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The differences in motivations of online game players and offline game players: A combined analysis of three studies at higher education level

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ABSTRACT

Computer games have become a highly popular form of entertainment and have had a large impact on how University students spend their leisure time. Due to their highly motivating properties computer games have come to the attention of educationalists who wish to exploit these highly desirable properties for educational purposes. Several studies have been performed looking at motivations for playing computer games in a general context and in a Higher Education (HE) context. These studies did not focus on the differences in motivations between online and offline game players. Equally the studies did not look at the differences in motivations of people who prefer single player games and people who prefer multiplayer games. If games-based learning is to become a recognised teaching approach then such motivations for playing computer games must be better understood. This paper presents the combined analysis of three studies at HE level, performed over a four year period from 2005 to 2009. The paper focuses on differences of motivations in relation to single player/multiplayer preference and online/offline game participation. The study found that challenge is the top ranking motivation and recognition is the lowest ranking motivation for playing computer games in general. Challenge is also the top ranking motivation for playing games in HE while fantasy and recognition are the lowest ranking motivations for playing games in HE. Multiplayer gamers derive more competition, cooperation, recognition, fantasy and curiosity from playing games and online gamers derive more challenge, cooperation, recognition and control from playing games. Multiplayer gamers and online gamers ranked competition, cooperation and recognition significantly more important for playing games in HE than single players and offline participants.

1. Introduction

Computer games are regarded by some educationalists as highly engaging and it is hoped that by exploiting their highly compelling even addictive qualities that they can be used to help people learn effectively. Games-based learning has been applied in a wide variety of different fields including medicine (Beale, Kato, Marin-Bowling, Guthrie, & Cole, 2007; Cameron & Dwyer, 2005; Lennon, 2006; Roubidoux, 2005; Yaman, Nerdel, & Bayrhuber, 2008), business and knowledge management (Christoph, 2007; Virtual Leader, 2010; Virtual University, 2010), military training (Artstein, Gandhe, Gerten, Leuski, & Traum, 2009; Patal, Leuski, & Traum, 2006), science and mathematics (Habgood, 2007; Nelson, 2007; Squire, Barnett, Grant, & Higginbotham, 2004; Young & Upitis, 1999) promotion of language education and vocabulary (Connolly, Stansfield, & Hainey, 2011; Johnson & Wu, 2008; Yip & Kwan, 2006), software engineering, computer science and information systems (Connolly, Stansfield, & Hainey 2007; Ford & Minsker, 2003; Hainey, Connolly, Stansfield, & Boyle 2011; Jain & Boehm, 2006; Oh Navarro & van der Hoek, 2005; Papastergiou, 2009; Shaw & Dermoudy, 2005; Waraich, 2004; Zhu, Wang, & Tan, 2007) civil engineering (Ebner & Holzinger, 2007), history (Huizenga, Admiraal, Akkerman, & ten Dam, 2008) and statistics (Nte & Stephens, 2008). In a recent study, Boyle, Connolly, and Hainey (2011) examine the literature on computer games and serious games, focussing on the potential positive impacts of gaming, particularly with respect to learning value and skill enhancement. Over 7392 papers were identified in the review of the research literature between 1996 and 2009, confirming the surge of interest in this area. However, only 127 papers were empirical and only 64 of these were considered to have used an appropriate methodology that would allow generalisations to be made. Their literature review

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Table 1
Reasons for playing computer games.

Reasons	Overall study		
	Rank	Mean	SD
Challenge	1st	3.73	1.04
Curiosity	2nd	3.33	1.07
Fantasy	3rd	3.22	1.13
Control	4th	3.16	1.17
Cooperation	5th	3.15	1.17
Competition	6th	3.08	1.15
Recognition	7th	2.77	1.20

shows that playing computer games confers a range of perceptual, cognitive, behavioural and affective and motivational impacts and outcomes. In their review the most frequently occurring outcomes and impacts were affective and motivational followed by knowledge acquisition/content understanding. This reflects the parallel interests in games as an entertainment medium but increasingly their use for learning. The authors felt that there was a dearth of evidence and believed that much more research was required to understand the use of computer games in education and in entertainment.

This paper contributes to empirical evidence in the game-based learning literature by analysing the results of three surveys: one performed in March 2005, one in March 2007 and one in March 2009. The combined results of the three studies give a total of 2226 participants. The purpose of this study is to investigate the differences in motivations and reasons between players who prefer single player or multiplayer games and players who play games online or offline in relation to: reasons for playing computer games and reasons for playing computer games in HE. This study also looks at differences in attitudes to computer games between single player/multiplayer preferences and online/offline players in this field.

Following a discussion of previous work in the field, we describe the methods used to collect the data including procedure, participants and materials. We then present the results of the surveys carried out including: game playing habits, reasons for playing computer games, reasons for playing computer games in HE and attitudes to computer games. The paper concludes with a discussion of the overall results and future research directions.

2. Previous work

Computer games are considered by some educationalists to be highly motivating and engaging by incorporating features that have extremely compelling, even addictive, quality (Griffiths & Davies, 2002). Connolly, Stansfield, McLellan, Ramsay, and Sutherland (2004) suggest that computer games build on theories of motivation, constructivism, situated learning, cognitive apprenticeship, problem-based learning, and learning by doing. By creating virtual worlds, computer games integrate "*…not just knowing and doing. Games bring-together ways of knowing, ways of doing, ways of being, and ways of caring: thesituated understandings, effective social practices, powerful identities, and sharedvalues that make someone an expert*" (Shaffer, Squire, Halverson, & Gee, 2004). Games and simulations fit well into the constructivist paradigm and "generally advocate the active acquisition of knowledge and skills, collaboration and the use of authentic and realistic case material" (Christoph, Sandberg, & Wielinga, 2003). The use of computer games can be linked to the display of "expert" behaviours such as: superior long and short-term memory, pattern recognition, qualitative thinking, principled decision-making and self-monitoring (Van Deventer & White, 2002).

Probably the best known distinction in motivation research is that between intrinsic and extrinsic motivation (Deci & Ryan, 1991). Intrinsically motivated behaviours are carried out because they are rewarding in themselves, while extrinsically motivated behaviours are carried out because of the desire for some external reward, such as money, praise or recognition from others. Intrinsic motivation is thought to be more successful in engaging students in effective learning because intrinsically motivated students want to study for its own sake, they are interested in the subject and want to develop their knowledge and competence. This distinction has been used by designers of educational computer games, notably Malone and Lepper (1987) who argued that intrinsic motivation is more important in designing engaging games and created a framework of points to consider when designing learning games. They suggested that intrinsic motivation is created by four individual factors: challenge, fantasy, curiosity and control and three interpersonal factors: cooperation, competition, and recognition. Interestingly these factors also describe what makes a good game, irrespective of its educational qualities. Garris, Ahlers, and Driskell (2002) present six dimensions that computer games can provide for educational purposes that are based on the work of Malone and Lepper (1987). These dimensions are: fantasy – imaginary themes, characters or contexts; rules/goals clear rules, goals and feedback; sensory stimuli – novel auditory and visual stimuli;

Table 2
Reasons for playing computer games in relation to gender.

Reasons	Male			Female		
	Rank	Mean	SD	Rank	Mean	SD
Challenge	1st	4.02	0.96	1st	3.74	1.00
Curiosity	2nd	3.56	1.15	2nd	3.38	1.17
Competition	3rd	3.46	1.06	4th	3.07	1.34
Fantasy	4th	3.27	1.30	3rd	2.88	1.12
Cooperation	5th	3.18	1.13	5th	2.74	1.04
Control	6th	2.99	1.16	6th	2.63	1.21
Recognition	7th	2.54	1.13	7th	2.26	1.10

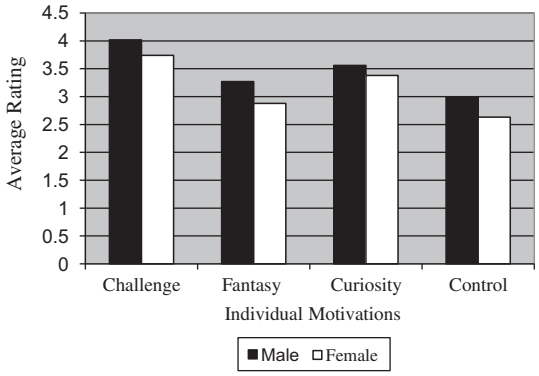

Fig. 1. Individual motivations for playing computer games in relation to gender.

challenge – optimal level of difficulty and goal attainment uncertainty; mystery – similar to curiosity providing optimal level of complexity of information; and control – active learner control. Thiagarajan (1996) suggests five critical characteristics of computer games: conflict – similar to challenge (Malone & Lepper, 1987) and encompasses the attainment of goals in both cooperation and competition with other players or the computer; control – the rules that regulate play; closure – the game has some form of 'end point'; contrivance – the game is not taken too seriously by the players and they are offered motivation to continue; and competency – the players experience growth in their problem solving, skill level and knowledge. Cordova and Lepper (1996) discovered that students learning by traditional methods were outperformed by students learning with instructional games and that control, context, curiosity and challenge increased.

The primary purpose for the discussion of intrinsic motivation in this study is due to the fact intrinsic motivation is more desirable than extrinsic motivation for learning according to the America Psychological Associations 14 learner centred psychological principles (APA, 1997). As a result Malone and Lepper's (1987) framework of intrinsic motivation was utilised to gain measurements as it has been extremely well utilised and documented in the games-based learning literature to study the educational design principles of learning games (Asgari & Kaufman, 2004). The framework uses the original interpersonal and individual factors. On an individual level:

- Challenge – an appropriate level of difficulty and challenge, multiple goals for winning, constant feedback and sufficient randomness;
- Fantasy – an appropriate level of immersion by assuming a particular role and dealing with related responsibilities;
- Curiosity – providing sensory stimulation to ensure prolonged participation; and
- Control – the ability to select choices and observe the consequences of these choices.

On an interpersonal level:

- Cooperation – assist others to achieve common goals;
- Competition – compare their performance to the performance of other players;
- Recognition – a sense of satisfaction when accomplishments are recognised.

A number of previous questionnaire/survey studies have been performed to identify peoples' reasons and motivations for playing computer games. Yee (2006) performed a study of 30,000 participants over a three-year period particularly focussing on motivations and experiences of users of Massively Multiplayer Online Role Playing Games (MMORPGs) and found significant differences between males and females with respect to relationship, manipulation, immersion, escapism and achievement factors. The results of this study were later used to formulate an empirical model of player motivations in online games (Yee, 2007). Whitton (2007) performed a study with 200 participants to examine gaming preferences, attitudes towards games in HE and motivations. 63.1% reported that they would find games

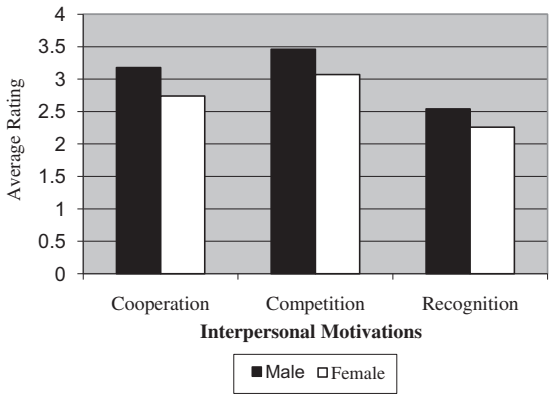

Fig. 2. Interpersonal motivations for playing computer games in relation to gender.

Table 3
Reasons for playing computer games in relation to single player or multiplayer preference.

Reasons	Single Player			Multiplayer		
	Rank	Mean	SD	Rank	Mean	SD
Challenge	1st	3.80	0.93	1st	3.71	1.14
Curiosity	2nd	3.29	0.92	2nd	3.47	1.21
Fantasy	3rd	3.18	1.04	3rd	3.46	1.10
Control	4th	3.10	1.11	4th	3.35	1.21
Cooperation	5th	3.07	1.10	5th	3.26	1.18
Competition	6th	2.82	1.08	6th	3.15	1.20
Recognition	7th	2.51	1.07	7th	3.02	1.22

positively motivating for learning, 28.3% not motivating either way and 8.6% demotivating. Gibson, Halverson, and Riedel (2007: chap. 8) performed a survey of 228 'pre-service' students to ascertain perceptions and attitudes to simulations and games. 80% of respondents were white females. 65% believed that simulations and games could be an important or very important learning tool; only 7% believed that they were of little or no importance. Males were more negative about the potential of games in learning. 53% of males were positive while 70% of females were positive. There was no notable generation gap between the respondents. Eglesz, Fekete, Kiss, and Izsó (2005) performed a study with two surveys, one online survey with 843 participants and a second with 102 participants. The studies found that woman play computer games significantly less than men and prefer Role Playing Games (RPGs) while men prefer action, adventure simulation and sports games.

3. Methods used to collect data in the 3 studies

3.1. Procedure

The survey was carried out across all students at the University of the West of Scotland. The questionnaire was made available through the online questionnaire packages Perception for study 1 and SurveyMonkey for study 2 and 3, for a two-week period during March 2005 (study 1), March 2007 (study 2) and March 2009 (study 3). Participation was voluntary and participants were notified of the availability of the questionnaire through email and a login notice posted in the BlackBoard Virtual Learning Environment (which the majority of students use). Notices were also posted across the University. Respondents completed the questionnaire online at their convenience during this period. Access to the questionnaire was controlled using the students' BlackBoard usernames and passwords, and the students' unique banner identification number was used to ensure a student only completed the questionnaire once.

3.2. Participants in 2005 (Study 1)

Out of approximately 12,070 students surveyed, there were 972 respondents, of which 428 (44%) were male and 544 (56%) were female. This compares with a gender breakdown in the University as a whole of 33% males and 66% females. The mean age was 26.6 (SD = 9.71) with a range from 17 to 58. A Mann–Whitney *U* test indicated that the mean age for males (26.1; SD = 9.6) was lower than the mean age for females (27.7; SD = 10.2), ($Z = -1.889$, $p < 0.059$).

Of the 971 participants who answered the question of whether they were full-time or part-time students at the University of the West of Scotland, 752 (77.4%) were full-time students and 219 (22.6%) were part-time students. This is slightly different from the University full-time student population of 65% and part-time student population of 35% for the year 2005. The breakdown of students across the different schools in the University was broadly in line with the student population.

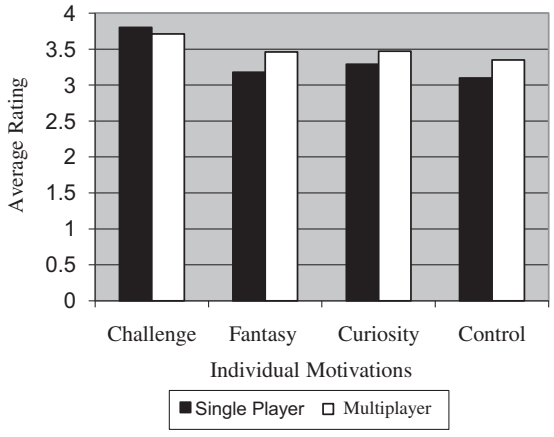

Fig. 3. Individual motivations for playing computer games in relation to single/multiplayer preference.

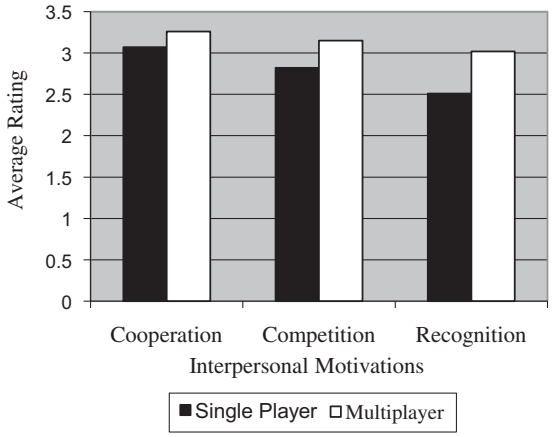

Fig. 4. Interpersonal motivations for playing computer games in relation to single/multiplayer preference.

3.3. Participants in 2007 (Study 2)

Out of approximately 13,880 students surveyed in 2007, there were 556 respondents; 5 were deleted, as they had not completed the questionnaire properly. Of the remainder who answered the question on gender, 328 (59.4%) were female and 220 (40%) were male. This compares with a gender breakdown in the University as a whole of 36% males and 64% females, although the proportion of females was higher in this sample than in study 1.

The mean age was 27.15 (SD = 9.53) with a range from 17 to 63. A Mann–Whitney *U* test indicated that the mean age for males (25.97, SD = 9.04) was lower than the mean age for females (28.16, SD = 9.77), ($Z = -1.923$, $p < 0.06$). 431 were full-time students and 119 were part-time students.

3.4. Participants in 2009 (Study 3)

Out of approximately 18,000 students surveyed in 2009, there were 704 respondents; 1 was deleted as the questionnaire had not been completed properly. The questionnaire that was deleted had only the banner ID of the student and no other fields answered. Of the remaining 703, 376 (53.5%) were female and 327 (46.5%) were male.

The mean age was 25.91 (SD = 8.82) with a range from 17 to 77, which is consistent with an overall average student age of 25. A Mann–Whitney *U* test indicated that the mean age for males (24.73, SD = 8.21) was significantly lower than the mean age for females (26.94, SD = 9.21), ($Z = -3.082$, $p < 0.002$). 700 respondents specified whether they were full-time or part-time, 606 were full-time students and 94 were part-time students.

3.5. Combined participants from 2005, 2007 and 2009

2226 usable results were collected over the 4 year period from 2005 to 2009. 975 (43.8%) were male and 1248 (56.1%) were female. 3 participants did not specify gender. The mean age was 26.54 (SD = 9.32) with a range of 17–77, which is consistent with an overall average student age of 25.A Mann–Whitney *U* test indicated that the mean age for males (25.22, SD = 8.41) was significantly lower than the mean age for females (27.58, SD = 9.86), ($Z = -4.598$, $p < 0.000$).

3.6. Materials

Questionnaire: As well as demographic questions, computer games specific questions included: whether or not participants played computer games; how many hours per week and how many years they had been playing for. The following definition of computer game was provided to participants: "*a game that is carried out with the help of a computer program*" (Smed & Hakonen, 2003).

Table 4
Reasons for playing computer games in relation to participation in online games.

Reasons	Online participation			Offline participation		
	Rank	Mean	SD	Rank	Mean	SD
Challenge	1st	3.85	0.94	1st	3.72	1.04
Curiosity	2nd	3.37	1.06	2nd	3.32	0.96
Fantasy	3rd	3.28	1.09	3rd	3.19	1.10
Control	4th	3.22	1.13	4th	3.07	1.13
Cooperation	5th	3.20	1.13	5th	3.03	1.15
Competition	6th	3.09	1.15	6th	2.96	1.10
Recognition	7th	2.82	1.12	7th	2.54	1.14

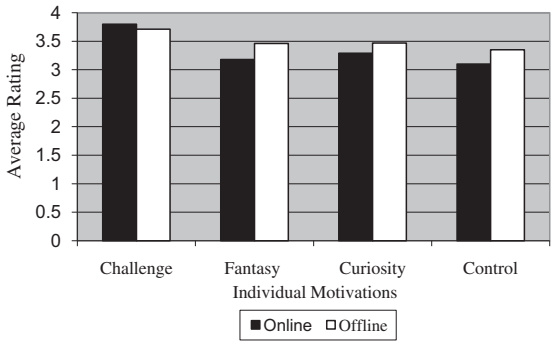

Fig. 5. Individual motivations for playing computer games in relation to online/offline participation.

Reasons for playing games: Malone and Lepper's (1987) framework was used to examine the reasons for playing computer games (challenge, fantasy, curiosity, control, cooperation, competition, and recognition). Participants were required to consider each possible reason for playing computer games and rate how important it was for them using a likert scale: very unimportant; unimportant; neutral; important; very important; don't know.

Reasons for using computer games for learning in University: In addition students' ratings of the importance of these reasons for using computer games for learning in University were examined. Participants were required to respond to the question: "If you had the opportunity to use computer games for learning in your programme at University, how would you rate each of the following reasons in terms of importance in learning?" The same likert scale as before was used.

Attitudes to computer games: Participants were also asked about their general attitudes to computer games and they were asked to rate how strongly they agreed with regards to each attitude. The attitudes included whether they considered playing games to be: sociable, a waste of time, useful for developing skills, time consuming, interesting, worthwhile, enjoyable, lonely, valuable and exciting.

Preference of single player or multiplayer computer games: Participants were asked about whether they preferred single player or multiplayer games. To reduce ambiguity for participants the following descriptions for 'single player' and 'multiplayer' were provided: a single player computer game is 'where input from only one player is expected throughout the gaming session' and a multiplayer computer game is 'where two or more players can play the same game at the same time either cooperatively or competitively'.

Preference of playing computer games online or offline: Participants were asked if they preferred to play computer games online or offline. To reduce ambiguity for participants the following descriptions for 'online' and 'offline' were provided: playing online is where 'the player plays a computer game while connected to a network or the Internet' and playing offline is where 'the player plays a computer game while not connected to a network or the Internet'.

4. Results

4.1. General game playing habits

78.4% of students in study 3 played computer games, which was lower than study 1 where 85.6% played and higher than study 2 where 69.2% played. 77.7% is the mean of all three studies. Overall 2218 answered the question of whether they played computer games. 79.8% played computer games and 20.2% did not play computer games.

95% of males in study 1 played computer games, which is consistent with the findings of study 2 where 91.8% of males played and study 3 where 90.8% of males played computer games.

80.7% of females in study 1 played computer games which is higher than study 2 where 55.8% of females played computer games and also higher than study 3 where 66.4% of females played computer games. This is possibly due to the fact that more participants took part in study 1 than in study 2 or 3. Overall, 92.6% of males played computer games and 69.9% of females played computer games across the three studies.

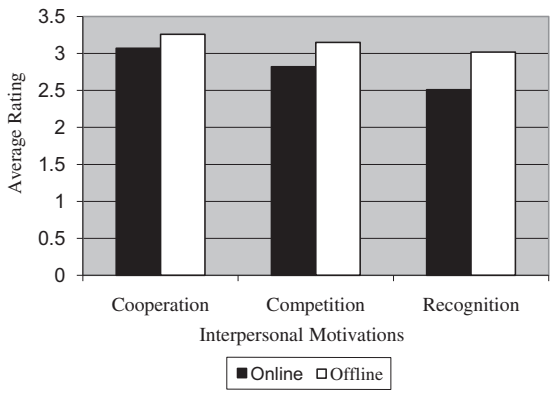

Fig. 6. Interpersonal motivations for playing computer games in relation to online/offline participation.

Table 5
Reasons for playing computer games in HE.

Reasons	Overall study		
	Rank	Mean	SD
Challenge	1st	3.49	1.36
Curiosity	2nd	3.19	1.36
Cooperation	3rd	3.15	1.26
Competition	4th	2.92	1.32
Control	5th	2.84	1.31
Recognition	6th	2.76	1.29
Fantasy	7th	2.74	1.32

To calculate the mean time spent playing games the time bands used as responses were recoded with their mean value (e.g. 1–5 h was recoded as 3, while less than 1 was coded as 1 and more than 25 was coded as 21). Using this recoded data the average number of hours played per week when the studies were combined was 7.46 h (SD = 5.98) with a range of 1–21. A Mann–Whitney *U* test indicated that males played computer games for significantly longer per week (9.02 h, SD = 6.46) than females (4.39 h, SD = 4.35), ($Z = -14.792$, $p < 0.000$).

38% of students participated in online gaming. Chi-squared tests indicated that there was a significant relationship between gender and participation in online games when all three studies were brought into consideration ($\chi^2(1) = 39.609$, $p < 0.000$). 39% of online gamers were male and 20.5% were female. A Mann–Whitney *U* test indicated that players taking part in online gaming played for significantly more hours per week (10.01, SD = 6.33) than those who did not (5.70, SD = 5.00) ($Z = -14.870$, $p < 0.000$).

Across all three studies the majority of students (61.5%) preferred single player to multiplayer games. Chi-squared tests indicated that there was a significant relationship between gender and preference of single player or multiplayer games ($\chi^2(1) = 43.072$, $p < 0.000$). 29% of males preferred single player games and 32% of females preferred single player games. 26% of males preferred multiplayer games and 13% of females preferred multiplayer games. This indicated that males prefer multiplayer games more than females.

Across all three studies on average participants had been playing computer games for 12.14 years (SD = 4.78) with a range of 0–30. A Mann–Whitney *U* test indicated that males have been playing games for significantly more time (13.68 years, SD = 4.74) than females (11.05 years, SD = 5.29), ($Z = -10.133$, $p < 0.000$). A Mann–Whitney *U* test also indicated that male respondents were significantly younger (25.22, SD = 8.41) than female respondents (27.58, SD = 9.86). Despite the fact that female respondents were older, male respondents had been playing for significantly more time than females possibly indicating either that males start taking an interest in computer games earlier in life or females have a tendency to stop playing computer games in later life.

4.2. Reasons for playing computer games

When all three surveys are taken into account, the results indicated that challenge was the most important reason for playing computer games and recognition was the least important reason. Table 1 shows the ranked reasons for playing computer games.

The results indicate that challenge is the top ranked reason for playing computer games and recognition is the lowest ranked reason for playing computer games regardless of gender and whether participants prefer single or multiplayer games. Table 2 shows the ranked reasons for playing computer games in relation to gender. Fig. 1 shows the individual motivations for playing computer games in relation to gender and Fig. 2 shows the interpersonal motivations for playing computer games in relation to gender.

Mann–Whitney *U* tests indicated that males considered all of the motivations to be considerably more important than females including: challenge ($Z = -5.606$, $p < 0.000$), competition ($Z = -9.210$, $p < 0.000$), cooperation ($Z = -7.172$, $p < 0.000$), recognition ($Z = -5.263$, $p < 0.000$) control ($Z = -5.263$, $p < 0.000$), fantasy ($Z = -2.609$, $p < 0.009$) and curiosity ($Z = -2.779$, $p < 0.005$). Table 3 shows the ranked reasons for playing computer games in relation to single and multiplayer preference. Fig. 3 shows the individual motivations for playing computer games in relation to single player/multiplayer preference and Fig. 4 shows the interpersonal motivations for playing computer games in relation to single player/multiplayer preference.

Mann–Whitney *U* tests highlighted that participants who preferred multiplayer games indicated that the following motivations and reasons were significantly more important than participants who preferred single player games: competition ($Z = -9.986$, $p < 0.000$), cooperation ($Z = -3.290$, $p < 0.000$), recognition ($Z = -7.724$, $p < 0.000$), fantasy ($Z = -2.945$, $p < 0.000$), and curiosity ($Z = -5.915$, $p < 0.000$).There were no significant differences in the level of challenge ($Z = -0.589$, $p < 0.556$) and control ($Z = -0.726$, $p < 0.468$) when the three studies are considered regardless of single player or multiplayer preference.

Table 6
Reasons for playing computer games in HE in relation to gender.

Reasons	Males			Females		
	Rank	Mean	SD	Rank	Mean	SD
Challenge	1st	3.98	1.17	1st	3.69	1.22
Curiosity	2nd	3.66	1.21	2nd	3.41	1.27
Cooperation	3rd	3.55	1.16	3rd	3.31	1.17
Competition	4th	3.23	1.21	4th	2.94	1.15
Control	5th	3.00	1.21	5th	2.89	1.23
Recognition	6th	2.85	1.19	6th	2.79	1.23
Fantasy	7th	2.57	1.30	7th	2.51	1.22

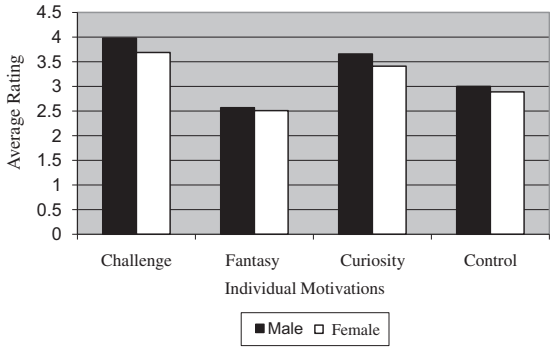

Fig. 7. Individual motivations for playing computer games in HE in relation to gender.

The results indicate that challenge is consistently the top ranked reason for playing computer games and recognition is the lowest ranked reason for playing computer games regardless of whether participants participate online or offline. Table 4 shows the ranked reasons for playing computer games in relation to online and offline participation. Fig. 5 shows the individual motivations for playing computer games in relation to online/offline participations and Fig. 6 shows the interpersonal motivations for playing computer games in relation online/offline participation.

Mann–Whitney *U* tests highlighted the following motivations and reasons were significantly more important for online players than offline players: challenge ($Z = -2.120$, $p < 0.034$), cooperation ($Z = -2.019$, $p < 0.044$), recognition ($Z = -4.381$, $p < 0.000$), and control ($Z = -3.165$, $p < 0.002$). Competition, fantasy and curiosity were not significantly different.

4.3. Reasons for playing computer games in HE

The results indicated that challenge was the most important reason for playing computer games in HE and fantasy was the least important reason. Table 5 shows the ranked reasons for playing computer games in HE.

The results indicate that challenge is consistently the top ranking reason and fantasy is the lowest ranking reason for playing computer games regardless of gender and whether participants prefer single or multiplayer games. Table 6 shows the reasons for playing computer games in HE in relation to gender. Fig. 7 shows the individual motivations for playing computer games in relation to gender and Fig. 8 shows the interpersonal motivations for playing computer games in relation to gender.

Mann–Whitney *U* tests highlighted that males considered the following five motivations more important than females for playing computer games in HE: challenge ($Z = -5.133$, $p < 0.000$), competition ($Z = -5.073$, $p < 0.000$), cooperation ($Z = -4.385$, $p < 0.000$), control ($Z = -1.921$, $p < 0.055$) and curiosity ($Z = -3.886$, $p < 0.000$). There were no significant differences between males and females with regards to recognition ($Z = -1.122$, $p < 0.262$) and fantasy ($Z = -0.920$, $p < 0.357$).

The results indicate that challenge is consistently the top ranking reason and fantasy and recognition are consistently the lowest ranking reasons for playing computer games regardless of whether players prefer single player or multiplayer games. Table 7 shows the reasons for playing computer games in HE in relation to single and multiplayer preference. Fig. 9 shows the individual motivations for playing computer games in HE in relation to single player/multiplayer preference and Fig. 10 shows the interpersonal motivations for playing computer games in HE in relation to single player/multiplayer preference.

Mann–Whitney *U* tests highlighted that participants who preferred multiplayer games viewed the following motivations and reasons to be significantly more important for playing games in HE than participants preferring single player games: competition ($Z = -3.107$, $p < 0.002$), cooperation ($Z = -4.751$, $p < 0.000$) and recognition ($Z = -2.992$, $p < 0.003$). When all three studies are brought into account there is no significant difference between: challenge, control, fantasy and curiosity.

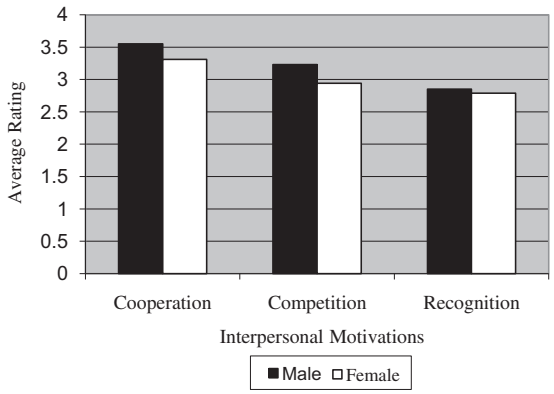

Fig. 8. Individual motivations for playing computer games in HE in relation to gender.

Table 7
Reasons for playing computer games in HE in relation to single player or multiplayer preference.

Reasons	Single player			Multiplayer		
	Rank	Mean	SD	Rank	Mean	SD
Challenge	1st	3.86	1.11	1st	3.85	1.11
Curiosity	2nd	3.38	1.28	2nd	3.48	1.12
Cooperation	3rd	3.18	1.08	3rd	3.39	1.11
Competition	4th	3.05	1.09	4th	3.27	1.15
Control	5th	2.94	1.13	5th	2.90	1.19
Fantasy	6th	2.71	1.26	6th	2.89	1.21
Recognition	7th	2.68	1.11	7th	2.73	1.22

The results indicate that challenge is consistently the top ranking reason and fantasy and recognition are consistently the lowest ranking reasons for playing computer games in HE regardless of whether participants participate in online gaming or not. Table 8 shows the reasons for playing computer games in HE in relation to online and offline participation. Fig. 11 shows the individual motivations for playing computer games in HE in relation to online/offline participation and Fig. 12 shows the interpersonal motivations for playing computer games in HE in relation to online/offline participation.

Mann–Whitney *U* tests highlighted the following motivations and reasons were significantly more important for online players than offline players for playing computer games in HE: competition ($Z = -3.285$, $p < 0.001$), cooperation ($Z = -1.936$, $p < 0.05$) and recognition ($Z = -3.238$, $p < 0.01$). The other motivations and reasons were not significantly different.

4.4. Attitudes to computer games

Due to the qualitative results obtained in study 1, it was considered important to gather data on attitudes to playing games in study 2 and study 3. The questionnaire was adapted and as a result the following data on attitudes to playing computer games is obtained from 1254 participants who completed the questionnaire over the 2 year period from 2007 to 2009. 549 (43.8%) were male and 704 (56.2%) were female, 1 participant did not specify gender.

The mean age was 26.45 years (SD = 8.99) with a range from 17 to 77, which is consistent with an overall average student age of 25. A Mann–Whitney *U* test indicated that the mean age for males (25.09, SD = 7.97) was significantly lower than the mean age for females (27.52, SD = 9.59), ($Z = -3.800$, $p < 0.000$). Table 9 shows the attitudes to playing computer games in relation to gender. Fig. 13 shows the graphical representation of attitudes to playing computer games in relation to gender.

Mann–Whitney *U* tests indicated that there were significant differences in attitudes in relation to gender. Males seen playing games as significantly more of a social activity ($Z = -6.811$, $p < 0.000$), less of a waste of time ($Z = -4.740$, $p < 0.000$), more time consuming ($Z = -2.575$, $p < 0.01$) reaffirming the result that males spend more time playing computer games than females do. Males also indicated that they felt that playing computer games was significantly more interesting ($Z = -6.928$, $p < 0.000$), more of a worthwhile activity ($Z = -5.221$, $p < 0.000$), more enjoyable ($Z = -7.754$, $p < 0.000$), less of a lonely activity ($Z = -4.687$, $p < 0.000$), more of a valuable activity ($Z = -2.104$, $p < 0.035$), and more exciting ($Z = -6.731$, $p < 0.000$).

Interestingly, there was no significant difference in attitudes between males and females with regards to playing computer games helping to develop useful skills ($Z = -0.910$, $p < 0.363$).

Mann–Whitney *U* tests indicate that there is no significant difference between players who prefer single player or multiplayer games in terms of: considering games to be a waste of time ($Z = -7.51$, $p < 0.452$), whether games are useful to develop skills ($Z = -1.038$, $p < 0.299$), time consuming ($Z = -0.922$, $p < 0.321$), interesting ($Z = -0.607$, $p < 0.486$), worthwhile ($Z = -0.596$, $p < 0.551$), enjoyable ($Z = -1.398$, $p < 0.162$), valuable ($Z = -.037$, $p < 0.970$) and exciting ($Z = -1.353$, $p < 0.176$). Table 10 shows the mean rankings of player attitudes towards computer games in relation to single or multiplayer preference. Fig. 14 shows the graphical representation of the attitudes to playing games in relation to single player/multiplayer preference.

Mann–Whitney *U* tests indicated that the only significant differences between single player and multiplayer attitudes to playing computer games is that multiplayer gamers consider games to be much more of a sociable activity ($Z = -7.201$, $p < 0.000$) and much less of a lonely activity ($Z = -6.743$, $p < 0.000$). There were no significant differences in any of the other attitudes.

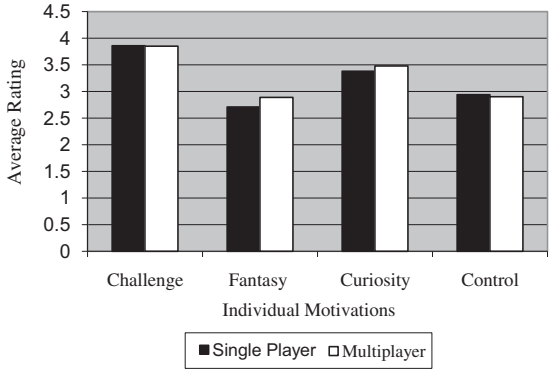

Fig. 9. Individual motivations for playing computer games in HE in relation to single/multiplayer preference.

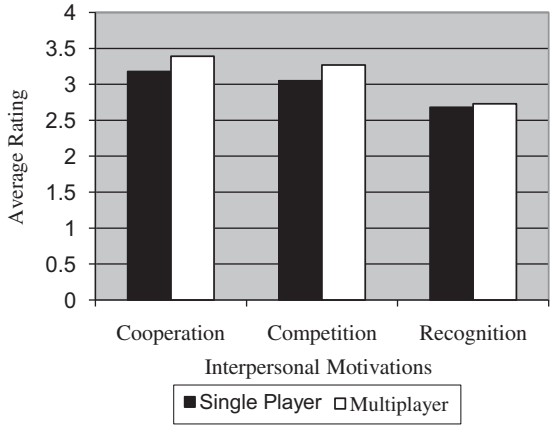

Fig. 10. Interpersonal motivations for playing computer games in HE in relation to single/multiplayer preference.

Mann–Whitney *U* tests indicate that there is no significant difference between players who participate online and offline in terms of: whether games are more useful for developing skills ($Z = -1.761$, $p < 0.078$) and time consuming ($Z = -1.309$, $p < 0.191$). Table 11 shows the attitudes to computer games in relation to participating in online and offline games. Fig. 15 shows the graphical representation of attitudes to computer games in relation to online/offline participation.

Mann–Whitney *U* tests indicated significant differences in attitudes between players who participated online and players who did not. Players who participated online believed playing games to be more of a social activity ($Z = -6.920$, $p < 0.000$), less of a waste of time ($Z = -5.340$, $p < 0.000$), more interesting ($Z = -4.296$, $p < 0.000$), more of a worthwhile activity ($Z = -5.815$, $p < 0.000$), more of an enjoyable activity ($Z = -5.456$, $p < 0.000$), less of a lonely activity ($Z = -6.620$, $p < 0.000$), more of a valuable activity ($Z = -1.937$, $p < 0.05$) and more exciting ($Z = -5.440$, $p < 0.000$).

5. Discussion

The results from all three studies showed that the majority of participants (79.8%) played computer games. As may be expected, it was found that males play computer games for a significantly greater amount of time than females. Eglesz et al. (2005) also found that women play computer games significantly less than men. In comparison with the three studies performed, all three studies showed that males play games for significantly longer than females separately. When the studies were combined the average amount of time per week spent playing computer games was 7.46 h which is interestingly enough, the amount of time that students at UWS are recommended to dedicate for independent study per module. Males played computer games for significantly longer per week (9.02 h) than females (4.39 h). Hartmann and Klimmt (2006) also performed a study which found that males play computer games for significantly longer per week than females. All five studies consistently show that males play games for significantly longer than females.

In terms of how long participants have been playing computer games, the study found that participants had been playing computer games for an average of 12 years. Males have been playing games for significantly more time (13.68 years) than females (11.05 years). Interestingly female participants were older possibly indicating that males begin taking an interest in computer games earlier in life or that females have a reduced interest in computer games later in life.

Challenge was found to be the top ranked motivation for playing computer games in general and recognition was the lowest ranked motivation for playing computer games regardless of gender and whether participants preferred single or multiplayer games. Males considered all motivations to be considerably more important than females for playing computer games, which is consistent with the findings that males play computer games for significantly longer per week and have been playing for a significantly greater amount of years. In terms of the differences in motivations between single player/multiplayer preferences, the results indicate that players preferring multiplayer games derive significantly more competition, cooperation, recognition, fantasy and curiosity from playing computer games than players who prefer single player games. There was no significant difference in the levels of challenge and control experienced regardless of single player or multiplayer preference. In terms of online/offline game participation, online players derive more challenge, cooperation,

Table 8
Reasons for playing computer games in HE in relation to participation in online games.

Reasons	Online participation			Offline participation		
	Rank	Mean	SD	Rank	Mean	SD
Challenge	1st	3.57	1.34	1st	3.68	1.21
Curiosity	2nd	3.36	1.28	2nd	3.42	1.20
Cooperation	3rd	3.30	1.23	3rd	3.25	1.12
Competition	4th	3.26	1.26	4th	3.11	1.17
Control	5th	3.09	1.25	5th	2.99	1.22
Recognition	6th	3.04	1.27	6th	2.82	1.26
Fantasy	7th	2.92	1.29	7th	2.81	1.19

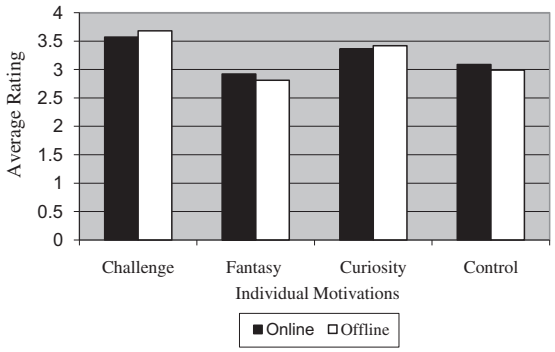

Fig. 11. Individual motivations for playing computer games in HE in relation to online/offline preference.

recognition and control. There are no significant differences between online and offline game playing preferences in terms of competition, fantasy, and curiosity.

Considering the motivations for playing computer games in HE, the results indicated that challenge was the most important reason for playing computer games in HE and fantasy was the least important reason regardless of gender and whether participants prefer single or multiplayer games. Males considered the following five motivations significantly more important than females for playing computer games in HE: challenge, competition, cooperation, control and curiosity. There were no significant gender differences with regards to recognition and fantasy. Participants who preferred multiplayer games viewed the following motivations to be significantly more important for playing games in HE than participants preferring single player games: competition, cooperation and recognition. When all three studies are brought into account there is no significant difference between: challenge, control, fantasy and curiosity. Challenge was consistently the top ranking reason and fantasy and recognition are consistently the lowest ranking reasons for playing computer games regardless of whether participants preferred online gaming or not. The following motivations were significantly more important for online players than offline players for playing computer games in HE: competition, cooperation and recognition. Interestingly, these are all interpersonal motivations in Malone and Lepper's framework which should be the key motivations for players participating online. Individual motivations and reasons were not significantly different.

In terms of the respondents' attitudes to playing computer games in relation to gender, males seen playing games as significantly more of a social activity, less of a waste of time, more time consuming, they felt that playing computer games was significantly more interesting, more of a worthwhile activity, more enjoyable, less of a lonely activity, more of a valuable activity, and more exciting. Interestingly, there was no significant difference in attitudes between males and females with regards to playing computer games helping to develop useful skills. In terms of the respondents' attitudes to playing computer games in relation to preference for single player or multiplayer games there were only two significant differences: multiplayer gamers considered playing games to be more of a social activity and less of a lonely activity. There was a larger amount of significant differences in attitudes to playing computer games in relation to online and offline participation. Online players believed playing computer games to be more of a social activity, less of a waste of time, more interesting, more worthwhile, more enjoyable, more valuable, more exciting and less of a lonely activity.

For playing computer games in general, the results indicated that males considered all of the motivations for playing computer games to be considerably more important than females. Males also considered the following five motivations more important than females for playing computer games in HE: challenge, competition, cooperation, control and curiosity. There were no significant differences between males and females with regards to recognition and fantasy. The results also indicated that players with a multiplayer preference derive significantly more competition, cooperation, recognition, fantasy and curiosity than players who prefer single player games. The results also indicate that online players derive significantly more challenge, cooperation, recognition and control then offline players. Multiplayer/online players derive significantly more recognition and cooperation than single player/offline players. For playing computer games in HE, the results indicate that players with multiplayer preference consider competition, cooperation and recognition to be significantly more important than single player participants. The results indicated that online players consider competition, cooperation and recognition significantly more important than offline players. There were significant differences in attitudes in relation to gender. Gender impacted on

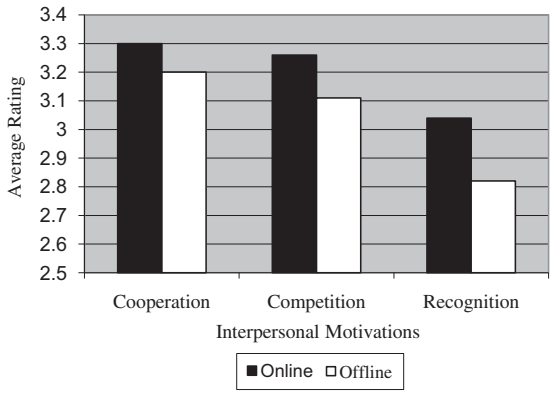

Fig. 12. Individual motivations for playing computer games in HE in relation to online/offline participation.

Table 9
Attitudes in relation to gender.

Attitudes	Male		Female	
	Mean	SD	Mean	SD
Playing games is a sociable activity	3.84	1.07	3.31	1.12
Playing games is a waste of time	2.07	1.02	2.36	0.96
Playing games helps to develop useful skills	3.68	0.87	3.63	0.81
Playing games is time consuming	4.01	0.83	3.86	0.86
Playing games is interesting	4.19	0.72	3.80	0.85
Playing games is a worthwhile activity	3.76	0.87	3.44	0.91
Playing games is an enjoyable activity	4.40	0.72	4.00	0.80
Playing games is a lonely activity	2.55	1.07	2.90	1.05
Playing games is a valuable activity	3.35	0.89	3.22	0.88
Playing games is exciting	4.14	0.81	3.72	0.91

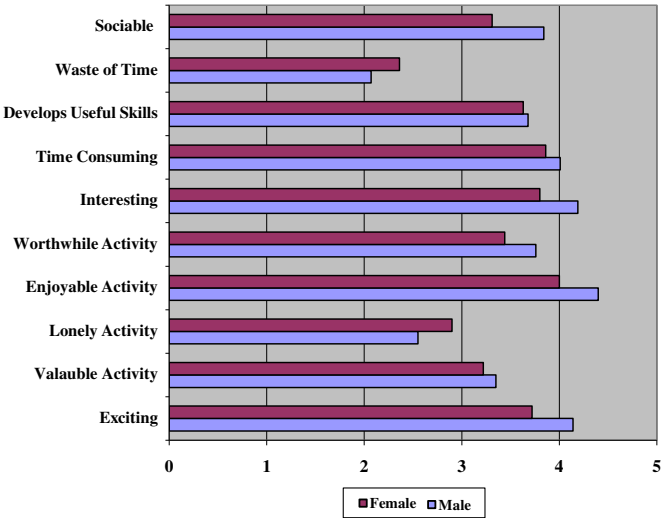

Fig. 13. The graphical representation of attitudes to playing computer games in relation to gender.

Table 10
Attitudes to computer games in relation to single player or multiplayer preference.

Attitudes	Single-player		Multiplayer	
	Mean	SD	Mean	SD
Playing games is a sociable activity	3.49	1.10	4.14	0.82
Playing games is a waste of time	2.04	0.94	1.98	0.91
Playing games helps to develop useful skills	3.73	0.81	3.80	0.85
Playing games is time consuming	3.89	0.87	3.97	0.85
Playing games is interesting	4.21	0.60	4.25	0.65
Playing games is a worthwhile activity	3.78	0.81	3.83	0.82
Playing games is an enjoyable activity	4.41	0.56	4.47	0.56
Playing games is a lonely activity	2.76	0.99	2.19	0.97
Playing games is a valuable activity	3.41	0.85	3.45	0.86
Playing games is exciting	4.11	0.76	4.21	0.66

nine attitudes indicating that computer games for learning and leisure may be more suitable for males than females and there may be some way to go to convince females about the applicability of games-based learning. The results suggest that online/offline participation has a greater impact on attitudes to playing computer games than single player/multiplayer preference. Single player/multiplayer preference only impacts two attitudes to playing computer games while online/offline participation impacts eight attitudes. It should be noted however that the results on attitudes are obtained through analysis of two collections of data (study 2 and 3) as the questionnaire was not directly collecting data on attitudes in study 1.

Challenge was found to be the most important motivation for playing computer games in general and in an educational context using Malone and Lepper's framework of intrinsic motivation. Interestingly participants also rated challenge as the most important motivation associated with continuing to play computer games when they get progressively more difficult in an open ended question in the three separate studies. This suggests that challenge is inextricably interconnected to other motivations in the framework, for example, deriving challenge through competition or cooperation or deriving challenge through curiosity or recognition. The results suggest that the optimal level of challenge or flow (Csikszentmihalyi, 1975) has a strong effect on other motivations in the framework.

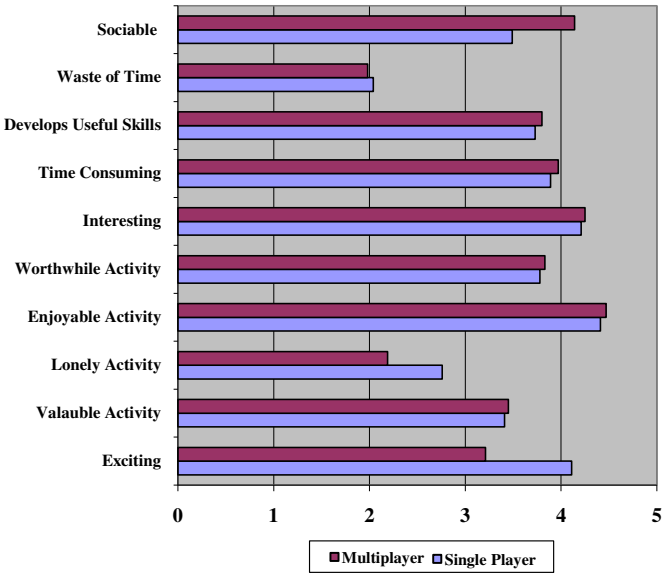

Fig. 14. The graphical representation of attitudes to playing computer games in relation to single/multiplayer preference.

Table 11
Attitudes to computer games in relation to participation in online games.

Attitudes	Participates online		Does not participate online	
	Mean	SD	Mean	SD
Playing games is a sociable activity	4.05	0.89	3.45	1.10
Playing games is a waste of time	1.83	0.91	2.19	0.90
Playing games helps to develop useful skills	3.80	0.83	3.69	0.81
Playing games is time consuming	3.98	0.85	3.88	0.87
Playing games is interesting	4.33	0.60	4.12	0.62
Playing games is a worthwhile activity	3.99	0.76	3.61	0.81
Playing games is an enjoyable activity	4.56	0.56	4.32	0.54
Playing games is a lonely activity	2.26	1.01	2.80	0.96
Playing games is a valuable activity	3.50	0.87	3.36	0.82
Playing games is exciting	4.32	0.66	3.99	0.74

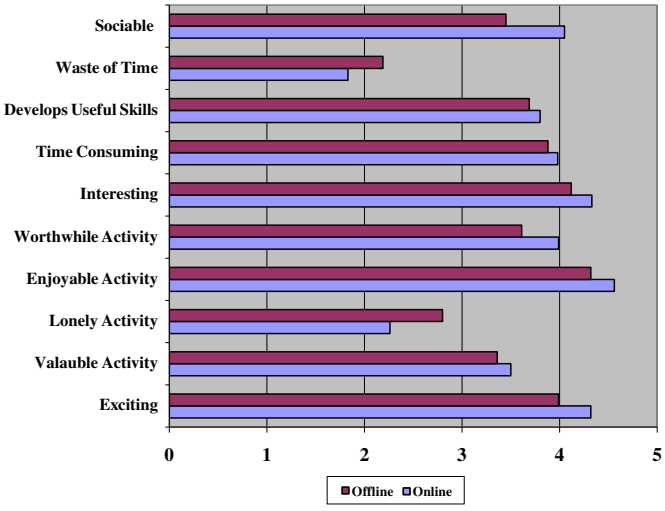

Fig. 15. The graphical representation of attitudes to computer games in relation to online/offline participation.

This study has provided an analysis of data collected from a longitudinal study to try and gain insight into the differences in motivations between players with a single player/multiplayer preference and online/offline participation. Future work will be further analysis of the results specifically focussing on personal differences associated with computer game preferences and attitudes and will take into account the differences between computer gaming and video gaming i.e. PC and console gaming to provide a more thorough analysis. Future work

will also entail the deployment of further studies at different institutions to produce additional empirical evidence in the field of game-based learning.

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