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Chapter

AN INTRODUCTION TO GAME TRANSFER PHENOMENA IN VIDEO GAME PLAYING

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ABSTRACT

The study of Game Transfer Phenomena is in its infancy. GTP have been conceptualized as a new area of research into video games' effects. Research into GTP attempts to understand how video game experiences are transferred to the real world and the consequential psychosocial, cognitive and physiological effects by exploring players' mental processes, sensory perceptions, and behaviours. This chapter introduces and overviews Game Transfer Phenomena (GTP) studies and examines how the GTP may contribute to the understanding of the most undiscovered places of the human mind. A number of key question are answer in this chapter.. What are GTP? What types of GTP have been identified and how do GTP seem to work? What games have been associated with GTP? What benefits and potential venues do the GTP studies offer? The authors' conclusions and hypotheses to explain GTP experiences are supported by a review of literature, and by examples of

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video game players' experiences. The transfer of video game experiences into the real world have been clearly identified in players' experiences collected in GTP studies to date.

AN INTRODUCTION TO GAME TRANSFER PHENOMENA IN VIDEO GAME PLAYING

> "When players see, hear, feel or interpret the real world based on video games' content, they are recreating, transforming, and aligning elements from the game into the real world 'puzzle'" (Ortiz de Gortari, 2011).

There is a long history of human beings trying to enhance and alter their senses artificially. As humans we have always done this in different ways. For instance, we can do it easily when we walk through crowds wearing headphones and enhance the panoramic view with our favourite music. To date, playing video games has been recognized as one of the most popular ways to enhance the senses, and has been associated with altered states of consciousness (Brockmyer, et al., 2009; Wood, Griffiths and Parke, 2007). Furthermore, it has been considered as a meditative experience that requires certain levels of attentional absorption (Gackenbach, 2008).

Playing video games requires users to respond to synthetic and hyperactive stimulus (e.g., colour, shape, sound, flashes, etc.) that are repeatedly presented in a particular way. When players disembody the physical body and embody a virtual representation in the virtual world, some sort of cognitive dissonance occurs (Murray and Sixmith, 1999). On one hand, players engage in the manipulation of different stimuli in the virtual platform while at the same time their bodies remain relatively immobile (Murray and Sixsmith, 1999). However, this does not imply that players do not experience physiological responses due to their virtual immersion (e.g., Wang and Perry, 2006; Hébert, et al., 2005). Players may get immersed, experiencing psychological absorption where the individual's integration of thoughts, feelings and experiences are suspended (Funk, et al., 2006; Wood, Griffiths and Parke, 2007).

Contemporary video games offer high levels of realism. Furthermore, they provide additional sensory information that facilitates a player's immersion in the game (Blascovich and Bailenson, 2011). The gaming field has witnessed the progressive implementation of augmented reality and the gradual introduction of 'controller-free gaming' based on advanced tracking systems.

Nevertheless, we are still dealing with primitive technology that does not yet offer players full body immersion. If some players are seduced by very 'primitive' technology that results in game transfer experiences what happen when technology becomes more immersive? In what ways our brain will organize, assimilate and adapt to advanced technological experiences in competition with reality? Evidence suggests that people will react in similar ways to virtual environment as to real ones. Typically, with optimal simulations the brain fails to make the distinction between reality and virtual reality (Blascovisch and Bailenson, 2011; Turkle, 2011; Dill, 2009). Game transfer experiences (described in more detail below) appear complex in nature. Players see, hear, and interpret, the real world in terms of the game as a result of their high engagement in video games. When players see, hear, and feel the real world based on the content of video games, players appear to be merely creating, transforming, and adapting components of their previous video game playing experiences into the real world 'puzzle'. As Blascovish and Bailenson (2011) point out, "humans are neurophysiologically wired to interpret sensory stimulus according to previously established expectations" (Blascovisch and Bailenson, 2011; p.17).

Today, many virtual experiences have become a matter of emotional touch, evoking not just sensations but lasting emotive imprints, which for some players hold many of the same characteristics as memorable real life experiences (Ortiz de Gortari, 2007). Therefore, it has become important to understand whether players' experiences in the virtual world can be transferred to the real world, and what psychosocial, cognitive and physiological effects these experiences might have. This has led the authors to examine what we call 'game transfer phenomena' (GTP).

Studies into GTP are in their infancy, and we are still in a somewhat descriptive phase. This chapter constitutes an introduction and overview into the study of Game Transfer Phenomena. The chapter provides an overview of game transfer experiences, and examines how the GTP may contribute to the understanding of the most undiscovered places of the human mind. A large part of the chapter is based on the findings of (i) the first GTP study conducted with 42 young frequent video game players (Ortiz de Gortari, Aronsson, Griffiths, 2011) and (ii) an ongoing study by the authors that has collected GTP experiences from over 2000 video game players in online gaming forums. Some of the questions that will attempt to be answered in this chapter are: What are GTP? How do GTP work? Why is it important to study GTP? What types of GTP have been identified? What games have been associated with GTP? What benefits and potential venues do GTP studies offer? The

chapter is divided in three main parts. In the first part, GTP and its antecedents are defined and explained. In the second part, each type of GTP is examined in more detail accompanied by players' experiences as examples. In the final part, challenges and potential avenues for GTP research are discussed.

BACKGROUND TO GAME TRANSFER PHENOMENA

Peoples' perceptions and thoughts about video game playing range from celebration to paranoia (Buckingham, 2004). On one hand, positive effects have been shown regarding the effects of video game playing in players' development of cognitive skills (e.g., Greenfield, DeWinstanley, Kilpatrick, and Kaye, 1994; Gee, 2003). On the other hand, negative effects have focused on violent video games (Anderson, Gentile and Buckley, 2007; Dill, 2009) and video game addiction (Griffiths, 2008). However, to date, there has only been one published empirical study (and a lot of anecdotal data) that has specifically examined phenomenological (game transfer) experiences of video game players' mental processes focus on psychosocial, cognitive and physiological effects of video game playing (i.e., Ortiz de Gortari, et al, 2011).

The effective transfer of learned skills from the virtual world to the real world has been shown by the use of video games in areas such as learning (Gee, 2003) and therapy (Parsons and Rizzo, 2008). In addition, Wright and colleagues (2011; Chapter X, this book) discuss how gaming allows the transferring of skills in ways that have not been seen before. They suggest that action gamers perceive the world in different way than non-gamers (Wright, Blakely, Boot, 2011). Furthermore, studies suggest that basic associative conditioning phenomena can occur within virtual worlds (Hamilton and Sutherland, 1999), and that stimuli in the virtual environment can acquire motivational properties that persist and modify behaviour in the real world (McCabe, et al., 2009). Players' actions in-game are rewarded and punished by the game systems establishing the conditioning of the players' behaviour.

Findings from the only published GTP study demonstrated that playing video games intensely can be associated with the elicitation of automatic thoughts, altered perception of real life contexts, alteration of sensory perceptions, and dissociative experiences (Ortiz de Gortari, et al, 2011). The term often used by players to refer to some of the phenomena describe by the game transfer phenomena studies is known more commonly as the Tetris Effect. Wikipedia defines the Tetris Effect as: "When people devote sufficient time and attention to an activity that it begins to overshadow their thoughts,

mental images, and dreams. It is named after the video game Tetris. Some of the Tetris effects include thinking about ways different shapes in the real world can fit together, such as boxes on a supermarket shelf or the buildings on a street. Also, dreams about Tetris pieces falling or see images of falling Tetris shapes at the edges of the player's visual fields or when they close their eyes"

The origin of the Tetris Effect is debatable. Some claim that the first references to the term were in the poem "Virus in digital dreams" by Neil Gaiman (1987). Also, there are some references indicating that Garth Kidd (1996) described Tetris Effect experiences such as "after-images of the game for up to days afterwards" and "a tendency to identify everything in the world as being made of four squares and attempt to determine where it fits in". Others consider the Tetris Effect as a:

> "Biochemical, reductionist metaphor, if you will, for curiosity, invention, the creative urge. To fit shapes together is to organize, to build, to make deals, to fix, to understand, to fold sheets. All of our mental activities are analogous, each as potentially addictive as the next" (Goldsmith, 1994).

We argue that there are important reasons for not using the "Tetris effect" concept when studying game transfer effects. Among the most important are that: (i) the 'Tetris effect' definition is very broad and does not emphasize the importance of the association between real life stimulus and video game elements as a trigger of some of the transfer experiences, (ii) it does not make a clear distinction between sensorial modalities in the game transfer experiences or talk about players' experiences across sensorial modalities (e.g., hear a sound and visualize a video game element), (iii) the name itself is inspired by a one specific stereotypical puzzle game (Tetris). This simple name indicates that it is repetition that triggers the transfer effects but there are other factors involved in game transfer experiences. Furthermore, modern video games use more than abstracts shapes and offer more flexible scenarios compared to Tetris and similar games.

To date we are aware of three German publications that specifically examined "transfer effects" in video games (i.e., Wesener, 2004; Tanja, 2007; Bilg, 2009). Wesener (2004) focused on the technical possibilities of learning transfer in computer and video games. Tanja (2007) interviewed 80 committed players and focused on analysing transfer effects in terms of players' behaviour, and their ethical and moral attitudes. Bilg's (2009) research focused on player's perspective and two specific research questions: "Are players

noticing anything after having played? Can they bring it into a connection with a specific computer game?" He defined transfer effects as "stimulus and context related transfer of elements into everyday life. It comes in the form of associations which depend on an abstract reflection on a whole game or a game situation".

There are also other published studies in the gaming literature that appear to relate to game transfer effects but are not defined by their authors as such. Spence (1993) reported a case study a female video game player who was diagnosed as suffering from persecutory delusions, exhibiting violent behaviour, and experiencing constant imaginary auditory hallucinations triggered by the music of the Super Mario Brothers video game. After 48 hours of treatment with neuroleptics, the auditory hallucinations decreased. This case (described by the author as Nintendo hallucination) represents an "example of an environment stimulus being recruited into the phenomenology of a psychotic illness" (Spence, 1993; p.98).

Stickgold, Malia, Maguire, et al. (2000) conducted an experiment to explore hypnagogic images induced by playing Tetris in both normal and amnesic people. After playing Tetris for over seven hours during a three-day period, 17 of the 27 participants (63%) reported experiencing visual images of the game as they fell asleep. The participants were classified according to level of expertise (i.e., 12 novices with no prior Tetris experience, 10 experts with considerable Tetris experience, and five amnesiacs with extensive bilateral medial temporal lobe damage). The participants' reports were very similar and their visualizations were very alike to the actual game experience. In all cases, the participants reported seeing the Tetris pieces, usually falling in front of their eyes and sometimes rotating and fitting together. Amnesiacs and non-amnesiacs both reported visualizations. Interestingly, two of the five expert players who experienced Tetris visualizations reported visualized Tetris pieces from previous versions. This implies that "remote memories can influence the images from recent waking experience"and that visualizations of Tetris pieces "do not depend on medial temporal structures involved in declarative memory" (Stickgold, 2000: p.352).

CONCEPTUALIZING THE GAME TRANSFER PHENOMENA

What Are Game Transfer Phenomena?

Game Transfer Phenomena have been conceptualized as a new area of research for studying video games' effects focusing on exploring how virtual experiences are transferred to the real world. The main aim of GTP studies is to better understand psychosocial, cognitive, and physiological video game transfer effects, the acquisition, development and maintenance of GTP, and the identification of the psychological engagement mechanism involved in the GTP experiences (e.g., structural characteristics and elements involved in the GTP experiences). The core of GTP studies does not focus on video game addiction or violent video game playing. However, based on our preliminary research, GTP experiences appear to be associated with excessive gaming. Furthermore, some GTP experiences involving criminal and risk behaviour content have been identified among video game players.

Initially, GTP were mainly described as phenomena that occurred by association between real life elements and video games elements[1] that triggered subsequent thoughts, sensations and/or behaviours in players (Ortiz de Gortari, Aronsson and Griffiths, 2011). However, due to the high incidence of players' experiences that reported alterations of sensory perception without an obvious real life element as a trigger, the operational definition of GTP has been modified to the following:

> Game Transfer Phenomena involve the transfer of video game experiences into the real world. These experiences can be triggered by the association between real life stimuli and video game elements, resulting in the subsequent alteration of mental process, sensory perception, impulses or reflexes, automatic behaviours, and/or players' actions based on the content of video games.

The study of GTP includes all human senses (e.g., sight, hearing, touch, smell, kinaesthetic). GTP can be manifested in either one sense modality or across different sense modalities (e.g., seeing video game elements accompanied by the music of the game). GTP experiences include experiences while awake, and experiences under altered states of consciousness such as falling asleep, being asleep, waking up, and mind wandering (i.e., daydreaming) A multimodal and eclectic framework is used to explain and understand GTP experiences and mainly focuses on socio-cognitive and behaviourist theories. The study of GTP makes a clear difference between involuntary experiences and voluntary experiences (e.g., involuntary daydreams and impulses vs. intentional behaviour). According to the

[1] 'Video game elements' are understood as whatever agent, character or object representation are located in the virtual world.

definition of Bourguignon (1979), some of the automatic GTP experiences can be classified as altered states of consciousness.

> "Altered states of consciousness are conditions in which sensations, perceptions, cognitions and emotions are alternated. They are characterized by changes in seeing, perceiving, thinking, and feeling. They modified the relation of the individual to self, body, sense of identity, and the environment of time, space, or other people. They are induce by modifying sensory input, either directly by increasing or decreasing stimulation or alertness, or indirectly by affecting the pathways of the sensory input by somatopsychogical factors. As a result, the rules of perception and cognition that cross-cultural psychology has been investigating… do not necessarily apply to these states" (Bourguignon, 1979; p.236).

Ortiz de Gortari, et al (2011) defined two main categories of GTP, these being (i) Automatic Game Transfer Phenomena and (ii) Intentional Game Transfer Phenomena. These are briefly examined in turn.

Automatic Game Transfer Phenomena

Such phenomena are characterized by:

1 Spontaneous occurrence without premeditation by the players, in other words intent, awareness and intention are absent as in automatic processing (Saling and Phillips, 2007),
2 Relatively short duration and typically out the players' control. However, occasionally, these experiences become more elaborate when players get engaged with video game content resulting in longer duration of the experiences,
3 Automatic responses to real life elements associated with video game experiences or as a result of perpetuation of the game activity after player have stopped playing, and
4 Occurrence once or in repetitive occasions. Experiencing automatic GTP in a repetitive manner sometimes results in a habit.

Automatic GTP can include (a) intrusive experiences, and (b) automatic responses to real life elements based on video game content. More specifically:

(a) Intrusive experiences: (i) Alteration of sensory perception: including (a) visual distortions and body sensations, (b) stereotypical

visualizations of video game elements, and (c) auditory imagery based on video game experiences; and (ii) intrusive images based on video game content, (iii) dreams involving video game content.

(b) Automatic responses to real life elements based on video game content: This includes (i) the mixing of video game elements with real life elements, (ii) misinterpretation real life elements due to video game experiences, (iii) impulses, sensations and body reflexes, and (iv) automatic behaviour.

Intentional Game Transfer Phenomena

Such phenomena comprise:

1 Voluntary player engagement with video game content in real life contexts,
2 Some degree of premeditation and planning,
3 Players selecting and discriminating which video game content is manifested in real life contexts, and
4 Game transfers appearing to be self-directed and controlled by the players

The behaviours are based on video game content including the:

1 Modelling or imitation of video game characters or events, and
2 Use of video game elements as tools for interaction.

The self-induced states can include:

1 Self-induced daydreaming,
2 Self-induced alteration of sensory perception.

The rest of this chapter mainly focuses on automatic Game Transfer Phenomena.

GENERALITIES DRAWN FROM THE STUDY OF GTP

Based on findings in the first GTP study and the study in progress, some general observations and tentative conclusions can be made. However, before going into further detail, it is important to bear in mind that some of the GTP

experiences can be misunderstood as pathological due to their similarity with symptoms of mental conditions or disorders (e.g., schizophrenia, drug abuse). However, in the case of the GTP experiences, these appear to be induced by a prolonged exposition to a virtual stimulus and repetitive activities in the game environment. Players' individual characteristics may also make them more prone to experience GTP. Video game elements are well identified in each GTP experience.

What Games, Game Experiences and Real Life Elements Seem to Be Associated GTP?

The presence of GTP may depend on individual characteristics. However, it has been observed that different individuals have similar experiences in the same games (Ortiz de Gortari, et al, 2011). Similarly, Stickgold, et al.'s (2000) study reported that their participants experienced very similar visualizations. However, it should be noted that the study by Stickgold and colleagues was done with only one game (Tetris) whose game style is very stereotypical and may have reduced the scope of possible GTP experiences. However, studies on dreams have suggested that some people incorporate waking activities into their dreams (Schredl and Hoffman, 2002).

The first GTP study was carried with young players who played video games frequently (Ortiz de Gortari, et al, 2011). Player reports that were similar included an array of activities including: climbing buildings, planning to shoot in real life contexts, zooming in to see things in real life with a sniper rifle, and moving fingers or performing involuntary movements such as when they were actually playing. In this study it is acknowledged that the research questions may have influenced video game players' responses. However, it was interesting to observe that these elements were repeatedly reported by players and that many of these narrations have been found among players' experiences reported in video game forums. For instance:

> "If I go out after like playing 'Assassin's Creed' for six hours. I can look at the walls and building and thinking 'oh maybe I can climb there' because when I am in the video game I can run in the roof and climb and it follows me to the real life" (Leo)

It appears that the elements that have some type of function in the game and require the player's attention are the ones that seem to be remembered the

most. For example, climbing and jumping from one building to another is a repetitive activity in Assassin's Creed and it is crucial to accomplish the missions in the game. However, we speculate that repetition is not the only important factor. A player's emotional attachment to a particular video game element or event trigger also appears to be important. This is supported by Cahill and McGaugh (1998). They argue that emotionally aroused stimuli are more memorable and more easily gain attention. Furthermore, emotionally arousing events are better remembered than neutral events. Research into traumatic experiences has also found correlations between negative experiences and dreams. Furthermore, some researchers who have examined the incorporation of daily activities into dreams have argued that emotional involvement in waking activities facilitates the incorporation rate of waking activities into dreams (e.g., Domhoff, 1996, Hartmann, 1998). In our GTP paper, we concluded that the realistic environments found in modern video games may have triggered associations between the two worlds among some individuals (Ortiz de Gortari, et al, 2011). However, it seems that what is more important is the exposure to simulations of real life elements in video game settings than how realistic the video game environments are. It may be that modern video games with their high resolution graphics trigger stronger (and sometimes more dangerous) GTP.

Also, it has noticed that different video games' structural characteristics usually lead to different types of GTP experience. The content of GTP experiences appears to depend upon the contents of the video game. While some GTP experiences are associated with the simple visualization of abstract or primitive video game elements (e.g., visualising pieces of Tetris blocks falling without any context), more elaborate content in video games may give rise to more challenging and realistic GTP experiences.

When and under What Conditions Do GTP Occur and How Long Does It Last?

In most cases, GTP occurs either when players (i) have just stopped playing, (ii) are in passive states (e.g., trying to sleep), (iii) are performing activities that induce trance states (e.g watching television, driving, listening music, etc.), (iv) are performing automatic task and activities (e.g., walking, exercising), (v) are engaged in acts of mind wandering (i.e., daydreaming). However, these conditions do not seem to be necessary or exclusive for their occurrence. The manifestations of GTP have also been associated with

player's physiological state such as arousal, anxiety, stress, tiredness, and/or being under the influence of psychoactive substances. In our GTP study with young video game players, it was speculated that the initiation of physiological reactions in real life may play an important role in dissociative GTP experiences as an escape mechanism. Some situations where GTP have taken place include: while giving a lecture, receiving a college grade from a teacher, "feeling the adrenaline pumping" when winning a game, experiencing anxiety when the teacher asked a question in the classroom, arguing with someone.

> "When I really was a hardcore player in ['World of Warcraft'] that's when I got my adrenaline pumping I started seeing health bars above people's heads. It was mostly when I played football in school in the breaks. We were losing in a game and when we started turning it to our advantage. I started to see stuff almost like some kind of 'bar' when I look down that I could use to, I don't know, do something strange" (Charlie).

> "[After playing], the first thing that I thought of was a math lesson when I was imagining the equations in a bubble over the math teacher's head. It felt weird and only lasted for a glimpse before I realised what I was seeing…the teacher was always asking the people that didn't look like they had understood the question and he would be kind of mad if you had it wrong so I was stress and nervous like anxiety trying to find the answer so if he asked me I would have it. Because I really didn't want to be yelled at in front of the whole class" (Linus).

GTP can manifest at almost any time after stopping playing video games. Some experiences appear to occur immediately. However, GTP can also appear a long time after playing. In the study by Stickgold, et al., (2000), where the participants played Tetris during a three-day period, it was found that 90% of the images reported occurred during the second night, and only 10% of the images reported by novices happened during the first night. Furthermore, a delay of 24 hours was observed in the novice group for the manifestation of the visualizations to occur. To date, two conditions have been identified where GTP take place (i.e., when video game players are exposed to limited (or no) external stimuli, and when video game players are in day life context). These are briefly examined.

When Video Game Players Are Exposed to Limited (or No) External Stimuli

This occurs when the players are lying in bed trying to sleep or situated in dark places. In these occurrences, visualizations of video game elements with closed eyes are the most common (e.g., sometimes in their minds and other times at the back of their eyelids) but some players also heard constant sounds from video games and felt their body move. In some cases, players reported visualising the video game elements immediately after they had closed their eyes without indicating that they had reached any trance-like state. These experiences appeared to be some type of after-image with long latency time of appearance and duration. Occasionally, players indicated that they got engaged in replaying the game during the whole night and that they observed the video game elements closely and manipulated them. In these cases, the players' experiences appeared to involve more advanced mental states commonly associated with hypnagogic states[2].

> "It was very Tron-ish like there were translucent cubes and spheres floating around my bed and I had to touch them or some shit. It went on endlessly and I couldn't "sleep" because of it. It really felt like I was mentally forced to play a real-life virtual game. Most fucked up thing ever, and it was very unpleasant" (Sam).

When Video Game Players are in a Day Life Context

These game transfer experiences occurred in parallel to a person's daily activities. Usually, these experiences were triggered by the association of real life stimuli or events with that of video game experiences. An emotional element such as a trigger in the moment of the experience appeared to be related with these types of experience. Usually, the experiences were of short duration. Some players experienced them recurrently or episodically over a period of time. Occasionally, these kinds of GTP appeared every time that the players encountered the real life stimuli. Typically, GTP occurred in periods where the players were playing the game frequently or constantly, but some players reported that even though they did not play the game any more, they still experienced GTP every time they encountered real life elements that triggered the associations with their previous video game experience.

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[2] Hypnagogia is defined as hallucinatory or quasi-hallucinatory events taking place in the intermediate state between wakefulness and sleep. Hypnagogia is usually understood as a borderland state, half-dream state (Mavromatis, 2010).

> "Looked through my game collection and remembered Max Payne. I still sometimes get these flashes that I want to throw myself down stairs, especially at subway stations which the first level of the game is set in" (Carl).

> "One time, I had been playing 'Guitar Hero' so much that I was talking to my friend and realize I thought her nose looked like a held note and her eyes looked like a chord" (Alux).

In summary, it is observed that some GTP can be triggered when a sensory stimulation is removed (e.g., by a person closing their eyes) while others may occur due to an external stimulus.

Who Experience GTP?

GTP appear to be associated with frequent and intensive playing. However, at present the incidence of GTP is unknown, and it is not known what individual characteristics make players more prone to experience GTP. We could perhaps speculate that players with high trait of absorption may be more susceptible to experience GTP. Usually, individuals high in absorption become easily involved in media and tend to pay more attention to media stimuli being easily induced by media messages (Sacau, Ravaja, Laarni, Hartmann, 2005). Also, individuals with high fantasy proneness may be more susceptible to experience GTP. On one hand, some GTP experiences appear to occur across different human senses modalities similar to synaesthesia. Studies into synaesthesia have found that classical synaesthesia occurs more vividly in children with high fantasy proneness (Hunt, 2005). On the other hand, GTP experiences, as mentioned previously, can be considered as some type of dissociation. Links between fantasy proneness and dissociation have been suggested (e.g., Merckelbach, Rassin and Muris, 2000).

The large amount of anecdotal data from different online gaming forums appears to indicate that GTP are relatively common among frequent video game players. The main objectives of future research are to assess the incidence of GTP and to identify which players are most likely to experience GTP. To date, the only published data were collected from Swedish video game players aged between 15 and 21 years old and who played frequently. In this study, no significant age differences among players were found in relation to GTP (although the age span of only six years was relatively small). GTP

experiences were found in both male and female players but the female player base was very small (n=3). In total, the study collected a total of 100 Automatic GTP experiences and 64 Intentional GTP experiences.

What Types of GTP Have Been Identified?

An overview of a large number of GTP experiences collected in our (as yet unpublished) online forum GTP study has resulted in a slight reclassification of GTP experiences. These are as following:

Intrusive Experiences

These include (i) alteration of sensory perception: (a) visual distortions and body sensations, (b) stereotypical visualizations of video game elements, and (c) auditory imagery based on video game experiences; (ii) intrusive thoughts based on video game content, and (iii) dreams.

Automatic Responses to Real Life Elements Based on Video Game Content

These include (i) mixing video game elements with real life elements, (ii) misinterpreting real life elements due to video game experiences, (iii) impulses, sensations and body reflexes, and (iv) automatic behaviour.

Behaviours Based on Game Content

These include (i) modelling or imitation of video games characters and/or events, and (ii) use of video game elements as tools for interaction

Self-Induced States

These include (i) self-induced daydreaming, and (ii) self-induced alteration of sensory perception.

In the following section some of the GTP experiences collected to date will be further described. The transfer of video game experiences into the real world was identified in all the players' experiences collected in our studies.

Intrusive GTP experiences are involuntary. According to our GTP studies, playing certain video games over long periods of time can alter the player's sensory perception of real life environments after the player stops playing. The next section outlines these types of experience in more detail.

VISUAL DISTORTIONS AND BODY SENSATIONS

The perseverance of seeing the real world as the game world appeared to be related to eye-strain when it occurred immediately after playing. A classic experiment provides a clue as to how virtual experiences can trick the mind. Blascovish and Bailenson (2011) cited the experiment done by George Stratton in 1896, where Stratton wore eyeglasses with prism lenses designed to optically invert the physical environment. Stratton wore the glasses for several hours a day over three consecutive days. When he took off the prism glasses at the end of the experiment, he experienced seeing the world upside-down. Very simply, his perceptual system had adjusted by re-inverting his view. This type of phenomenon is similar to that reported by pilots a few hours after using Virtual Environment (VE) simulators where they view the world as inverted while driving (LaViola, 2000). According to LaViola (2000), there is a strict rule in many air forces that pilots are not allowed to fly an aircraft 12 to 24 hours after the exposure to the VE flight simulator.

Among the GTP experience, players reported perceiving real life environments as distorted. Some examples included: seeing real life environments as pixelated, blocky, with lag, monochrome, more colourful, seeing colour outlines of objects, and/or experiencing the 'tunnel effect'.

> For instance: "Our real worlds had turned monochrome. Some optical trick involving those red and white tiles had broken our eyes, and we could only see in pea green, sickly yellow and all the shades in between" (Otto).

> "I remember one weekend I got ungrounded after being stripped of electronics for a month, and I played 'Minecraft' for 72 hours straight. I went to bed Sunday night but couldn't sleep, so I turned on my light and looked around my room. And everything was on a square. Fucking. Grid. I started freaking out, and moving my furniture around by inches at most, until everything fit on the grid perfectly. I went to bed crying because my dresser wasn't small enough to fit on one square but wasn't thick enough to fit on two" (Peter).

Perceiving selective elements or the full environment as 'pixelated' or 'in blocks', appeared to be related with the visual symptom known as 'visual snow' where people see snow or television-like static in their visual fields, especially against dark backgrounds. There appeared to be no clear etiology for this phenomenon. Snow vision can manifest itself as a symptom of migraine aura (Belvis, Ramos, Villa, Segura, et al., 2010). Some players also

experienced an alteration of visual perception that takes place hours or (in some instances) days after having played the game. For instance:

> "I had this happen in a math lecture. I was tired, and pure math lectures aren't exactly riveting even for engineers like me. For the week or so before, I'd been playing one of the old Final Fantasy games on an emulator. At some point during the lecture, I realized that the professor's head had become pixelated. I stared at him for a while, and then it dawned on me that nothing he said made any sense. Then I did that fun "jerk awake in an obvious way" thing. Good times. In that class, not making sense was kind of par for the course (ha!), but this wasn't even math" (Zaserov).

Additionally, some players experienced an alteration of sensory perception triggered by an association between real and video game stimuli. For instance:

> "Well this explains why I'm seeing everything in red, blue, yellow and black every time I see a yellow "Y" after I played 'Assassin's Creed: Brotherhood's Campaign'" (Zarte).

For instance:

> "After playing 'Rock Band' all night at a friend's house, I was driving home in the wee hours of the morning with the road all to myself. The white dashed lane markings on the freeway had turned into the game's moving fret board, and I can remember wondering why there were no notes for the song that was playing on the radio" (Sebastian).

The connection between visual perception and vestibular (i.e., sense of balance) systems seems to be implicated in some of the GTP experiences reported to date. Players reported immediate after effects when stopping playing as a remembrance of some of the cybersickness symptoms[3] such as headache, disorientation and nausea. Furthermore, some players reported struggling to disconnect from the game:

[3] Some literature has reported a number of symptoms correlated with motion sickness and cybersickness such as: eye-strain, headache, pallor, sweating, dryness of mouth, fullness of stomach, disorientation, vertigo, ataxia, nausea, vomiting (Scibora, Flanagan, Merhi, Faugloire, Stoffregen, 2010). Symptoms of cyberpsickness can last for hours and in some cases even days (Gower and Fowlkes, 1989).

> "I'll have to play several hours, 4-5 without taking my eyes of the screen for that to happen. It's fine as long as I keep playing, but when I quit and start doing something else it strikes and I'll be a zombie for a couple of minutes, then it gets better. 15 minutes is around the longest I'm affected…It's a state I will sometimes experience. My eyes can't focus properly, I feel extremely tired and I'm unable to chain thoughts together or make conclusions. Basically, it feels like my body is disconnected from my head, and my head disconnected from my brain. It's a lot like being hungover really. I'll usually get annoyed and sit still and just look straight forward, then it blows over in a short while" (Aron).

Players also reported body sensations of movement usually manifesting hours after the video game playing ceased. Here players felt that they were still climbing or flying, mostly occurring when the players were falling asleep. Additionally, some players experienced tactile sensations of pushing buttons. For instance:

> "When 'Just Cause 2' got released, I played it a lot for about two weeks. But when I tired of the game, and I was sitting at my windows, four floors up, I thought 'It would be so awesome if I could [tie a] hook to that car and get to town that away' and felt like pressing the 'F' [button on the game pad] but it was like a reflex" (Milton).

> The second time would be playing tons of 'Armored Core', and trying to fall asleep that night. When I closed my eyes I could 'feel' the constant movement of an arena fight because I had done the whole damn arena list before bed). I can liken this to feeling the waves at the beach after you get home" (Norra).

Evidence suggests that it is not necessary to actually be in motion to experience motion sickness, since visual stimulation alone can provoke it (LaViola, 2000). Previous studies have demonstrated that motion sickness can occur in virtual environments (e.g., Stanney, Hale, Nahmnes, Kennedy, 1999) and in commercial video games play through a head-mounted display (Merhi, Faugloire, Flanagan, et al., 2007).

In our studies, players experienced visual motion after-effects. This usually happened when the player looked at different points far away from the screen and things appeared to be moving slowly as if the objects were levitating. These experiences were usually associated with rhythm games that included the perception of repetitive and rapid movements of video game elements such as arrows moving from top to bottom or bottom to top. This

phenomenon can be induced simply by looking at the centre of a spiral in movement for about 20 seconds. This effect is the result of motion adaptation (Kohn and Movshon, 2003).

> "We also get the Guitar Hero effect after we played it for a while. After a couple of hours with it when we turn it off, everything slowly moves up for a short period. If you play 'Guitar Hero, play it for a while then turn it off, look at the wall or a bookshelf and you see everything moves slowly upwards like an optical illusion" (Albin).

STEREOTYPICAL VISUALIZATION OF VIDEO GAME ELEMENTS

Some players visualized elements from the video game in their mind, whereas others saw video game elements "externally projected" as they were "out there" rather than "in the head". In these experiences, the players clearly saw and identified video game elements at the back of their eyelids when they had their eyes closed and/or projected video game elements in real life contexts when they had their eyes open. The shapes, the colours, and the movement from these games seem to be preserved in some of the players' anecdotes, although players also reported that colours and configurations can change.

> "Whenever I close my eyes I see the highway and notes coming, it's annoying... And my all notes are pink so its even more annoying!" (Shelton).

Furthermore, players visualized video game elements at high speeds and in stereotypical patterns. Players did not report visualizing the screen or some other element external to the video game just like the majority of participants in the study by Stickgold and colleagues (2000). We speculated that the players' reports of only seeing video game elements were indicative of immersion. Interestingly, studies into dreams have found that playing computer games is related to dream content whereas using a computer for work is not (Hartmann and Schredl, 2000, Schredl, 2000). However, repetitive virtual tasks such as wanting to copy and paste, reload or save in daily life appear to be a common transfer effect reported by players. Typical experiences in this category include:

> "The worst was trying to sleep after 'Civilization' and seeing units move constantly under your eyelids" (Patson).

> "I had this bad when 'Meteos' first came out. While falling asleep I'd be playing in my head. And this wasn't intentional, it just kind of happened" (Tim).

It was common for players to report visualising video game elements while they were trying to sleep and sometimes when they had reached a state between being awake and asleep. However, many players reported that they visualized elements as soon as they closed their eyes and/or repetitively during the day every time they closed or blink. In these cases video game elements appeared to be floating in any context.

> "[This] happened to me after I played 'Guitar Hero 3' all day and all night long... Every time I blink... Those scrolling lines" (Jordan).

Sometimes players got engaged replaying full video game sessions in their minds.

> "I did this with 'Meteos' and got to the point where I could actually play the game in my head. Not just watch the game, but play the game. I quit the game cold turkey and have never gone back. Although by this point it's more because I don't own a DS any more than because I'm trying to avoid that" (Nathan).

IMAGINARY AUDITORY EXPERIENCES

These experiences are understood as experiences that go beyond the basilar membrane and are considered as an 'inner ear' phenomenon. Three forms of imaginary musical phenomena have been studied: voluntary, anticipatory and involuntary imaginary (Liikkanen, 2011). In our studies, players reported imagined musical phenomena when they believed that they heard a sound with video game content. Sometimes the players identified the real life stimuli that were misinterpreted as some video game sound or the stimuli worked as a trigger of the auditory experiences. It was as if the players were expecting to hear something from the video games. On other occasions, the players just reported hearing a sound from the video games. Other players' auditory experiences occurred when some video game auditory effect constantly repeated itself in the player's mind. These experiences were

classified as 'earworms', a non-clinical condition that occurs when music repeats constantly and unintentionally in one's mind (Brown, 2006, Liikkannen, in press For instance:

> "Sometimes I hear the achievement sound for the Xbox"(Lars)
>
> "It hasn't happened as of late, when I used to REALLY play 'TF2' [Team Fortress 2], I'd get all alert when I heard a beeping noise. Damn Sentries" (Jack).

Some auditory experiences were triggered by association, for instance:

> "Every time I climb stairs at random places, be it work, school or elsewhere, I always hear 'Bloody Tears" (William).

INTRUSIVE THOUGHTS BASED ON VIDEO GAME CONTENT

Many of the GTP experiences seem to be experienced as intrusive memories that occurred involuntary and can take the form of either mental images or verbal thoughts (Holmes, et al., 2009) and are common in people's everyday life (Kvavilashvili and Mandler, 2004). Involuntary memories are usually triggered by identifiable and mostly external visual or auditory cues and can occur when someone is doing a routine or automatic activity that does not require full concentration, for example, when someone is tying up a shoe lace and suddenly an old memory pops up in their mind (Kvavilashvili and Mandler, 2004). Intrusive images are commonly associated with Post Traumatic Stress Disorder (PTSD) (Holmes, James, Coode-Bate, and Deeprose, 2009) and are known more commonly as flashbacks.

Players' experiences in this category take many different forms, such as when players (i) interpret the world in terms of the video game experience, (ii) make illogical conclusions based on the logic of the video game and pops up in the player's mind when they are doing their daily routines, or (iii) expect that things would happen as in the video game sometimes manifested as paranoid thoughts For instance:

> "After long sessions I can feel like I'm in the game still like about a week ago. I thought my food wouldn't finish if I didn't expand because I would run out of resources" (Samuel).

> "I was playing 'Glider PRO' and I'm typing some text into 'Livejournal' and I expected it to fall to the bottom of the text box because there was no air vent underneath it" (Kevin).

> "After playing 'TF2' [Team Fortress] into the wee hours of the morn, I'll have strange little mentality changes. Like, if I go to get a drink from the fridge, I'll honestly think of something along the lines of there being a spy coming up behind me, and I should watch my back, or some shit like that" (Kameron).

Automatic responses to real life elements as in the video game environment Individuals' everyday life is determined by conscious intentions and deliberate choices. However, mental processes are influenced by elements in the environment that operate without awareness or guidance (Bargh and Chartrand, 1999). Usually, people are not comfortable with this idea since they "like to believe that we are autonomous" (Dill, 2009: p.37) but behaviours can be influenced by both conscious (control) and unconscious (automatic) processes (Bargh and Chartrand, 1999). In fact, studies suggest that intentional goals that are practiced over and over again can become automatic, as a habit (e.g., Ouellette and Wood, 1998).

Studies also suggest that mental processes that are conscious over time can (through repetition) become an automatic process (Bargh and Chartrand, 1999). In these types of GTP, the players respond to real life stimuli as they do in the video game. Video games usually required the player to accomplish a set of repetitive tasks to succeed in the game. The players learn to respond to the stimuli presented in the video game. Then when the players find similar stimuli in real life or something that triggers their semantic associations, players respond in ways similarly to that in video games, mixing video game elements in real life and/or fitting video game elements into their real life contexts.

According to classical conditioning theory, responding in the same way to a similar stimulus is called stimulus generalization. This is the tendency for the conditioned stimulus to evoke similar responses after the response has been conditioned (e.g., Pearce, 1987). According to classical conditioning, this can include physiological reactions, sensations, impulses, and feelings in front of some stimulus that usually should not provoke such responses. Also, according, to Collins and Luftus (1975), associated links or nodes can be established between objects, people, and events resulting in what is called associative priming. This effect is believed to be of short duration, but linkages

between the nodes are believed to be strengthened through repeated association. Also, errors in the monitoring of reality have been reported by some players when they mix video game experiences with real life situations. For instance:

> "Some time ago, I spent a pair of minutes in a shop in front of the lighting bulbs department, trying to remember why I needed to buy one... only to remember that it was for a secret room in the Shenmue dojo" (Leonardo).

Confusion between actual perceptions and thoughts has been reported in studies on reality monitoring (Johnson, 1998). Johnson (1998) argued that "if a memory is vivid, we tend to believe that it represent a real, perceived event. Also, if a vivid memory of a fantasy or dream passes the heuristic check for perceptual detail, it would likely be mistaken for reality unless caught by the more systematic plausibility check" (Johnson, 1998: p.182).

MIXING VIDEO GAME ELEMENTS WITH REAL LIFE ELEMENTS

These GTP experiences manifested in different ways. These include (i) players replaying the game combining real life elements as they have done in the game, (ii) players seeing video game elements in real life context, and (iii) players sensory associations being induced by video game playing.

Replay the Game Using Real Life Elements

GTP experiences where players find themselves automatically replaying the game combining real life elements for making combinations of three pieces (e.g., as in Tetris), can be explained by the fact that such games train the brain to look for patterns. After hours of playing and looking for patterns, players return to the real world and their brain automatically keeps looking for these patterns. For instance:

> "'Gemcraft'. It's this sweet tower defence game on 'armorgames.com' I would see two coloured objects and mentally combine them to form a fused, upgraded version of the two objects. YEAH!" (August).

Seeing Video Game Elements in Real Life Content

Other experiences that may be related with 'looking for patterns' are the ones that occur when players see video game elements projected as a complement to real life stimuli. This visual experience appears to be some kind of hallucination. However, in this case, the hallucinations are induced by previous video game experiences. For instance:

> "For an older example, when I was still working on 'Super Mario 64', whenever I went outside I thought I saw floating red coins over the tops of trees" (Alf).

> "The Mass Effect conversation wheel comes up at the bottom of my vision every time I talk to someone" (Jerome).

We speculate that these experiences can also be related to the searching of patterns. However, in these cases, the GTP are manifested in more bizarre ways when players actually see video game elements mixed with real life contexts. It is important to note that these elements appear to be situated in a stationary point in a context (e.g., health bars above people heads). The player's mind may be often plagued by video game experiences after long video game playing sessions. The player's mind might – after playing – expect to see and hear things as in the video game. Associations between different stimuli, actions and events will have been well paired by the repetitive presentation of these elements within the video game. According to Tobler et al (2005) "once a stimulus has been presented bottom-up sensory information is 'matched' to a predictive code rather than being processed de novo in feed forward succession" (p. 500).

Sensory Associations Induced by Video Game Playing

Other players' experiences include sensory associations, where video game playing induces dual perceptions such as when players listen to music or hear a word related with the game and then simultaneously visualize elements from the video game For instance:

> "When I first got really into 'Guitar Hero' whenever I would hear music I'd pretty much see the gems floating down in front of my eyes as I'd imagine what it would be like to play in GH. It's worn off now but it went on for probably 3 years" (Redex).

> "When I went to a meeting with one of my teachers and she said something about guitars I suddenly saw the frets and the notes before my eyes and I could barely even hear her" (Eva).

These types of GTP are similar to synaesthesia experiences where a stimulus or a mental image is activated or is experienced in a different sensory modality. For example, some people identified as synaesthetes have described the "sound of her crying baby as having an unpleasant yellow colour" (Grossenbacher and Lovelace, 2001). In the most of the cases, synaesthesia is experienced as projected outside the individual, rather than being an image in the mind's eye as noted by Cytowic (1995). In the case of the GTP, sensory associations appear to be learned by associations of stimulus in different sensory modalities.

MISINTERPRETATION OF REAL LIFE ELEMENTS

It is common for individuals with normal vision to occasionally mistake one object for another (Summerfield, Egner, Mangels and Hirsch, 2006). Misperceiving or misinterpreting one object for another has been associated with neurological and psychiatric disorders (e.g., Ffytche and Howard, 1999). However, healthy individuals may also be prone to report illusory perceptual experiences (e.g., McKellar, 1957). Usually the misperception occurs when visual information is limited, such as at night or in the dark room (Murgatroyd and Pettyman, 2001). In GTP, the interpretation of real life objects appears to be affected by video game playing experiences. Players reported seeing elements in real life that look like (or seem to be like) video game elements that they actually think are video game elements. In these experiences, players' interpreted the real world was based on their previous video game experiences. For instance:

> "I was passing by a Chase Bank ATM and it's got that big blue logo over it, and it was night and stood out very well and for a solid second I swore I was looking at BLU's intel[ligence]" (Blom).

> "There was a minute there where I would confuse real airplanes in the sky for uavs [Unmanned aerial vehicle] in 'Modern Warfare 2'. Glad those days are over" (Coolman).

Impulses, Sensations and Body Reflexes

According to the psychological literature, "self-control failure tends to portray these cases as involving a relatively automatic tendency to act in one way, which is opposed by a planful and effortful tendency to restrain that act, the action that is inhibited is often characterized as impulse, a desire that would automatically be translated into action unless it is controlled" (Carver, 2005:324). In this category of GTP, players experienced impulses, sensations and even body reflexes when they found themselves wishing and/or imagining doing activities in real life as they do in the video game. For instance:

> "I can still like try to find good camper spots [in real life] without thinking about it like, 'ooh, that would be a nice spot to be a sniper' but then I realize that I don't need camper spots in real life" (Linus).

> "I've seen these old wooden fruit crates like the ones in Fallout 3 at antique stores n such and it takes quite a bit of effort to not flip them over looking for ammo" (Persson).

Also, repetitive tasks in video games appear to influence players in different ways. Sometimes players found themselves moving their fingers involuntarily. This can either occur when automatic thoughts are accompanied by an 'ideo-motor reflex' (Stock and Stock, 2004) or automatic muscular reaction due to, for instance, the 'priming movement' (Kibele, 2006) of pushing buttons. For instance:

> "After completing 'Prince of Persia: Sands of Time' when I accidentally dropped a sandwich with the butter side down, I instantly reached for the R2 button. My middle finger twitched, trying to reach it. Only to discover that I didn't have a PS2-controller in my hands" (Milton).

> "After playing longer sessions it sometimes happens that I push my fingers as I do in-game. After a long session of playing and communicating

by pushing my finger to start transmitting my voice it sometimes happens that I do it in Real Life to speak with my girlfriend" (James).

"When I was giving a presentation I wanted to press the 'shift' button to start the microphone, because I had a function in the computer. But in Real Life when I was giving the speech, I couldn't find the button. I was looking for my keyboard in the air but it wasn't there" (Carl).

Other interesting examples include when players feel attached to video game elements. An interesting phenomenon experienced by those who have suffered amputation appear relevant to understand GTP experiences with attachment to certain video game elements. In these experiences, the players found themselves missing and looking for video game control interfaces in real life. Similarly, "amputees report feeling as if their amputated limb is 'still there'" (Murray and Sixsmith, 1999; p.330). Additionally, amputees usually express an emotional attachment to an artificial limb. Turkle (2011) refers to technology as "the phantom limb" (p.17). For instance:

"When I had played 'Bionic Commando' for a long time, in reality it felt so weird not to have the Bionic arm" (Tobias).

"The only time I remember this was once while driving I looked to the lower left and expected a minimap from Saints Row 2. It wasn't there but I saw it in my mind's eye" (Selly).

Also, some players resolved real life issues using video game elements or as they do in the game. For instance:

"The gravity gun from Half Life. I want to use pretty often. When you want something from the fridge and don´t wanna go all the way over there" (Simon).

"I played Tomb Raider and could reach something with the grapple Lara has, and when I saw a bowl in our pantry that I couldn't reach I wished I could have her grapple so I could've reached it!" (Eva).

"The thought just pop up in my mind, like "Oh, what if I were able to use my telekinetics to move this car out of my way so that I can drive pass with my moped" (Anton).

Automatic Behaviour

The most resilient types of GTP, and the ones considered most extreme is when players experienced some type of dissociation and suddenly performed actions as if they were in the game. It was only after a few seconds that they realized what they were doing. Automatic processes work independently of conscious control and can be triggered by stimuli that we are not even aware of (Bargh, Chen and Burrows, 1996). Micschel (1973) asserts that based on the social-cognitive model, an individual can have different reactions to a person or event. He enumerated the following: (i) expectations for what was going to happen next in the situation, (ii) subjective evaluations of what was happening, (iii) emotional reactions one has had in the situation in the past; and most important in relation to GTP, (iv) the behaviour responses to one's past experience (Mischel, 1973 cited in Bargh, et al., 1996). Among the GTP experienced by players, we found that some players experienced some type of dissociation when they suddenly performed actions as they did in the game, and a few seconds later they realized what they were doing. For instance:

> "I remembered when someone told me to dance. I think it was in school or something. I started dancing as the chars in 'World of Warcraft' but then I realised what I was doing and stopped" (Linus).

> "When playing a lot of 'Grand Theft Auto' I felt like I was still in the game. So I walked to the bike and thought about taking it when I realized what I was doing" (Simon).

> "'Fallout 3'. I was looking at a trash bin, and saw a bobby pin on the floor. Next thing I knew, the bobby pin was in my hand. It took me another heartbeat to realize that I was unable to use this for lock picking in the real world" (Flavy).

Self-Induced States

Some GTP experiences appear to be self-induced and controlled by the players. These include: (i) self-induced daydreaming, and (ii) self-induced alteration of sensory perception. Studies carried out by Schooler and Smallwood (2006) make distinctions between daydreams ('zoning out' where the action is involuntary) and mind wandering ('tuning out' where the action is

voluntary). Their studies suggest that people's minds zone out 15-25% of the time and tune out 25-35% of the time (Blascovich and Bailenson, 2011). In this category players appear to control and self-induce their daydreaming. For instance:

> "What I wanted was to live in the 'Final Fantasy' universe and be one of the characters. So all of the time, I imagined living in that world. It was like wishful thinking" (Milton).

> "Sometimes I dream about games, and sometimes when I let my mind wander freely, I wander around in the 'World of Warcraft'. I don't think of anything special, or sometimes when I´m about to go to sleep and you're clearing your head and relaxing" (Alexandra).

Gackenbach and Bown (2011) have framed video game playing as a type of meditative experience to the extent that it requires similar levels of attentional absorption. Furthermore, some players have reported that once the GTP occur, that they are able have some control in their experiences such as manipulating the video game elements. Also, among the GTP experiences collected to date, we have found that a few players have reported that they can control their GTP experiences, and that they have self-induced their GTP experience. For instance:

> "After playing 'Crysis' for a long period of time with infinite ammo, just blowing things up with a rocket launcher (which can slow down the frame rate), I experienced the world in a slower frame rate. It was kind of awesome. It wasn't incredibly slower or frustrating. It just felt a little more rigid. When it started to wear off, I could induce intentionally. This lasted for maybe two days. It was awesome" (Luyi).

Behaviours Based on Game Content

Anderson (1983) has explored the cognitive effects of creating behavioural scenarios with oneself as the main character. His experiment demonstrated that by imagining oneself performing or not performing a particular behaviour, produced changes in intentions toward that behaviour. It is also shown that the more frequent one imagines oneself in a behavioural script, the more intention change is produced. Social learning theory (Bandura, 1994) can explain the dynamics involved in playing video games and learning

by practicing and modelling a behaviour. Social learning theory proposes that behaviour is learned through imitation of attractive and rewarding models. From this perspective:

> "video games should have powerful effects due to the high attention levels of players and the active identification with characters on the screen, predicting that longer playing times should result in stronger effects because there is greater learning and reinforcement of the modeled behavior" (Turkle, 2007; pp.251-52).

Moreover, transfer learning theory explains how it is possible to apply what has been learned in one situation to a different situation (Rebello and Zollman, 2005). The transfer of video game play experiences has been observed when players deliberatively integrate video games into their daily routines. Here, video game content is used for joking, playing, and imagining and pretending together. For instance:

> "I send spells to others, moving hands" (Arnold).

> "I've played a lot of 'Final Fantasy XI' with two of my friends. We use to joke around about how we gain a skill or rise a level in whatever we do, such as cooking, cleaning, etc" (Sixten).

> "You know, with friends. One time we joked about running faster with a knife like you do in 'CounterStrike'. Never did it though. Just imaginary" (Adrian).

> "My gaming friends and me will often joke with each other, like 'this school lunch looks like a barbecued locust' (enemies from the game 'Gears of War 2')" (Aron).

GTP CHALLENGES, POTENTIALITIES AND IMPLICATIONS

Video games offer alternative realities that can be accessed by many individuals (Gackenbach, in press). In these alternative realities supported by virtual platform, players not only get engaged with "private" and interactive fantasies, but also players' fantasies become collectives. These fantasies can sometimes be manipulated by players, and can result in original reproductions. However, in most of the cases they are just a little twist of a manufactured

product due to video games' structural characteristics and content. This might be one of the explanations why most game transfer experiences are quite similar. The most interesting observation is that by focusing on the study of the similarities, it may possible to identify patterns, test hypotheses, and create new knowledge from the GTP findings.

The bigger challenge in the understanding of GTP experiences and the potential to contribute to other areas in science is that many of the experiences associated with GTP (e.g., hypnagogic experiences, visual phenomenology, synaesthesia, dissociations) have not been systematically studied and their etiology in many cases is uncertain or very controversial.

The GTP experiences may indicate how video game playing activates different areas of the brain resulting in sometimes hilarious, and at other times bizarre, experiences. New studies need to be carried out in order to confirm if the GTP experiences are really resulting in the activation of high function process or if the GTP are simply the result of behaviour conditioning.

Evidently, transfer experiences are not exclusive to video game playing. However, conceptualizing game transfer experiences in video games allows us to study video games' effects without pathologizing video game playing. Alternatively, virtual platforms have been demonstrated to be an excellent medium for understanding human behaviour (Blascovich and Bailenson, 2011). Studying game transfer experiences induced by video game playing experiences has many advantages, mainly because:

- GTP experiences are induced by video games. The content of video games can be measured, controlled and manipulated. In addition, transfer experiences in GTP can be corroborated, identified and associated with particular video game elements, video game activities, and video game events.
- GTP experiences are related with different areas of human cognition such as perception, attention, memory, learning and unconscious mechanisms. For example, studying GTP experiences that occur across different sensorial modalities can be very valuable (e.g., hearing a sound and visualizing a video game element is similar as what happens in synaesthesia experiences). It is believed that induced synaesthesia can help deaf or blind people to establish a neural joining of senses, replacing one sense with the other (Ward, 2008).
- Today we have more knowledge about what areas of the brain are involved in different mental processes thanks to the advances in neurosciences. However, we are still trying to understand how the

brain combines information for different modalities. This is how we interpret an object, event or the world as a whole. For instance, how we combine all our senses to enjoy the flavour, texture, and colour when eating an apple. According to Cytowic's (1995) study, synaesthesia might tell us something about the relationship between reason and emotion. Also, the pedagogic potential of video games has been demonstrated by some GTP experiences. Players picturing information visually can contribute to developing effective learning tools to encourage visual thinking. This is also relevant because autistic individuals do not think in words but in images. Furthermore, GTP experiences are related with a series of phenomena (e.g., snow vision) where medical diagnoses have not been clearly stated.

- GTP experiences appear to be related with mind enhancement when we see players starting to picture information in visual forms but also when players state that they can self-induce and control their state of mind to the point where they alter their perceptions. Players have reported not just visualizing images; they also project the visualization of video games elements "out there", and replay video game session in their minds where the vividness of the images allow them to manipulate the video game elements. This may imply the engagement in different states of mind for being able to prolong the GTP experiences. Maybe the common practice in video game playing of multitasking and connecting with the real world and connecting with the virtual world, and then again connecting with the real one is training some players' brains to easily experience trance states in ordinary life, triggered by the influence of external stimuli and players' emotional reaction to these encounters. Or maybe it is just that video game playing is making players more aware about these daily life dissociative experiences. This can be positive because it may make players more aware of their own reactions, emotions, and video game playing implications in their life. If clear triggers are identified in GTP, it can be used for self-induced trance states that may be useful in therapy. Study of video game players' dreams demonstrate that video games can act as a preparation or training for having lucid dreams and somehow control the dreams as they progress. There is evidence based on different studies that frequent gamers have more lucid and controlled dreams than those who rarely play (Gackenbach, 2009; Gackenbach and Kuruvilla, 2008a).

- GTP can be experienced as a "trip to the moon", but the automatic nature and the bizarre nature of the experiences can make players aware of their real life surroundings and can make them reflect about their excessive gaming. Also, the study findings invite insight into how easy it is to be seduced by media technology and the psychosocial implications of our virtual immersion.
- The potential to identify specific video games characteristics that are associated with GTP experiences that result in undesirable consequences for the players. This may be beneficial for the both video game players and the video game industry.
- Understanding GTP may be crucial in creating gaming prevention programs that promote healthy gaming habits, and to develop instruments for diagnosing and treating gaming-related problems.
- Studying GTP may guide those in the gaming studies field in the progressive integration of augmented technologies into our daily life.

CONCLUSIONS

Many pathways of the mind are uncertain. We do not know the potential consequences of immersion in alternative realities such as video games. For this reason, we need to create new models to guide us during this period of adaptation to intensive technology use. What is considered as "abnormal" today may become "normal" in the future (e.g., use of current technologies may be perceived as excessive in contemporary society, yet may be considered as the norm in future society (Ortiz de Gortari, 2005).We must diligently work to optimize the psychological and social benefits of emerging interactive virtual technologies while finding effective ways to reduce the risks or dangers it can present in some cases. Game Transfer Phenomena appear diverse and complex in nature. Our GTP studies are primarily descriptive and can be conceptualized as a work in progress. In this chapter has been reported the initial conclusions from preliminary data analysis in conjunction with the findings in the already concluded GTP study done with frequent young players. The incidence of cases of GTP among young people and the large amount of data collected in video games online gaming forums demonstrates human suggestibility, and it seems important to encourage more research in this promising area.

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