous studies suggesting that norm violations fuel perceptions of power and power affordance. Therefore, in the evaluation,

we attempt to prove the following hypothesis: *Subjects perceive norm violators as more powerful and afford them more power*, creating a scenario where subjects have to face two simultaneous conditions, norm abider and norm violator. Finally, in the conclusion [Section 6], we make an overview of the document and discuss future work.

2. Background and Related Work

As stated initially, during the introduction of this paper, studies focused on norm violations and power reveal that norm breaking behaviours may lead to power perceptions, given that powerful individuals find less social restrictions [20]. The norms violated could be related to fairness [6], honesty, respect or care [10]. Furthermore, according to Gerben van Kleef et al. [19], prosocial norm violations can lead to power affordance, which means that people who break the rules in order to benefit someone or a group may be perceived as more worthy of power. Apart from preferring prosocial over selfish individuals, people also favour individuals who belong to their own group instead of other groups ("in-group bias" [21]).

In one of Gerben van Kleef et al.' [19] experiments, a short movie clip with three individuals in a waiting room was shown to participants. Later in the video, one of the individuals stands up to close a window. The conditions tested were Norm Violation vs. Control (the window has a "Do not touch" sign, so closing it constitutes a norm-violation vs. the window has no sign, so opening it is allowed) and Prosocial vs. Selfish (the other two individuals are cold, so closing the window benefits them vs. the other two individuals are very warm and sweating, so closing the window does not benefit them). By combining and testing the previous conditions with different participants, experimenters could measure how much power each participant afforded to the individual closing the window and what was the perceived prosocial behaviour of that same individual.

Experiments like the one previously described have the disadvantage of being low on ecological validity, since reactions to a fictional scenario may not be the same as in a comparable real-life event.

Game theory is a mathematical language used to describe games, outlining players' strategic interactions and their expected outcomes [4]. In the game theory point of view, it is expected that players always choose the self-interested strategy during a game. However, their choices often deviate from this prediction, because of the existence of social norms. Given experimental economics, a methodology that uses controlled laboratory experiments to study economic questions [13], researchers managed to verify the previous behaviour. Colin Camerer et al. [4] listed and described several economic experimental games, such as the Public goods Game, the Ultimatum Game, the Dictator Game and the Third Party Punishment Game, where players would follow norms during their choices (fairness, for example), sometimes even punishing selfish players. These results may allow researchers to draw conclusions on how social norms influence player's behaviour, however these type of experimental games are still low on immersion. Therefore, we decided to focus on research using video games.

Video games are considered useful tools for psychological research. First of all, they are designed to be engaging and motivating to play. This gives them a leverage comparing to the not so engaging research methods mentioned before. Video games' advantages include the ability to model interpersonal interactions, without having to spend money or time on confederates (when the game has computer-controlled players), the capacity to easily record data (e.g., decision branches, conversation logs) and the possibility of simulating situations impossible or unethical to test in real life. In addition, video games reveal to be much more engaging than traditional research methods, keeping the player focused on the experiment [8].

The use of video games in research is also very beneficial for scientists, especially "Citizen Science" games [2], such as *Fold it* and *Eyewire*. They are defined as a "form of collaboration involving ordinary citizens in scientific research projects to address real-world problems" [2]. Therefore, regular individuals help experts complete their research studies, by participating and contributing actively for their scientific work.

Regarding the economy field, there are a few tools using games that allow researchers to easily conduct economical experiments, such as the *Colored Trails* tool, that allows the configuration of economic experiments, using a non-immersive 2D environment, where players have to decide how to use their resources in order to satisfy their goals [2], and the *INVITE framework*. The *INVITE framework* [3] is a great example of a useful research tool in the form of a video game. Its high level of flexibility allows the configuration of several game theory paradigms, like public goods experiments, in an engaging and immersive environment, since the framework includes a 3D multiplayer video game, called *Volcano Island* [1].

Despite the video games' benefits, they also present several disadvantages. They can be less intuitive to play, meaning that participants unfamiliar with the technological resources used to play the game, may have to spend a lot of time learning them [8]. Also, it can be difficult to obtain valid results in a research through video games, especially if the goal of the research is to study social norms.

So, researchers should focus on experiments using immersive and realistic games to obtain valid results.

Immersion is the sensation of being surrounded by a completely other reality, as stated by Alison McMahan [16]. In a game context, it means that the players are so caught up inside the world of a game, that they tend to "forget" about the real world. Therefore, the main conditions needed to create immersion in a game are [16]: Player's expectations of the game must be similar to the game's conventions, player's actions should have a significant impact on the game environment and game's conventions should be consistent.

One way to assess the levels of immersion experienced by players in a game is to use the IEQ (Immersive Experience Questionnaire) [9]. Alison McMahan also concluded that immersion could be improved by changing the game's perspective. Virtual Reality/first-person games allow players to explore the full game environment by using a non-restrictive camera, which is way more immersive than a god view/isometric perspective.

Online multiplayer realistic video games are perfect to teach players useful social behaviours, allowing researchers to perform experiments concerning social norms as well, given their high immersion and engagement scores. They may provide players with beneficial social skills [5] (teaching or observing other players, leadership, instrumental coordination), or allow researchers to study social interaction, considering that real-life social norms may also be present in a multiplayer video game context. One of the most valuable skills learned in these type of games is "social learning, where a community of players in cooperation learn and master a game" [14], even when the designed game has a different purpose.

Researchers can use serious multiplayer games to study or teach specific social skills. As an example, we have *Infiniteams* [11], a multiplayer online serious game designed to improve leadership skills and team dynamics. All players have to work in team in order to fulfil the game goal, completing several puzzles during their game play. A random player is assigned as the team leader at the beginning of the game, and members of the team have to cooperate to overcome all obstacles within the game.

Furthermore, social norms are often developed within multiplayer online games, such as *The Sims Online* [15] and *Second Life* [22], given the rules and goals of the game. The provided examples are 3D online multiplayer games with rich and realistic virtual environments, where players can create their own customized avatar and communicate with other users via written text. Findings demonstrate that virtual environments are a great tool to study real social interactions. Even when people navigate within a virtual environment using a keyboard and a mouse, they still follow the same social rules of the physical world, which means that we can generalize players' interactions within immersive and realistic games into real life interactions. It should be noted that when researchers want to explore social norms using multiplayer online games, it is valuable to consider that the expressions and animations of the avatar of a player, while reacting to another player following or breaking a norm, are valuable not only to display more accurately the emotions felt by the player, but also to reflect the importance of the norm [7].

3. Game Concept

We gathered and fulfilled the main requirements we needed to create a norm violating game. These requisites were discussed with two professors from the University of Amsterdam, who have been investigating the relation between norm violations and power for a long time now.

First, players should find **opportunities to follow or violate norms** within the game. We agreed that players should be trapped inside a closed space with limited resources available, in order to establish circumstances within the game where they would have to consider whether to obey or break a norm, while interacting with other players. As a result, we classified the game as a survival resource management multiplayer game. Players would have to gather resources in the game in order to survive. The accumulated resources could go to a group stash, shared by all players, or an individual stash, containing the resources held only by the player. This implied that there would be individual and group resources within the game, which was extremely helpful in defining norm violating vs. norm abiding actions. Then, we defined three distinct actions where players could break or follow norms:

- **Resource Collection:** After a player collected resources, they would have to decide how many of the gathered resources they would like to give to the group (group stash) – norm abiding action – and how many they wanted to keep to themselves (individual stash) – norm violating action, if the norm of sharing with the group is perceived with a higher importance (for example, if there is a significant contrast between the collecting behaviour of two players). This could be seen as an adaptation of a public goods game [4].

- **Resource Request:** When a player had no individual resources and low health, they would have the possibility of requesting resources from another player that had enough resources

to help. The player that received this request would have two responses available: accept the request – norm abiding action – or deny the request – norm violating action.

- **Resource "Exchange":** Players could steal or give resources from/to other players without their permission. A player could be really dishonest and steal individual resources from other player even if they had enough personal resources available – norm violating action - or they could be really selfless and give their own individual resources to other players, without having to receive a request – norm abiding action.

Following this requirement, we focused on defining ways to ensure that **norm violations were visible to all players**. We agreed that making a log of activities available to all players, where they would be able to read everything going on inside the game, was the best and easiest way to guarantee the fulfilment of this requirement. Actions such as those mentioned in the previous requirement should be explained in short and insightful sentences, for players to process and analyse within the the game.

Additionally, we decided to consider **engagement and realism within the game**, since we wanted to create a more immersive and appealing experiment in which players could feel like their actions were significant. Then, we concentrated on the game perspective, deciding on a 3D first-person game, since immersion has been shown to improve using this form of game perspective [16]. Following this, we moved on to the plot of the game, intending to create an engaging game narrative. Inspired by an apocalyptic scenario, we decided that infected humans were trying to attack the players and, consequently, they had to stay inside a closed space for an arbitrary number of days in order to survive. That closed space was a bar, and the players were its employees. As time went by inside the bar, players would lose health, so they would need to collect resources in order to survive. Resources were going to be in a specific area inside the bar that we called the dangerous zone, and this area would be full of the infected humans.

As a way to address our research question, we needed to capture enough information about how players felt when they came across norm violating players - **Emotion and behaviour registry throughout the game**.

It was beneficial to define power giving and taking behaviours within the game, since it would allow researchers to infer how a player felt about another player based on the type of behaviour shown. In order to illustrate these behaviours, we needed to introduce the role of the *Leader*. Players would spend an arbitrary number of days inside the bar and, during each day, one of the players would be the leader. When the day ended, the leader would have two tasks to perform, in which they would have to make certain decisions that would, consequently, demonstrate power giving or taking behaviours. The tasks in question were:

- **Resource Distribution:** Following the end of the day, the leader had to perform the task of distributing the collected group resources between all players. If the leader decided to give more resources to a player that violated norms, they might have been showing support for that same player and their actions. On the contrary, if the leader wished to provide less group resources to a norm violating player, they could have been exhibiting a behaviour of opposition against that same norm violator. This task could be seen as a dictator game [4].

- **Leader Assignment:** Following the resource distribution, the leader had to select a player to be the new leader for the next day. If the chosen player violated norms and the leader was aware of their conduct, they were demonstrating that they supported the actions of the norm violator. If the new selected leader did not break norms, the leader could have been showing opposition concerning the behaviour of the norm violator.

Given the described tasks, it should be possible to obtain a big share of information regarding players' emotions. We could link their actions to specific feelings: opposition revealed anger and support showed admiration. Besides that, we could also relate their decisions with power giving or taking behaviours. So, when the leader supported the norm violator, they were revealing a power giving behaviour. In contrast, if the leader opposed the norm violator, they were demonstrating a power taking behaviour.

Furthermore, we wanted a way for players to openly express their feelings within the game. Since this was survival type game, we thought it would be enjoyable to have a place for players to write their survival story. At the end of each day, after the leader assignment, we invited players to write in their **journal**, where they would share how they felt about the other players (performance and behaviours) and also write about the game itself (visuals and mechanics).

In short, players were going to spend an arbitrary number of days inside the bar and the goal was to obtain resources and consume them in order to survive. In the first day, one of the players was going to be the leader. At the end of each day,

the leader distributed the group resources between the players and voted for the next leader. Following the selection of the leader, all players wrote in a journal. Players would have standard actions available, like walking, changing direction and jumping. As defined in the previous section, other actions allowed were related with norm-violating/abiding and power giving/taking behaviours. Players would also be able to write in the journal.

4. Implementation

The defined game was implemented iteratively using *Unity*[1]. It was improved with feedback received during intermediate tests of the game. The final implementation is depicted below.

We created a main Unity scene, where we built the game **environment**, the bar, using 3D assets in order to make the players feel like they were in a realistic bar. We illuminated the space lightly, giving the game a dark and spooky atmosphere. Regarding the player **character**, we used a 3D rigged model of a human, programming the player movement, including animations, and implementing the camera movement in a first-person perspective. We defined the limits of the **dangerous zone** [Figure 1] within the bar area, positioning in this zone the infected humans, as a symbol of danger, and the resources, which were first-aid boxes.

Figure 1: Dangerous Zone with Zombies and Resources

To add multiplayer to the game, we used a *Unity* package for multiplayer games called *Photon Pun*[2], which allowed for reliable synchronization of players' information and actions during the game (resources, name and leader, position, animations, ...). We created a *Start Game Unity Scene*, where players could see all rooms available in the *Photon Server* and join one of them or host their own. When players entered a room, they could see the list of players in that same room. Once the master player started the game, all players entered the game simultaneously.

Regarding player's information, we displayed on top of their screen their **health bar** and **name** and, in case they were the **leader**, the word *Leader* in red above their name. Players could also see this information floating above other players' heads. We also displayed the **countdown timer**, with a *mm:ss* format, and the **current day number**, to indicate the days passing by within the bar. Then, we specified the maximum number of days spent inside the bar and defined the maximum number of seconds in a day, to verify if the day or the game ended. Player's health decreased according with the time passed inside the bar multiplied by a constant coefficient. This coefficient increased, as the days were incremented.

To collect a resource, players would have to enter the dangerous zone, and click on a resource to catch it, given that the resource was close to them and in their field of view. Then, the resource would disappear, being respawned again after a specific time. Players could collect an "unlimited" number of resources within this zone, but "the more resources collected by the player the more health the player would lose". We computed a linear interpolation between the minimum and maximum health coefficients of the dangerous zone, having the percentage of caught resources as a parameter. The result obtained corresponded to the coefficient used to reduce health inside the dangerous zone.

When players left the dangerous zone with collected resources, the **resource collection** menu [Figure 2] would appear on their screen. In here, they had to decide on how many of the collected resources they would like to give to the group or keep to themselves. We opted to limit the number of times a player could collect in a day, given that they could easily catch a lot of resources by entering the dangerous zone several times. Players would be able to see on their screen the **resources collected** within the dangerous zone, their number of **individual resources** and the amount of **group resources**. Additionally, players could **consume** their individual **resources** by simply clicking on the *R key* of the keyboard, and, consequently, increase their health.

Figure 2: Resource Collection Menu

[1] Unity Engine: `https://unity.com/`
[2] Photon Engine: `https://www.photonengine.com/pun/`

Regarding the **resource "exchange"** and **request** actions, we allowed them to be performed only when players were close to each other. For the first action, players had to click with their mouse on another player in order to open the steal or give menu. In this menu, players decided on their action, steal or give, and the respective sub-menu would open according to their decision. Then, they chose how many resources they would like to steal or to give. For the resource request, this action was only allowed when player's health was really low and they did not have any individual resources left to consume. The player in need of help would click on a player to open the resource request menu, and the player that received the request would have a menu displaying on their screen where they had to decide if they wanted to accept or reject the request. All players involved during these transactions would have their individual resources updated. During testing, we found that players couldn't find a reason to perform the resource "exchange", concluding that the resource request action made much more sense, given that if a player had low health and no resources, that same player had a valid reason to request resources. We agreed to simplify these actions, deciding to let players steal/give/request a fixed number of resources instead of letting them choose any number of resources they wanted.

Concerning the **resource distribution**, when the day ended, the respective menu would show up on the leader's screen, while the rest of the players would see a waiting screen, notifying them that the leader was deciding. In this menu, the leader was in charge of distributing all the group resources collected during the current day between all players, seeing all of them on their screen. After distribution, players' individual resources were updated, as well as the number of group resources. After closing the distribution menu, the **leader assignment** menu [Figure 3] popped up for the leader, while the other players kept seeing the waiting screen. In the menu, the leader had to click on one of the other players to be the new leader. After this power giving action, the leader role was updated.

Following the leader assignment task, the display of the **journal writing** menu [Figure 4] would be activated on every players' screen. In this menu, we displayed two panels, one above the other. The one at the top showed everything the player wrote in their journal within the game, while the one at the bottom worked as an input text box where the player could write freely before officially sending it to the panel above. Once a player finished writing, if it was the last game phase, the game would end, otherwise players would return to their initial positions within the bar, having to wait for everyone to finish writing to advance to the next day.

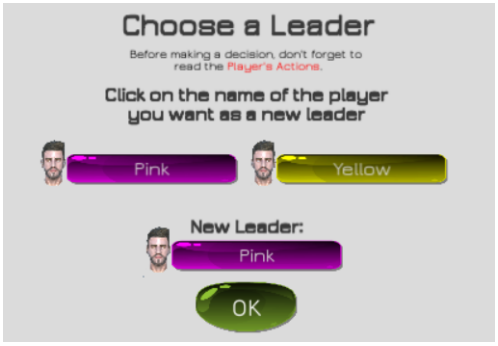

Figure 3: Leader Assignment Menu

Figure 4: Journal Writing Menu

Regarding the **log of actions**, we displayed a scrollable panel in the lower right corner of the screen, available for all players to read [Figure 5]. It included text logs of important game behaviours. As a way of improving their readability, we decided to highlight the logs' key words, using bold and the colour red, choosing also to darken the panel's background colour. We increased the height of the panel of actions and gave it a bold and red title, *Player's Actions*, during resource distribution and leader assignment, making it stand out. This was vital to guarantee that the leader would read the logs before making any decision.

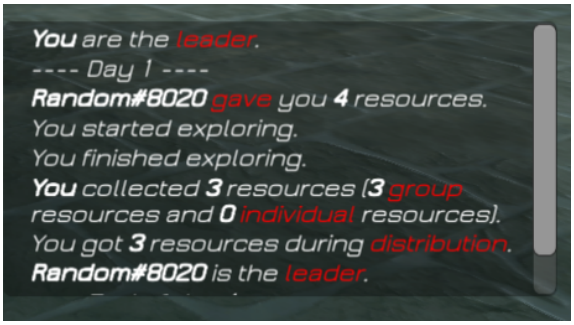

Figure 5: Log of Actions

Furthermore, we saved all game actions into a **database**, using *PostgreSQL* and *PHP*, which would be useful for the analysis of results [Section 5]. Data could be easily exported to *CSV*, and then be imported and analysed in a statistical software tool. The database structure we built was very simple. We had a table to upload all the subjects, which stored the identifier of the player and the room name. Regarding the other tables, we essentially saved every detail of every action happening within the game, including the involved players, the number of resources, and when the action took place (number of the phase).

We also implemented a password-protected **administrator mode** within the game. The researchers could use this feature to have more control of their experiments, being able to be a hidden spectator of the game, which would allow them to verify if players had any problems during their game play (connection issues to the photon server, issues understanding the controls,...) and also to visualize their actions in real time, having access to the log of actions. Additionally, administrators could select any player they wanted to be the leader before starting the match. Moreover, we implemented a way for researchers to be able to configure some game variables, by editing a *JSON* file holding the game configurations, in order to generate different experiments according to what they intended to test. They could control which actions were allowed within the game, which actions were mandatory, the value of each resource and several other parameters.

To guide the players throughout the remote experiments made with the game, we exported our game to *WebGL* and developed a **website**[3] with the following structure: an introduction header with the game name, *Bar Invasion*, a slider presenting illustrated instructions of the game [Figure 6] and also its goal, a first survey which had to be filled before playing, our game ready to play, a second survey containing questions that could only be answered after playing and a contacts section, in case players had any further questions. Our intention was to make the instructions easier to retain, using many illustrations and not a lot of text, to provide examples of every action of the game. Also, players would just have to follow the sequence of the website during a experiment, being this less confusing than having different links for the game and the questionnaires. In addition, since we wanted to easily identify other players within the questionnaires, we randomly **assigned** different primary **colours** to each player, changing the character's t-shirt and name according to their respective colour. In the game menus, we also changed the background colour of each one of the rectangles containing the name of the players.

Figure 6: Game Website - Instructions Slider

We decided to add a **training phase** (phase 0) to the game, where players would have more time to adapt to the controls and mechanics of the game and, simultaneously, take the following phases more seriously. All players' actions and resources would be restored after the end of the practice.

5. Evaluation and Results

Former studies indicate that norm violators can be perceived by others as more powerful. To verify if we could obtain these same results with the implemented norm violating video game, we conducted an experiment with the following hypothesis *subjects perceive norm violators as more powerful and afford them more power*. We tested a game scenario where the participant could engage simultaneously with two confederates that had a scripted behaviour, a norm violator and a norm abiding player. The norm abider would collect only group resources and request resources to the norm violator. The norm violator would collect only individual resources and reject the norm abider's request. The subject would then interact with these confederates within the game. During the experiments, the participant would always play the role of the leader, being selected by the administrator/researcher. We would, consequently, evaluate the subject's decisions during resource distribution and leader assignment to conclude if more power was afforded to the norm abider or to the norm violator. In addition, subjects would have to fill two questionnaires during the experiment, one before playing (demographics, personality and gaming habits) and another one after (immersion, engagement and power perception). In this study, subjects played during two stages, each one lasting 5 minutes. The first stage was a training phase. Furthermore, the resource "exchange" action was disabled during this experiment.

A total of 23 subjects participated in this study, however only 20 were considered for the result analysis, given that only these players reported seeing the denied resource request within the game. This

[3] Bar Invasion Website: `https://web.tecnico.ulisboa.pt/~ist424817/BarInvasionTheGame/`

means that 87% of the subjects that tested the game were attentive to the confederates' behaviour and aware of the norm violations, which was positive. Subjects' ages varied from 18 to 34 years old, 60% of them were male and 85% were students with a bachelor's degree. Most of the participants considered themselves *gamers*, only 20% answering *No*, and 75% of them admitted to playing frequently.

We obtained a mean score (μ) of 3.054, s = 0.523, for immersion and engagement within the game (scale: 1-5). The immersion and engagement scores were average, however most of the players felt at ease with the game controls. That being said, given the immersion ratings, we cannot state that subjects cared about the outcome of the game or that they were emotionally involved in it, therefore we can't really guarantee the validity of their decisions within the game. Concerning subjects' social presence (scale: 1-5), we obtained a mean score of 3.183, $s = 0.637$ for empathy, a mean score of 2, $s = 0.346$ for negative feelings, and a mean score of 3.7125, $s = 0.386$, for behavioural involvement. This last component presented a favourable score, meaning that subjects were aware of other players' actions and that these actions probably influenced their own behaviour.

Then, given our hypothesis, we focused on *Power Affordance* and *Power Perception*.

We measured power affordance using two in-game variables, leader selected during Leader Assignment and resources distributed to norm violator and norm abider during Resource Distribution. We verified that 35% of the subjects selected the norm violator as the Leader. We performed a binomial test, given we had only one categorical variable, testing whether the proportion of norm violators selected as leaders was more than the test proportion 0.5, $p = 0.942$. During distribution, the norm abider ($\mu_a = 11.6$ and $s_a = 5.844$) received more resources than the norm violator ($\mu_v = 8.95$ and $s_v = 7.141$). A *Wilcoxon Signed-Ranks Test* indicated that more resources were given to the norm abider (mean rank = 8.60) compared to the norm violator (mean rank = 4.75), Z = -2.109, $p = 0.035$. Then, we obtained a significant (0.35 <0.05), but unexpected, result, given that the norm abider was favoured instead of the norm violator.

Concerning Power Perception, we analysed the responses obtained from a perceived social power questionnaire (scale: 0-5) answered by the subjects about the norm violator ($\alpha = 0.910$) and the norm abider ($\alpha = 0.935$). Power ratings were higher for the norm abider ($\mu_a = 2.115$ and $s_a = 0.986$) compared with the norm violator ($\mu_v = 1.985$ and s_v = 0.843). This test did not show a statistically significant difference between power perception regarding both confederates, $p = 0.467$.

Overall, these findings were not consistent with what has been found in previous studies about norm violations and power, therefore we could not prove our hypothesis. One possible reason for the previous results was the asymmetric design of the study. After testing, we verified that the norm violator's behaviour was very selfish, contrasting extremely with the norm abider's conduct. If we only allowed the resource collection task (collect only individual resources or only group resources), the experiment would have been much more balanced. However, when the norm violator rejected the norm abider's request, not only this increased the selfishness factor, but it also showed participants that the norm violator did not care about the other players.

Additionally, we decided to evaluate subjects' performance within the game, by considering the in-game variable *resources collected* as a performance measure, obtaining a mean of 24.95 resources, a median of 21 resources and a high standard deviation of 24.063. We differentiated players between two equal-sized groups: low performers (less than 21 resources) and high performers (more than 21 resources), in order to see if there was any correlation with performance and the choice of the leader. A *Chi-squared Test of Independence* showed that there was no significant association between performance and leader choice, $p = 0.639$. Furthermore, regarding subjects' personality, players were ranked in openness to experience (O), $\mu_O = 3.45$ and $s_O = 0.583$, conscientiousness (C), $\mu_C = 2.95$ and $s_C = 0.647$, extroversion (E), $\mu_E = 2.9$ and $s_E = 0.926$, agreeableness (A), $\mu_A = 3.55$ and s_A = 0.510, and neuroticism (N), $\mu_N = 3.3$ and s_N = 1.117, using a small Big Five Personality Test [17] (scale: 1-5). Similarly to the previous section, we were interested in verifying if there was a relation between the participants' personality and the leader choice. A *Point-biserial Correlation* showed no statistically significant correlations between these two variables. The lowest *p-values* obtained were for Conscientiousness (positive correlation, $r = 0.308$, $p = 0.187$) and Extroversion (negative correlation, r = -0.383, $p = 0.095$). Even though no significant correlation was found, perhaps with the full Big Five Personality Test, we would find significant results.

For further information about subjects' decisions, we decided to analyse the data of the journal. We managed to find 10 subjects who wrote about the other players in their journal. The rest of the subjects had to be excluded from the journal analysis, since we were not able to extract anything from their journal content, given that they did not acknowledge other players in there.

We determined the main feelings, from the 10 players we considered, present in each journal, find-

ing more negative feelings (anger, disgust, frustration, fear) than positive feelings (admiration). We verified that 90% of these subjects showed *Negative Feelings* regarding the norm violator, mentioning that this player was "mean. He ain't saving no one." or that the player was "an a**hole who keeps everything for himself", which revealed *Anger* and *Disgust*. In addition, 40% of these participants demonstrated *Negative Feelings* concerning the norm abider. One of them was "worried about him", showing *Fear*, however the rest felt *Frustration* about the player's performance ("needs to keep some for him and stop asking", "still doesn't consume the medicine", "press R to heal...!"). Concerning the *Positive Feelings*, only 20% of the 10 participants showed *Admiration* regarding the norm abider ("only tries to help the others without thinking about himself", "shared all resources with group").

We also asked subjects to choose the leader one more time in the questionnaire and justify their choice. 45% of the participants would choose the norm abider as leader: 30% felt the norm abider was less selfish than the norm violator ("since he offered his resources to the team"; "we cared for the group", the norm violator "sucked and hoarded the items"); 10% did not justify their choice; 5% felt sorry for the player's performance ("so that he can decide how to distribute resources best, given that he couldn't find a way to get many of them.").

30% of the participants would choose the norm violator as leader, since these subjects felt the player was more skilful than the norm abider ("he knew more about the game than" the norm abider; "the action of rejecting the" norm abider's "request showed he was assertive").

20% of the participants would choose themselves as Leader: 10% said they had the fairest behaviour of the group; 10% felt the norm violator was selfish and that the norm abider was incompetent (The norm violator "kept the resources all to himself and" the norm abider "doesn't keep any for him and almost died"; The norm violator "is selfish and" the norm abider "is dumb and always almost dies").

During the previous text analysis, even though many subjects mentioned the selfishness of the norm violator, some of them perceived the norm violator as more skilful and the norm abider as a poorly performing player, choosing the norm violator as leader. Therefore, within the game context, we believe that players who violate the norms might be seen by a few subjects as more experienced and knowledgeable compared to norm abiders, and, consequently, worthy of power.

6. Conclusions

This research aimed to define and develop a computer game tool addressing the following research question: *When, why and how norm violators gain or lose influence?*

We implemented a first-person 3D resource-management multiplayer game called *Bar Invasion*, where players were presented with opportunities to follow or violate norms, during actions involving the collection, exchange and request of resources. These actions were visible for all players in an action log displayed on each player's screen. Within the game, we also introduced the role of the *Leader*. The leader was responsible for distributing resources between players and selecting the following leader. The decisions made during these two actions could convey power giving or taking behaviours concerning the other players. In addition, we implemented a journal inside the game, where players could write freely. These game features would allow researchers to create norm violating scenarios within the game, as an attempt to find responses to the mentioned research question. Moreover, several game parameters could be configured just by altering a *JSON* file, which would let researchers conduct their desired experiments according to their focus hypothesis.

In this paper, we also intended to validate how the developed game tool would behave in a scenario where a subject was confronted with a norm violator and a norm abider simultaneously. Prior studies reveal that norm violators are perceived with more power, and can even be afforded more power than norm abiders. Then, within the game context, our hypothesis was: *Subjects perceive norm violators as more powerful and afford them more power.*

Attempting to prove the previous hypothesis, we conducted an experiment where one confederate would violate norms, other confederate would follow norms, and the subject would decide who to give power to. The results obtained with a sample of 20 valid participants did not confirm our hypothesis, given that 65% of subjects selected the norm abider as leader and there was a significant difference ($p = 0.035$) during the resources distributed to both confederates in favor of the norm abider. Regarding power perception, the norm abider obtained higher ratings of power, however this difference was not significant. These results were explained by the asymmetry of actions of both confederates, given that the norm violator's behaviour was too selfish, causing an unbalanced experiment. Regardless of that, during text analysis we could still find interesting results, highlighting the fact that a few players associated norm violations with having more skill and experience within the game, and, consequently, with being more deserving of power.

Although we did not prove our hypothesis, we believe that the created game tool has potential to be used in the study of responses to norm violations, given that most subjects were aware of the norm violating actions happening inside the game. Nevertheless, there is still a lot of space for improvements.

First, another study should be conducted using a balanced scenario and having the current hypothesis of this dissertation as a basis. Then, we believe that using a full version of the Big Five Personality Test will possibly provide interesting results when verifying if there is any relation between personality and leader choice. Moreover, we suppose it would be interesting to allow researchers to add instructions within the game, highlighting certain norms, in order for them to study other hypothesis. Following this, we suggest the implementation of a configuration interface, as a replacement of the configuration *JSON* file, which could only be accessed by game administrators. At last, we agree that adding computer-controlled characters to substitute the confederates would be extremely useful in terms of time consumed training and waiting for confederates' availability.

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