The effects of Avatars' Gender and Appearance on Social Behavior in Virtual Worlds

Domna Banakou, University College London, United Kingdom

Konstantinos Chorianopoulos, Ionian University, Greece

ABSTRACT: In this article, we investigate the effects of avatars' appearance on user sociability in virtual worlds. In particular, we study gender and appearance differences in social communication preferences and behavior in virtual worlds. For this purpose, we have employed the virtual ethnographic method, which is an adaptation of traditional ethnography for the study of cyberspace. Although we only employed nine users who used four different avatars, we observed a cumulative of more than two hundreds social encounters. We found that users with the more elaborate avatar had a higher response rate in their social encounters, than those users with the default avatar. Most notably, female users selected to speak with male avatars much more frequently, when using the attractive avatar, which indicates a self-confidence effect induced by the appearance of the personal avatar.

Keywords: Virtual ethnography, Second Life, avatar appearance, sociability.

INTRODUCTION

Virtual worlds have become an important aspect of the networked society. A contemporary example of such an online virtual world is Second Life; notably, more than five hundreds thousands Second Life users have logged-in at least once during the last week of May 2009[i]. In the beginning, engineers and computer scientists developed virtual worlds as an alternative interface to computer information processing. Most of those works have been inspired by the science fiction literature (e.g., Gibson's Neuromancer). Later, human-factors engineers have considered the ergonomic aspects (Stanney et al, 1998) and have focused mostly on the motor and cognitive dimension of ergonomics (e.g., presence, navigation). In our work, we focus on the social aspects of virtual worlds and we provide empirical evidence for the relationship between social behavior and avatar appearance. Indeed, Donath (2007) has called for a focus on the social effects of appearance of avatars in virtual worlds.

For this purpose, we explore what is the effect of avatar appearance on user sociability in virtual worlds. In particular, we hypothesize that avatars with attractive clothing, hairstyles, or body shapes will be treated favorably in a virtual world. In particular, we explore the differences in gender and appearance with regard to social communication preferences and behavior. For example, are attractive female avatars treated differently when compared with less attractive choices? Or, do male avatars have the same conversation response rate in novel social situations?

The rest of this article is structured as follows: In section 2 (Related work), we analyze previous related work in the fields of virtual environments and social communication. In section 3 (Methodology), we set our goals and approach, introduce the materials used in study (virtual world, avatars), and explain the process of the experiment. In addition to that we discuss the way our data was collected. In section 4 (Results), we present the findings on the users' behaviors and attitudes and we discuss the differences of a person's appearance both in the real and the virtual world. In

section 5 (Discussion), we describe the implications of this work for theory and practice. In the last section (Conclusion and further research) we provide conclusions and propose further studies that should consider cultural and ethnic background, in addition to style enhancements treated here.

RELATED WORK

There are multiple definitions for such virtual worlds; a contemporary one refers to "a synchronous, persistent network of people, represented as avatars, facilitated by networked computers" (Bell, 2008). The concept of virtual world however is to be distinguished from the concept of persistent online games and game spaces; virtual worlds are focused on "socialization and content creation" as Spence states (2008) contrary to game spaces where the players' purpose is pursuing the goals of the particular game (Hypography, 2008).

The representation of users in virtual worlds has been known as 'avatar' and has been a major component of Massively Multiplayer Online Role Playing Games (MMORPGs), such as World of Warcraft (WOW). Previous research indicated that people would like to be able to have great control over their avatar representation, or have input into its design (Smith et al, 2000). In addition, in most major virtual worlds, one can spend extraordinary long time choosing the appearance of the avatars (Schroeder, 2002). As a matter of fact, practitioners have been developing several mechanisms for avatar selection and customization.

Always wonder how it would be like to be a tall, blonde woman or a dark-skin male? In an online virtual world everyone could become what he or she desires. Moreover, avatar appearance can be used as an indicator of team membership and, thus, regulating the colors, skins or shapes of the avatars within the team is often employed (Manninen 2003). In contrast to early findings, researchers have argued that virtual world users select and design their avatars to reflect their own appearance (Vasalou et al, 2007), or their ideal selves (Bessière et al, 2007). Regardless of the motivations for avatar choices, researchers have not yet fully explored the differences between avatar types (e.g. gender, attractiveness). Notably, Yee and Bailenson (2009) have demonstrated that the avatar under control affects the user's social behavior, but they have not investigated how other avatars treat it.

Social communication in online worlds

What is social behavior? Rummel (1976) states about social behavior: "behavior that is peculiarly social is oriented towards other selves"; according to that statement, someone's actions are taking into account other selves. Social behavior from a psychological perspective is directed towards members of the society. It results in social actions, rational, emotional or other, which eventually lead to a way of communicating. An individual's social behavior can be determined by different aspects such as gender, race, age, religion, work or family roles, interactions with other social groups and so on.

Social communication and the development of social relationships is one of the main aspects in all virtual worlds since they allow people to speak or share knowledge with each other. Communication between users has ranged from text, graphical icons, visual gesture, and sound. Online virtual worlds are not limited to games but, depending on the degree of immediacy presented, can encompass computer conferencing and text based chat-rooms. Sometimes, emoticons or "smilies" are

available, to show feeling or facial expression. Curtis (1997) was among the first to study the social phenomena that take place in online virtual worlds with a special focus on Multi-User Dungeon (MUD), which are considered to be the ancestors of contemporary graphical online worlds. Although, the technologies of online virtual worlds have been progressing through the years, the main medium of communication has been mostly textual (Curtis, 1997), which does not provide many clues for the physical appearance of others.

Contemporary research has focused on the social aspects of virtual worlds, but has mostly considered a gaming application context. Ducheneaut et al. (2006) have claimed that story-driven online gaming communities face important challenges affecting their cohesion and eventual longevity. Nevertheless, Ducheneaut et al. (2007) have also identified several opportunities for increased sociability in virtual worlds and have proposed directions towards increased social capital creation. Notably, their research revealed that "third places" (i.e., spaces for social interaction and relationships beyond the workplace and home) have the capacity to function as one form of a new public space for informal sociability. Participation in such virtual "third places" appears particularly well suited to the formation of bridging social capital—social relationships that, while not usually providing deep emotional support, typically functions to expose the individual to a diversity of worldviews (Steinkuehler and Williams, 2006).

Previous research has shown that different aspects of the environment as well as multiple cultural patterns, which are closely linked to differential aspects of one's self, (Triandis, 1989) can impact social behavior. That behavior can be affected in online worlds as it does in the real ones; more specifically, Eastwick et al. (2009) have claimed that: "This study suggests that interactions among strangers within the virtual world are very similar to interactions between strangers in the real world"[1]. People tend to have similar if not the same behavior in communicating and interacting in online worlds as in reality, revealing the same beliefs, morals or biases.

Physical appearance online and offline

A person's outer appearance can significantly affect social communication. When referring to outer appearance, it doesn't always has to do just with the height, the weight, the body type, etc. Additional factors, such as body pose and attitude, face expressions, or even the high self-confidence many people have and show to others, all of which may have their own significance. In addition, clothing and personal accessories are seriously taken into consideration and can form somebody's aspect for one of his/her mates.

In the area of immersive environments, the realism of appearance has been investigated in terms of impact on the quality of communication (Garau et al, 2003). Contemporary research has also revealed that the virtual self in online games could serve as a compensatory function that might satisfy the unfulfilled roles in real life (Wan and Chiou, 2006). Indeed, Turkle (1995) has argued that online environments offer people the option to create multiple representations of themselves and to explore alternative aspects of their personality. The latter research has been performed in the

[1] Real-world behavior and biases show up in virtual world http://esciencenews.com/articles/2008/09/09/real.world.behavior.and.biases.show.virtual.world)

context of text-based online virtual worlds. Vasalou et al. (2007) have provided explanations for users that prefer to customize their avatars as close as possible to their real physical appearance or ideal shelf.

At the same time, researchers have been examining how users select avatars online. Several research findings have indicated that users of online worlds masqueraded or enjoyed playing roles that they did not have in reality (Turkle, 1995; Donath, 1999). In addition, it has been demonstrated that role-playing is not only an entertaining past-time, but it might be beneficial for developing empathy, when a virtual environment is experienced through the eyes (and body) of someone else (Bailenson, et al, 2008). Yee et al (2009) have also provided a study on the effects of the avatars' physical appearance, but they have not provided neither gender-related, nor social aspects of the behavior in virtual environments. Finally, the latter study has been performed in the context of an immersive environment in a lab setting, which is rather different to the desktop virtual world accessible to the majority of the population, such as SL.

Gender differences

Variations in the physical appearance of humans, known as human looks, are believed by anthropologists to be an important factor in the development of personality and social relations. Previous work has revealed that physical appearance, global self-esteem, and appearance self-esteem, might be experienced differently between the two genders (Pliner et al, 1990). It has also been found that when comes to cyber-flirting, in terms of attitude, individuals downplay the importance of physical attractiveness online, while men are more likely than women to initiate contact (Whitty, 2004). Nevertheless, real behavior (offline or online) might be different to attitudes expressed in a questionnaire, which is affected by a motivation of just being ' politically correct.'

Previous research has considered several aspects of gender differences in online social behavior. It has been noticed is that the qualities of cross-sex online friendships are higher than that of same-sex online friendship (Chan and Cheng, 2004). A common phenomenon revealed when participating in online worlds is that men may play the roles of women and women vice versa, an experience called "gender swapping" through which they form ideas about the role of gender in human interactions (Kiesler, 1997). Nevertheless, for the sake of simplicity, in this study, we asked the participants to select an avatar that matches their gender.

METHODOLOGY

We have employed the virtual ethnographic approach (Hine, 2000), which is an adaptation of traditional ethnography for the study of cyberspace. Kozinets (1997) first employed the term "netnography", for ethnographic research conducted on the Internet, to suggest specific techniques and standards to study online cultures and communities.

The purpose of this study was to examine the effects of physical appearance on social behavior in a virtual world. For each gender, two avatars with significant differences in their external appearance were created. Instead of asking our test-users (or others in the online world) about their attitudes towards particular issues (Slater, 2004), we opted for a more natural data collection methodology (virtual ethnography). Each one of the test users was given one avatar at a time and was asked to interact with other users in public spaces of SL, while the coordinator of the study was recording social

behavior from a distance, by employing an avatar.

In our study, the researcher participated as a member of the virtual world. The researcher did not behave actively towards others, but tried to record the subject's behavior. The virtual ethnographic methodology took two forms with regard to the data collection: 1) The researcher either recorded the avatars' communication with the help of the chatting feature of the virtual world, or 2) recorded the members' behavior and interacting through observation. The coordinator of the study was trying to record the participants' social behavior from a distance. Before entering the virtual world as a participant, the researcher first became familiar with the characteristics of the virtual world.

Subjects

Nine users agreed to take part in the study: four females and five males. Most of them did not have previous experience with SL, while some of them had experience with related technologies, such as video games, or online text-based virtual communities. Users used the SL application from their home having access from their personal computer. In the same way, the researchers had access from their own PC over a distance. There was an advance communication with each user, in order to allocate a convenient time slot and virtual meeting place.

Materials

As a case study, we examine social behavior in SL, which is a desktop virtual world application. Second Life takes place in a virtual world, which is partly created by its "Residents" all over the world. SL users are given the option to be represented by default avatars, or to customize an avatar to their liking by buying clothes, body types and postures.

Previous research raised the question of how the appearance of the avatar might affect the nature of interaction. In particular, Schroeder (2002) points out that "it is not only the shape of virtual bodies that matters in the experience of virtual worlds, but also the level of detail with which they are represented". Thus, we chose the avatars according to how much elaboration is need to construct one. We selected the default avatars (default avatar a) and we constructed two more elaborate avatars (elaborate avatar b). In Figures 1 to 4, we present indicative snapshots of the four avatars.

Figure 2: Default female avatar (a): Mary

Figure 1: Elaborate female avatar (b): Sarah

Figure 4: Default male avatar (a): John

Figure 3: Elaborate male avatar (b): Leo

Since the way one considers a person attractive or good-looking is rather subjective, we made the following assumptions:

- The avatar with the 'non attractive' appearance is considered to be the one which is given on user's first login into the virtual world, when no changes in the outer appearance have been previously made (default avatar a).
- The 'attractive' avatar has been changed physically, with different hair styles, clothes and accessories, which the first avatar does not possess: shoes, make-up, eyes, or even differences in the way they pose, dance, walk, sit, talk and make any kind of gestures (elaborate avatar b).

Process

In order to avoid phenomena where the behaviors of the users adapt to the goal of the research, participants were given a slightly different research goal than that of the study. In particular, users were informed that the goal of the study is the evaluation of chatting mechanisms in SL. In this way, in addition to disguising the real purpose of the study, participants were motivated to interact with numerous other avatars. Indeed, our users interacted (through two avatars each) with a cumulative number of over two hundred other avatars in SL.

According to the user's gender, they used one avatar at a time. In addition, the researchers gave each user an exact location and time in SL, where they will be both transported. Although the users were aware of the coordinators' existence in the same area, they did not know what the coordinator's avatar looked like. In this way, each participant was free to act spontaneously and not let her behavior be affected by the physical presence of the researchers.

Each time a user entered the virtual world the exact location where the research took place changed from person to person. In SL, locations are not always occupied, which could be an issue if users didn't have an adequate number of other avatars to communicate with. For that reason a rather crowded place was chosen each time, according to SL's 'Popular Places'.

The users were asked to engage in public conversation with other avatars. In this way, the coordinator was able to record and evaluate their behavior and choices. In the case of private messaging (PM), they were asked to note it down and then inform the coordinator of the event at the end of the session. Finally, users were given a time-limit of one hour, half with each different avatar, to contact other avatars and discuss about anything they wished to know or to do.

Data collection

The data was recorded in real-time using a table where the study's coordinator noted down each user's acts and behaviors with regard to the number of, type of (gender, appearance) social encounters with other avatars. An example of this table is presented in Table 1. The majority of them chatted for about two or three minutes about where they are from, whether they liked the place they were at or not, the reasons they connect to SL. Some participants asked for help to manipulate objects or make specific moves. An example of such a conversation follows:

[John]: "Hello there Michael"

[Michael]: "Hey, how r u?"

[John]: "How can I fly here?"

[Michael]: "see a button called "fly" at the bottom? Click it and use the keyboard arrows to navigate"

….

[John]: "I see I can fly thanks Michael"

[Michael]: "anytime, bye for now"

[John]: "bye"

	Num of avatars they talked to/ Gender/ Appearance	Num of avatars who replied	Friends/ Pm
1st User (Female)	F/↓	x	x
Default avatar (a)	F/↓	1	x
	M/↑	x	x
	M/↓	1	x
	F/↑	1	x
	F/↓	x	x
	M/↓	x	x
	F/↓	1	x
	F/↓	x	x
	M/↑	x	x
ΣΥΝΟΛΟ	6F + 4M = 10	4	0
Elaborate avatar (b)	M/↑	x	x
	M/↑	1	x
	M/↑	1	x
	F/↑	1	1
	F/↑	x	x
	M/↑	1	x
	M/↑	x	x
	F/↓	1	x
	F/↓	x	x
	M/↑	1	x
	M/↓	1	x
	F/↑	1	x
ΣΥΝΟΛΟ	5F + 7M = 12	8	2

	Num of avatars they talked to/ Gender/ Appearance	Num of avatars who replied	Friends/ Pm
8th User (Male)	M/↓	1	x
Default avatar (a)	M/↓	1	x
	F/↓	1	x
	F/↑	x	x
	F/↓	x	x
	M/↓	x	x
	F/↓	x	x
	F/↑	1	1
	F/↓	x	x
	F/↓	x	x
	F/↑	x	x
	M/↓	x	x
SUM	8F + 4M = 12	4	1
Elaborate avatar (b)	F/↑	1	x
	M/↓	x	x
	F/↑	1	x
	F/↑	x	x
	F/↓	1	x
	F/↑	1	x
	F/↑	x	x
	M/↓	x	x
	F/↓	x	x
	F/↑	1	1
	M/↓	x	x
	F/↑	1	x
	F/↑	x	x
	F/↑	1	1
SUM	11F +3M = 14	7	3

Table **1** Indicative table used to record data for the 1st female user and the 8th male user.

F = Female avatars
M = Male avatars
↑ = attractive
↓ = non attractive

1 = positive reply
x = negative reply

After the end of the experiment users were asked to fill-in an attitude questionnaire, which contained questions such as: 'How much do you believe that your physical appearance is related to developing interpersonal relationships in contemporary societies?' and 'How much do you believe that your avatar's physical appearance is related to developing interpersonal relationships in a virtual world?' Furthermore, we asked the users to use free text in order to describe or rationalize their opinions on the above questions.

RESULTS

Behavioral findings on the effect of physical appearance in a virtual world

During the observation of the users, it was recorded that correspondence was bigger for those who chose the elaborate avatar (b) instead of the default avatar (a). We recorded 56.88% (62 out of 109 observations) successful social encounters of the elaborate avatar (b) in contrast to 31.5% (30 users out of 96 observations) for the default avatar (Figure 5). In addition, other SL inhabitants proactively engaged in a conversation with the attractive subjects of our study. In particular, we recorded twenty SL inhabitants 'breaking the ice' towards an elaborate avatar, and only three towards the default avatar.

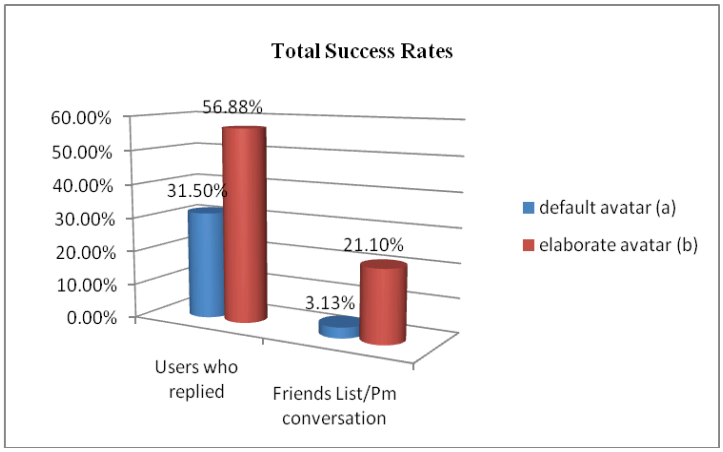

Figure 5: Success rates of users using two different types of avatars: default avatar (a) and elaborate avatar (b) for both genders (9 users, 2 avatars each, 205 social encounters)

Besides public conversation, sometimes users initiated private chat. For the elaborate avatar (b), there was a 21.1% (23 out of 109 observations) interested in creating some kind of friendship with the users from inside the SL, just as to move to private conversation. In the case of the default avatar (a) there were only 3.13% (3 observations out of 96). In summary, it seems that the elaborate avatar (b) has been very successful in social encounters.

Gender differences and success rate in social communication

Female avatars seem to have slightly higher success rates when they engage in virtual social encounters. In particular, when it comes to others who replied to male avatars (Figure 7), the success percentages are 30.18% for the default male avatar (a) (16 replies out of 53 observations) and 52.54% for the elaborate male avatar (b) (31 replies out of 59 observations). Success rates for female avatars are 32.55% (14

replies out of 43 observations) for default female avatar (a), and 62% (31 replies out of 50 observations), for elaborate female avatar (b) (Figure 6).

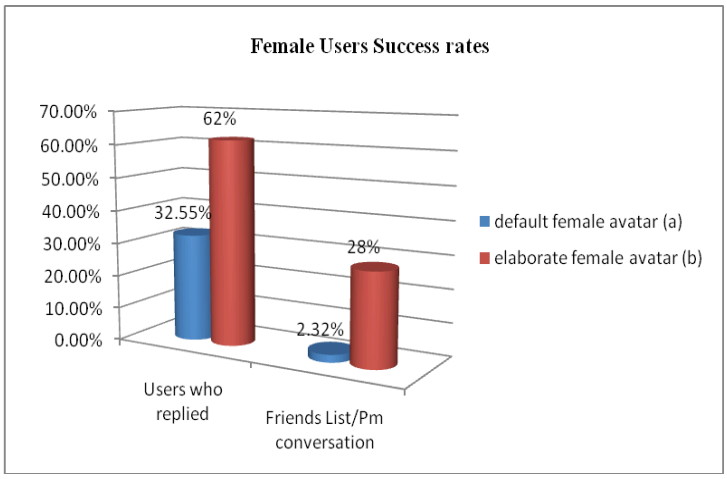

Figure 6: Success rates for females using default female avatar (a) and elaborate female avatar (b)

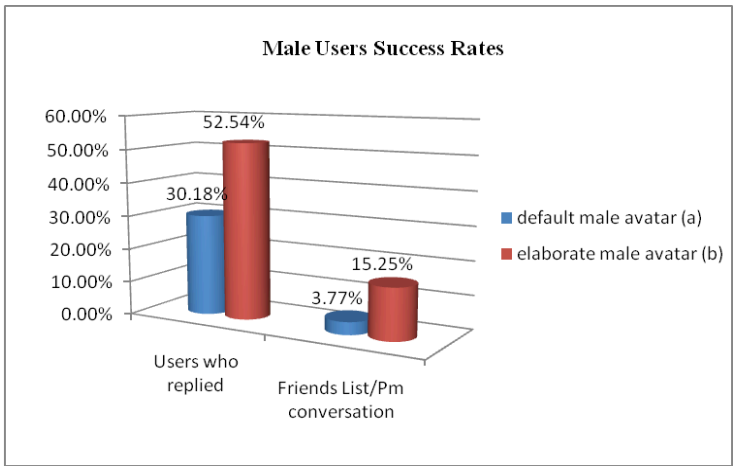

Figure 7: Success rates for males using default male avatar (a) and elaborate avatar (b)

Notable gender differences appear for the users' PM conversations and friends' list. Using the elaborate male avatar (b) the percentages for men are 15.25% (9 PMs out of 59 users) and 3.77% (2 PMs out of 53 users) for the default male avatar (a). Female users have been added as friends 28% times for elaborate female avatar (b) (14 PMs out of 50 observations) and 2.32% for the default female avatar (a) respectively (1 PM out of 43 observations). In summary, female users seem to have higher success rate in communication than men and come in contact more easily than men.

Gender preferences for communication partner

Most notably, it was found that female participants with the 'attractive' elaborate female avatar (b) preferred to talk to male avatars. The percentage of other male avatars who they chose to chat with is much higher than the percentage of the other women whom they chose not to, with percentages of 68% (34 out of 50 observations with regard to four women) and 32% (16 out of 50 observations with regard to four

women) respectively.

On the other hand, when using the default female avatar (a) female participants choose to talk to other male avatars 44.2% times (19 out of 43 observations) and more frequently 55.8% times with female avatars (24 out of 43 observations). The findings reveal that even in a virtual world the appearance can influence someone's self-confidence, mainly in the interest that is expressed towards the opposite gender (Figure 8).

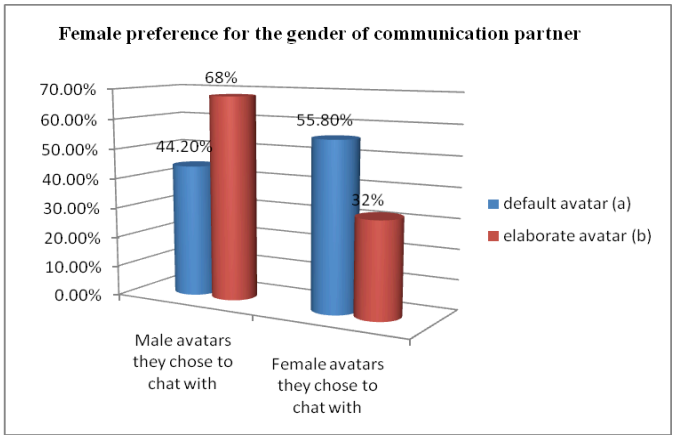

Figure 8: Gender choices and communication for women users with default avatar (a) (observations = 43) and with elaborate avatar (b) (observations = 50).

The gender of the communication partner that female users of the application chose to speak to did not have significant differences. In particular women chose to speak to female and male avatars 43.1% (40 out of 93 observations) and 56.9% (53 out of 93 observations) times, respectively (Figure 9).

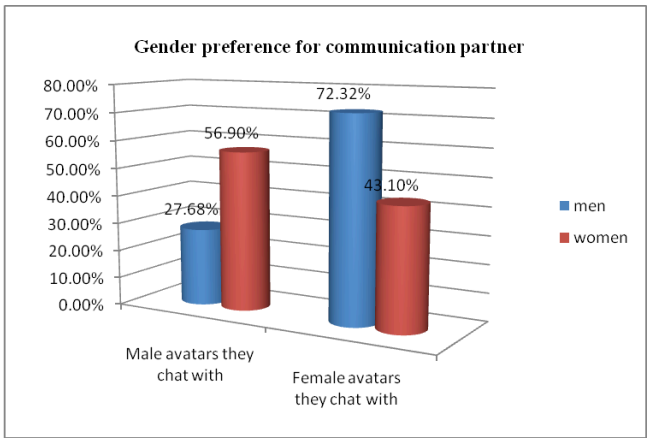

Figure 9: Gender preferences for communication partner for males (observations = 112) and for females (observations = 93)

In contrast, male participants preferred to spoke mainly towards female avatars regardless of the avatar they used. In particular 72.32% times (81 out of 112 observations with regard to 5 male users) talked to female avatars, and only 27.68% times (31 out of 112 observations with regard to 5 male users) towards other male avatars.

Attitudes towards appearance in online virtual worlds

According to the majority of the participants, physical appearance is important in everyday life. Based on their questionnaire answers, the importance of the physical appearance depends on the type of relationships (professional versus personal).

What is the attitude towards physical appearance in a virtual world? The answer to this question seems to be split. After the end of the study, five out of nine participants answered that physical appearance plays a significant role in such a "virtual game". On the other hand, four out of nine of them answered that an avatar's look matters just a little bit, or not at all.

Most notably, we found that participants behaved in contrast to their stated beliefs. Before starting the first session, participants were asked to choose the avatar that they preferred. It turned out that seven out of nine users chose to use the elaborate male/female avatars (b). In contrast, according to participants' answers to the questionnaires, only five out of nine agreed that the physical appearance of the avatar is important in a virtual world. Thus, two out of nine users chose to use the elaborate male/female avatars (b), although they finally claimed that their personal appearance in Second Life is not important at all. Due to the small number of participants, we cannot raise conclusive arguments, but the above findings might reveal subconscious stereotypes about physical appearance in online virtual worlds.

DISCUSSION

The findings of this research are in accordance with and build upon findings from previous research in the respective fields. Gender differences in text-based computer-mediated communication have been reported to reflect the real-world stereotypes (Herring, 2003). Indeed, our study has revealed that several commonly held beliefs and stereotypes about physical appearance and gender apply to virtual worlds, as well. Moreover, users with elaborate avatars (especially women) have increased confidence, which complements both (real-world) intuition and previous related research on height and attractiveness (Yee, et al, 2009). Although virtual worlds provide the opportunity of ignoring or transforming stereotypical attitudes towards gender and appearance, our study has revealed that casual users have not exploited the opportunity.

The findings of this research are also related with previous works in human-computer interaction (HCI) (Ducheneaut et al, 2006; Garau et al, 2003; Smith et al, 2000; Vasalou et al, 2007), which have studied the evaluation methods and the mechanics of effective user interaction in virtual worlds. In addition to avatar customization, basic user interaction and evaluation concepts (e.g., position and gestures of avatars) between avatars have been found important in the sociability of users (Smith et al, 2000). In our work, we provided both elaborate and default versions of avatars and we have confirmed that the customized version of an avatar provides significantly more opportunities for socialization in a virtual world. Moreover, in complement to previous research methods on non-verbal social interaction (position, gesture), we have provided several metrics in the context of virtual ethnographic method for the evaluation of verbal social interaction in virtual worlds.

Based on the behavioral data collected during several social encounters in SL, we have realized that physical appearance is an important factor in determining the social communication in virtual worlds. In addition to behavioral data, we recorded the opinion of the users on several aspects of physical appearance and sociability in

virtual worlds. Most notably, users referred to the social identification function. In particular, one user reported "[...] There are also different groups of people like in real life with specific characteristics (e.g. metal outfits, rapper outfits and glamorous outfits) who might prefer to communicate only with people in their own groups." While another user said that "I believe that appearance is very important in SL because I also chose to speak to people who had a closer appearance to mine. I thought that since they are more like me they might be the same in their real life". Therefore, further research on this topic should consider providing the choice of alternative avatars to the users.

Finally, it is worth mentioning some limitations of this study. Even if appearance is the basic factor determining the beginning of a conversation through virtual worlds, the topic of subjectivity of when someone believes that another avatar has a nice outer appearance comes up. Indeed, attractiveness is rather subjective and it depends on several factors such as belonging to a social, ethnic or cultural group, as well as comparison to the majority of the rest of the people (Nowak and Rauh, 2008). A future study might need to perform a pre-study that identifies attractiveness of avatars with regard to a particular population. An additional limitation of the present study is that we did not employ 'blind' coders for the identification of the sociability metrics. Nevertheless, we employed a pre-defined data collection table (see Table 1) and we focused on rather objective data (gender, replies). Overall, the ethnographic methodological underpinnings of the study provide results that should be regarded for qualitative pragmatism rather than quantitative accuracy.

CONCLUSION AND FURTHER RESEARCH

In conclusion, we have collected initial evidence that confirms previous studies on social communication preferences in the real world. Although the similarities with the established real-world stereotypes might be the result of low experience with virtual worlds, we need to elaborate further on social behavior in virtual worlds and how it is related with real world social behavior (Jacobson, 1999). In particular, we have found that the customization of avatars does not only fulfill the need to adapt a user's representation to his liking, but it is also critical for the effective sociability of users in virtual worlds. Further studies should consider other cultural and ethnic backgrounds, in addition to the style enhancements treated here. Moreover, we plan to replicate the same study in the context of particular online activities, such as education.

LIST OF ABBREVIATIONS

3D	3 Dimensional
HCI	Human-Computer Interaction
MMORPG	Massively Multiplayer Online Role Playing Game
MUD	MultiUser Dungeon
PM	Private Messaging
SL	Second Life
WOW	World of Warcraft

[i] http://secondlife.com/statistics/economy-data.php

References

Bailenson, J. N., Yee, N., Blascovich, J., Beall, A. C., Lundblad, N., and Jin, M. (2008). The use of immersive virtual reality in the learning sciences: Digital transformations of teachers, students, and social context. *Journal of the Learning Sciences*, 17:102–141.

Bell, M. (2008). Toward a definition of "virtual worlds". *Journal of Virtual Worlds Research*, 1(1).

Bessière, K., Seay, A. F., and Kiesler (2007). The ideal elf: Identity exploration in world of warcraft. *CyberPsychology & Behavior*, 10(4):530–535.

Chan, D. K. S. and Cheng, G. H. L. (2004). A comparison of offline and online friendship qualities at different stages of relationship development. *Journal of Social and Personal Relationships*, 21(3):305–320.

Curtis, P. (1997). Mudding: Social phenomena in text-based virtual realities. In Kiesler, S., editor, *Culture of the Internet*, pages 121–142. Lawrence Erlbaum Associates Inc.

Donath, J. (2007). Computer science: Virtually trustworthy. *Science*, 317(5834):53–54.

Donath, J. S. (1999). Identity and deception in the virtual community. In Smith, M. A. and Killock, P., editors, *Communities in Cyberspace*, chapter 2, pages 29–59. Routledge, London.

Ducheneaut, N., Moore, R., and Nickell, E. (2007). Virtual 'third places': A case study of sociability in massively multiplayer games. *Computer Supported Cooperative Work (CSCW)*, 16(1):129–166.

Ducheneaut, N., Yee, N., Nickell, E., and Moore, R. J. (2006). "Alone together? ": exploring the social dynamics of massively multiplayer online games. In *CHI '06: Proceedings of the SIGCHI conference on Human Factors in computing systems*, pages 407–416, New York, NY, USA. ACM.

Eastwick, P. W. and Gardner, W. L. (2009). Is it a game? Evidence for social influence in the virtual world. *Social Influence*, 4(1):18–32.

Garau, M., Slater, M., Vinayagamoorthy, V., Brogni, A., Steed, A., and Sasse, M. A. (2003). The impact of avatar realism and eye gaze control on perceived quality of communication in a shared immersive virtual environment. In *CHI '03: Proceedings of the SIGCHI conference on Human factors in computing systems*, pages 529–536, New York, NY, USA. ACM.

Herring, S. C. (2003). Gender and power in online communication. In Holmes, J. and Meyerhoff, M., editors, *The Handbook of Language and Gender*, pages 202–228. Oxford: Blackwell Publishers.

Hine, C. (2000). *Virtual Ethnography*. Sage Publications Ltd.

Hypography (2007). What is an acceptable definition of a game?

Jacobson, D. (1999). Impression formation in cyberspace: Online expectations and offline experiences in text-based virtual communities. *Journal of Computer-Mediated Communication*, 5(1).

Kiesler, S., editor (1997). *Culture of the Internet*. Mahwah, NJ: Lawrence

Erlbaum Associates, Inc.

Kozinets, R. (1997a). On netnography: Initial reflections on consumer research investigations of cyberculture. *Advances in Consumer Research*, 25:366–371.

Kozinets, R. V. (1997b). "i want to believe": A netnography of the x-philes' subculture of consumption. *Advances in Consumer Research*, 24:470–475.

Manninen, T. (2003). Interaction forms and communicative actions in multiplayer games. *The international journal of computer game research*, 3(1).

Nowak, K. and Rauh, C. (2008). Choose your â buddy iconâ carefully: The influence of avatar androgyny, anthropomorphism and credibility in online interactions. *Computers in Human Behavior*, 24(4):1473–1493.

Pliner, P., Chaiken, S., and Flett, G. L. (1990). Gender differences in concern with body weight and physical appearance over the life span. *Personality and Social Psychology Bulletin*, 16(2):263–273.

Rummel, R. J. (1976). *Understanding Conflict and war: The conflict helix*, volume 2. Beverly Hills, California: Sage Publications.

Schroeder, R. (2002). *The Social Life of Avatars*. Springer, 1 edition.

Slater, M. (2004). How colorful was your day? Why questionnaires cannot assess presence in virtual environments. *Presence: Teleoperators & Virtual Environments*, 13(4):484–493.

Smith, M. A., Farnham, S. D., and Drucker, S. M. (2000). The social life of small graphical chat spaces. In *CHI '00: Proceedings of the SIGCHI conference on Human factors in computing systems*, pages 462–469, New York, NY, USA. ACM.

Spence, J. (2008). Demographics of virtual worlds. *Journal of Virtual Worlds Research*, 1(2).

Stanney, K. M., Mourant, R. R., and Kennedy, R. S. (1998). Human factors issues in virtual environments: A review of the literature. *Presence: Teleoperators & Virtual Environments*, 7(4):327–351.

Steinkuehler, C. and Williams, D. (2006). Where everybody knows your (screen) name: Online games as "third places". *Journal of Computer-Mediated Communication*, 11(4).

Triandis, H. C. (1989). The self and social behavior in differing cultural contexts. *Psychological Review*, 96(3):506–520.

Turkle, S. (1995). *Life on the Screen: Identity in the Age of the Internet*. New York, NY: Simon and Schuster.

Vasalou, A., Joinson, A. N., and Pitt, J. (2007). Constructing my online self: avatars that increase self-focused attention. In *CHI '07: Proceedings of the SIGCHI conference on Human factors in computing systems*, pages 445–448, New York, NY, USA. ACM.

Wan, C.-S. and Chiou, W.-B. (2006). Psychological motives and online games addiction: Atest of flow theory and humanistic needs theory for taiwanese

adolescents. *CyberPsychology & Behavior*, 9(3):317–324.

Whitty, M. T. (2004). Cyber-flirting: An examination of men's and women's flirting behaviour both offline and on the internet. *Australian Academic Press*, 21(2):115–126.

Yee, N., Bailenson, J. N., and Ducheneaut, N. (2009). The proteus effect: Implications of transformed digital self-representation on online and offline behavior. *Communication Research*, 36(2):285–312.