Computer game use and communication habit changes

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ABSTRACT

Extensive use of computer games have been suggested to induce behavioural differences in the players, either as a result of neuroplasticity or through social mechanisms. The usage patterns of computer mediated communication channels, such as internet chat rooms and web based forums, as well as other communication channels enabled by recent technological advances, such as voice and SMS text messages through mobile phones, are of interest in this game related context. Also, any potential changes in the usage patterns of traditional media such as books an television are of interest when linked to computer game use.

To obtain information on possible changes in student communication patterns, an empirical study was conducted. Students participating in a test project extensively using computer games as teaching tools, were interviewed about both games related and communication related behaviours. The acquired data was then compared to previously obtained data regarding the corresponding communication behaviours prior to joining the game-intensive project.

Results show that communication through web based chat and dedicated chat programs showed only minor changes, while web based forums, email, and SMS text messages showed various degrees of increased use. Television viewing habits continued the decreasing trend seen in previous papers in this series, particularly regarding entertainment related television programs that are now down to only 53.9% of the viewing time prior to entering the game project. A dramatic difference is seen between fans of MMORPG and FPS games, the former viewing only 17.5% as much television as the latter group.

BACKGROUND

As computer games have evolved over time, many new features and aspects have been introduced. Previous papers in this series have studied using games as learning/teaching tools (Wiklund and Glimbert 2005) and (Wiklund 2006), as well as behavioural changes possibly induced by games (Wiklund 2005). This fourth and final paper following the same group of highly game-intensive students focuses on their communication habits, including observed differences when grouped according to favourite game genres.

While a genre like first-person action games may have a strong emphasis on the story or plot in its single player form, this is reduced in the corresponding multiplayer version. This shift can be quite notable, as Klastrup puts it: "Did anyone notice when the story left?" (Klastrup 2001). The narrative burden in single player games lies solely on the game designer, while in multiplayer games this, at least to a degree, is replaced by the interactions among those participating in the game.

With multiplayer games, the element of player-to-player communication is introduced. The player interactions, including verbal/textual communication as well as other forms of interaction such as combat, can make up the major content of gameplay. These player interactions shift the burden of producing the plot away from the game designers and onto the players themselves.

Player-to-player communication may be divided into several categories, which may in turn be subdivided further. On the top level a distinction can be made between in-game communication and out-of-game communication, the latter often taking place in web based forums. During such out-of-game communication a variety of game related information can be shared, including topics like strategy tips and codes that enable hidden features in the games. An interesting variant is described in (Frasca 2001), regarding the family album feature in the online version of The Sims: "What the designers did not anticipate was that players would use this feature to craft stories starring their Sims. Suddenly, the family album became a comic book.".

Sometimes, the communication may require a combination of out-of-game and in-game communication.

This is described in (Castronova 2001), in the case of buying and selling game items for real money: "Earthling A gives Earthling B the money. Then they both create avatars in Norrath and meet at an agreed-upon spot." The real-world trading place may be an internet based auction house, as further noted by Castronova: "On an ordinary weekday (Thursday, September 6, 2001), the total volume of successfully completed auctions (N-112) was about $9,200.". Such trading of game entities in the real world is strongly discouraged by some game developers, and in a later paper Castronova notes countermeasures emerging: "In Ultima, you can directly buy your levels; in Camelot, you can start a new avatar at level 20 if you have already gotten one to level 50. These strategies help companies discourage the buying and selling of avatars outside the game" (Castronova 2003).

In-game communication can occur not only while acting out your game characters personality, but also without such considerations. In-game communication can therefore be subdivided into in-character and out-of-character communication. In-character communication is performed in such a way that the style and atmosphere of the game is preserved.

However, also out-of-character communication can occur in-game, as a result of players chatting without using the personalities of their game characters. In game genres relying heavily on atmosphere and game characters personalities, such out-of-character communication may be discouraged since it has a negative affect on the atmosphere and flow of play. This is noted by Pajares Tosca in her study of the online version of the role-playing game Vampire: The Masquerade – Redemption: "In my experience, players will only go OOC" [Out-Of-Character] "when they experience some technical problem" (Pajares Tosca 2001). In other situations out-of-character communication is more common. As Heide Smith observes: "Age of Empires matched players for multi-player battles through a web interface that required some amounts of chatting and opened up a variety of trust issues. For instance, players would often lie about their skills in order to find willing opponents" (Heide Smith 2003).

Regarding in-character communication Heide Smith further notes that a majority of the participants in a survey of his either mostly agrees or totally agrees to the statement "Communication/chat with other players is an appealing part of online gaming", and that 81.4% of the participants (those replying "Sometimes" excluded) stated that they often or all the time judged other players on the basis of dialogue (ibid.). This interplayer communication may leave a strong impression on the player. As Klastrup describes her impressions after participating in the online role-playing game EverQuest: "I also take with me the experience of becoming part of a social network which goes beyond the individual character" (Klastrup 2003).

Also in action games with a more modest number of players and a higher degree of fast combat situations, player-to-player communication may be a key feature, as observed by Wright et al.: "The meaning of playing Counter-Strike is not merely embodied in the graphics or even the violent game play, but in the social mediations that go on between players through their talk with each other" (Wright et al. 2002)

With real time player-to-player communication in place, multiplayer games fulfil the criteria for Networked Virtual Environments, as defined by Singhal and Zyda: "1) A shared sense of space, 2) A shared sense of presence, 3) A shared sense of time, 4) A way to communicate, and 5) A way to share" (Singhal and Zyda 1999). If the communication also includes sound, crucial parts of the "Rich Interaction" outlined by Manninen can be implemented in multiplayer games (Manninen 2001). Such interaction include para-language, the non-verbal audio part of speech (Manninen and Kujanpää 2002), and spatial sound effects that add significantly to realism. As Furness points out: "Humans like parallel input. People make use of a combination of sensory stimuli to help reduce ambiguity. The sound of a letter dropping into a mailbox tells us a lot about how full the mail box is." (Furness 2001).

Many computer games can thus be regarded as communication-intensive, and induce many types of in-game and out-of-game communication. When this aspect of games is paired with their claimed potential as teaching tools, in essence leading to changes in player behaviour, interesting questions arise regarding possible changes in player communication patterns.

As early as 1974 computer games were pointed out to have potential as communication tools, and were suggested to be useful in a teaching/learning context by Duke, suggesting that games may become an entirely new form of communication in education, as noted by Woods: *"He suggested that simulation games might offer a possible answer to the problems of education in an increasingly complex society"* (Woods 2004), in reference to: *"...gaming is a future's language, a new form of communication emerging suddenly and with great impact across many lands and in many problem situations"* (Duke, quoted from Woods 2004).

Among the first observed behavioural changing effects regarding computer games are those related to reflexes and hand-eye co-ordination. As remarked by Griffiths, these findings are also accompanied by those pointing out particular aspects of games as having important bearing on using them as educational resources: *"Playing computer games (irrespective of genre) produces reductions in reaction times, improved hand-eye co-ordination an raises players self esteem. ... The nature of the challenge also appear to add to a games educational potential"* (Griffiths 2002).

Further research in the area of specific advantages of computer games as educational tools has pointed out several aspects where games fit very well into key patterns of successful learning. As Gee points out, these aspects need not be related to such features that are often noted regarding computer games, such as graphics: *"The secret of a videogame as a teaching machine isn't its immersive 3-D graphics, but its underlying architecture. Each level dances around the outer limits of the players abilities, seeking at every point to be hard enough to be just doable"* (Gee 2003a). This positive aspect of something being hard, and the danger of making things too easy, is also discussed by Papert: *"What is best about the best games is that they draw kids into some very hard learning ... The fact is that kids prefer things that are hard, as long as they are also interesting"* (Papert 1998). This touches on the Practice Principle, outlined by Gee as one of several principles involved in successful learning situations: *"Learners gets lots and lots of practice in a context where the practice is not boring"* (Gee 2003b).

Such a high degree of practice, reached because it is implemented through computer games and thus in a way that is not boring, may have even more far-reaching effects than just successful knowledge acquisition, as pointed out by Prensky regarding recent research on neuroplasticity: *"... there is no longer any question that stimulation of various kinds actually changes brain structures and affects the way people think, and that these transformations go on throughout life."* (Prensky 2001b). On the issue of why the extent of this possibly behaviour-changing neuroplasticity has not been obvious in the past, Prensky further expands: *"A key finding of brain plasticity research is that brains do not reorganize casually, easily, or arbitrarily"* (ibid.). Instead, extensive practice is needed for neuroplastical changes to occur. With the introduction of computer games into society, the type of repeated practice needed to induce behavioural changes as a consequence of neuroplasticity is in place. As Prensky points out in reference to a learning program involving extensive practice: *"Several hours a day, five days a week, sharply focused attention – does that remind you of anything? Oh, yes – video games!"* (ibid.).

As a result of the neuroplastical changes discussed above, Prensky argues that *"Todays students are no longer the people our educational system was designed to teach."* (Prensky 2001a), and remarks that *"Today's average college grads have spent less than 5,000 hours of their lives reading, but over 10,000 hours playing video games..."* (ibid.). Coining the term *Digital Natives* for the generation having grown up with computer games and other recent information technology, Prensky outlines some of their typical characteristics as *"They like to parallel process and multi-task. They prefer their graphics before their text rather than the opposite. They prefer random access (like hypertext). They function best when networked.*

They thrive on instant gratification and frequent rewards." (ibid.).

In the light of these characteristics, it becomes clear that computer games may fit well as an educational tool, especially if one also takes into account that many games span across subject boundaries, being able to offer learning in several areas at once. As pointed out in a study by Kirriemuir and McFarlane regarding the roller coaster simulator game RollerCoaster Tycoon: *"The game could be used across a number of subject domains, such as physics (motion and velocity), and business and economics (running a theme park)"* (Kirriemuir and McFarlane 2003).

The usage of unmodified, commercial, off-the-shelf games is not the only possibility, though. A combination of educational software and computer games, often referred to as "edutainment" is the result of exploring the game format and filling it with more school curriculum oriented material. However, the usefulness of such edutainment software has been questioned in many cases, as observed by Kirriemuir: *"The result has often been disappointing; the educational value is debatable or irrelevant, and the gaming and engagement qualities compare poorly to those of pure games"* (Kirriemuir 2002).

A similar standpoint is taken by Papert, viewing this edutainment "offspring" from games and education software as possessing none of the best features from either "parent": *"Shavian reversals – offspring that keep the bad features of each parent and lose the good ones – are visible in most software products that claim to come from a mating of education and entertainment"* (Papert 1998).

Relating this to the previously discussed behavioural differences described by Prensky, an educational environment utilising unmodified off-the-shelf computer games as teaching tools might be ideally suited to meet the needs of today's students. Such an environment, though, if implemented as the main teaching method used during the majority of each school day, would increase the students exposure to computer games significantly, possibly even further accentuating any potential changes in communication patterns related to computer game use.

The Studied Test Project

In Botkyrka, Sweden, a test project using computer games as the primary teaching tool for a class of students in upper secondary education was initiated in the fall of 2003. The project included students in their 10:th to 12:th year of education in a mixed fashion. This represents the first three years of the non-compulsory education in the Swedish school system, normally corresponding to students reaching the age of 16 to 18 if continuing directly from the compulsory school system.

The students were free, up to the limitations of the project budget, to suggest game titles to be used. Although the teachers has the right to refuse any suggested game they feel would be too extreme, this veto right had never been used up to the time of the study.

The teachers main approach to teaching using unmodified computer games involves using in-game activities as starting points for discussions and assignments of various kinds. This method is applied constantly. Both teachers reports that the students seems highly motivated and interested in discussing issues in fields like history, English, or social studies, if the event spawning the discussion/assignment has occurred in one of the computer games. The teachers also frequently requires the students to hand in essays describing their avatars personality, their situation in a game, and similar game related issues, and then uses the received essays in Swedish class.

With kind permission from all involved parties, we were allowed to perform several studies interviewing the students participating in the project. This is the fourth and final paper in a series that have followed these students through the test project, with previous results published in (Wiklund and Glimbert 2005), (Wiklund 2005) and (Wiklund 2006).

RESEARCH QUESTION

As it has been suggested that extensive playing of computer games may induce behavioural changes due to neuroplasticity, more information in this area is needed. The research issue addressed in this paper is to find out if behavioural changes can be observed in students participating in a test project where unmodified, commercial off-the-shelf computer games are being used as the main teaching tool and thus played extensively. The study focuses on the area of changes in communication patterns.

METHODOLOGY

The empirical contribution of this paper is an evaluation study of a test project in Botkyrka, Sweden, using commercial, unmodified computer games as the main teaching tool in upper secondary education. The project in question includes students in their 10:th to 12:th year of education, in a mixed fashion. The interviews were conducted towards the end of the test project, at a time when it was clear to the teachers which final grades they would give the students at the upcoming end of their final semester. All 17 remaining students in the project participated in the study through in-depth interviews. As all the students in the project were interviewed, rather than just those choosing actively to participate, the risk of results being biased as a result of personality differences was minimised.

The interviews were conducted individually in a separate room, away from the class room, with no possibilities of anyone else overhearing the conversations. The students retained full anonymity, only being identified by a sequential number untraceable to the specific individual. Each student was informed of this anonymity, and that his or her answers would not be disclosed to anyone else. By taking these measures, the risk of students not daring to answer the questions honestly was reduced as much as possible.

During the interviews, the interviewer followed a fixed form with questions to ensure equal coverage of topics with all students. Only follow-up questions may differ somewhat among the students, depending on the answers given. The information was entered into a database for processing. Key quotes were translated to English for the purpose of appearing in this paper.

RESULTS

All 17 students (males, ages 17-20) remaining in the class participating in the test project were interviewed, revealing that while using computer games as their main learning tool in school, they also played on-line games on their free time for an average of 3 hours and 17 minutes per day.

Web Forums, Web Chat, and Chat Programs

Before entering the test project the students reported using in web based forums on average 26 minutes per day, and participated in web based chat on average 30 minutes per day. The corresponding figures at the time of the study, at the end of the project, were an average of 42 minutes per day using web forums and an average of 25 minutes per day participating in web chat.

When questioned about chatting through other computer mediated chat tools than the web based ones, such as MSN or similar dedicated communication programs, the students reported doing this on average 2 hours and 48 minutes per day at the time of the study, virtually unchanged from the average of 2 hours and 51 minutes before entering the test project.

Email

Students reported receiving an average of 1.2 emails per day and sending an average of 0.4 emails per day before entering the test project. At the time of the study, the corresponding figures were 3.3 emails received and 1.5 emails sent on average per day.

The above figures does not include the special in-game mail systems present in certain on-line games that are limited to the users of those games. Nor does the number of received emails include spam emails from

sources to which the receiver had not indicated approval.

Telephones, Mobile Phones, and SMS Text Messages

Before entering the test project the students reported calling and receiving an average of 1.8 daily phone calls using the regular (non-mobile) telephone network, talking for 29 minutes per day on average using this fixed phone network. At the same time they made and received an average of 4.1 daily mobile phone calls, talking for an average of 38 minutes per day.

At the time of the study, at the end of the test project, the students participated in an average of 0.6 fixed network phone calls daily, with a total average talking time of 8 minutes per day. The corresponding figures for mobile phones were an average of 5.1 calls daily, with a total average talking time of 57 minutes per day.

Before entering the test project, the students also reported receiving an average of 7.1 SMS Text messages daily through their mobile phones. while sending 6.8 such text messages on average per day. This had increased to 16.9 received and 17.1 sent SMS text messages through mobile phones on average per day at the time of this study.

Reading and Television Viewing Habits

At the time of the study, towards the end of the test project, the students reports reading an average of 9.6 books per year. When divided into the categories of fiction versus technical/specialist facts-related literature, the students reports reading an average of 5.6 fiction books and an average of 4.0 facts-related books per year. These figures does not include reading books on-line, through a computer, only printed books.

Regarding television viewing habits, the students reports watching television on average 16.2 hours per week at the time of this study. This can be divided into an average of 5.2 hours per week of watching news and other facts-related programs, and an average of 11.0 hours per week of watching film and other entertainment-related programs. These figures includes watching television through a computer.

The above figures regarding reading and television watching habits at the time of this study are compared with the corresponding figures obtained earlier and presented in (Wiklund 2005), in the Discussion section below.

When broken down according to the favourite game genres stated by the students, the television watching habits of different types of television programs differ as indicated by the following table:

Favourite Game Genre	Facts/News TV (hours/week)	Entertainment TV (hours/week)	Total TV (hours/week)
Massively multiplayer on-line role-playing games (MMORPG)	1.3	4.5	5.8
First Person Shooters (FPS)	12.0	21.1	33.1
Others	1.5	7.1	8.6

Television watching habits divided by favourite game genres stated.

DISCUSSION

The method of interviewing the entire class in question, as opposed to ask for volunteers, has the advantage of not just reaching a subset of individuals who might differ from the rest in various ways. In studies performed on volunteers that have actively chosen to participate, great care must be taken when interpreting the results. In such cases it is vital taking into account that the participants are more interested in the subject at hand, or at least more active and willing to take part in a study, than other people in general, even in the same age group, etc. This potential problem has been reduced as much as possible by interviewing not just enthusiastic volunteers, but everyone in the class.
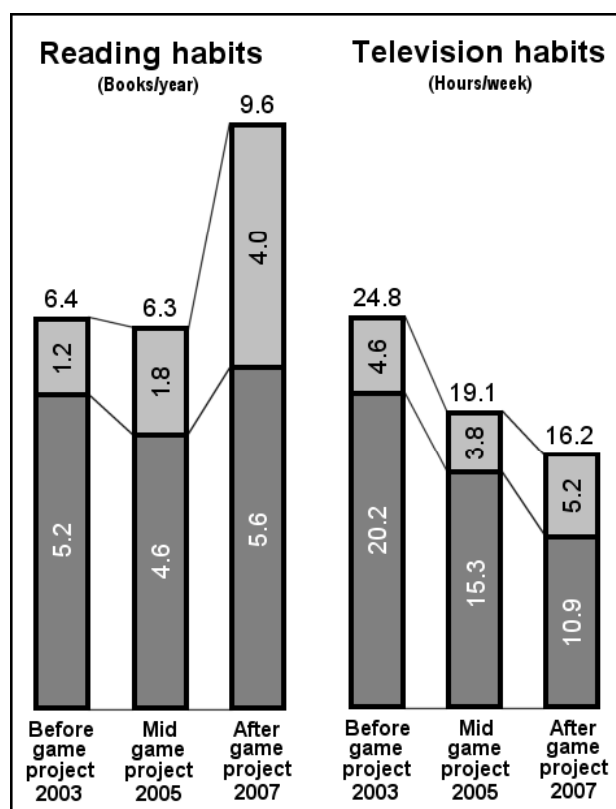
Reading and Television Watching Habits

Previous papers in the series following the same group of students revealed that they read an average of 6.4 books per year before entering the game-intensive project, and 6.3 books per year on average after two years of participation (Wiklund 2005). This virtually unchanged figure becomes a bit more varied when broken down into the categories fiction versus facts-related books. Here, fiction was down from 5.2 to 4.6 books per year, and facts-related books was up from 1.2 to 1.8 books per year on average (Ibid.).

With the data presented in this paper, obtained at the end of the four-year project, the trend of increased reading of fact-related books accelerates, now up to 4.0 books per year on average, a significant increase. The decreasing trend in fiction is broken, now up to an average of 5.6 books per year, giving a total of 9.6 books read per year on average at the end of the four-year project.

A particularly clear trend is seen regarding television viewing habits, where the previously observed decrease from 24.8 hours per week on average before entering the project was down to 19.1 hours per week after two years of participation in the gaming project (Wiklund 2005), now continues even further. The corresponding figure obtained at the end of the four-year project was down to 16.2 hours per week of viewing television.

An interesting aspect regarding television viewing habits emerges when breaking down television programs into the categories of news/facts-related programs versus film/entertainment programs. Here, news/facts-related TV, down from an average of 4.6 hours per week before the project to 3.8 hours per week half-way through the project (Wiklund 2005), was now up to 5.2 hours per week at the end of the four-year project, despite the fact that the overall television viewing had decreased.

Not surprisingly, the film/entertainment category of television programs had suffered a significant decrease in viewing time. The average of 20.2 hours viewed per week before entering the gaming project was down to 15.3 hours per week after two years of participation (Wiklund 2005), and has now decreased even further to 10.9 hours per week on average after four years in the project. During the time studied, the students have reduced the time spent on viewing entertainment-related television programs to only 53.9%, while news and facts-related programs defend their position well with even a moderate increase in viewing time.

Changes in reading and television viewing habits during four years of participation in the test project using computer games as teaching tools. Legend: dark grey = fiction literature and entertainment television programs, light grey = technical/facts-related literature and news/facts-related television programs.

Web Forums, Web Chat, and Chat Programs

Some of the other communication channels studied in this paper show only small changes, including web based chat (slightly down from 30 to 25 minutes per day on average) before versus at the end of the four year project, and MSN or other chat programs (virtually unchanged from an average of 2 hours and 51 minutes per day before the project to 2 hours and 48 minutes per day at the end of the project). In the latter case several students reported using voice chat through MSN while playing World of Warcraft. Web based forums shows a somewhat larger change with its increased use from 26 to 42 minutes per day on average before versus after participating in the project for four years.

Email

The number of incoming emails nearly tripled over the four-year project time, from an average of 1.2 to 3.3 incoming emails per day. These figures does not include spam emails from unknown sources or sources to which the receiver had not agreed to receive emails. At the same time the number of outgoing emails was up from 0.4 to 1.5 emails sent per day on average, an increase on par with that of received emails. Due to differences in the potential number of people reached, in-game email systems like that of many MMORPG:s are not included in these figures.

SMS Text Messages

Another type of written messages with properties partly similar to emails is SMS (Short Message Service) Text messages accessed through mobile phones, the two main differences being the increased accessibility through the portability of mobile phones (normally considered an advantage) and the disadvantageous limitation to short messages, also with more limited possibilities to attach material. Here, the interviewed students report a significant increase, from an average of 7.1 received and 6.8 sent SMS text messages per day before entering the project, to 16.9 received and 17.1 sent text messages on average per day at the time of the study at the end of the four year project. The differences between number of sent and received messages are explained by contacts with people outside the studied group.

### Fixed Network and Mobile Phone Voice Use

The regular voice communication through mobile phones had also increased during the studied four year period, from 38 to 57 minutes per day on average. It is interesting to note though, that the increased use of SMS text message is even larger than voice usage. Not surprisingly, the increases in voice and SMS text usage of mobile phones is accompanied with a decrease in the use of the fixed telephone network, down from 29 minutes to just 8 minutes per day on average, less than one third of the previously used capacity continues to be used.

Television Viewing and Favourite Game Genres

Taking the favourite game genres reported by the students into account, an unusually clear and interesting pattern appears. The two most popular game genres indicated were Massively Multiplayer On-line Role-Playing Games (MMORPG) and First Person Shooter (FPS) games, with 41% and 35% of the students stating them as their favourite game genre, respectively.

When broken down according to favourite game genres, television viewing habits vary greatly. The group with FPS games as their favourite genre watched an average of 33.1 hours of television per week (12.0 hours facts/news and 21.1 hours film/entertainment), approximately twice as much as the average student in the project. On the other extreme, the MMORPG fans only watched an average of 5.8 hours of television per week (1.3 hours facts/news and 4.5 hours film/entertainment), only 17.5% of the time spent by the FPS fans.

The corresponding figures for the combined group of all other genres were an average of 8.6 hours of television per week (1.5 hours facts/news and 7.1 hours film/entertainment). It seems clear that in the studied group, the MMORPG fans were responsible for most of the decrease in television viewing time, while FPS players watched television to a much greater extent.
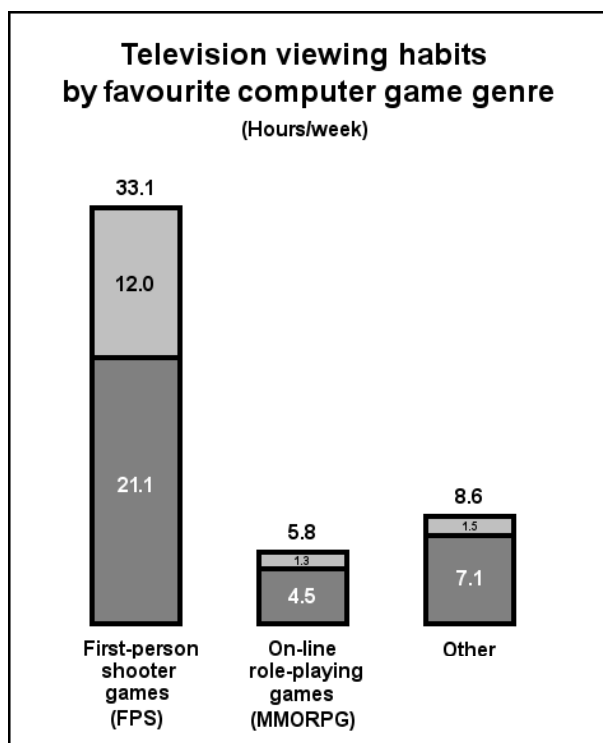
Television viewing habits in groups of students having different favourite game genres. Legend: dark grey = entertainment television programs, light grey = news/facts-related television programs.

The observed differences in television watching habits between FPS and MMORPG fans are significant and interesting, though perhaps only logical since massively multiplayer on-line role-playing games possess many interesting properties that are complex and thus correspondingly time-consuming. As MMORPG:s offer in-game activities along more dimensions (complex character design and improvement, trade, the manufacturing of goods, diplomacy, ability to take on different social roles, and taking both practical and magical skills into account, as well as combat), this is accompanied with a comparatively high degree of socially complex communication and networking.

The observed pattern, though, may have several causes, ranging from MMORPG fans being behaviourally affected by extensive gameplay and thus increasingly disfavourable of passive mass-media like television, to MMORPG:s simply being so time-consuming due to their complex and communication-intensive nature that little time remains for other media digestion. It goes beyond the scope of this paper to investigate for which of these reasons (or possibly combinations of reasons) the observed pattern exists. It can be concluded though, that a clear pattern of significant differences in television viewing habits exists among the studied students when grouped according to their favourite game genres.

FUTURE RESEARCH

To further investigate the area of frequent playing of computer games, and possibly pinpoint reasons for the observed patterns of varying media consumption among different types of players, more studies in this field is needed. Since in the present study, a limited number of students have been followed for four years, studies involving a larger number of subjects would be especially useful.

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