Can the Environment be Used to Reliably Manipulate Players Moral Decisions Within Video Games?

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Abstract—Previous studies show that priming definitely exist within the games industry, these focus primarily on environmental storytelling whereas little to no research has been done into how developers can use the environment to manipulate the decisions players make in games. This paper aims to fill the void and provide developers with a whole new method of influencing the players moral decisions and potentially increasing enjoyability in games.

I. INTRODUCTION

PRIMING is the memory effect whereby exposure to one stimulus influences responses to a later stimulus, used a lot in psychology to train the mind [1]. The most common priming methods used are; perceptual, the modification of sensory information []; semantic, which is the use of linguistics [2]; or conceptual, the process of exposing people to stimuli to activate associated memories [3][4]. However there are many more.

In the video games industry we most frequently encounter perceptual priming, as designers work to encourage and guide players using environmental storytelling. Games use various things such as lighting and markings to subtly highlight key areas to the player, the goal is to push them in a certain direction and making them believe it was entirely their own idea [1] [5] [6]. Many experiments and studies conducted outside of the games industry [7] [8] have found that there are a lot of variables that affect peoples ability to make decisions which would lead us to believe similar circumstances in games too. With this paper we aim to find out whether we can use the environment to manipulate players moral decisions inside of video games.

In this study we aim to find out if perceptual priming methods can be used to manipulate players moral decisions within a virtual environment. The study looks at various methods of priming and how to measure the effects therein as well as the real world benefits of priming and how it may be used in a negative manner. Following this we will conduct an double blind A—B test using two different visually styled environments which have been hand crafted to try and influence players mentalities. All data recorded will be completely anonymous so as to not impede players decisions and jeopardize the experiment.

II. LITERATURE REVIEW

The focus in this paper is the manipulation of moral decisions within video games, however as there is very little previous research into this area the majority of the literature review will be looking in to other methods of influencing people and players. We will be looking at existing research both inside and outside of the games industry starting with environmental story telling in Subsection II-A, followed by the negatives effects of priming within violent video games in II-B. Section II-C will be where we look at previous research done into influencing moral decisions and the factors that affect the way people make those decisions. This will be primarily focused outside of the games industry as this is where the majority of the relevant literature can be found. "Subtle and subliminal suggestions placed over a period of time have a more positive and long-lasting effect in embracing innovation." [9].

A. Psychology of Priming

There are various methods used to measure the effects of priming such as the word-stem completion and word fragment tasks which are used to measure perceptual priming. Priming effects can be observed during word completion tasks which give participants words with letters missing or mixed up if the words produced are less novel [10]. A method of measuring conceptual priming is the lexical decision task which has participants decipher whether a string is a real word or made-up. Priming can be observed here when a participants are faster to recognize the word yellow when proceeded by the word banana for example [11]. Priming works most effectively when two stimuli are used within the same area but can also be used across multiple modalities as well as between semantically associated words such as health and hospital. Priming is believed to play a huge role in stereotyping because attention to an idea increases the frequency of the idea even if undesired [12].

1) Priming Types

Positive and Negative priming refers to when priming effects cause a distinct increase or decrease in the speed of processing in the human brain [13]. Positive priming is simply experiencing the stimulus and most commonly occurs without being consciously seen [14]. Whereas negative priming is the act of experiencing the stimulus and then choosing to ignore it. Positive Priming occurs by spreading activation which generally means that the stimulus activates a specific

representation in the mind prior to carrying out a task, when more stimulus is encountered is becomes easier to influence the action. However it also becomes increasingly riskier that the subject would become consciously aware of the stimulus [15]. Negative priming is most widely regarded as when the activation of a stimulus is inhibited by the brain, also known as the distractor inhibition model [13].

Perceptual priming is when the items take a similar form to the subject being primed, and is usually enhanced by the match between both the early and later stimuli. The most common example of perceptual priming is the word-stem test which is frequently used by psychologists, who would ask the patient to identify an incomplete word. Studies show evidence of priming even with distinct size differences between stimuli e.g. longer or shorter words. [16]. Conceptual priming is quite similar however is based on the meanings of the stimulus, for example one could find priming effects on the words foggy and rainy because they are both categorically similar. Repetition priming is also quite common and as you can imagine consists of repetitively exposing a subject to the same stimuli and therefore later exposure would be processed by the brain much quicker [17].

Kindness priming is a specific form of priming that occurs when users experience kindness and are therefore subconsciously kind to other people. In addition to being primed easier to future kindness the people may experience an increased resistance to negative priming which is unique to this type [18]. Semantics is the study of the meaning in languages such as words that mean the same thing yet may feature subtle shades of meaning. Semantic priming is where the prime and the target are from the same semantic category like piranha and cod are both types of fish. When a subject is asked to think of something from a certain category their brains are stimulated by other similar items [19]. Auditory priming is where the is probably something we all experience daily, the effect that sound has on us and how it primes the emotions we feel [20]. For example if you hear rain on the window at night a low of people have been primed to find this soothing and therefore find it easier to sleep. Studies have shown people who were primed with sleep related words claimed they slept for longer than those who were primed with neutral words as well as experiencing a lower resting heart rate [21]. For this experiment we will be looking at using both Conceptual and auditory priming methods in order to sufficiently immerse players and influence their decision making.

2) Real World Uses of Priming

Psychological priming has long been used to aide people who suffer from brain injuries however results have proven to be quite varied. A recent study discovered that in healthcare nurses could be encouraged to perform safety behaviours by priming them with safety words within their change of shift reports [22]. Experiments conducted on amnesia patients have produced mixed results, commonly dependant on the type of priming being used. These patients struggle to remember everyday facts or events from their daily lives, however they perform equally as well as healthy patients when using perceptual priming but express difficulties when partaking in conceptual priming activities [23]. Studies show
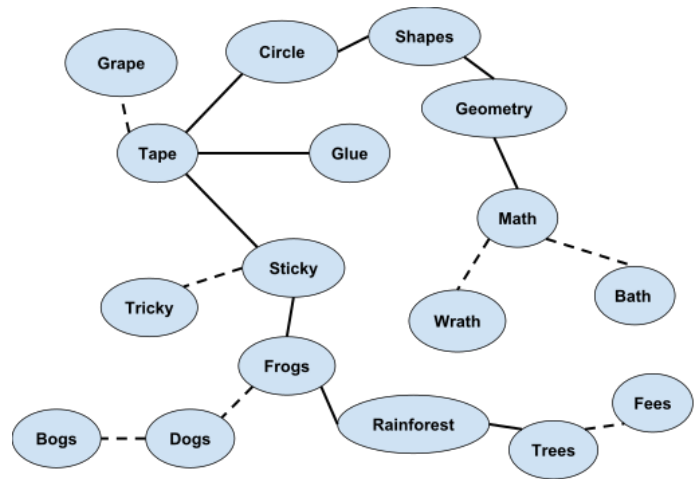

Fig. 1. Imagine depicting a web built from various types of priming.

that when Amnesic patients were asked to complete a word-stem test using the first word that came to mind they were more successful than when they were asked to remember a specific missing word. It is believed that the part of the brain that controls priming is completely separate to the part that supports explicit long term memory and therefore these tests can prove inconclusive [24]. One of the first successful use of semantic priming was used on stroke patients who suffered with Aphasia which is the inability to comprehend or formulate language. Baum conducted an auditory lexical decision task discovered that words were responded to faster when preceded by a rhyming word and similar nonword primes [25]. Possibly the most extensively studied use of priming is with patients who suffer from dementia, specifically Alzheimers disease. Ober *et al* provided patients with a mixed set of words and nonwords and found that they were able to better identify and pronounce a word if it was preceded by a context related word and were able to use this to help patients both remember words and pronounce them properly [26] .

B. Influencing Decision Making

Literally everything we experience from the moment we are born influences the decisions we end up making later in life. Every day we are inundated with decisions, big and small and understanding how we arrive at those decisions comes from an area of cognitive psychology which is receiving a lot of attention [27]. Significant factors include past experiences, various cognitive biases, escalation of commitment and sunk outcomes and individual differences such as age and economic status. It stands to reason that if a decisions comes with a positive result then people are more likely to decide in a similar way if placed in the same situation. However on the other hand people are naturally going to avoid repeating past mistakes or decisions that have negatively impacted them [28]. For example, in financial decision making, people invest based on the information they are provided with and choose to disregard past experiences even if they were positive which is contrary to what one would expect [29]. There are also several cognitive biases when making any decision, these are thinking patterns

Fig. 2. Scenes showing structural composition patterns

based on observations and generalizations and may in fact lead to inaccurate judgments or faulty logic [30]. Cognitive biases may include; belief bias, over dependence on preexisting knowledge, hindsight bias, the belief that an event is inevitable [31][32]. People who rely too heavily on cognitive biases tend miss out on the bigger picture and dismiss the information being presented to them. This can result in poor decisions, however cognitive biases allow subjects to make efficient decisions with the help of heuristics [32]. Juliusson *et al* suggests that some people make decisions based on irrational escalation of commitment which essentially means that when people put a lot of time, money or effort in to something then tend to continue making riskier decisions as they feel responsible for the sunk costs. This is also known as being to far in the hole [29]. Various individual differences may also influence decision making. Research indicates that cognitive functions decline as we grow older, therefore decision making may also see a decline in performance, however its commonly believed that older people tend to be more wise as they have all the past experience and therefore make decisions effectively [33] however this could still suffer from the previously discussed cognitive bias issues such as missing the bigger picture. In regards to age, there is evidence to support the belief that younger people prefer more choice than older people [34]. Age is only one of many unique differences that make us human and directly influence the way we make decisions.

C. Architecture & Environmental Story-telling

Fig. 3. Fallout Series renown for their impressive story based environments

Possibly the best example of using the environment to lead people can be found in various theme parks around

the world, most notably Disney's theme parks [6]. Disney uses an architectural method known as weaning points, which are designed to attract visitors attention from a distance and encourage them to visit. An example of this is the space mountain ride which features a towering vertical structure which projects way above the horizon and can be seen from basically anywhere in the park. This method is also very commonly used within video games as you can see in **Fig 2**. [5] [35] At a GDC talk back in 2012, Lemarchand [36] spoke about how effectively Naughty Dog managed to use weaning points to influence the way people played their games. For example in **Fig 2 image 4** you can see how the Uncharted games moulded the landscape in the scenes to try and subtly push the player to take certain paths towards a weaning point. Carson[37] has worked theme park and video game designer and he believes "One of the trade secrets behind the design of entertaining themed environments is that the story element is infused into the physical space a guest walks or rides through." This appears to be a re-occurring theme within environmental design. The Timeless Way of Building [38] suggests that there is one powerful method for building and by following this you can create environments which feel genuinely alive and that is to build around the stories of the people who live there and over time they will become as beautiful as any town in history. We could definitely see the link between this and what Carson suggests, it is important for the environment to tell a story too as this is what makes people feel so immersed within the worlds you created. Once a person is truly immersed within your world it becomes incredibly easy to influence and manipulate the way they feel and the things they do without ever explicitly telling them to do so. If it is possible to influence the path people choose to take using environmental cues, one could begin to wonder how far you can influence people using similar methods.

1) Environmental Priming

Psychogeography is the study of the relationship between ones surroundings from our everyday lives and the effects those places have on our minds. Collin Ellard, a cognitive neuroscientist, believes that on some level everybody is aware that where you are influences what you do and how you feel [39]. When you think about it, everyday we are bombarded with countless options even so simple as when to get out of bed or which route to take to work. A lot of these choices we actively make as we know the logical answer, however some of these choices can be quite tough and we often end up making

the decision based on environmental cues around us [40]. Chu suggests that we can in fact design our environment to help us, meaning by simply changing our surroundings we can completely change our lives. For example you may leave your work far away from your desk therefore your mind thinks it is okay to procrastinate. Studies have shown different peoples activities are maybe a cause of the physical area around them and other people in the same area may show similar traits. Davison and Lawson conducted dozens of studies [41] to find the environmental influences on children's physical activities in an attempt to find why so many young people do not meet the minimum physical activity guidelines. One study found that students with shorter walk times to school or students who travelled through areas with sidewalks on main roads were more likely to walk or bike. Other studies suggested: number of parks, number of indoor play areas, lower reported crime rate and simply the weather all impacted how much physical activity was done.

Further to this is the study performed by Mary Jo Bitner [8] which found that the employees tended to perform better and be generally happier if they were in an environment that they found physically appealing, this includes the physical design and decor elements. They also discovered that customers were positively affected by the atmospherics of stores, because consumers subliminally look for cues in their environment to help them piece together the companies overall image and the quality of their products which inevitably impacts the customers overall satisfaction [40]. It is fairly common knowledge that managers tend to rearrange stores frequently in order to try and push products on to its customers, they put sale items right by the door to pull customers inside. By first making changes to your own environment, you can influence the way you act in future and make seemingly hard tasks a lot easier. These changes may seem small at first but if you make incremental improvements to your surrounding it becomes much easier to do what needs to be done, "Having a better option within reach makes it become the better choice"[40].

Jim Brown is a video game designer with 20 years of experience, currently working for Epic Games [42]. Jim introduces us to various new concepts within game design, such as the paradox of choice which suggests that humans would be happier with less choice in their lives. Many games studios use a concept known as the illusion of choice, which is essentially where they manipulate players into making a certain choice while tricking the player in to believing it was their own ideas. They use various priming methods to do this, specifically conceptual and auditory [22]. Bethesda Studios purposefully evokes overwhelming emotions in their players by using the illusion of choice and it works like magic. Most of the illusion is heavily impacted by pacing and focusing in games. Another key concept Brown discusses is the Availability Heuristic which is the idea that things that are more familiar to you are easier for you to believe in or like. This concept is based heavily on the psychology of priming, are brains are constantly trying to build connections between knowledge in our brains and things we experience frequently build more and more connections. Game developers use this to essentially push players to enjoy their games
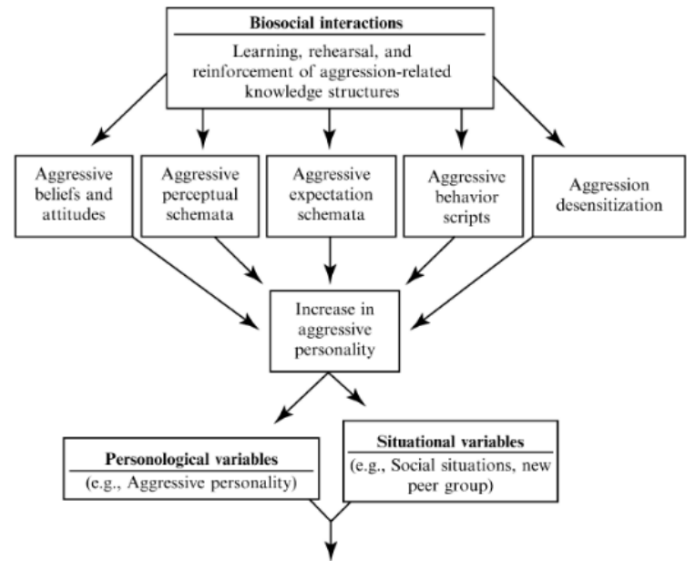

Fig. 4. Long-term changes in aggressive behaviour under the GAM [44, p45]

more, for example in a lot of RPG games you will usually end up in a sewer beneath a city fighting rats etc, this is because even though these experiences may not sound fun: they actually are because our brains keep referencing them as fun experiences as familiarity breeds enjoyment. The sunk cost is a concept we discussed previously but is essentially once we make a decision our brains immediately become invested in the outcome and therefore we continue working towards the expected outcome [42][29].

D. Priming in Violent Video Games

In recent years there has been an ongoing controversy about how video games make people violent in there every day lives, some going so far as to say they are the cause of several mass murders. Clearly this is not the intention of games developers so if it is in fact true, they are unintentionally priming people into becoming more violent in later life. There are hundreds of news articles hinting that video games are initiating various attacks and murders and some out right blaming them, yet there are many studies claiming the opposite. The General Aggression Model (GAM) is a comprehensive framework for understanding aggression and it insists that the depiction of aggression in video games primes users to act out these aggression related concepts [43].

David Zendle recently performed two experiments which investigated whether priming effects were still apparent within video games of which he found to be not true [45]. However with so much literature showing that priming affects almost every aspect of our lives, it seems ridiculous to imagine that we are not influenced by anything in our virtual environments which is what this paper aims to prove. Zendle did in fact find that novel negative priming was observed in both studies, this is when exposure to a specific concept inhibited players reaction experiences related to that concept. We could argue that previous studies in to the influence of colour would sug-

gest as the colour red has been known to prime failure would also suggest similar traits in the video game environment [46]. For many the video games first became an issue as far back as the 1992 West Paducah school shooting which saw a 14 year old boy walk into his school and open fire on his peers. There is no argument that violent video games that include a lot of blood can inhibit young players minds, this would backup the various news articles that make these claims [47]. Although these observed priming effects could also be the victim of a false positive as you could blame it on the gun problem America suffers from [44]. Zendles studies suggests that while priming related effects within video games may be observed they may also be heavily overstated. Over 3000 adolescents (50% split between male and female) participated in a study conducted by Zhang [48] revealed a number of them exhibited strengthened aggression levels after playing violent video games specifically in boys, similarly to how boys were impacted more by the colour red[49]. Zhangs studies seem to find evidence of various priming methods previously discussed here, predominantly semantic priming. When users play a first person shooter for example they are being subconsciously primed to kill as they have a gun in their hand which is a tool directly related to death therefore they both share the same category. Dittrick's [50] research discovered childrens preferences for mature content were distinctly related to their perpetration of bullying. All of these studies seem to predict the outcomes we expect to get from this study, as they found that users who player cutesy friendly games where less aggressive than those playing violent or riskier ones.

III. METHODOLOGY

The hypothesis drawn from this question can be found under Section III-A. To determine the required participant sample size, a a-priori power analysis was performed using G*Power statistical test for the means with two groups [51], an effect size of 0.8 was chosen as this would provide a large enough difference to notice an impact on players. I could have also used a slightly lower effect size such as 0.7 or 0.6 however this increased the sample size significantly to almost 100 which would not be plausible in the given time frame for this study. The final result gave us a minimum sample size of 52 participants. The play-testing sessions were conducted mostly in person using students and staff from around Falmouth University, however some users will be selected from outside of the University also. All participants received the same game as well as instructions, the only difference being the small environmental variations. The vast majority of participants will be selected from game development backgrounds which, however we will be actively seeking out players from various walks of life to provide a more varied and realistic analysis. If all participants were chosen from one area then the results may not be representative of real world scenarios. Kao & Harrell conducted a similar experiment which explored the impact of avatar colours on game experiences which showed that blue avatars led to higher immersion [52], competence and overall better game-play over the use of a red avatar. The study also looked at other variables such as gender which indicated that

the effect seemed weaker in females, this is consistent with previous literature which indicated that red is a more impactful colour on males [49][46]. This experiment seeks to emulate Kai *et al* in an attempt to determine if more advanced methods of priming than just a colour changes can influence player decisions.

A. Research Question

The research question that this paper aims to answer is: Can the environment be used to reliably manipulate players moral decisions within video games. There is a lot of existing research in to priming moral decisions in the real world as well as how our surroundings influence our lives, however when looking into this area in a video games scenario the main focus appears to be on using environmental storytelling to guide the player. Here lies a potential gap in the literature as there is little crossover research into how our virtual environment affects the decisions we make in video games. The psychology behind using subtle in game cues and priming effects to manipulate users is fascinating and this is the core motivations behind this paper.

B. Hypotheses

Table I shows hypotheses we will be testing during this experiment, which will be based on previous related research conducted both inside and outside the video games industry. The methodologies I will use to test this will be a A—B double blind play-testing session. This experiment will be using human participants and as such it is required that I receive ethics approval for both parts of the test, which was gained from the Falmouth University Research Ethics Board. Players were placed in the same level but saw different versions which we will call the positive and negative variations, following which they were given a questionnaire about their experience. The game used was a voxel based hack and slash with RPG elements created by a student team from the University Games Academy.

C. Play-testing

The purpose of play-testing is to put the game in the hands of players to obtain individual subjective feedback on the product, this is more than just a bug report [53]. Play-testing is vital for this experiment as it is the only viable way to measure the hypotheses determined above. For this experiment there are two different variations of the game that can be seen in Table I, each with a different visual style; positive & negative. At the start of the game a random number generator was used to assign the player with a moral score, which in turn would determine which variation they were presented with. The participants where asked to play the game for as long as they wanted. The game would log which variation of the game they used and record their in-game activities, specifically the moral choices they make. For example we would be able to see if the player is being violent based on the amount of civilians they attack or if they make negative moral decisions and we could use this to make connections to their environment. All

TABLE I
HYPOTHESES

	Hypothesis	Null Hypothesis	Data Collection Source
1	When players are primed by a positive environment they will be more likely to forgive the opponent than to punish them.	When players are primed by a positive environment there will be no difference in how they respond to an opponent.	Game Data
2	When players are primed by a negative environment they will be more likely to punish the opponent than to forgive them.	When players are primed by a positive environment there will be no difference in how they respond to an opponent.	Game Data
3	When players are primed by a negative environment they will spend more time engaging in negative activities.	A negative environment will have no impact on how long players spend engaging in negative activities.	Game Data
4	Virtual environments will effect the number of times players die.	Virtual environments will not effect the amount of player deaths.	Game Data
5	Players become aware that they are being primed by an environment.	Players are unaware that they are being primed by the environment.	Questionnaire Data

of this data was then exported to a .CSV file and analysed using the R statistical package in R Studio. Following the play test users were asked to complete a short questionnaire about their experience. The questionnaire was used to to determine whether the user may have been aware that they were being manipulated which could affect the integrity of the data. This also helped us to determine their player types.

D. Questionnaire

Along side the play-test, participants were asked to fill out a simple questionnaire on their experiences using Google Forms, which features the ability to export that data into many usable formats. Nordin *et al* [54] explains that questionnaires are vital for assessing player experiences because they are both; easy to deploy and provide a standardized test for quantifying specific aspects of the experience[54]. Nordin insists questionnaires are a useful technique that allows participants to convey their thoughts and feelings albeit within the within the framework of the questions. They also give some form of consistency and uniformity to the collected data[54] and could prompt participants to discuss issues they may not have otherwise mentioned. For this study we could have used one of many preexisting questionnaires or created one tailored to the experiment and its hypotheses. Preexisting questionnaires come with the benefit of being thoroughly tested to measure players experiences during play testing, these include; Immersive Experience Questionaire (IEQ) and the Gaming Engagement Questionnaire (GEQ). The IEQ uses 5 point Likert scale questions [55] to measure player experience, focusing on the notion of immersion in games which would be useful for this experiment as to effectively prime a player they need to be somewhat immersed within the environment [38], [56]. There are many issues with using preexisting questionnaires, first and foremost being that a lot of them are not readily available to the public as well as them potentially not being as thoroughly tested as expected. Another key issue is that they may ask irrelevant questions to the experiment being carried out and therefore researchers could struggle to see what data is supposed to be collected. The vast majority of data collected in this paper are quantitative data from play-testing, however some hypotheses require quantitative data

on player motivations so a questionnaire is needed. For this paper we will be using a combination of the pre-existing Bartles Player Type Instrument [57] and Yee's Taxonomy [58], [59] as well as a small questionnaire which we will use to see if participants were aware of the experiment or that they were being manipulated which is important as this could drastically affect the end results. The official description of the original four Bartle Types [57] was based on the observation of users playing together in a Multi User Dungeon (MUD) and states that there are four distinct play style interests; Killers, Achievers, Explorers & Socializers. Bartles player types are among the earliest and simplest and has been is proven to be both most frequently referenced and most enduring to use [60], as such it is no surprise that they are still the most commonly used even after more advanced models have been created.

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