Affective Computing and Interaction:

Psychological, Cognitive and Neuroscientific Perspectives

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Chapter 16
Affective Games:
How iOpiates Elicit an Emotional Fix

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ABSTRACT

Video-games, like movies, music and storybooks are emotional artifacts. We buy media to alter our affective state. Through consumption they impact our physiology and thus alter our affective world. In this chapter the authors review the ways in which playing games can elicit emotion. This chapter will discuss the increased power of video-game technology to elicit affect, and show how the mash-up of traditional and interactive techniques have delivered a richness of emotion that competes with film and television. They then conclude by looking forward to a time when video-games become the dominant medium, and the preferred choice when seeking that emotional fix.

INTRODUCTION

As I sit here in my apartment and look around the room I feel surrounded. The mass of media has taken hold of my home - books overflow bookshelves, DVDs and CDs are barely contained by the racks, a giant screen TV hides the beautiful print that hangs on my wall, and hi-fi speakers dwarf the coffee table. I share my life with all this technology, all of this media, but what is it for? I know its purpose, the reason it exists is to entertain me - but to what end? What does it mean to be entertained? It seems much more than simply passing the time. It is about changing the way I feel. Unhappy with my current affective state I am constantly looking to experience something outside my natural emotional repertoire. I need emotional stimulation. I want to experience fear, amusement, anger, sorrow. I am an emotion junky.

Being an emotion junky I am always looking for a supplier. Historically the largest dealer of affect altering product has been the film industry. Hollywood understands the monetary value of emotion, having peddled affective products for nearly 100 years. To maintain the flow of content to an addicted public, the film industry has

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developed many tools and techniques to elicit an emotional experience. They know the power of narrative, the importance of soundtrack, and the effect of aesthetic. But have we have reached the limits of traditional, linear technology? Although established media such as film and television might once have been the opiate of the people, there is evidence to suggest that interactive entertainment will soon eclipse linear media to become the *iOpiate* of the people. Video-games now outsell Hollywood box-office (Rosenberg, 2009), and traditional media struggles to hold attention as we multi-task between web-browsing, texting and watching television. This chapter will discuss the increased power of video-game technology to elicit affect, and show how the mash-up of traditional and interactive techniques have delivered a richness of emotion that competes with film and television. I will then finish by looking forward to a time when video-games will become the dominant medium for managing our affect. However, before I begin I shall define some of the terms used.

There is much debate concerning the terminology used in emotion research. Many researchers will use the terms 'affect', 'emotion' and 'mood' interchangeably, or like Norman (2002) stick to the term 'affect' to avoid making distinction between them. Here I will use the term 'emotion' to refer to a brief subjective feeling that is in response to some stimulus - such as the momentary feeling of fear we experience when watching a horror movie. I differentiate emotion from the term 'mood', which I use to represent longer episodes with no discernible stimulus - such as an extended bout of depression. I will use the term 'affect' as a general reference to our emotional experiences.

Of pornography, Supreme Court Justice Potter Steward once said "I shall not today attempt further to define [pornography]... but I know what it is when I see it". Most of us intuitively know what it means to 'play', but much like pornography, *defining* play turns out to be extraordinarily difficult. What appears playful in one context might seem very different in another. I find shopping to be an excellent example. Making lists, choosing items, queuing to pay, trudging home with heavy bags - none of this strikes me as fun. But on a Saturday at the Farmers' Market I see couples happily choosing their evening meal; on the high street groups of young women seem to be at play as they enjoy the fellowship of clothes shopping with their closest friends. And what about a child running after a ball on the beach? They often seem much more at play than a professional soccer player lining up for a penalty kick. I will therefore follow Supreme Court Justice Potter's example and defer definition of play - as we all know what it is when we experience it. To those readers who would like to better understand the nature of play, I direct you to Huizinga (1938), Caillois (1958) and I also recommend Egendfelt Nielsen *et al.* (2008) for a superb review of play and game taxonomy.

EMOTIONAL ASPECTS OF PLAY

Which form of media do you believe delivers the greater emotional experience – film or video-games? I would guess that most of us are more likely to associate film with emotional engagement. We categorise films by the emotion they elicit - to experience fear visit the horror section; for amusement you need comedy; to raise your adrenaline levels check out the latest thriller. By contrast, video-games are organised by base mechanic - RPG, platform game, or first-person shooter. The reason many of us don't naturally associate gameplay with emotional experience is likely historical. The emotions evoked playing early video-games such as Pac Man or Space Invaders were mostly uni-dimensional, dominated by feelings of frustration and the occasional feeling of accomplishment - should we achieve entry into the high score table. In the following section I will review the kinds of feelings people experience with and through games and show how modern games offer a rich and varied emotional palette.

If you think back to the time when you last played a game, can you remember what you were feeling at the time? Were you laughing with your friends? Did you feel triumphant as you finished the boss-level? It is very likely that you remember the emotional component of your play experience. Indeed, neuroscientist and play researcher Jaak Panksepp (2004) argues that the two are inseparable owing to a neurological link where affective states are automatically activated during play. So important is this co-occurrence of play and affect, that his neurological definition of play explicitly *requires* concurrent firing of emotive behaviour patterns. It seems that without emotion, play cannot manifest.

The neurological evidence for co-presentation of play and affect would come as no surprise to play therapists, who have long argued that play is the language of children's feelings (Landreth & Homeyer, 1998). Without the verbal capacity of an adult, children have great difficulty expressing affect linguistically. Instead they use play to engage with their feelings. Sometimes the play can be expressive as in the knocking over towers of wooden blocks, other times it can be more symbolic as the child buries the 'bad man' in the sand pit and asks the toy animals to keep her safe. This concept of playing with emotion is borne out in adulthood also, where we control our fears in the play world as a means of dealing with the real world. During times of social stress, such as war, there is significant increase in the number of film and video-games released around the topic - giving us the chance to play with our emotions in a safe space.

Traditional thought on the evolutionary purpose of play is being re-examined, and the importance of emotion is coming to the fore. As highlighted by Sutton-Smith's examination of play rhetoric (2001), each scientific discipline tends to view play through its own specific lens. For example, Fagen (1976) was able to differentiate play behaviours in grizzly bears and found a positive correlation between play and survival. Bears who play more, live longer - despite multiple disadvantages of play, such as increased attraction to predators, and the general risk of accident. For some, this supports their developmental view that play is a form of skill training preparing animals for later life. They argue that when play fighting, adolescents are actually developing the skills needed for hunting and defence - that this is the evolutionary importance of play. However, an experiment involving the deprivation of play in kittens did not result in an inability to hunt. Instead animals deprived of play appear to lack emotional intelligence - that is the ability to identify signals of emotion in others (see Brown, 2009, p60). The kittens could not determine the affective state of others, and as such failed to distinguish friend from foe. It seems that from an evolutionary perspective, the purpose of play is to develop the emotional intelligence necessary to live within a socially complex community. Through play we learn how to read emotion in others, we also learn to control our own emotions – whether play-fighting or losing at checkers.

Given that games are a sub-set of playful activity, and that play is an emotional pursuit, it is to be expected that video-games also elicit emotion. In his book, 21st Century Game Design, Chris Bateman (Bateman & Boon, 2005) details his review of the emotional episodes players report when playing video-games. He also lists the emotional experiences people seek when choosing a game. Based on over 1000 survey responses, where participants identified the principle emotion experienced when playing video-games and the extent to which they enhanced the experience, Bateman developed a Top 10 Video-game Emotion list (as shown in Table 1). It is interesting to note that the emotion people most look for in a game is amusement. Approximately 93% of respondents noted that 'amusement' was an emotion they seek when choosing video-game entertainment, and over 98% reported that they had experienced this emotion playing video-games previously. This maps onto other forms of entertainment, such

Table 1.Top 10 Emotions to Enhance Gameplay (Bateman & Boon, 2005)

Position	Emotion
1	Amusement
2	Contentment
3	Wonderment
4	Excitement
5	Curiosity
6	Fiero – the feeling we experience when triumphant against adversity
7	Surprise
8	Naches – the feeling of pride that comes from training others to play
9	Relief
10	Bliss

as film. In the UK, the largest grossing genre of 2008 was comedy, accounting for nearly 24% of box-office revenue (UK Film Council, 2009). It appears our lives are such that we need comedic relief when we turn to our media for emotional support.

Lazzaro (2008) has identified 4 high-level categories of enjoyment, which she calls the '4 Fun Keys'. In her original report (2004), the 4 categories were Hard Fun, Easy Fun, Altered States and People Factor (see Table 2 for an overview of each category). By 2008 the category 'Altered States' had been replaced by 'Serious Fun'. Lazzaro's most significant contribution comes from her attempt to match each of her 'fun' categories to a set of typical affective states, and the provision of example mechanics that might evoke them. For example she notes that fiero is more likely to co-occur with hard-fun, curiosity with easy-fun, amusement when playing with others, and relaxation when players were participating in serious-fun. Although each of Lazzaro's keys are associated with a principle emotion, they also open a further set of emotions. For example, fiero is the product of player's sense of achievement. Adventurers would have experienced this emotion upon reaching the North Pole, or completing their ascent of Everest. Others of us will have a similar experience when receiving good grades at school after expending great effort revising. But fiero is not the only emotion we experience when tasks are hard. We are likely to experience a feeling of hope at the outset as we plan for the challenge ahead, frustration and maybe anger as we deal with adversity, and relief when the task is complete. Indeed, the feeling of fiero is but one of a very varied palette of emotion.

One might expect the level of fiero evoked to correlate with size of achievement, such that the bigger the mountain we ascend, the greater the emotion we experience. However, I would argue instead that we all have our own mountains, however, they may appear as mere hills to others.

Table 2. Lazzaro's Four Fun Keys to Emotion (Lazzaro, 2008)

Key	Principle Emotion	Secondary Emotions	Mechanic Goal
Hard Fun	Fiero	Boredom Frustration Relief	Create challenge. Allow for strategy and mastery.
Easy Fun	Curiosity	Surprise Wonder Awe	Offer novelty, ambiguity, fantasy, and role-play.
People Fun	Amusement	Shadenfreude Naches Gratitude	Provide co=operation, competition, and socializing.
Serious Fun	Relaxation	Excitement Satisfaction	Self-challenge, learning or real work.

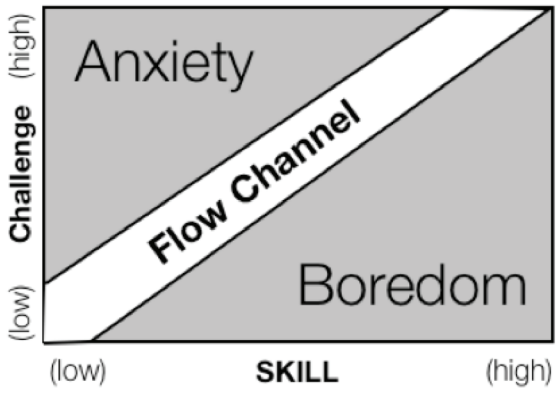
This is supported by Csikszentmihalyi's theory of Flow (1990). Flow is not tied to a specific set of emotions, but instead referred to as an optimal affective state. Flow is that feeling of being 'in the zone', where concepts of self, time, and the 'real word' subside and we feel at-one with our activity. It is an experience most of us will recognise, losing ourselves in a game to the point where hours have passed as though they were minutes. Activities that elicit Flow share a number of design features, too numerous to discuss here. However the most pertinent aspect of Flow is that it occurs when the activity is neither too easy, nor too hard. Tasks we find too easy rarely hold our attention for long periods, and those that we find too difficult also provide little engagement. As shown in Figure 1, when we develop skills, harder tasks become more engaging and activities once considered difficult will become too easy to hold our attention. For any task, different people have differing skill levels, and so my climbing a Monroe could elicit the same sensation of fiero as Hillary experienced when reaching the top of Everest.

Much less tangible than our emotional response to a video-game is the element Swink (2009) refers to as 'game feel' - the aesthetic sensation of control we experience when interacting with a video-game. Game feel is the melding of man and machine, where our cognition and motor-control are at one with the game, giving the sensation that our senses somehow extend into the game world. It can be likened to driving a car, where the mapping of cognition and car movement appears as one. We make a decision, and the car responds without conscious direction of our limbs. Our fine motor-control is no longer a perceptual barrier to the machine.

Swink argues that good design produces an intuitive interaction, where control feels natural. However, sometimes the design team fails to achieve that feeling, and instead the interaction might be described as too floaty or loose. Whenever we push a button or shake our wii remote the game responds. Mario might move left or right, he might jump or even double-jump. How the game responds, and in particular the timing of that response, will have distinct impact on how we perceive our level of control. When playing a video-game it will typically take a player 240 milliseconds (ms) to perceive, think, and then perform an action. Should the game take longer than 240 ms to respond to player input, the sensation of real-time interaction is lost. Responses of 0ms - 100ms feel 'instant', whereas 150ms - 240ms response would seem sluggish (Swink, 2009).

Much of our control sensation comes from the interaction envelope – that is the time it takes for Mario to reach maximum speed from button

Figure 1. Flow Channel (Csikszentmohalyi, 1990)

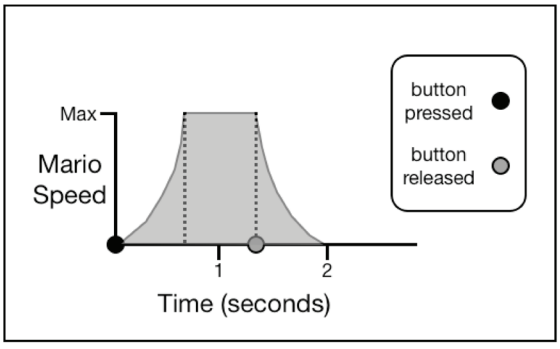


depression, and the time it takes for Mario to then stop moving on button release. Example envelopes are shown in Figures 2-4. In Figure 2 we see an interaction where Mario's acceleration increases exponentially when the button is pressed until a maximum speed is achieved, and then slowly ramps down when the button is released. This gives the perception of 'fluid and responsive' control. The envelope shown in Figure 3 is much more immediate, and as such the interaction feels 'stiff'. The interaction shown in Figure 4 offers little response upon button depression and a slow, gradual acceleration to maximum speed. Such an interaction would feel unresponsive, and the player might wonder if the controller was broken.

HOW GAMES ELICIT EMOTION

Game developers employ numerous techniques to generate emotion. Traditionally games elicit emotion through the game mechanics. However, in-line with the evolution of computing power, video-games can now generate rich visuals and dynamic audio in real-time and are able to borrow many techniques applied in film and animation. Modern video-games are a mash-up of different approaches, where emotions are evoked using a variety of media that now contribute to the video-game experience. In the following section I shall introduce the fundamental structure of games, and then discuss ways in which we might elicit emotion through game mechanics, the game's aesthetic, narrative, and orchestral score to deliver a powerful experience comparable to film.

Figure 2. Fluid and responsive interaction (Swink, 2009)



Game Mechanics and Emotion

The seminal work of Reeves and Nass (1996) where they substitute computers for humans in a number of social psychology experiments, show that our interaction with computers mirror many of our social and emotional interactions with humans. It seems that we approach interactions with artificial agents in much the same way as organic ones. Games such as Nintendogs, and the Petz series, and toys like Tamagotchi and Furby all exploit our natural tendency to humanize our relationship with artificial agents. Caretaking games/toys compel us to care for, and thus foster emotional attachment to virtual animals. Our emotional involvement with our virtual pets is such that we display examples of real emotional stress when away from our pet, and we mourn them when they 'die'. Artificial pets share a few simple mechanics that encourage owner attachment, such as appearing to be autonomous - in that the virtual pet appears to have free, rather than a programmed response to their owner; they are dependent on their owner for survival and/or

Figure 3. Stiff game-feel (Swink, 2009)

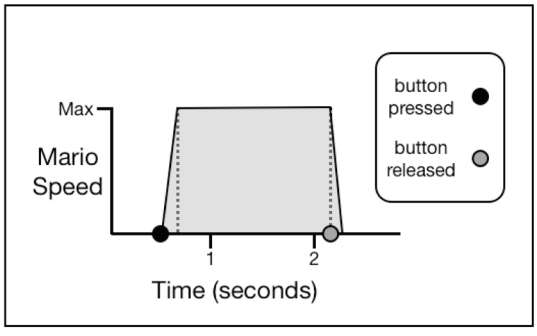
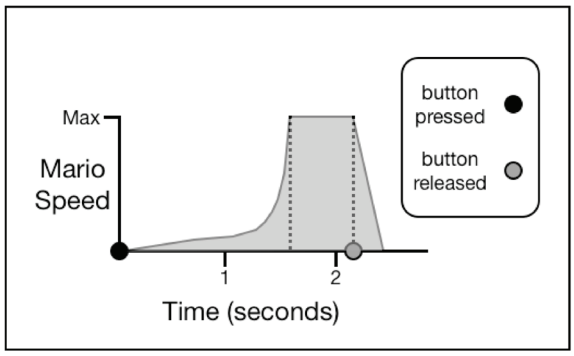


Figure 4. Unresponsive game-feel (Swink, 2009)



emotional health; and they reflect the accomplishment of the owner through positive or negative behaviours (Donath, 2004).

Through their MDA framework LeBlanc, Hunicke, and Zubek (2004) explain how game designers elicit emotion using game mechanics. MDA refers to game Mechanics, which affect player Dynamics, which then result in Aesthetic - or player feeling. Where houses use brick and cement in their construction, games use mechanics and resources. A game *mechanic* is a pattern of actions available to accomplish the player's game objectives. For example, to move our avatar in Monopoly we apply a 'roll-and-move' mechanic, which involves rolling dice and moving the number of squares identified.

Most game mechanics concern either the movement of resources (within the same play-space or between play-spaces), or the resolution of player conflict. The above roll-and-move mechanic is an example where the player moves within the same play-space. However, 'trading' is a mechanic that allows the movement of a resource from one space to another. This might be a private transaction where the player gives one set of resources to the bank in return for another - such as the purchase of property in Monopoly where the player gives currency in return for land rights. Alternatively, it might be accomplished openly between players, such as in Settlers of Catan where the actioned player initiates a trade of resource cards by proclaiming a product they have available for trade and the items they require to complete the transaction. Should two or more players declare interest in the deal they enter into conflict for prized resources and an auction mechanic is implemented to bring about resolution - with the player offering the more valuable resources being the victor. In a video-game context a movement mechanic might be as simple as pressing left on the game pad to move Pac-Man three pixels to the left, or it might involve selecting an item and then pointing to its destination - such as in StarCraft. Like board-games, video-games also involve the movement of items from one play-space to another – for example, spawning characters in a first-person perspective shooting game (FPS) such as Unreal. For a comprehensive compilation of game mechanics, Bjork and Holopainen (2004) have done a superb job of describing most core game mechanics as a series of design patterns.

Game mechanics typically allow players to manage their own *resources*, and to challenge the management of their opponent's resources. The board-game Settlers of Catan, for example, employs traditional resources, such as brick, wheat, and wood. Players attempt to acquire sets of resources that they can then trade for victory points, while simultaneously impeding the progress on their opponent. Games such as Thebes and Space Dealer are less traditional, and use 'time' as a resource. Here specific actions have a tem-

poral cost associated, and how you manage 'time' is key to winning the game. Video-games also concern resources although they are not always so salient. Tekken, for example, is a beat-em-up game where the goal is to deplete your opponent's health resource through the application of conflict resolution mechanics - such as punch, kick, etc.

We call the *function* of a mechanic its *dynamic* (LeBlanc *et al.*, 2004). 'The Downfall of Pompeii' is a board-game where players prepare for the impending eruption of Mount Vesuvius. The game includes a mechanic where the volcano erupts upon the drawing of the 2nd 'A.D.79' Omen card. In this way, the Omen deck is a mechanic that functions as a timer, informing the players of imminent disaster. LeBlanc *et al* (2004) make a distinction between the action (in this example, the mechanic of drawing Omen cards) from the function it performs (the countdown dynamic that results). Understanding how a series of game mechanics might elicit specific player dynamics is the dark art of game design. For example, the main mechanic of the board game Settlers of Catan involves the trade of resources between players. With player victory points being displayed openly, a common dynamic is for players to stop trading with the leading player – as this avoids feeding them the winning resources. Because of this, it is common for a further dynamic to appear where players avoid early lead position and instead make a late sprint to accumulate winning victory points. I am unsure whether Klaus Teuber, the designer of Settlers of Catan, initially meant for this dynamic to occur or whether this was a fortunate accident. Player dynamics are often hard to predict during the design process as they are influenced by a number of different factors - such as the state of the game, the strategies adopted by players, and the relationship between players.

The game's *aesthetic* is the subjective quality we experience as a direct consequence of the game's dynamic (LeBlanc et al., 2004). As such, the aesthetic does not refer to the overall play experience (including the graphics, sound, and narrative), but the experience of gameplay only. LeBlanc clearly identifies emotion evoked by mechanics and dynamics as being separate from affect generated by the game's audio, visual or haptic output. The emotional experience of aesthetic can be very powerful, despite the lack of multimedia support. Those of you who have experienced the dismay of losing good friends over a game of Diplomacy will, I am sure, concur.

Aesthetic Experience, Narrative and Emotion

In 1999 Ramachandran and Hirstein argued for a neurological theory of aesthetic experience, which academics have since built upon to describe the cognitive processes involved when we experience visual images. Leder et al (2004) present a cognitive model of how we process visual images – such as paintings, and Grodal's PECMA flow model (2009) offers a similar explanation of how film affects us emotionally. While there is some variation between the two models, they agree that our understanding of an image involves both conscious and subconscious processing.

Both authors agree that perception of an image involves subconscious processes necessary to identify visual forms, such as contour, colour, contrast, symmetry, order and grouping. Once processed, our implicit memory becomes activated (along with any emotional tags) as we attempt to find a match for the perceived image. Grodal (p149) gives the example where black and yellow lines are perceived and a matched association with 'tiger' is made. When the image is matched, related emotions are also activated, and in the tiger example can elicit a feeling of fear. Where difficulty exists matching form to memories (as can be the case with abstract paintings), the viewer might still experience a meaningful feeling of intense perceptual pleasure. This, claims Grodal, is because the brain is constantly looking for meaning, giving the sense of significance even where none is found.

Ramachandran and Hirstein (1999) found that we display aesthetic and affective preference for particular formations during the subconscious matching process. They report of a phenomenon where we naturally prefer images where defining features of a familiar image are amplified. They call this the peak-shift phenomenon. They found that the greater the amplification, the more typical the image becomes. For example, a caricature of Nixon may be considered more Nixon-like than a photograph of the ex-president. This suggests that affective preference for an image may increase with both familiarity and prototypicality (the extent to which the image represents a class of images). This is supported by Kunst-Wilson & Zajonc (1980) who found that familiarity, even where the image is degraded such that it is no longer recognizable, can still positively impact viewer preference.

In an attempt to comprehend the image, it is argued that we apply conscious processes. In the context of viewing a painting, this might involve drawing upon our knowledge of the artist, the historical importance of the painting, or what we might know of the subject depicted. In the context of film, the viewer attempts to align the image with the developing narrative, but will also draw upon their wider world knowledge. In this way the aesthetic experience is largely subjective and reliant upon our own personal connection. Subjective identification with art, whether aesthetic or narrative, is often key to our emotional engagement. In a bid to enhance the personal connection between media and consumer, authors and scriptwriters will apply techniques such as *imaginative elaboration* (Glassner, 2004, p98), where elements of the story are purposely ambiguous so as to facilitate audience self-projection. This then enhances the emotional tie between story and viewer. Applying this technique, writers provide only enough detail to make their characters believable, forcing the audience to breath their own personal experience into them. The result of this process is that we then share personal, and potentially intimate connection with the character's story.

The first generation of video-games (going back to Pong) offered black and white graphics, simple beeps, and little narrative beyond a basic back-story. The primary avenue for emotion elicitation was the game's mechanics. As the machinery evolved, the software was able to exploit richer graphics, offer complex sounds, and provide a more involved story. Game developers typically applied narrative to provide emotional context for a player's actions (a notable exception being the text-based title 'Adventure', arguably the first interactive narrative and precursor to the MMORPG). Rescuing the kidnapped princess gives Mario a purpose, a reason to continue his ludic journey. Like our relationship with virtual pets, we find it hard to deny the pleas of the princess. The narrative hands us responsibility for her welfare, and makes it clear the princess is dependant upon us for survival. The story thus attempts to tie us emotionally to the outcome of the game, and gives added pertinence to our actions.

Traditionally stories are delivered linearly, with the medium dictating the pace and order of delivery. For example, films start at the beginning and then run at 24 frames per second until the last frame is shown. A film does not stop and wait for the audience to catch up should they miss the plot – it carries on regardless. Film does not allow the viewer to choose the direction of the story - this has been set by the production team and remains the same for each viewing. However, computer technology supports the possibility of interactive narrative, where the audience decides how the story will unfold, each and every time they play. Modern titles, such as Heavy Rain, have adjusted the gameplay/narrative balance and now play like interactive stories, and less like games. In Heavy Rain, for example, game mechanics are used to support the narrative, enhancing the perception of presence and increasing the viewer's sense of control over the character's fate.

It is thought that emotions generated through storytelling are potentially less potent than those that game mechanics elicit. This is because game mechanics affect you directly, whereas narrative generates 'fictional' emotion. It was philosopher Colin Radford (1975) who first promoted the paradox of fictional emotions. While watching a horror movie we see a 'monster', and although we know that the creature is a fiction and cannot truly harm us, we still feel an emotional reaction that seems much like fear. Feagin (1996) makes the case that fictional emotions are mostly sympathetic or empathic responses to the characters and their situation, and that this is subjectively different from feeling emotions first hand. In a laboratory setting, Mandryk & Inkpen (2004) compared the impact of both direct and fictional emotions. Using physiological indicators (both electrodermal and EMG) and subjective reports, arousal was measured when players were competing against both a computer-controlled opponent (fictional character) and a human opponent. As they hypothesised, player arousal increased significantly when competing against a human opponent, as did self-report measures. This suggests we have a different, and possibly less powerful emotional response to situations we know to be fictitious.

Music, Emotion, and Games

Music is a powerful tool for evoking human emotion. It has been used on battlefields to rouse and motivate soldiers, it was used in cinema to manipulate the tears of an audience long before talking movies existed, and is used daily to motivate exercise. There are a number of ways in which music might trigger an emotional response, one of which is the intrinsic structure of the piece. Sloboda (1991,1992) has identified specific characteristics of music that are consistently found to elicit emotion, such as syncopations, enharmonic changes and melodic appoggiaturas. It appears to be that the structural changes within the piece influence our emotional experience of it. This is accomplished through the disruption and/or maintenance of audience expectations.

It is not just the structure of music that leads to an emotional response. Music, like many sensory stimuli, can trigger strong memories of past emotional events. Upon retrieval of the memory we are prone to re-live the associated emotion. When we hear 'our song', our attention is drawn to the memory of that first dance with our loved one - and we re-live the positive affect experienced at that time. The difficulty of eliciting emotions via memory is that our life experiences are subjective. The music that triggers an emotional memory for me is unlikely to trigger a similar response in others. Therefore, for a game developer to elicit associated emotion through music, they must find culturally significant pieces - music that has a shared communal response. A good example of such is the soundtrack to Battlefield Vietnam where the music triggers iconic memories of life in the 60s - even for those of us too young to have experienced the era. The cultural importance of the 1960s - a decade which saw advances in the liberal political movement, change in popular music, space exploration leading to the moon landing, the death of JFK, and the Vietnam war - has resulted in extensive media exposure of the decade in the form of documentary, film, and television. The extensive media coverage has shaped our memories of the period to such an extent that we all share common emotions on which Battlefield Vietnam was able to capitalise.

The emotional power of audio in gameplay is best exemplified by work carried out at Sonic Studio in Sweden. They have developed Beowulf, a game for the iPhone that is primarily audio-based (Liljedahl, Papworth, & Lindberg, 2007). In the game you are blind, but for minor spatial visualisation that identifies the layout of rooms, thus avoiding the need for good spatial memory. As you move between locations you determine the terrain from subtle changes in the sound of your steps and ambient sounds such as the howling wind. The player must identify the content of

a room, and combat against foe, based purely on the environment's soundscape - no narration is given. The game was not developed for the blind, but as an exploration of what can be accomplished when attention is shifted from the eyes to the ears. The studio reported that players found the game experience emotional, they became free to create their own mental imagery of the game world, allowing the designer to exploit the 'scary shadow syndrome' - a technique used in horror movies where a hint of what is off-screen has greater emotional impact than actually showing the monster.

Recent studies carried out within the eMotionLab at Glasgow Caledonian University have shown that our emotional relationship to music can impact our gaming behaviour (Cassidy & MacDonald, in press; Khan, Cassidy & Sykes, in press). Cassidy and MacDonald (2009) looked at driving performance while playing Project Gotham with (and without) music. The game comes with a number of modes, allowing players to race against time, race against an opponent, or navigate a course of cones. Under experimental conditions, Cassidy asked players to complete one of the cone navigation tasks while listening to player-selected music, or music that had been independently rated as having a highly arousing intrinsic structure. Interestingly, she found players were quicker and more accurate (i.e., hitting fewer cones) when they listened to their preferred music. A similar effect was found by Kahn *et al* (in press) when looking at music preference during exergaming. They found that music impacts the extent of effort exertion when participants jog on Nintendo's WiiFit. Music has long been known to encourage exercise, and songs with a high beat-per-minute are commonly used to increase exercise in the gym. However, Khan *et al* found listening to our preferred choice of music impacts exertion above and beyond the effect of the beats-per-minute measure.

Future iOpiates

So far we have discussed how current video-game technology might elicit emotion, showing how developers employ techniques used in game design, film production, music composition, and story telling. We will now consider the next evolutionary development of iOpiate - games that monitor our emotional engagement and dynamically tailor the experience accordingly.

During an emotional episode we undergo physiological changes such as increased heart-rate, changes in blood flow, and perspiration. We might also communicate our affect through facial gesture, intonation of voice, and/or body posture. To obtain an objective measure of emotion, psychologists employ a variety of techniques to record physiological changes. A widely used technique is the measurement of electro-dermal activity (EDA), where a small electrical current is passed across the surface of the skin. With increased arousal there is often an increase in perspiration, which will alter the resistance of the electrical current. Changes in the EDA measure will therefore indicate a possible autonomic change. Li & Chen (2006) have developed a system that can identify 22 features of our physiology and make an 85% accurate assessment of the discreet emotion experienced. An alternative approach to physiological measurement is to consider gesture. Ekman (1982) developed the Facial Action Coding System (FACS) as a means to determine discrete emotions through examination of facial gestures. This can be a laborious process of coding muscle activation to determine the emoted affect. To aid the coding of facial muscles there are now a number of software solutions which analyse video footage in real-time, such as Face Reader (published by Noldus).

In recent years researchers and private companies have made attempts to apply affective technology to video-games. In 2003, Sykes and Brown applied Clynes' (1978) work on sentics (the emotional aspect of touch) to investigate how

arousal levels may be determined through measurement of gamepad button depression. A more complex solution is offered by Journey into the Wild Divine (JitWD), an off-the-shelf video-game that comes with bespoke technology to measure electrodermal activity and heart rate. Hazlett (2006) has also shown that we can track movement in facial muscles using electromyography to measure emotional valence of game players. More recently, in 2009 Emotiv released a headset for domestic use that can read EEG signals during gameplay. For a review of physiological devices that can measure emotion during gameplay see Mandryk, Inkpen, & Calvert (2006).

The reason why games have become the focus of affective technology is two-fold. Firstly, as explored earlier in this chapter, play is an emotionally rich experience. Video-games are a bridge between technology and the play experience, making them the ideal space for affective technologies. Secondly, video-games (unlike film, music or literature) are dynamic. They respond differently dependant upon the dialogue with their players. Repeated play does not provide the exact same experience, and we are not assured successful achievement of our goals every time we play. By allowing games to respond not merely to player intent but also player emotion, we have the opportunity to foster a richer ludic experience. As identified by Gilleade & Dix (2004), there are a number of different ways in which affective interaction could generate more satisfying experience. Games that detect the affective state of the player can provide bespoke gameplay where the challenge adapts relative to player stress. For example, the game Tetris involves rotation and placement of falling shapes. At the beginning the blocks fall slowly, making it easy for the player to perform the necessary actions. As players progress, the rate of descent increases making the game much more difficult, eventually becoming too hard for the player. By monitoring arousal levels, it would be possible to adjust the speed at which blocks fall to match the player's stress levels, thus maintaining the optimal experience (i.e., flow). Alternatively, games might involve your affective state as part of a game mechanic. A good example of this can be found in JitWD's archery game. Here the player alters their state of arousal to aim the bow. To direct the aim down, the player must relax. However, as they begin to align the perfect shot the body naturally responds to the excitement of goal achievement and arousal increases, thus creating conflict between a player's intent and their affective response. It has also been suggested that affective gameplay could potentially allow for more realistic gameplay. In narrative driven games the non-player characters might react emotionally to affect expressed by the player (Hudlicka, 2009). If characters could respond to how we are feeling, the game-world would likely appear more believable, thus increasing the potential for enhanced emotional engagement.

CONCLUSION

Throughout the chapter we discussed how game technologies elicit affect, particularly through game mechanics, aesthetic, narrative and music. Although the emotion junky might not be satisfied by retro games such as Pong and Pac-Man, current iOpiates mash-up emotionally rich media offering an experience comparable to competing artifacts, such as TV or film. With the recent advancement in techniques to measure affect we will likely see greater emotional interaction, and can expect video-games to supersede linear media to become the emotion drug of choice for the next generation of junkies.

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