Engagement in digital entertainment games: A systematic review

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Since their introduction over 40 years ago, digital entertainment games have become one of the most popular leisure activities globally. While digital games clearly provide highly engaging activities, the nature of this engagement is not well understood. The current study aims to advance our understanding by reviewing a systematic review of recent literature addressing engagement in computer games. The papers in the review comprise a sub-sample of papers relating to engagement in digital games that was selected from a broader literature search carried out on the outcomes and impacts of playing computer games. A diverse range of studies was identified that examined varied aspects of engagement in games including subjective experiences while playing games, the physiological concomitants of these experiences, motives for playing games, game usage and time spent playing games and the impact of playing on life satisfaction. A narrative review was carried out to capture these diverse aspects of engagement and to develop a more coherent understanding of engagement in computer games.
1. Introduction

Since the introduction of the computer games Pong and Space Invaders into the UK during the 1970s, digital games have had a transformational impact on how we spend our leisure time. Games provide engaging and enjoyable activities and the digital games market has expanded to become the fastest growing leisure market even during a worldwide recession (Chatfield, 2010). While the appeal of digital games is self-evident in terms of sales of games, numbers of people playing games and time spent playing games, it has been deceptively difficult to explain (Nabi & Kremar, 2004). Vorderer, Klimmt, and Ritterfield (2004) suggested that understanding game usability has had priority over understanding game enjoyment, while Yannakis and Hallam (2007) argued that our knowledge of how to develop enjoyable computer games is “fundamentally incomplete”.

Existing theoretical frameworks developed in the literature on motivation, communication and media may help to structure our understanding of engagement in games. These theoretical perspectives broadly address two different topics relevant to engagement, the subjective experiences and enjoyment of games and motives for playing games. The most influential construct used to explain subjective experience while playing games is flow theory (Csikszentmihalyi, 1990). Csikszentmihalyi originally developed the notion of flow to describe the rewarding, subjective, emotional state of optimal pleasure that arises when an individual is absorbed in either work or leisure activities that are perceived as valuable. Csikszentmihalyi characterised flow as a complex construct with eight different components. Central to flow is the idea that there should be an optimal match between the skills an individual possesses and the challenges presented by an activity. In addition the experience should be intrinsically rewarding, immersive, involve a high degree of concentration and a sense of personal control, have clear goals and provide direct and immediate feedback (Sherry, 2004) applied flow theory to explain the engagement that players experience in playing games.

Self determination (SD) theory is an influential account of human motivation (Deci & Ryan, 1985) which proposes that human behaviours are determined by very general human needs for competence, autonomy and relatedness. Competence refers to the need to take part in activities which allow us to feel capable and effective, autonomy refers to the need to experience freedom in the activities we choose and relatedness refers to the need to feel a sense of connection to other people. Self determination theory has been applied to many different human behaviours and could potentially explain engagement in digital entertainment games. Uses and gratifications (U&G) theory is another needs based motivational theory which claims that people have specific needs for entertainment and they will use a range of media to meet these needs. U&G theory was originally developed within the domain of media and mass communication to explain why people watch television and listen to music (Schramm, Lyle, & Parker, 1961) but has been extended to explain why people play computer games (Lucas & Sherry, 2004).

Another theory relevant to explaining why people play games is the Technology Acceptance Model (TAM) (Davis, 1989). This theory was developed to explain determinants of technology acceptance in the area of work and training. TAM proposes perceived usefulness and perceived ease of use as two key factors in this. While ease of use of a system may be a contributing factor to explaining engagement in entertainment games, perceived usefulness may be less important in determining the acceptance of games for leisure purposes.

While much of the early research on computer games focused on the negative impacts of playing digital games, more recently there has also been interest in positive outcomes of playing games. Durkin and Barber (2002), for example, found that adolescents who play games had more favourable outcomes with respect to family closeness, school engagement, involvement in other leisure activities, positive mental health, substance use, self-concept, friendship network and obedience to parents. The engagement provided by games can be viewed as one of these positive outcomes. It is recognised that there is a dearth of empirical evidence concerning the impact of games (Connolly, Stansfield, & Hainey, 2008) and the current review aims to add to our understanding of the nature of engagement in digital entertainment games by reporting the results of a literature review of selected papers which address this topic.

2. Methodology

2.1. Data collection

In 2011 a literature search was carried out with the aim of developing a searchable database of papers relevant to the impacts and outcomes of computer games. The time period covered in this search was 1961 to 2011.

2.1.1. Search terms

Search terms used in the main literature search were derived from a previous search carried out on the evaluation of computer games (Connolly et al., 2008) and addressed the variety of digital games that might be played:

("computer games" OR "video games" OR "serious games" OR "simulation games" OR "games-based learning" OR "MMOG" OR "MMORPG" OR "MUD" OR "online games").

Additional search terms used for the impacts and outcomes of computer games reflected our interest in broadly defined outcomes and impacts of playing games, as well as the more specific impact of games in learning or engaging or motivating players:

("evaluation" OR "impacts" OR "outcomes" OR "effects" OR "learning" OR "education" OR "skills" OR "behaviour" OR "attitude" OR "engagement" OR "motivation" OR "affect").

2.1.2. Databases searched

The databases searched included those identified as relevant to education, information technology and social science: ACM, ASSIA (Applied Social Sciences Index and Abstracts), BioMed Central, Cambridge Journals Online, ChildData, Index to Theses, Oxford University Press (journals), ScienceDirect, EBSCO (consisting of Psychology and Behavioural Science, PsycINFO, SocINDEX, Library, Information Science and Technology Abstracts, CINAHL), ERIC, IngenetAConnect, Infotrac (Expanded Academic ASAP) and Emerald.

2.1.3. The searchable database

The searchable database is available to the public and can be found at http://ict.e.uws.ac.uk/search.aspx.

2.2. Selection criteria for inclusion of papers in the current review of engagement in games

This searchable database was used to select papers for the current review of papers relating to engagement in digital entertainment games. To narrow down the selection of papers for inclusion in the current review, the database was further searched
using only the terms “engagement”, “motivation”, “affect” and “attitude”. These entries were narrowed down further by focusing on papers which (a) included empirical evidence relating to engagement in digital entertainment games; (b) discussed engagement in digital entertainment games but not learning or serious games; (c) focused on positive aspects of engagement; (d) dated from January 2001 to October 2011 (because interest in engagement flourished during this time period); (e) were published in refereed academic journals; and (f) included an abstract. Using these six conditions 55 papers met the criteria for inclusion in the current review.

### 2.3. Data analysis

Papers were coded in terms of: name of authors and date published; the main aims of study; the sample, including details of the participants, their mean age, age range and gender split; the research design and method and major findings. The design of each study was coded according to whether it used a randomised control trial (RCT), a quasi-experimental design, a survey or a qualitative design. Coding of the papers along these dimensions is shown in Appendix A.

### 3. Results

#### 3.1. Main literature search

19,776 papers were identified by the search terms used in the main literature search. The majority of these papers were speculative or discussion papers, considering the potential impact of games or papers describing how specific games were designed.

#### 3.2. Papers selected for current review using our inclusion criteria

Fifty-five papers met the inclusion criteria for the current review on engagement in digital entertainment games. These papers were very diverse in scope and addressed a range of different aspects of engagement in games, utilised a range of theoretical models and adopted a variety of methodological approaches. To capture the heterogeneity of topics and approaches a narrative synthesis was adopted.

#### 3.3. Categorisation of papers

Scrutiny of the papers suggested that it was useful to organise them into categories depending on the main focus of the paper. The categories used are shown in Table 1 along with the number of papers in each of these categories. The categories were derived from consideration of different stages in the engagement process. Subjective experience is core to engagement and looks at the moment-to-moment experiences of players while they play the games. Related to this, a group of papers looked at the physiological correlates of emotions experienced in playing games. Motives for playing games are more enduring appraisals of players’ reasons for playing games. Some of these papers looked at motives for playing specific games; others focused on motives typical of different kinds of player. Several papers examined game usage including time spent playing games and intentions to play games as well as the market for games. The last group looked at the impact of playing games on life satisfaction and well-being. Papers were spread fairly evenly across the different topics with papers on motives the most frequent (18) followed by papers examining subjective experiences while playing games (13). There were several papers on games usage, impact of games on life satisfaction and physiological responses with fewer on the games market and player loyalty.

### 3.4. Research designs

Table 1 also shows the different designs which were used in the studies identified in the review with respect to the main focus of the papers. Overall, surveys (30) were the most frequently used designs followed by quasi-experiments (19), with qualitative studies (3) and RCTs (2) much less frequently reported. In theory, the design of choice in evaluating engagement in a game would be similar to assessments of other interventions, a randomised controlled trial (RCT) [Connolly et al., 2008]. In an RCT players would be randomly allocated to a game or control condition, measures of engagement administered before and after taking part in the intervention and pre to post differences between the two groups assessed. However, entertainment games frequently offer new leisure experiences for which there is no obvious non-game-based condition to act as a control. It is likely that this is one reason for the relative dearth of RCTs. Table 1 shows that there were differences between the designs used to study different aspects of engagement games. The quasi-experiment was the design used most frequently in studies of subjective experiences and physiological responses in games, while surveys were the most popular designs in studies of motives, game usage and market and impact on quality of life.

### 3.5. Subjective feelings of enjoyment experienced while playing games

Several papers in the current review addressed the pleasurable, subjective experiences which are central to media enjoyment (Vorderer et al., 2004). The only papers which reported RCTs were Russell and Newton (2008) and Jennett et al. (2008). Russell and Newton compared mood and enjoyment of physical activity in a cycle only, game only and game plus cycle condition. They found that incorporating a game element into an exercise cycle led to improved mood compared to a sedentary activity (game only control condition), but there was no additional effect of the game plus exercise over exercise alone. This suggests that exercise games have the potential to elicit affective benefits, but careful consideration needs to be given to how these games are implemented and the circumstances under which these benefits are most likely to occur.

Jennett et al. compared performance on a real-life “tangram” task before and after taking part in either a game (Half-life) or a non-immersive square-clicking task. While they found the predicted differences in immersion between the game and non-game conditions, they also found that players actually found the non-immersive control condition quite immersive! This illustrates the difficulties of selecting an appropriate control condition.
Jennett's study was an in-depth analysis designed to clarify the nature of immersion and develop better subjective and objective measures of immersion. A validation study of their immersion experience questionnaire confirmed five factors: cognitive involvement, emotional involvement, real world dissociation, challenge and control. Jennett et al. also experimentally tested two objective measures of immersion. The first measure using the “tangram” task focused on the “dissociation from the real world” component of immersion and found that participation in an immersive game impaired subsequent performance on the real world “tangram” task. The second measure predicted that players’ eye movements would significantly increase over time in a non-immersive task, but decrease over time in an immersive task as their attention became focused on visual features relevant to the game. Jennett et al. found that both methods had potential as objective measures of immersion.

Jennett et al. also looked at the role of negative emotions in immersion in games. They examined the impact of the pace of a game on immersion, predicting that faster paced games might be more immersive, although they might also lead to higher levels of anxiety. While they found that state anxiety and negative affect were higher for faster paced games, these differences were not significant. Although these findings about pace and immersion were inconclusive, they did suggest that negative emotions should be studied in understanding the immersive appeal of games.

Other studies of subjective experience in games compared enjoyment, presence, immersion and arousal in different games or different conditions of the same game. WeiBel, Wissmatt, Habegger, Steiner, and Groner (2008) found that playing against a human-controlled opponent in the online game Neverwinter Nights elicited stronger feelings of presence, flow and enjoyment than playing against a computer-controlled opponent. They also found strong positive correlations between presence, flow and enjoyment with regression analysis confirming Hoffman and Novak’s (1996) prediction that presence precedes flow with flow mediating the relationship between presence and enjoyment. However Aymeric-Franch (2010) found that body participation does not always lead to an enhanced sense of being in the game. They compared presence and emotions for participants in two different game conditions, interacting either through body movement or a joystick. They found that body participation did not impact on the sense of presence or on self reported valence (positive or negative) or arousal (excitement or boredom) dimensions of emotion compared with a joystick condition, although presence was linked to both dimension of emotion.

Rapid advances in the technology used in games, such as increased interactivity, animation and download speed, provide increasingly realistic experiences for players. Ivory and Kalyanaraman (2007) suggested that the increased realism of these technologically more advanced games may enhance players’ feelings of presence while playing games. They compared engagement in both violent and non-violent games which were more or less technologically advanced. They found a significant main effect of technological advancement, indicating that technologically more advanced games did lead to higher levels of presence, involvement and physiological (skin conductance) and self-reported measures of arousal for both violent and non-violent games. This result would appear to justify the development of increasingly realistic games while also suggesting that non-violent games can be just as engaging as violent games. Nacke, Grimshaw, and Lindley (2009) found that the presence or absence of sound and music in a game impacted on measures of subjective experience including immersion, tension, competence, flow, negative affect, positive affect and challenge, but did not have an impact on tonic psychophysiological measures.

A number of papers focused on specific features of games thought to increase enjoyment. Klimmt, Rizzo, Vorderer, Koch, and Ficher (2009) found that suspense added to player enjoyment of a game: a suspenseful version of a game was more enjoyable than a non suspenseful version, although in their study spatial presence had no impact on enjoyment. Klimmt, Hartman, and Frey (2007) found that reducing player effectance in a game by reducing the immediate feedback provided to players about their actions in the game reduced players’ enjoyment of the game, while reducing player control by increasing the speed of the game did not reduce player enjoyment. Schneider, Lang, Shin, and Bradley (2004) investigated the impact of introducing a storyline into a first person shooter game and found that players felt a greater sense of presence, showed increases in physiological arousal and greater identification with characters when a game was structured round a story than an equivalent game without a story, but there were no differences in self-reported arousal or dominance.

Chumbley and Griffiths (2006) and Qin, Rau, and Salvendy (2010) looked at how changing features of a game could change emotions and presence in the game respectively. Chumbley and Griffiths found that increasing the ratio of negative to positive reinforcement provided to players increased their frustration and decreased excitement, while increasing positive reinforcement increased the chances of players returning to play. Qin et al. found that player immersion was higher when the difficulty of the game between levels was changed in a down and up direction than with up and down or continuous change.

In developing their Game Engagement Questionnaire, Brockmyer, Fox, Curtiss, McBroom, and Burkhart (2009, p. 624) argued that “definitional agreement regarding how to label subjective experience during video game-playing has not yet been achieved”. They adopted an eclectic and inclusive definition of engagement in developing the questionnaire including items on flow, immersion, presence and adsorption. Rasch analysis provided support for the reliability and functionality of the questionnaire and the questionnaire predicted engagement in video games.

### 3.6. Physiological responses to playing games

The search terms in the main literature search did not include specific terms for physiological impacts of games, but several papers identified in the search reported a range of physiological outcomes of playing games. These papers are relevant because they describe physiological correlates of emotional responses while playing a game. All 7 of these studies used quasi-experimental designs either to compare physiological responses to different kinds of games or events in games. Baldaro et al. (2004) compared the short-term effects of playing violent or non-violent computer games on physiological (heart rate and arterial pressure) and psychological variables (state and trait anxiety) in young adults before, during and after playing a violent game (Unreal tournament) or a non-violent game (Puzzle Bobble). The results revealed increased systolic blood pressure during game-play and an increase in state anxiety following game-play only for those playing violent games. This indicated that physiological and emotional changes take place while playing games and these differ for violent and non violent games. van Reekum et al. (2004) used an action adventure computer game, Xquest, to study the impact of different game events on changes in a range of physiological measures including cardiac activity, skin conductance, skin temperature and muscle activity and emotion self-report. Goal conduciveness (whether the event was congruent with the desired game goal or not) was found to have an impact on the physiological measures but intrinsic pleasurtness (subjective appraisals of emotional events as pleasurable or not) had little impact on physiological responses. While this seems to suggest that physiological responses do not reflect our intuitions that we much prefer pleasant to unpleasant events, van Reekum et al. argued that congruence of emotions was more
relevant to game players than their intrinsic pleasantness in this situation.

Neuropsychologists are interested in identifying the regions of the brain where the enjoyable subjective experiences felt while playing games are located. Since previous research has shown that activation in the prefrontal cortex (trans-cranial direct current stimulation or tDCS) was negatively linked to the subjective feeling of presence, 

Beeli, Casutt, Baumgartner, and Jäncke (2008) examined how the feelings of presence felt during a virtual roller coaster simulation could be modulated by decreasing activity in the dorsolateral pre-frontal cortex (dlPFC). The researchers argued that, since the dlPFC is also involved in the inhibition of impulsive behaviour, lowered activation within the dlPFC should also be accompanied by higher impulsiveness. Participants were randomly assigned to cathodal, anodal or sham trans-cranial direct current stimulation (tDCS) and measures of electro-myogram (EMG), skin conductance, impulsivity and presence were recorded. Cathodal tDCS led to increased skin conductance and increased numbers of false alarms (i.e. increased impulsivity) relative to the other two groups, but there were no differences between the three groups in emg or subjective measures of presence. This study demonstrated that the relationship between physiological stimulation and measures of subjective experience is not always straightforward.

Salminen and Ravaja (2008) examined brain wave activity (EEG responses) linked to two emotional events, wounding and killing an opponent, while playing a first-person shooting game (James Bond 007: NightFire). They found increases in theta wave activity in response to both violent game events compared with the pre-event baseline, suggesting that this kind of brain activity is linked to the emotional responses experienced during violent events. In a previous study they had found no similar responses when players were playing a non-violent game, SuperMonkey Ball 2 (Salminen & Ravaja, 2007). Taken together these results suggest that the observed increases in theta wave activity were linked to taking part in emotional events in games.

Ravaja, Turpeinen, Saari, Puttonen, and Keltikangas-Jarvinen (2008) looked at facial EMG activity and skin conductance responses as well as assessments of mood during game-play (joy, pleasant relaxation, fear, anger, and depressed feeling) in response to short duration emotional game events. They found that counter-intuitive emotions were experienced during game playing events. Although we might expect that wounding and killing one’s opponent would elicit positive emotional responses since these events indicate progress in the game, the events did in fact lead to anxiety or anger. Players possibly experience “normal” empathetic responses that would be felt in response to such an event in real life. Similarly wounding or killing of one’s own character, which would be a negative event in the game, led to positive emotions, which may have been due to relief from the stress of playing the game. The authors concluded that we should not assume that we know which emotions are experienced during game-play as it may be difficult to dissociate the import of emotions in games from those experienced in real life.

Sell, Lillie, and Taylor (2008) measured enjoyment of the game as well as physiological benefits (heart rate, oxygen consumption and energy expenditure) experienced by players while playing the dance exercise game Dance Dance Revolution (DDR). Sell et al. found that all players enjoyed playing the game more than working on a treadmill but the physiological benefits experienced depended on the level of fitness of the players. More experienced players were able to work at higher levels of the game and could consequently expend more energy, achieving improved physical benefits and increased enjoyment compared to less experienced players. This study also illustrates difficulties in choosing an appropriate control since treadmills are not typically known for their engaging properties!

Liu, Agrawal, Sarkar, and Chen (2009) reported an innovative use of players’ predictable physiological responses to games as a basis for adjusting the level of game difficulty (DDA) for players in trying to provide them with optimal challenge. This method was compared with DDA based on player performance measures. While the study used small numbers, it was found to provide a promising means of quantifying players’ emotions when playing computer games and using these to provide optimally challenging experiences for players.

3.7. Motives/reasons for playing games

Over time, enjoyable feelings experienced while playing games will lead to positive attitudes and expectations of games which provide more enduring reasons or motives for playing games. Motives for playing games provide an alternative perspective on engagement which involve appraisals of feelings experienced while playing games. Tan (2008) made a similar theoretical distinction between “on-line phenomenal experiences of activities” and “selecting and engaging in activities” in discussing emotions linked to media.

Overall the method used most frequently in studying motives for playing games was the survey (14), although two good quasi-experimental studies and two qualitative studies were also identified. Several studies of motives for playing digital games were grounded in rigorous theoretical models, mostly based on satisfaction of needs. Ryan, Rigby, and Przybylski (2006) argued that understanding motives for playing games is an under-researched area and they applied Deci and Ryan’s (1985) generic motivational theory, self determination (SD) theory, to examine players’ motives for playing games. The main finding from Ryan et al.’s detailed studies was that players’ ratings of enjoyment and value in games and a desire for future play were strongly predicted by presence and players’ self determined needs for competence, autonomy and relatedness. This suggests that the need for challenge, the freedom to act in a virtual world and opportunities to develop relationships are important contributors to game enjoyment. Ryan et al. also found that player presence was an important predictor of game enjoyment.

Uses and gratifications (U&G) theory provides an account of more specific, media-related motives for playing games. Lucas and Sherry (2004) asked 18–24 year olds to rate six previously established uses and gratifications for playing computer games (competition, challenge, social interaction, diversion, fantasy and arousal). Challenge was the top rated reason for playing games for both genders, with the need for arousal and excitement also rated highly by both genders. Colwell (2007) was also influenced by U&G theory and identified companionship, preferring playing games to being with friends, fun/challenge and stress relief as needs that playing games meets for adolescents.

Chou and Tsai (2007) examined links between reasons for playing games and enjoyment of games in Taiwanese high school students. They found that using games for entertainment, seeking information, filling time and social reasons were among the four most important reasons predicting enjoyment of games for both males and females.

A sub-set of papers focused on motives for playing specific kinds of games. Kim and Ross (2006) extended U&G theory to study the gratifications of playing sports games and found sports knowledge and application and identification with sport as unique motives for playing sports games. Klimmt, Schmid, and Ortmann (2009) found that the primary determiners of the appeal of multi-player browser games were the social relationships developed in the games and their flexibility of use, with competition a less important motive for playing these games. Clearly some game genres or platforms are more engaging than others. Lee et al. (2007)
found that simulation, role-playing and action games were the most popular games with high and middle school students in Korea.

Several papers addressed the increasing popularity of Massively Multiplayer Online Games (MMOGs) and Massively Multiplayer Online Role-Playing Games (MMORPGs). In a short but influential paper, Yee (2006) found achievement, socialising and immersion were important motives for playing online games. Using Yee’s (2006) questionnaire, Suznjevic and Matijasevic (2010) found that achievement was the most important motive for players of the MMORPG World of Warcraft with team work also important but immersive features less so. Using a qualitative approach, Frostling-Henningsson (2009) found that online gaming is motivated primarily by social reasons with players seeking opportunities for cooperation and competition. Players were also motivated by escapism and flow as well as opportunities to carry out behaviours that would not be possible in the real world. Lin and Lin (2011) used a more specialised qualitative technique used in marketing to identify players’ perceptions of the attributes, consequences and values associated with playing MMORPGs. Players identified fun and enjoyment of life, a sense of belonging, warm relationships with others and a sense of accomplishment as reasons for playing games. These studies confirm, using a different methodological approach, the use of games for enjoyment and to satisfy the needs for competence and relatedness as specified in self-determination theory.

The popularity of violent games would appear to suggest that the violent content of games is an important factor in the enjoyment of these games. While the current review did not focus on violence, Przybylski, Ryan, and Rigby (2009) argued that “little research has examined the role of violent player content in player motivation and immersion”. They examined violence as a motive for playing games but found that the violent content of games did not predict player ratings of enjoyment and value in games over and above players’ needs for competence and autonomy. This suggests that violence is not an important factor in contributing to game enjoyment. Rather players play violent games for reasons similar to those for playing other games, i.e. because these games provide challenges and the freedom to act in a virtual world.

A number of papers focused on differences between players in motives for playing games. Gender is the most obvious user characteristic which influences engagement in games: males are more interested in games, enjoy games more, spend more time playing games, are much more likely to play for extended periods of time than females and have different game preferences to females (Chou & Tsai, 2007). Lucas and Sherry (2004) found that males rated all six reasons for playing (challenge, competition, social interaction, fantasy, arousal and diversion) as more important than females, confirming the greater enthusiasm for games that males have. Interestingly males rated social interaction as the second most important reason for playing games, while females rated it the least important suggesting that males are much more likely than females to regard game playing as an opportunity to socialise with friends. Jansz, Avis, and Vosmeer (2010) found that social interaction, fantasy and challenge were rated significantly more important motives for males than females with no gender differences in enjoyment, control and diversion. Olson (2010) found that boys were significantly more likely than girls to play for fun, to compete with other people, for challenge and for emotional reasons, including excitement, relaxation and coping with anger.

Age differences in motives for playing were also reported. Eglesz, Fekete, Kiss, and Izsó (2005) found that children under 10 play games to achieve better results, while 14- to 18-year-olds like more stimulating games because they are more driven by sensation-seeking motives. When they fail players over 30 are motivated to try again. Griffiths, Davies, and Chappell (2004) showed differences in motives and play patterns between adult and adolescent players of Everquest. They found that adolescents are more likely to play because of violence and are more likely to sacrifice work to play, while adults are more likely to sacrifice socialising.

Jeng and Teng (2008) found that personality traits were strong predictors of game-playing motivations, while Teng (2008) found that players of online games had higher openness, conscientiousness, and extraversion scores but not neuroticism or agreeableness. Koo (2009) found that players with an external locus of control enjoy online games more, concentrate more on the games and use games as an escape strategy more than those with an internal locus of control.

Sell et al. (2008) found that player expertise impacted on enjoyment of games, with more experienced players of DDR achieving improved physical benefits and greater enjoyment than less experienced players. Fang and Zhao (2010) brought together player characteristics and game type, arguing that the fit between these will influence the level of enjoyment experienced in playing games. They examined the impact of sensation seeking and self-forgetfulness on enjoyment of five different categories of computer game and found that sensation seeking was linked to behavioural enjoyment for action oriented game types and to cognition for family entertainment/simulation game.

Wan and Chiou (2007) found that players who were classified as on-line game addicts had higher levels of intrinsic than extrinsic motivation, while non-addicts’ extrinsic motivation was significantly higher than their intrinsic motivation. This suggests that addicts are more susceptible to the pleasurable features of the games. Lee et al. (2007) found that players in a high risk group for internet addiction played games more and reported more difficulty in controlling their game use than those in potential or low risk groups.

3.8. Game usage

The huge amounts of money spent on games, the large numbers of children, adolescents and adults who play games worldwide and the amount of time spent on playing games are important indicators of engagement in games. The only design which was used in studying game usage was the survey, although several papers used sophisticated modelling techniques to analyse predictors of game usage. Playing games is clearly a highly popular leisure activity with players spending around 7 h per week playing games (Lee & Larose, 2007; Lucas & Sherry, 2004). Eglesz et al. (2005) found that children in the 14–18 year old age-range spent the most time playing games, a fact that they attributed to their need for sensation seeking and emotional release. Griffiths et al. (2004) found that the average number of hours played by players of the game Everquest was 25.3 h per week for adolescents and 24.7 h for adults.

A number of authors looked at the links between motives for playing games and game usage. Colwell (2007) found fun/challenge, preferring games to friends and stress relief were significant predictors of the amount, duration and total weekly play. Shieh and Cheng (2007) found that Taiwanese adolescents and young adults who value games as a leisure pursuit, who are concerned about social norms, who play games for a sense of empathy and escapism and who value the social aspects of games will play online games more. Yee (2006) found that escapism, hours played per week and advancement (the desire to progress in the game) were the best predictors of problematic use of games.

Just as we might assume that people play games primarily because they enjoy them, so too we might predict that the more people enjoy playing games, the longer they will play. However people play games for both positive and negative reasons and Lee and LaRose (2007) found that time spent playing games is strongly influenced by negative reasons for playing games. They proposed that many people start to play video games to help them manage negative...
psychological states by relieving boredom, reducing loneliness, passing time or providing an escape, so-called self-reactive outcome expectations. Lee and LaRose also highlighted the importance of self-regulatory mechanisms in controlling game usage. They modelled computer gaming habits and usage of 388 college undergraduates and found that players’ self-reactive outcome expectations were positively linked to deficient self-regulation of game playing, with respect to inaccurate judgements about appropriate norms of acceptable games use and failure to feel guilt about excessive play. Lee and LaRose also found that flow did not have a direct impact on the amount of time spent playing computer games, directly questioning the commonsense assumption that the more players enjoy a game the more time they will spend playing it. However, flow did have an impact on habit strength, self-reactive outcome expectations and self-regulation variables, suggesting that experiencing flow makes it more likely that players will have difficulties in regulating media consumption. This study provides an interesting insight into the mechanisms by which normal players might be drawn into playing games excessively and explains why enjoyment is not necessarily a good predictor of time spent playing games.

Many players feel passionate about playing games, but a distinction is made between harmonious passion (HP) and obsessive passion (OP), where harmonious passion is regarded as positive and obsessive passion as negative. Przybylski, Weinstein, Ryan, and Rigby (2009) argued that the former is determined by wanting to play games, while the latter is determined by needing to play. Wang, Chen, Lin, and Wang (2008) found that players with higher HP and OP had significantly higher flow disposition, positive affect and played for longer than those with moderate or low HP/OP profiles. Overall the findings confirmed that harmonious passion tends to be linked to positive outcomes and obsessive passion tends to be linked to negative outcomes.

Koo (2009) found that perceived enjoyment, escape and social affiliation but not concentration or epistemic curiosity predicted players’ intention to play. They also found that players with an external locus of control enjoy online games more, concentrate more on the games and use games more as an escape strategy than players with an internal locus of control. Hsu and Lu (2004) used the Technology Acceptance Model (TAM), extending it to leisure applications of IT and showing that social norms (i.e. players’ perceptions of other people’s views of the technology), critical mass (the number of people using the technology) and flow are more relevant to explaining attitudes to and the use of on-line entertainment games than the traditional extrinsic TAM variables, perceived ease of use and usefulness.

3.9. Game market and player loyalty

The current review did not explicitly address the computer games market, but several papers mentioned the need to understand the games market in providing a rationale for the study. For example Lee and Larose (2007) reported that retail sales of computer games plus consoles, software and accessories reached US$10.5 billion in 2005, while Przybylski, Ryan et al. (2009) reported that the computer games market is now even bigger than Hollywood.

Wu, Wang, and Tsai (2010) examined why players want to continue playing a particular game. They found that achievement, enjoyment and social interaction gratifications derived from the game as well as service mechanisms (fairness, incentive and security) positively predicted players’ motivations to continue playing a game and their “proactive stickiness”, i.e. players’ tendency to be loyal to the game. Presence did not predict players’ motivation to continue playing. Chang and Zhang (2008) found that players’ attitudes to materialism were linked to their motivation for online gaming (self-confidence and achievement; escape and virtual identification; sociability; reward and entertainment) and this predicted players’ attitudes toward online games, although the effects of materialism on attitude were fully mediated by motivation. Hsu and Lu (2007) found that customer loyalty in online game communities was influenced by perceived enjoyment, social norms and preference, while perceived cohesion of the community had an indirect impact on loyalty through its impact on customers’ loyalty to the community.

3.10. Impact of game-playing on life satisfaction

Seven papers looked at the impact of playing games on life satisfaction. Apart from Smyth’s (2007) between groups study, all studies in this category were surveys. Most of the studies looked at both positive and negative impacts of playing games. Ogletree and Drake (2007) found gender differences in the impact of games with males playing games for longer durations than females and males agreeing that playing games interfered more with sleeping and class preparation then females. More males also complained about their own game playing, while more females than males complained about the amount of time their significant other played computer games. The results are consistent with the displacement hypothesis, which proposes that game playing replaces more important activities in the lives of young people. Wang, Khoo, Liu, and Divaharan (2008) found that physiological and aesthetic dimensions of game satisfaction had positive effects, but web surfing frequency and the educational component of game satisfaction had negative effects on adolescent life satisfaction. Skoric, Teo, and Neo (2009) found that addictive but not engagement tendencies had a negative impact on the academic performance of primary school children.

Self-determination theory proposes that taking part in activities which meet his needs enhances a person’s well-being. Przybylski, Weinstein et al. (2009) examined links between game players’ self-determined needs and harmonious and obsessive passion and found, as predicted, that players with higher levels of self-determined need satisfaction also had higher levels of harmonious passion and this was positively linked to life satisfaction, while those with lower levels of need satisfaction had higher levels of obsessive passion, which was negatively linked to life satisfaction. Similar findings were reported by Lafrakne, Vallerand, Donahue, and Livagne (2009), although these authors found that high obsessive passion was positively related to positive as well as negative affective experiences, again suggesting that, despite negative outcomes, even players with high obsessive passion enjoy playing games.

Addressing concerns that playing online games is associated with detrimental outcomes, Smyth (2007) compared aspects of engagement (game usage, health, well-being, socialisation, sleep and academic progress) in MMORPGs with arcade, console and computer games. Smyth reported that playing MMORPGs is linked to both positive and negative consequences. The MMORPG group reported greater enjoyment of the game and a greater interest in continuing to play the game. However they also spent significantly more hours playing, reported worse sleep and poor quality and greater interference of games with their social life and academic work suggesting that, while the MMORPGs are clearly engaging, the outcomes are largely detrimental.

4. Discussion

The number of papers providing empirical evidence about engagement in digital entertainment games captured in the current review confirms the surge in interest in this area over the past 10 years. A structured approach to synthesising the findings from these diverse papers was developed which categorised studies in terms of the different approaches used by their authors to
understand engagement in games. This categorisation is consistent with process models of engagement which look at different stages in the course of engagement. For example, the model of media enjoyment proposed by Vorderer et al. (2004) placed subjective experience at the heart of media enjoyment but claimed that a comprehensive account of media enjoyment should also consider the antecedents of enjoyment such as motives and player and game prerequisites and outcomes of media enjoyment. O’Brien and Toms’ (2008) process model of engagement with technology made similar claims about different stages in the process of engagement but adopted the perspective of an individual engaging with a game rather than providing an abstract description of the process.

As Brockmyer et al. (2009) acknowledge there is still a lack of consensus about how best to characterise subjective experience in games. The different constructs which have been proposed, enjoyment, immersion, presence, flow and arousal are similar but emphasise slightly different aspects of subjective experience in games. Flow, the best known term for describing the enjoyable subjective experiences of playing games, has a strong focus on cognitive features relating to the task such as challenge, concentration, goals and feedback. Jennett et al. (2008) argued that immersion is a more useful construct than flow since it can exist to varying degrees on different tasks and can explain a broader range of subjective experiences than flow which refers only to states of optimal experience. Presence, with its specific focus on the feelings of actually being present in the game, is an important aspect of the engagement experience, but it describes a rather narrow view of engagement. While many accounts view enjoyment of games as almost synonymous with engagement, arousal theory highlights excitement as a distinct emotion from enjoyment as suggested in the dimensional theory of emotions (Aymerich-Franch, 2010). Brockmyer et al. adopt a pragmatic and eclectic approach to characterising engagement in games in their Game Engagement Questionnaire by including questions about different aspects of subjective experience.

While most measures of engagement are questionnaire based, several papers described objective measures of engagement in games, based either on behavioural or physiological responses. While time spent playing games may seem like an obvious correlate of enjoyment, Lee and Larose (2007) suggested caution in using this as a proxy behavioural indicator of engagement in games since negative reasons for playing games and poor regulation of game playing were better predictors of game usage than flow. On a more positive note Jennett et al. (2008) found that both eye movements and time to re-engage in an activity following immersion provided promising objective measures of immersion. Liu et al.’s (2009) use of a range of physiological correlates of emotions felt while gaming to adapt the difficulty level of a game to players’ needs suggests that these measures can provide reliable and useful indicators of engagement in games. However links between physiological and subjective measures of engagement are not always so easy to interpret. Ravaja et al. (2005) pointed out that physiological measures can provide potentially ambiguous measures of arousal in computer games. Heart rate, for example, can either increase in response to emotional arousal or decrease in response to attentional engagement, both of which are relevant subjective indicators of engagement in games.

While subjective experience is central to explanations of the appeal of games, players’ motives for playing games provide an alternative perspective on understanding player engagement which examines the factors which impact on why people might choose to play games. Many different motives for playing games were identified with fun/enjoyment and challenge consistently rated as the most important reasons for playing games. Challenge (competence) is a key reason for playing games in SD theory, Yee’s (2006) motivational theory and in U&G theory. Playing games satisfies players’ need for achievement, a need first identified by McClelland, Atkinson, Clark, and Lowell (1953) as an important motivator of behaviour. There was evidence too that games satisfy players’ needs for autonomy (Klimmt et al., 2007; Ryan et al., 2006) and relatedness (Lin & Lin, 2011), the other needs specified in SD theory. Ryan et al. (2006) also recognised the importance of presence in predicting game enjoyment, although Jennett et al. (2008) pointed out that presence is not necessary for immersion as many games and puzzles which do not involve a strong sense of presence are nevertheless highly engaging.

SD theory has been criticised for considering a narrow range of motives for playing games and U&G theory identified a broader range of needs that playing games can meet including competition, arousal and fantasy. Many other features including suspense and narrative have been found to contribute to engagement in games and it seems likely that other features will be identified. While we may want to provide a more coherent understanding of motives for playing games, the reality is that a range of diverse and unrelated features contribute to engagement. O’Brien and Toms (2008) call these features “engagement attributes”.

While SD theory focuses on user needs it is also recognised that features of the games themselves contribute to engagement. Progress in understanding motives will be made by looking in more detail at the characteristics of specific kinds of games as well differences between players in the kinds of games that they enjoy. Social motives are especially important reasons for playing online games and browser games (Klimmt, Rizzo et al., 2009; Klimmt, Schmid et al., 2009), while competition seems to be more important in some games than others (Frostling-Henningsson, 2009) and for some players (Lucas & Sherry, 2004; Olson, 2010). Several papers looked at the impact of gender (Chou & Tsai, 2007; Karakus, Inal, & Cagiltay, 2008), age (Eglesz et al., 2005) and personality differences between players in their engagement in games. Fang and Zhao (2010) brought together player characteristics and game type, arguing that the fit between these will influence the level of enjoyment experienced in playing games. O’Brien and Toms (2008) side-stepped the issue of whether motivational features are properties of the game or the player by proposing that engagement attributes are properties of the user—game interface.

We have argued that it is useful to distinguish motives and subjective experience as separate components in understanding engagement. However, in practice many game characteristics, including enjoyment, challenge, arousal, fantasy, suspense, competition and interest are relevant both as reasons for playing games and as facets of subjective experience. Challenge for example is a key characteristic of flow theory but it is also recognised as a motive for playing games. A number of studies examined links between reasons for playing and subjective experience. For example Ryan et al. (2006), Przybylski, Ryan et al. (2009), and Chou and Tsai (2007) looked at motives for playing games as predictors of enjoyment. In a detailed theoretical analysis of interest, Tan (2008) argued that the experience of boredom (the distal reason) will set in train behaviours which will be experienced as interest. It would be useful to carry out similar detailed examinations of other characteristics which are important in engagement.

While enjoyment is key to explanations of engagement in games, players also experience negative emotions while playing games. Jennett et al.’s (2008) preliminary studies of pace related anxiety and immersion were inconclusive but suggested that experiencing negative emotions such as anxiety may actually help to engage players in games. Players also play games for negative reasons such as escapism, avoiding boredom and depression and, as Lee and LaRose found, this has negative consequences since such players are less able to control their gameplay. While violent games are very popular, Przybylski, Ryan et al. (2009) found that
violence itself did not predict enjoyment of and immersion in games while Ivory and Kalyanaraman (2007) found no difference between violent and non-violent games in ratings of presence, involvement and arousal. Future research should consider the role of negative emotions in engaging players in games in more detail.

Studies looking at the impact of playing games on general life satisfaction also suggest that playing games has both positive and negative consequences. Smyth (2007) found that players of online games enjoyed them more than those playing other kinds of games, even although they also suffered more from the detrimental effects of playing these games. As with other highly enjoyable behaviours there is a fine dividing line between enjoyment and addiction. Wan and Chiu’s (2007) finding that on-line game addicts had higher levels of intrinsic motivation suggests that, despite the disadvantages of being an addict, these players still enjoy playing games. Even those who are not addicts may experience both harmonious and obsessive passion for games, and several studies suggest that players with a more obsessive passion suffer more detrimental outcomes than those with a more harmonious passion for games.

Methodologically, while RCTs would theoretically provide more rigorous evidence that digital entertainment games lead to increased engagement, difficulties in establishing meaningful controls would suggest that other designs may be more informative and appropriate. Several good quasi-experimental studies were found in the review, which have added to our understanding of subjective experience and physiological correlates of emotions experienced in playing games. Surveys were the most popular method for studying motives and time spent playing games, although many of these studies used sophisticated modelling techniques to examine links between different aspects of engagement providing more coherent models of engagement in games (Chou & Tsai, 2007; Hsu & Lu, 2004; Lee & LaRose, 2007; Ryan et al., 2006; Przybylski, Ryan et al., 2009). Nevertheless experimental studies of motives for playing games would help to provide more rigorous evidence of motivational aspects of games. In addition qualitative research looking at players’ experiences in playing games would help to add detail to our understanding of engagement in games.

The current review had a number of limitations. It was limited by the search terms used, the journals included and the time period of papers published, although the focus on the past 10 years ensured that the review covered the most recent research. The review concentrated on empirical evidence regarding engagement in games and speculative papers were excluded as we felt it was important to ground our understanding of engagement in research evidence. In addition, while we regarded engagement as a positive outcome of playing games, in practice it is difficult to focus uniquely on positive aspects of engagement. The current review related to digital entertainment games and excluded papers which discussed engagement in games for learning. However it is expected that many of the ideas discussed here will also be relevant to understanding engagement in games for learning.

4.1. Conclusion

This systematic literature review of empirical research over the past 10 years has revealed the complex, multi-factorial nature of engagement in digital entertainment games. The range of games and game platforms available is continually expanding and we are just beginning to understand the motivational appeal of different kinds of games. Future research should aim to develop this in conjunction with a better understanding of player preferences for different kinds of game. As with many other pleasurable activities, playing games can easily lead to negative outcomes as engagement turns into habitual play or even addiction if played for the wrong reasons. The current review has regarded engagement in games in a positive light, but has also highlighted the need for researchers to investigate in more detail the delicate balance between positive and negative experiences, emotions and motives in engaging players in games.

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Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.chb.2011.11.020.

References


