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Video Game Structural Characteristics: A New Psychological Taxonomy

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Abstract Excessive video game playing behaviour may be influenced by a variety of factors including the structural characteristics of video games. Structural characteristics refer to those features inherent within the video game itself that may facilitate initiation, development and maintenance of video game playing over time. Numerous structural characteristics that influence gambling frequency and expenditure have been identified in the gambling literature, and some researchers have drawn comparisons between the rewarding elements in video gaming and those in slot machine gambling. However, there have been few rigorous attempts to classify and organise the psycho-structural elements of video games in a similar way to gambling. In order to aid current psychological understanding of problem video game playing and guide further research questions in this area, a new taxonomy of video game features is proposed, which includes: (a) social features, (b) manipulation and control features, (c) narrative and identity features, (d) reward and punishment features, and (e) presentation features. Each category is supported with relevant theory and research, where available, and the implications of these features for excessive video game playing are discussed.

Keywords Video game playing · Structural characteristics · Problematic involvement

The question of whether excessive video game playing constitutes a problematic activity in its own right is a current subject of debate. In numerous studies, researchers have identified a subgroup of video game players who report adverse consequences of playing video games

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excessively (Fisher 1994; Griffiths and Davies 2005; Grüsser et al. 2007; Ladouceur and Dube 1995; Salguero and Moran 2002). It has been suggested that a heavy pattern of video game usage that is sustained over time may represent a technology-based addiction. Griffiths (2008a) has argued that, if the clinical nomenclature can accept pathological gambling, then similar compulsive behaviours should be recognised as "addictive". However, the concept of technology-based addictions has been criticised on a number of grounds. Blaszczynski (2008) has argued that the primary features of addiction are dependency and lack of control, but the prevailing literature on problem video game play has overlooked these psychological features in favour of highlighting the adverse consequences of excessive playing. Similarly, Wood (2007) and Shaffer et al. (2000) have argued that excessive video game use may be symptomatic of other primary disorders, like depression, and/or the result of poor time management skills, rather than a bona fide addiction. Jaffe (1990) has claimed that researchers may inadvertently trivialise the concept of addiction by prematurely accepting so-called "behavioural" addictions, including computer-based ones.

Regardless of whether video game playing may be termed an "addiction", it is generally agreed that some individuals' video game usage may be considered problematic (Griffiths and Davies 2005). Griffiths (2008b) has argued that researchers still face the task of identifying the mechanisms—biological, psychological and/or social—that underlie problematic involvement in video games. One further explanation for excessive playing has been drawn from the gambling literature, and states that there may be various structural characteristics of video games that make them "addictive" (Brown 1989; Johansson and Gotestam 2004). This explanation has followed the many observations that both gambling machines and video game machines share a number of structural elements in common. Fisher and Griffiths (1995) argued that both video game machines and (gambling) slot machines feature (a) the requirement of response to stimuli that are predictable and governed by a software loop, (b) the requirement of total concentration and hand-eye coordination, (c) rapid span of play negotiable to some extent by the skill of the player, (d) the provision of aural and visual rewards for a win, (e) the provision of an incremental reward for a winning move, (f) digitally displayed scores of 'correct' behaviour, and (g) the opportunity for peer group attention and approval through competition. In a recent review, Parke and Griffiths (2007) outlined a comprehensive list of structural features that have been shown to influence problem gamblers to risk larger sums and bet more frequently. However, a similar taxonomy for video games has not yet been developed and subjected to extensive empirical scrutiny. King et al. (2008) have attributed this fact to (a) the more variable nature of video games compared to the standardised format of games of chance, (b) the lack of a recognised standard for identifying "problem" video game players, and (c) a lack of knowledge among researchers of which specific features and what kind of content within video games are important to the large community of end users.

Wood et al. (2004) were the first to publish a framework of the psycho-structural features of video games. They sought to identify the features of video games that made them appealing to players. They devised a list of structural features by (a) playing a variety of video games, (b) examining and comparing known gambling structural characteristics, (c) discussing these features with players of video games, and (d) examining relevant research in the area of video game design. Their framework included:

- *Sound*, including sound effects, speaking characters and background music.
- *Graphics*, including high-quality realistic or cartoon-style graphics and full motion video (FMV).

- *Background and setting*, including whether the game is based on a story, film, or television program, and the use of realistic or fantasy settings.
- *Duration of game*, referring to how long the game usually takes to complete.
- *Rate of play*, referring to how quickly the player "absorbs" or "gets into" the game.
- *Advancement rate*, referring to how quickly the game play advances.
- *Use of humour* in the game.
- *Control options*, referring to what the player can control in the game (including sound, graphics, and skill settings, choice of control methods, and physical feedback).
- *Game dynamics*, including exploring new areas, elements of surprise, fulfilling a quest, skill development, AI interactions, collecting things, avoiding things, surviving against the odds, shooting, different ending options, different modes of transport, solving puzzles, beating times, cheats/Easter eggs, solving time limited problems, building environments, mapping, and linear/non-linear game format.
- *Winning and losing features*, referring to the potential to gain or lose points, finding bonuses, having to start level again, and ability to save regularly.
- *Character development*, referring to character development over time and character customisation options.
- *Brand assurance*, referring to brand loyalty and/or celebrity endorsement.
- *Multiplayer features*, referring to various multi-player options, communication methods, building alliances, and beating other players.

Wood et al.'s (2004) framework covers a range of video game types and player interests. As the researchers themselves noted, for some video games, some features may be more important than others in influencing a player's enjoyment. However, some revisions and improvements can be made to their framework. For example, a number of features in the section named "game dynamics", such as "elements of surprise" and "surviving against the odds" are difficult to operationalise. The model would also benefit from more distinct, conceptual groupings akin to gambling structural characteristics models (Parke and Griffiths 2007), and further explanation of the importance of specific features in influencing player behaviour. There is an underlying assumption to Wood et al.'s framework that only those features that players report to enjoy are important in initiation, development and maintenance of playing behaviour. It is possible that this perspective overlooks a number of key features that play an important role in the development of excessive involvement in video games.

The aim of this paper is to expand upon Wood et al.'s (2004) list of psycho-structural features in video games by reorganising some features into new categories as well as suggesting additional features in light of recent theory and research findings. Given the paucity of psychological literature in this area, this framework draws on gambling research and includes some preliminary observations based on informal discussion with players and exploratory research by the authors (e.g. Chappell et al. 2006; King and Delfabbro in press; Wood et al. 2004). This paper is organised in five main sections that cover the (a) *social features* (i.e., social aspects of video game playing, (b) *manipulation and control features* (i.e., the role of user input in influencing in-game outcomes), (c) *narrative and identity features* (e.g., the role of character creation and interactive storytelling), (d) *reward and punishment features* (i.e., the ways in which players win and lose in video games), and (e) *presentation features* (e.g., the visual and auditory presentation of video games). The intention is to demonstrate the ways in which the psychological effects of these features may contribute to the development of problematic styles of video game playing. In addition, it is intended that this framework will aid in guiding further research questions in

psychology concerning those structural characteristics that influence problematic video game play. It was not the intention of this paper to challenge or minimise dominant frameworks for games in the fields of computer game design, video game semiotics, and ludology (e.g., Bartle 2004; Crawford 1982; Myers 1990; Salen and Zimmerman 2004).

Summary of the five-feature model of video game structural characteristics

Feature type	Sub-features	Example
Social features	Social utility features	In-game voice and text chat
	Social formation/institutional features	Guilds/clans in MMORPGs
	Leader board features	"Hall of fame" high score list
	Support network features	Internet forums, strategy guides
Manipulation and control features	User input features	"Combos", "hot keys"
	Save features	Checkpoints, "quick-save"
	Player management features	Managing multiple resources
	Non-controllable features	Scripted events, loading screens
Narrative and identity features	Avatar creation features	Choice of sex, race, attributes
	Storytelling device features	Cut-scenes, mission briefing
	Theme and genre features	"Role-playing", "shooting"
Reward and punishment features	General reward type features	Experience points, bonuses
	Punishment features	Losing a life, restarting a level
	Meta-game reward features	Xbox 360 Achievement points
	Intermittent reward features	Increasing difficulty of levels
	Negative reward features	Gaining health, repairing items
	Near miss features	Difficult "boss" at end of level
	Event frequency features	Unlimited replayability of game
	Event duration features	MMORPGs have no endpoint
	Payout interval features	Rewarded instantly for playing
Presentation features	Graphics and sound features	Realistic graphics, fast music
	Franchise features	Trademarked names, e.g. Mario
	Explicit content features	Violence, drug use, nudity
	In-game advertising features	Real-life brands, sponsors logos

Social Features

Social features refer to the socialising aspects of video games, such as how players can communicate with other players in both online and offline ("stand-alone") games, and the features that create a cooperative and competitive community of players. In addition, this category considers the role of social support networks that assist players in learning about video games, and enable experienced players to pass on their knowledge of games to others and receive social recognition rewards.

Social Utility Features

Computer-mediated communication (CMC) features enable players to engage in social interaction with other players before, during, and after video game play. Interaction may

include expressions of encouragement, excitement or frustration, or the exchange of strategies and tips about games, all of which can be highly reinforcing. Players can also use text-based messaging where experienced players have developed an idiosyncratic language, employing a range of "emoticons" (animated expressions), acronyms (e.g., "lol": laugh out loud) and slang language (e.g., "l33t": elite, meaning skilful). Social utility features play a role in forming a player's video game identity in virtual worlds and games (i.e., creation of a name or "handle", with associated attributes like images and signatures), and this identity can make the player feel more personally invested in the game. Avatars are the most sophisticated kind of CMC, enabling a digital representation of the player (without necessarily resembling the player in any way). Players can communicate using gestures and other means available to the avatar. For example, players in *World of Warcraft* can wave, laugh and tell jokes to other players. In games with less emphasis on non-verbal social interaction, like the first-person shooter *Counterstrike*, players have developed a gesture-based communication system using combative features like crouching, jumping and pointing weapons.

Social Formation and Institutional Features

Baumeister and Leary (1995) have argued that people have a fundamental need to belong to a social group. Within massively multiplayer online role-playing games (MMORPGs), a number of social institutions have emerged which can satisfy this need (Cole and Griffiths 2007). Guilds are the primary institution to which players belong, mainly for the purpose of playing the game cooperatively and sharing the rewards of playing ("loot") among members of the guild. Yee Ducheneaut et al. (2006) reported that 66% of all *World of Warcraft* players belong to a guild, and this figure increases to 90% for advanced players. Guild members (belonging to groups of varying size) are often requested to meet at specific times to play the video game. However, rather than being close-knit groups of friends, Ducheneaut et al. (2006) reported that fewer than one in four players personally know their fellow guild members. Nevertheless, players feel a sense of social obligation to play the game, which may include playing until an in-game event such as a "raid" is complete. The player may be penalised in a number of ways for not meeting these social obligations, including losing respect or rewards in the guild, and/or being asked to leave the guild. Studies have shown that the negative emotional effects of being ostracised within an online environment can be as powerful as in the real world (Williams et al. 2000, 2002). Thus, social formations and institutions within a video game can be highly rewarding and provide additional incentives for playing the game, but they may also place inflexible time commitments on players, that may cause conflict with other responsibilities.

Leader Board Features

Vorderer et al. (2003) argued that the competitive elements in video games are the most important determinant of enjoyment from playing video games. They identified *social competition* as a process that develops by competitive actions performed by individuals or social entities in order to maintain their own interests to the disadvantage of others. A major feedback mechanism for social competition in video games is the player leader board that can be found both offline (e.g., 'Hall of Fame' screen on arcade video games) and online (e.g., multiplayer leader boards). In online gaming as well as stand-alone gaming, multiplayer leader boards use player tracking systems to monitor a player's statistics and progress in the game in relation to other players. The leader boards give players an overall

rank that is usually a position number (but can sometimes be a title rather than a rank position). Leader boards are updated regularly, which may encourage players to play continuously over long periods to compete with other players for higher, more prestigious ranks and the associated feelings of increased self-efficacy.

Support Network Features

Online relationships are a relatively new phenomenon, but they have become a large part of adolescent culture. Wolak et al. (2002) reported that 25% of Internet users aged 10–17 years had formed casual online friendships in the last 12 months, and 14% had formed close online friendships or online romances. Similar findings have been found within MMORPGS. For example, Cole and Griffiths reported that 10% of online gamers met a sexual and/or romantic partner in-game. Suler (2004) has argued that individuals are more likely to self-disclose or act out more intensely when online because online settings are highly disinhibiting. Despite the apparent richness of communication styles available in online settings, it has been shown that high levels of CMC without comparable levels of face-to-face communication are associated with loneliness and decreased social well-being (Moody 2001). As Castronova (2005) has suggested, online worlds may appear to be the best available place for some individuals, and increased participation within them provides fewer opportunities for connection with people in the real world. In addition to player-to-player relationships, there are numerous sources of support that can assist the player to play a video game, including the Internet (e.g., forums and websites), television, magazines and strategy guides, as well as telephone help-lines. These support networks can provide advanced knowledge of the video game, enabling the player to optimise their playing strategy in order to overcome various difficult obstacles or find hidden game features. In addition, these networks provide an outlet for expert players to relay their own knowledge of the game when not playing and receive appreciation and recognition from other players.

Manipulation and Control Features

Manipulation and control features refer to the ways in which a player can interact with and control in-game properties using a physical control scheme. This category also considers various functions in a video game that directly relate to the player's sense of mastery and control over the game, such as being able to save progress in order to correct mistakes, and the ability to manage simultaneously numerous resources in the game. There are also features in video games that the player has no direct control over, and these may also affect the video game playing experience.

User Input Features

Players must think and react to objects on the screen but the experience of playing a video game is also highly tactile. For instance, video games may be played using a keyboard and mouse configuration on a personal computer. For handheld and dedicated games consoles, the control set-up may include some combination of assorted buttons, triggers, analogue joysticks, touch-screens, and motion-control. Arcade machine games may employ further additional features. To be proficient at some video games, players may require good hand-eye coordination and the use of "combos" (a sequence of timed

input that has special in-game effects) and "hot keys" (an optimised control scheme for greater efficiency). Video games may be thought of as predominantly "deterministic", meaning that all the major elements of the game are essentially held constant from one game to the next. This enables players to compare their performance in a video game to other players.

Cognitive psychology research has found that players rapidly develop a mental model of in-game elements that qualitatively shifts with experience to accommodate insights into the functional qualities of these elements (Graham et al. 2006). A study of video game playing children aged 10–11 years noted that they displayed "expert" behaviours such as self-monitoring, pattern recognition, principled decision-making, qualitative thinking, and superior memory (VanDeventer 2002). In this sense, the appeal of a video game lies in the variation of users' ability to use the control scheme to learn new information about game elements and thereby maximise their rewards and enjoyment of the game. An interpretive phenomenological analysis by Chappell et al. (2006) suggested that excessive playing may be linked to an obsessive need to master the user interface, control scheme and game mechanics of the video game.

Save Features

Cognitive regret may occur when a player makes a mistake in a video game that results in a losing outcome (Loftus and Loftus 1983). However, by their design, video games allow players numerous chances to rectify (i.e., correct) their mistakes. For example, the game may feature "lives" or "turns" which give the player another attempt at the game's challenges. Furthermore, video games are the only kind of games that enable the player to "save" their progress, and subsequently revert to this earlier point in the game if desired. Save features allow players to replay a losing scenario, thereby minimising cognitive regret incurred by losing. For this reason, video games perhaps offer a higher degree of control and freedom to the player than any other game. There are two main types of save features. The first type enables the player to save at any point in the game (some games have a "quick-save" function that enables the player to save without interrupting play). The second type of saving is a "checkpoint" system that requires the player to reach predetermined parts of the game in order to save their progress. It is possible that checkpoint systems contribute to longer playing sessions because players may decide not to quit the game until a checkpoint is reached.

Player Management Features

Onscreen video game elements are generally represented to the player in a clear and quantified way. Most games have a HUD ("heads up display") that details all of the player's available resources. In shooting games, this is usually the health and remaining ammunition of the player's character. In role-playing games, this may be a complex inventory system of assorted weapons, apparel, magic spells, and miscellaneous items. The player's role is to decide how these resources are to be managed in order to complete the various goals of the game. These features provide feedback on how well the player is doing in the game (e.g., having plenty of resources suggests competency). Gambling research has identified problem gamblers are often unable to quit a gambling session when they are down, instead choosing to "chase" losses until all money is lost (Breen and Zuckerman 1999). Similarly, it is possible that excessive players of video games are less likely to end a playing session when their in-game resources are low, and will continue to play until resources have been replenished or spent completely. Chasing

within a video game can occur within and between playing sessions. For example, a player may continue to play a game until the game character is on 100% health (i.e., "within session" chasing). Alternatively, if the player is for some reason unable to keep playing, there may be an urge to return to the game sooner (i.e., "between session" chasing).

Non-controllable Features

Some features in video games are out of the player's control, either by design or by technical necessity. Whilst these features may appear to be relatively minor to the actual playing experience, it is possible that they contribute to longer playing sessions. For example, in some games there are non-interactive or "scripted" events that occur each time the game is played. The player cannot influence the outcome and usually cannot "skip" these events. Similarly, all games feature "loading" screens that usually occur in between levels, or when the player wants to access something new in the game. Loading screens can range between a few seconds to a few minutes. Loading also occurs in multiplayer games, when the player must wait in a "lobby" for other players to connect or for a map to download before playing a game. The waiting times in multiplayer can vary greatly. In MMORPGs, there can also be waiting periods associated with travelling long distances in the game world. It is important to note that these loading periods are not always tracked by a video game's clock or timer, which means that the player may think they have played for less time than is the case. From another perspective, video games with scripted events, loading times and turn-based action may be attractive to some players because they enable a player to more easily play the game whilst doing something else, like drinking, eating, or smoking a cigarette. Video games that can be played in this way may be more conducive to long, uninterrupted playing sessions than more involved and attention-demanding games without natural breaks in the action.

Narrative and Identity Features

Narrative and identity features refer to the ways in which the player can take on another identity in the game (as a fictional character or a construction of the self). This section also considers the role of storytelling as a means of immersing the player in the video game. In addition, certain video game genres and themes may broadly relate to player's expectations and attitudes about the video game.

Avatar Creation Features

Most video games feature a single character (in the form of a person, creature or non-living thing) that the player controls throughout the entirety of the game. In some games, like *Sim City*, the player controls multiple "characters" and objects at once. Most games offer a range of customisation options to suit the player's preferences. For example, in role-playing games, players can select their character's race, sex, background, physical appearance, class and skills. The manipulation of identity within a video game can be an important part of the reason for playing games as demonstrated by studies on gender swapping in MMORPGs (Hussain and Griffiths 2008). Furthermore, a large number of customisation options may encourage the player to play the video game multiple times as different characters. It is the intention of video game designers to give players these different choices so that they can form an attachment to their personalised character, and feel more invested in their

character's development. Selnow (1984) argued that some players formed "electronic friendships" with their game machines; it is possible that avatar attachment represents a more sophisticated form of this attachment. A study by Blinka (2008) found that adolescent players' relationships with their game avatars were largely characterised by "identification", referring to a sense of unity with the character, accompanied by the desire to master the game through the avatar, and "immersion", an emotional connection with the avatar, including daydreaming about the character. Thus, a player who has a strong attachment to the game character may have the short-term effect of the player ensuring that the character has "levelled up" or has plenty of resources before ending a playing session, and the long-term effect of playing the video game through to completion with that character.

Storytelling Device Features

Psychological research has largely overlooked the role of narrative in video game playing except perhaps in the area of educational applications of online gaming (de Freitas and Griffiths 2007, 2008). Storytelling may be limited to simplistic "survival against the odds" scenarios or, in longer games, the storytelling may involve multiple characters and complex storylines. A narrative in a video game is likely to play an important role in facilitating a sense of escape or immersion for the player. The most common storytelling device is the "cut-scene" (e.g., a short full-motion video or "machinima" sequence) or a written/oral briefing to segue between game levels. An example is historical footage of World War II in a war action game. Storytelling devices are also incorporated into the player-controlled experience of the game. Players may find books, notes, recordings, messages, or hear dialogue or narration from in-game characters. Some of these storytelling devices are incorporated into the game's reward system, others are additional information designed only to "flesh out" the game world. Some video games feature multiple endings depending on player's in-game choices, which may encourage the player to complete the game multiple times.

Theme and Genre Features

Unlike film or literature, there are few agreed upon genre classifications for video games although some researchers have attempted such classifications (e.g., Griffiths 1997). Nevertheless, there are some groupings of video games that are commonly recognised by game designers and the video game playing community. Many of these are derived from Crawford's (1982) taxonomy of video games. These include "first-person shooting" games, "role-playing" games, "real-time" or "turn-based strategy" games, casual "puzzle" games, etc. These classifications are not discrete but continuous, as some games are a "cross-over" (e.g., a first-person shooting role-playing game). Each video game genre usually has particular conventions in terms of game dynamics, such as game length, linearity of level format, and character development. For example, a first-person shooter typically takes 10–15 h to play, whereas that duration may be considered too short for a role-playing game. Video games also attempt to present specific stylised themes, such as a post-apocalyptic wasteland, a *"Lord of the Rings"*-style fantasy, or a futuristic space station setting. There are usually associated design and game-play conventions within the theme of the game. It may be speculated that themes and genre features have a broad influence on players' decisions to begin playing video games, and guide consumer choices in terms of choosing new games to play (Yee 2006b). In addition, players may form positive attitudes toward certain video game genres based on previous experiences with games of that kind.

Reward and Punishment Features

Reward and punishment features refer to the ways in which players are reinforced for skilful play (i.e., winning) and punished for losing. This section covers the many types of rewards in video games, and explains that these rewards are often delivered intermittently on random and fixed ratio schedules. Player motivation may also be influenced by a more recent feature in games known as "meta-rewards". This section draws on previous models of gambling structural characteristics by applying the concepts of near miss, payout interval, event frequency and event duration to the playing of video games.

General Reward Type Features

Some video game systems deliver physical force feedback via vibration in the game controller. A car racing game, for example, may use force feedback to reward the player for driving skilfully at high speeds. However, for most video games, the rewards are primarily psychological in nature. Some games reward the player with in-game currency (e.g., gold coins) that also provides a system to judge the objective value of all other items in the game. A similar type of reward is points that usually accrue without being converted or exchanged into some other kind of reward. Similarly, depending on the type of game, players gather experience points ("XP") as they complete objectives and defeat enemies in the video game. Once the player has collected a sufficient amount of XP, the character "levels up" and becomes stronger in various ways. The XP requirements generally increase for each subsequent level. Players can also earn assorted items and upgrades that make their character more proficient within the game (however, many games are also designed to scale the difficulty to compensate when this occurs). Some in-game items are extremely rare or "unique" (i.e., the only such item in the game) and these rewards may require a significant amount of time in order to be obtained. Fulfilling a video game's objectives within certain game parameters can also unlock "bonus" game content, including short videos, concept artwork, and additional game modes. The key point is that games often take a "kitchen sink" approach to rewarding the player, meaning that the player are often playing to obtain multiple types of rewards concurrently (Griffiths 2008a, b).

Punishment Features

Video games in general are positively reinforcing because video game developers want to reinforce a player's decision to play a video game. However, some elements of failure and punishment in video games are perhaps essential in order to establish the contextual worth of in-game rewards (i.e., that rewards can prevent the player from losing) and show the player that making progress is not simply inevitable but skill-based. Historically, game developers incorporated rather severe failure scenarios in video games, such as having to completely restart a video game when the player's character "died" (Kent 2001). Since the advent of in-built system memory, players have been able to save their progress in a game and simply "reload" when a playing error is made. Video games have also become longer and more complex, making a punishment like permanent character death an unappealing feature, particularly for a less committed, casual playing audience. Common forms of punishment in games include having to restart a level, failing an objective, or losing resources of some kind, like items, XP or points. Recently, the emphasis on storytelling in

games has led some designers to remove significant punishments from their game to maintain story progression, instead incorporating the failure scenario into the game's story. For example, in *Prince of Persia* (2008), the main character cannot fall to his death by a player's mistimed jump, and instead reappears on the screen without penalty.

Meta-game Reward Features

A study by King and Delfabbro (in press) has identified the potential influence of meta-game rewards on excessive playing behaviour. Meta-game rewards are designed to give players an overall assessment of their mastery over a video game. In some games, this has been represented by a single percentage rating that indicates how much of the game the player has completed. The purpose of this feature is to encourage the player to continue playing until total completion is reached. King and Delfabbro reported that meta-game features often set large goals for the player, which keep a person playing longer than intended and contribute to the belief that no amount of time spent playing is "enough". Recent advanced examples of meta-game rewards include the *Xbox 360's* Achievement Point system and the *Playstation 3* Trophies system. On the *Xbox 360* system, a player is awarded "achievement points" for accomplishing the varied requirements on a game's list of achievements. Most games on the *Xbox360* have between 35 to 50 achievements that require the player to either accomplish a difficult feat or perform a certain number of actions in succession. Achievement points are designed to keep the player involved with the video game after the game has been completed, either by replaying the game or playing the game online. For example, the game *Ghost Recon: Advanced Warfighter* has achievements for finishing the game on all three difficulty levels, for playing eight consecutive hours of the game, and for getting 10,000 kills when playing online. To obtain these achievements, players may have to play the game for many weeks, or even months.

Intermittent Reward Features

According to operant conditioning theory (Ferster and Skinner 1957), the way in which a player is rewarded for playing a video game is more important than the rewards themselves. Like gambling on slot machines, video games reinforce correct or skilful play on variable and fixed ratio reinforcement schedules (Chumbley and Griffiths 2006). For example, in role-playing games, once the player has collected enough XP, their character "levels up". The XP requirements per level usually increase each level, meaning the player has to play for increasingly longer periods in order to make progress in the more advanced stages of the game. Item rewards in games are also delivered on variable ratio schedules. For example, a video game may be programmed to reward a particular item 5% of the time. It is well known that variable ratio reinforcement produces the most consistent and steady responding and is the least susceptible to extinction. In addition to rewards delivered on variable ratio schedules, video games also use fixed ratio reinforcement schedules. For example, a player may earn a particular reward for killing ten creatures. Due to the variable nature of reward, Yee (2006a) has stated that players often report that the later stages of a video game can be a "labour of fun" (i.e., more tedious and time-consuming than exciting), and playing can become more like a second job than entertainment. It is possible that video game players may employ irrational logic similar to the gambler's fallacy or hold superstitious beliefs about the reward schedules in games (e.g., they may overestimate or otherwise mistake the probability of certain items being awarded during play). In summary, video games commonly feature

fixed and variable schedules of reinforcement that can sustain a player's motivation to play a video game for long periods because the next reward is "just around the corner."

Negative Reward Features

Perhaps to a lesser extent than positive reinforcement, video games employ negative reinforcement techniques to keep players involved (Chumbley and Griffiths 2006). For example, in a shooting game, the player's character may be become injured by enemy fire. This is represented by a decreased "health" statistic on the 'heads up display' (e.g., 65%). The player's character has been placed in an unwanted or unpleasant state. By finding an item that will increase the character's health (e.g., bandages), the unwanted character state is removed and the player feels a sense of relief. Similarly, when a player is given difficult objectives to complete urgently, the player may be negatively reinforced by completing the objective and relieving a feeling of tension or pressure.

Near Miss Features

It has been argued that slot machine gamblers are not constantly losing, but are constantly "nearly winning" (Griffiths 1990). This statement refers to the principle of the "near miss", the psychological construal of a losing event as being very similar to a winning one. Near misses occur frequently in video games and can be highly exciting. For example, in a platform jumping game, a player may execute three perfect jumping manoeuvres in a row and then misjudge the final obstacle and lose the game. In this example, the player may not perceive the loss purely as a loss, but as an attempt that came very close to winning. Video games may also provide some tutorial-like feedback to guide the player so that they do not repeat their mistakes, which reinforces to the player that the game's challenges are designed to be overcome. In this sense, a video game can be reinforcing even in "losing" situations because the player is often on the verge of winning and knows what needs to be done in order to win.

Event Frequency Features

Event frequency refers to how often a player is able to play a game in a given time period. It has been argued that gambling on slot machines is more reinforcing than a bi-weekly lottery game because people can play a slot machine as often as they like but the lottery is drawn only twice a week (Parke and Griffiths 2007). In this example, assuming the player places only one bet on each type, a higher event frequency therefore enables a greater amount of play. To the authors' knowledge, most video games have a high event frequency. In casual puzzle games, the player may be able to play hundreds of games over the course of an hour. Similarly, in a shooting multiplayer game, a player can kill numerous opponents in a short time. Whilst there are goals in some games, such as MMORPGs, which may require hours, even months, to complete, often these goals are broken down into smaller tasks along the way, such as 'mini-games', checkpoints, levels, etc. In very few games is the player required to play continuously (without interruption) in order to earn a reward. Thus, the high event frequency of video games may explain why some individuals lose track of their video game playing and experience feelings of escape, immersion and dissociation. However, it should also be noted that time loss in this situation may be something that is positively valued by video game players and should not necessarily be pathologised by the research community as something that is negative (Wood et al. 2007; Wood and Griffiths 2007).

Event Duration Features

Event duration refers to how long a video game event takes to finish. This may be difficult to predict in video games. For example, in an online shooting game, the host of the match may define the game length as 15 min, and players will compete to get the highest score in that time whereas, in the puzzle game *Tetris,* the game ends when the player is unable to solve the increasingly difficult challenges of the game. In MMORPGs, players can participate in "raids" which range in duration but may take many hours to complete. Further, MMORPGs do not feature a definitive end point and thus they essentially have "unlimited" event duration. The key point is that video game event durations are highly variable and, for those games without save features, it may be difficult for some players to play only within an intended time period.

Payout Interval Features

Payout interval refers to the delay between the end of a game event and the subsequent reward. In video games, there is virtually no payout interval, meaning that players are rewarded immediately. In a shooting game, the player is instantly awarded points for shooting an opponent. Similarly, when a player is shot by an opponent, the loss is recorded immediately. A rapid event frequency and short event duration has been shown to increase gambling behaviour because the loss period is brief so the player has little time to reflect on losses before a new game begins (Delfabbro and Winefield 1999). The fact that video games are structurally similar to gambling slot machines in terms of payout interval also enables a player to reinvest the rewards earned in the game into more video game playing (e.g., using coins collected in a level to purchase an item in the game's shop). In this way, short payout intervals may explain why some individuals play to excess.

Presentation Features

Presentation features refer to the aesthetic qualities of a video game, such as how the game looks and sounds to the player. Included in this category are explicit content and in-game advertising that also influence the presentation of a video game. Some video game properties may be considered as "franchises", and the psychology of familiarity may explain the broad appeal of these games.

Graphics and Sound Features

Few would disagree that the visual and auditory features of video games can make them highly exciting and appealing. Game scholars have argued that the graphics and sound effects in games enable a more realistic and immersive context for the video game's reward and storytelling design (Salen and Zimmerman 2004). Earning points or achieving a goal in a video game is often accompanied with particular sounds and visual displays. According to classical conditioning theory, players will form associations with various stimuli within the video game and the pleasurable feelings associated with positive reinforcement. Over time, the sounds and graphics of a video game may provoke the pleasurable feelings associated with reward in the absence of the reward. For example, the player may associate the background music of the game with the excitement of winning, such that the player feels excited as soon as the video game begins. Music has been suggested to play an important

role in slot machine gambling by inducing a "romantic" affective state that makes the player overestimate the chances of winning and disregard previous losses (Griffiths and Parke 2005). Other studies have found that players gamble more quickly when the music is 'high tempo' (i.e., high number of beats per minute) (Dixon et al. 2007). In relation to video games, an unpublished study by Griffiths found that the music of *Tetris* significantly increased players' excitement and arousal compared to playing the game in silent mode with the music off (cf. King et al. 2008). Thus, it is possible that sound and visual elements play a major role in boosting player confidence and arousal, and may facilitate the subjective perception of time loss.

Franchise Features

Like the Hollywood film industry, major video game "franchises" have emerged over the last few decades, such as *Halo, Mario, Tomb Raider, Grand Theft Auto, Resident Evil,* and *The Sims*. Video game developers understand that particular properties of a game may constitute recognisable brands associated with various playing experiences. Gambling researchers have noted that slot machines that employ franchise elements, like characters from *The Simpsons,* may be more inviting to players because of their familiarity (Parke and Griffiths 2007). The psychology of familiarity would suggest that previous positive experiences with certain video game elements may transfer to other activities featuring those elements. Similarly, players may form strong positive feelings, like trust, with certain video game brands and prefer to play these games over others, even persevering with the game when it becomes too complex (Griffiths and Dunbar 1997).

Explicit Content Features

Explicit ("adult") content in video games has been examined with regard to its potential negative effects on young children (Anderson and Dill 2000), but the notion that players enjoy and choose to play video games primarily to engage with explicit content has received little attention. Brand (2007) reported that 88% of adult players in Australia support a common classification for video games and film, including a restricted classification (18 years and over). In addition to puzzle and sports simulation games, violent shooting games have been among the most commercially successful games for decades. The consumer demand for explicit content may possibly be linked to demand for more complex, adult storytelling in games (Atkins 2003). Some players may choose games that feature depictions of explicit language, violence and/or sex for the unique thoughts and emotions that this content can provoke in the form of an interactive video game. For example, the game *Bioshock,* in which the player is faced with the moral decision to "save" or "kill" young girls*,* was critically acclaimed and very popular among the gaming community. Another explanation is that players seek out explicit content because of the cathartic effects of playing (Dill and Dill 1998), which points to an explanation of excessive play based on the mood-modifying effects of play (Jacobs 1986).

In-game Advertising Features

Some video games receive corporate sponsorship and feature advertisements within the game (e.g., a virtual billboard advertisement), whereas some game developers pay for a license to use certain brands in their game, (e.g. the use of the name *"Ferrari"* in a driving game). The effect of in-game advertising on playing behaviour is relatively unknown. It

may be speculated that video games with official licensing may be more popular among players because of their greater authenticity (e.g., the official *FIFA* soccer games have been more commercially successful than other soccer games). However, inappropriate use of in-game advertising may intrude on the playing experience and decrease player enjoyment.

Summary and Conclusion

The field of technology-based addictions is new and faces many theoretical obstacles before being accepted by traditional addiction theorists. Nevertheless, it is important that research is conducted to identify the psychological mechanisms that underpin the excessive or problematic use of video games. The gambling literature suggests that the structural characteristics of video game playing may play a role in the initiation, development and maintenance of problem video game playing. This paper presented a five-feature framework to conceptualise many of the known features of video games that may influence video game playing behaviour. This paper attempts to speculate how these features apply to problem playing, however the extent to which these features contribute to excessive playing of video games requires further investigation. It is hoped that this taxonomy acts as a catalyst for future research into excessive video game play, particularly in those areas that the psychological literature has not explored in detail. The question of whether these features are as clearly demarcated as we suggest deserves further attention, as does the prospect that this framework is indicative of different player typologies.

The study of structural characteristics in video games is of benefit to multiple parties, including (a) psychologists, who stand to learn more about the dynamic role of technology in the emergence of new problematic human behaviours and how this knowledge can assist problem users, (b) video game players, for whom education on potentially harmful structural features may be a good preventative measure, and (c) the video game industry, who aim to develop games to include more appealing and rewarding features to increase long-term consumer loyalty. As video games become increasingly complex and interwoven into the cultural landscape, it is important that researchers can recognise and understand the psychological effects that these new technologies can bring for players, for better or worse.

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