

Online Addiction: A Cultural Comparison of Privacy Risks in Online Gaming Environments



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ABSTRACT: *In this paper we investigated the levels of addiction and personal data disclosure within Massively Multiplayer Online Role Playing Game environments (MMORPG's). The study made use of an online survey, a combination of a six point behavioural addiction framework, Self Determination Theory and Impression Management theory to assess addictive behaviour and consequential data disclosure amongst a sample of 188 Singaporean based MMORPG gamers. These findings were juxtaposed with results of a previous study which investigated MMORPG addiction and data disclosure amongst 357 European online gamers to facilitate a cultural comparison [8]. Results found that pathological gaming addiction had a direct effect on levels of personal and sensitive data disclosure and participants who were disclosing high amounts of data were considered more vulnerable to exploitation and predation. In addition, the Singaporean sample exhibited similar levels of addiction yet marginally lower levels of data disclosure compared to their European counterparts.*

Keywords: MMORPG, Gaming Addiction, Privacy, Data Disclosure

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1. Introduction

Massively Multiplayer Online Role Playing Games (MMORPG's) are fully immersive three dimensional societies in which thousands of end users can interact and collaborate to accomplish complex tasks. MMORPG's have evolved from traditional single-player games and provide gamers with a highly social environment that facilitates and promotes hyper-personal communication. These virtual worlds have created extensive global communities in which end users can meet other gamers and build reputations based on their performance and ability to meet common goals [1]. Players can create one or more visual representations of themselves known as avatars. Avatars hold different sets of professions or roles that the MMORPG provides and the permanence and fluidity of roles varies depending on the design of the environment [2]. Each role has varying strengths and weaknesses and the structural characteristics of many MMORPG's forces players to trust and become dependent on their more experienced counterparts. MMORPG environments are infinite both in terms of size and ending. Goals and rewards typically use a random ratio reinforcement schedule based on operant conditioning [3], [4]. Hence, early achievements are quick, almost instantaneous; however as a player progresses in the game the amount of time, effort and level of complexity is increased until progression becomes almost imperceptible. In addition, the realism of MMORPG graphics continues to grow more sophisticated, contributing to the seductive, captivating appeal of the game and the likelihood of prolonged excessive engagement. This captivating appeal is otherwise described as 'stickiness' or 'flow' [5], [6]. The concept of cognitive 'flow' predicts an experience that completely engages an individual (e.g. MMORPG's) and creates the conditions conducive to maintain such a 'flow'. Moreover, such an immersive environment creates a highly pleasant and desired experience encouraging gamers to repeatedly engage in a particular game [7]. In addition to the seductive appeal of naturalistic graphical environments, MMORPG's are played in real time, requiring participants to remain online for excessive periods of time

in order to keep up with the action. Indeed, this increase in time, effort and complexity encourages users to engage in such environments for literally hours and days as they compete with themselves and other opponents to achieve higher ranks or beat previously attained scores [1], [2], [8]. Recent studies have highlighted the potential addictive aspects of MMORPG design infrastructures and press articles have revealed the impact of pathological Internet use [9], [10], [11].

2. Emergence and Measurement of Online Gaming Addiction

MMORPG addiction is currently one of the most discussed psychosocial aspects associated with playing computer and video games [12]. The emergence and acceptance of addiction to MMORPG's has grown significantly over the last decade [13], however, the conceptualisation of 'behavioural addiction' (i.e. one that does not involve the ingestion of a psychoactive drug) has long since been a matter of great debate. Any conceptualisation of addiction has implications for several groups of people (e.g. addicts, family members, researchers, practitioners and policy makers) and in some cases the needs of these groups may not be equally well served by certain models [14]. Griffiths [15] states that excessive activity and addictive activity are two very different levels of engagement and argues that the fundamental difference between excessive engagement and addiction is that the former enhances an individual's life as opposed to the latter which is destructive. Irrespective of the terminology used, researchers generally agree that computer and videogame overuse can lead to behavioural addiction [14]. Furthermore, addictive behaviour refers to behaviour that is excessive, compulsive, uncontrollable, and psychologically or physically destructive [16].

Online gaming addiction has been identified as a specific subtype of Internet addiction [17] and although Young [13] states it is difficult to estimate how widespread the problem is, the emergence of international online gaming addiction support centres illustrate the significance and acceptance of the problem [18], [19].

Many studies on gaming addiction are based on the diagnostic criteria for pathological gambling found in the Diagnostic and Statistical Manual of Mental Disorders (DSM). Researchers have developed various different scales to measure "pathological" gaming by adapting 6 or 7 of the DSM's criteria [20-30] (i.e. salience, tolerance, mood modification, withdrawal symptoms, relapse and conflict). Young's 8 item questionnaire [31] for diagnosing Internet addiction has often been adapted in studies specifically focusing on online gaming addiction [32-35], whilst other studies have adapted the ICD-10 diagnostic criteria for pathological gambling [36]. Several studies have devised their own set of criteria for gaming addiction [37-39].

The 6 point diagnostic (adapted) DSM criteria has been extensively embraced in many studies by Griffiths [11], [15], [23], [24] and is one of the few adapted frameworks that has been fully developed and validated as a game addiction scale. Moreover, Lemmens et al. [12] used factor analysis to confirm the validity of the second-order construct. According to Griffiths [11] an individual can be classified as behaviourally addicted if they satisfy each of the following 6 criteria:

1. **Salience:** Playing a game becomes the most important activity in a person's life and dominates his or her thinking (preoccupation), feelings (cravings), and behaviour (excessive use).
2. **Tolerance:** The process whereby someone starts playing games more often, thereby gradually building up the amount of time spent on games.
3. **Mood modification:** The subjective experiences that people report as a result of engagement in games. This dimension was previously labelled euphoria [11], [15], referring to a "buzz" or "high" that is derived from an activity. However, mood modification may also include tranquillizing and/or relaxing feelings related to escapism.
4. **Withdrawal Symptoms:** Unpleasant emotions and/or physical effects that occur when game play is suddenly reduced or discontinued. Withdrawal consists mostly of moodiness and irritability, but may also include physiological symptoms, such as shaking.
5. **Relapse:** The tendency to repeatedly revert to earlier patterns of game play. Excessive playing patterns are quickly restored after periods of abstinence or control.
6. **Conflict:** This refers to all interpersonal conflicts resulting from excessive gaming. Conflicts exist between the player and those around him/her. Conflicts may include arguments and neglect, but also lies and deception.

3. Privacy Risks in Online Gaming Environments

Online privacy and data protection are two of the most widely discussed aspects of computer mediated communication and evidence suggests that there is an increase in social and psychological dependencies to online communication services

(e.g. instant messengers, email, VoIP) [8]. Indeed, it is commonly acknowledged that the Internet has provided a platform for cheap, worldwide communication, offering support and interactive interaction amongst end-users [40].

Many studies have been conducted highlighting the identity and privacy risks associated with both synchronous and asynchronous computer mediated communication [1], however little attention has been given to privacy risks and data disclosure within MMORPG environments save for the social and lifestyle implications of pathological gaming.

Walther [41] describes peer-to-peer communication within MMORPG environments as hyper-personal and states that due to the nature of the communication channel, interactions are more intimate, more intense and more salient. Text based communication within such environments enable a sender to optimise their self-presentation which causes the receiver to form an inflated view of the sender due to the few optimised pieces of transmitted information. As a result of true visual anonymity and representation (e.g. body language) end-user perceptions of one another are purely based on the cues transmitted in text format [3]. Hyper-personal interaction invokes more personal and intimate communication between individuals which induces idealised impressions through reciprocity. As the levels of intensity and intimacy accumulate, so does the desire to spend increasing amounts of time online.

Yee [2] suggests there are factors unique to MMORPG environments that facilitate the formation of relationships. Indeed, collaboration and trust is required for achievement of many complex in-game goals and these scenarios initiate and nurture the building of relationships. In addition, the mythical and chivalric romance embraced in many MMORPG's (e.g. a 'knight in shining armour') further exacerbates the levels of hyper-personal interaction. Moreover, in-game collaboration, frequently involves peer-to-peer mentoring and exchanging of gifts (e.g. charms to advance to the next level).

Relationship development is a crucial factor in exploitation and predation [42] and the preceding evidence clearly illustrates that MMORPG environments encourage subscribers to form close, intimate and trusting relationships with fellow gamers, many of whom are in reality complete strangers. In addition, gamers often adopt gender-neutral pseudonyms for their characters, which enable the separation of real world and virtual identities but can also provide a greater level of anonymity for individuals with darker motives.

The purpose of our research was to explore a) levels of addiction to MMORPG's b) levels of personal and sensitive data disclosure within MMORPG environments and c) the resultant level of risk to MMORPG gamers. Our research also explored the correlation between addiction and data disclosure, which to date has not been investigated.

4. Method

4.1 Participants

The sample consisted of 188 self-selected native Singaporean MMORPG players. All participants completed an online questionnaire in their own time. Of these participants, 74% were male ($n = 140$), 26% were female ($n = 48$). The mean age was 22.6 years ($SD = 2$ years). Of the participants who gave their current country of residence, 98% were currently living in Singapore ($n = 184$), 1% in Canada ($n = 2$) and 1% in the United States of America ($n = 2$). The high proportion of Singaporean respondents could have possibly created a cultural bias. Lack of motivation and integrity in online based surveys are two potential concerns, but studies have shown that web-based respondents are typically highly motivated because of self-selection. In addition, anonymity does not have an adverse effect on data integrity [2].

4.2 Design and materials

An online questionnaire survey was designed using a browser based data collection program (Lime Survey) and was divided into 6 sections. The first section asked for information about gender, age, country of origin and current residence, level of education and number of years using the Internet in the home. The second section asked respondents where in the home their computers were typically situated and what Internet based functions were used on a daily basis.

The third section focused on addiction asking participants about their playing habits, time spent online during weekdays and weekends and the number of different avatars used in the current MMORPG game that they currently spent the most time engaging in. In addition, a 22 item Game Addiction Scale (GAS) developed by Lemmens et. al. [12] in accordance with Griffith's 6 point behavioural addiction framework [11] (salience, tolerance, mood modification, conflict, relapse, withdrawal symptoms) was used and participants were provided with a 7 point Likert scale ranging from "never" (1) to "often" (7). The construct validity of the GAS is found to be significantly high as both convergent and criterion validity has provided satisfactory correlations with other measures such as time spent on games. These validity tests demonstrate a strong construct validity of the GAS [12].

The fourth section explored impression management in MMORPG environments. Impression management is the process through which people try to control the impressions other people form of them. It is a goal directed conscious or unconscious attempt to influence the perceptions of other people about a person, object, or event by regulating and controlling information in social interaction [43]. An impression management scale for organisations developed by Bolino and Turnley [44] based on the Jones and Pittman Taxonomy [45] was adapted to fit the context of online gaming. Their taxonomy includes: *self promotion* (pointing out ones abilities or accomplishments in order to be seen as competent by observers), *ingratiation* (use flattery or do favours to elicit an attribution of likability from observers), *exemplification* (self sacrifice or go above and beyond the call of duty in order to gain the attribution of dedication from observers – (this subscale was omitted as it was considered irrelevant to MMORPG environments)), *intimidation* (signalling of power or potential to punish in order to be seen as dangerous by observers) and *supplication* (advertisement of weaknesses or shortcomings in order to elicit an attribution of being needy from observers). Participants were presented with a 7 point Likert scale ranging from “never” (1) to “often” (7).

The fifth section used an adapted Basic Psychological Needs Scale which is central to Deci and Ryan’s Self Determination Theory (SDT) [46]. According to the theory, for an individual to develop and function in a healthy and optimal way the following fundamental needs must be continually satisfied: *autonomy*, (the condition of being autonomous; self-government, or the right of self-government; independence), *relatedness* (association or connection to others) and *competence* (possession of required skill, knowledge, qualification, or capacity; of sufficient quality). These 3 needs were measured using a total of 9 questions (3 – autonomy, 3 – relatedness, 3 – competence) adapted to fit the context of online gaming and the construct measured the extent to which online gaming fulfilled these needs. Respondents were provided with a 7 point Likert scale ranging from “not at all true” (1) to “very true” (7).

The final section focused on data disclosure in MMORPG environments together with the type of issues discussed between online gamers. Participants were presented with an array of personal data types and were required to select the details they had previously divulged (e.g. passwords, home address, financial data). In addition, participants were asked about their experiences of meeting online based friends in person.

4.3 Procedure

Following a small pilot study, recruitment invitations were sent to 80 Internet gaming cafes in Singapore and the questionnaire was also emailed to a range of students at a Singapore University. Both recruitment methods provided a hyperlink to the online questionnaire. The email address of the first author was given for any queries about the study. Participants were informed that participation was entirely voluntary and that the research was conducted according to the British Psychological Society’s Ethical Code of Conduct for Psychologists. If participants no longer wished to take part, they simply had to close the Internet browser. All incomplete or duplicate answers were omitted from the data prior to analysis.

5. Results

5.1 Basic demographics of gamers

Age. The average age of MMORPG players was 22.6 years ($SD = 2.21$ years).

Occupation. The sample comprised a large majority of students (95%). The rest of the participants were in a government employment/training scheme (2%), in paid full time work (1%), in paid part time work (1%) or were unemployed (1%).

Location of PC in the home. Most home gaming computers were situated in the bedroom (68%). Other locations included the hall (38%), study room (28%) and the spare room (8%).

Years of Internet usage. The majority of respondents (88%) had been using the Internet in the home for longer than 6 years. The remaining participants had been using the Internet between 5 and 6 years (8%), 3 and 4 years (3%) and 1 and 2 years (1%).

Online application usage. The most popular online applications used on a daily basis were email (92%), web browsing (92%) and online gaming (91%). Other applications included instant messaging (86%), downloading multimedia content (75%), social networking services (68%), online banking (21%), Voice over IP (21%) and shopping (18%).

5.2 MMORPG Experiences

Most played MMORPG's. The most played MMORPG's are shown in Table 1:

Title	Description	%
World of Warcraft (WoW)	Fantasy based multiplayer interactive role playing game with ~11 million paying subscribers in 2009. Developed by Blizzard, California and released in November 2004. Players can choose from a set of characters with differing skill sets and play in different virtual worlds known as realms. The game is set in the world of 'Azeroth' – a fantasy world consisting of monsters and dragons. Players use virtual currency for buying and selling of virtual goods. Experience points and levels are accumulated from successful missions and in game combat.	32%
Maple Story	Developed in 2003 by Wizet, South Korea with ~100 million user accounts in 2010. Free of charge 2D side scrolling role playing game focusing on venturing into dungeons and combating monsters in real-time. Experience points and virtual currency is obtained from successful missions.	14%
Cabal Online	First released in 2005 by ESTSoft, South Korea. Free of charge 3D online role playing game set in the world of 'Nevareth'. Centred on killing monsters by groups of players known as guilds. Experience points and virtual currency is awarded for successful missions.	6%
Granado Espada	First released in 2005 by IMC Games, South Korea. Subscription based fantasy game which takes place on a newly discovered continent based on the Americas during the Age of Exploration. Regions include forests, tropical jungles, plains, swamps, deserts and ice fields. Experience points and virtual currency are accumulated from successful combat. Players can control many characters simultaneously.	4%
Ragnarok Online	Developed and first released in 2002 by Gravity, South Korea. Subscription based multi player fantasy game which is based in a 2D world. Players develop their strength, agility, vitality, intelligence and luck through combat with other players. The setting is based on Korean comics and cartoons as well as being influenced by a wide variety of international cultures.	4%
Perfect World	Developed in 2005 by Perfect World Company, China. Heavily based on ancient Chinese mythology and set in the mythical world of 'Pangu'. Free to play game which relies on items sold in-game to make profits.	2%

Table 1. Most Played MMORPG's

62 other games were named and comprised the remaining 38% most-played MMORPG's.

Avatars. Just under one third of respondents (31%) used 5 or more avatars in the MMORPG they spent the most time playing. 40% used between 2 and 4 different avatars and just under a third (29%) only used 1 avatar. Only 13% of participants previously sold their avatar for real money and of these, 13% had regretted selling their character, highlighting the level of emotional attachment. In addition, 56% of participants had previously gender-swapped their avatar.

Time Investment. The mean average number of days per week spent playing MMORPG's was 4.69 ($SD = 2.17$). Moreover, the mean average number of hours per weekday was 4.42 ($SD = 5.43$) compared with 4.48 hours ($SD = 3.31$) per weekend day; highlighting that the majority of participants spent an equal number numbers of hours gaming during the week and at weekends.

Lifestyle Preference. Participants were asked if they had a lifestyle choice of living in a virtual world environment or in the real world environment as we exist today. Almost one third of participants (31%) stated they would prefer to live in a virtual environment as opposed to the remaining respondents (69%) who would prefer to live in a real world environment. Moreover, a chi-squared test (X^2) which compares the similarity of two distributions revealed that females showed no preference between the real ($n=30$) and virtual worlds ($n=18$), $X^2(1, N = 48) = 3.00, p = .083$, (where n denotes the category size and N denotes the sample size). However, a greater number of males prefer the real world ($n=100$) over the virtual world ($n=40$), $X^2(1, N = 140) = 25.714, p = .001$. These, and other test statistics reported in this paper also provide a measure of the probability that he results are due to chance (p). For a more comprehensive explanation of the procedures, see [49]

Addiction. Approximately three quarters (76%) of participants were classified as moderately addicted and one quarter (24%) as highly addicted to MMORPG's. The subscales (salience, tolerance, mood modification, conflict, relapse, withdrawal symptoms) of the addiction construct [12] were averaged for each participant (7 point Likert scale) answer set. Participants

with an average addiction score > 4 (median value of 7 point Likert scale) were classified as highly addicted and respondents with a score ≤ 4 were classified as moderately addicted. Similar results were found for self-perceived addiction with 80% of participants categorising themselves as moderately addicted and 20% categorising themselves as highly addicted. Regression analysis found that participants who classified themselves as highly addicted typically obtained a high addiction score from the six point addiction construct ($R(N = 188) = .295 p < .001$). In addition, males ($M = 3.4614$, $SD = .85390$) typically exhibited higher levels of addiction to MMORPG's than females ($M = 3.0646$, $SD = 1.00642$), ($t(186) = -2.446 p = .015$). There was however no significant difference in the number of hours spent playing MMORPG's between participants categorised as highly addicted ($t(139) = -.810$, $p = .419$) and those classified as moderately addicted ($t(47) = .782$, $p = .438$).

5.3 Player Behaviour in MMORPG's

Impression Management. Participants with a subscale score of >4 (median value of 7 point Likert scale) were categorised as exhibiting high levels of self-promotion, ingratiation, intimidation or supplication and respondents with a score ≤ 4 were categorised as exhibiting low levels of the aforementioned behaviours. The most common type of impression management behaviour exhibited within the MMORPG environment was ingratiation (high level 45%, low level 55%), illustrating that many players perceived their progression and development of in-game relationships was most effective when complimenting and praising fellow gamers. Self-promotion (high level 34%, low level 66%) was perceived to be the second most effective behaviour, whereby players talk about their experiences, achievements, accomplishments and talents in order to impress fellow gamers. Intimidation (high level 26%, low level 74%) was found to be less frequently adopted in online gaming, suggesting that players found aggression and awkward behaviour to be less of an effective tactic. In addition, supplication (high level 15%, low level 85%) was viewed as the least effective behaviour, suggesting players who constantly pretend to require assistance in an attempt to elicit help from fellow players find this to be relatively ineffective. There was no significant difference in the adoption of impression management techniques between male and female participants.

Basic Psychological Needs (SDT) of Online Gaming. Participants with a subscale score of > 4 (median value of 7 point Likert scale) were categorised as experiencing high levels of autonomy, competence or relatedness and respondents with a score ≤ 4 were categorised as experiencing low levels of the aforementioned behaviours. The results revealed that gamers' levels of autonomy (high level 83%, low level 17%) was the most satisfied basic psychological need. Relatedness (high level 52%, low level 48%) and competence (high level 52%, low level 48%) were satisfied to an equal degree. Participant subscale scores (autonomy, competence and relatedness) were averaged to give an overall measurement of needs satisfaction derived from MMORPG's. Respondents with an overall score of > 4 (median value of 7 point Likert scale) were categorised as experiencing high levels of psychological needs satisfaction, where as respondents with a score of ≤ 4 were categorised as experiencing low levels of psychological needs satisfaction. The majority of participants (69%) were found to be experiencing high levels of psychological needs satisfaction with approximately one third (31%) of participants experiencing low levels of satisfaction. There was however, no significant difference in basic psychological needs between genders.

5.4 Social Interaction in MMORPG's

Interaction with Fellow Gamers. The majority of participants (41%) mainly interact with online friends and some offline friends although an equal proportion of respondents (39%) interact mainly with offline friends and some online friends. Furthermore, 40% of respondents felt their relationship between their online and offline friends based friends were equally important to them.

Interaction Technologies. The most popular interaction technologies embraced by online gamers were instant messengers (80%), Facebook (44%), voice chat (37%) and SMS (32%). There was no significant difference in preference between genders save for that males ($M = .419$, $SD = .495$) preferred voice technologies to females ($M = .111$, $SD = .319$), ($t(88.885) = -4.448$, $p < .001$).

Issues Discussed. Issues discussed within MMORPG environments varied considerably, with 66% of respondent's frequently discussing game tactics, over one third (39%) often giving advice on personal issues and nearly a quarter (21%) frequently receiving advice on personal issues. Interestingly, over half of respondents (57%) rarely followed advice from fellow gamers on personal issues leaving 43% of respondents who occasionally followed advice on personal issues. The results also revealed a positive correlation between gamers that offered more advice on personal issues received more advice on personal issues ($r(N=188) = .664 p < .001$). Moreover, there was a positive correlation between gamers that received greater amounts of advice on personal issues tended to follow the advice given to them ($r(N=188) = .541 p < .001$).

Face-to-face Meetings. Just over two thirds (67%) of participants had previously met an online based gamer in person. Of these, 13% found the meeting to be completely different to what they had expected it to be whilst one third (33%) had no prior expectations. There was however no difference in expectations between genders.

5.5 Privacy Risk in MMORPG's

Data Disclosure. Each participant was given an overall disclosure score based on the number of data types they had previously disclosed within MMORPG environments. Participants with a disclosure score of >7 (median value) were categorised as high level disclosers and respondents with a score ≤ 7 were categorised as low level disclosers. The study revealed high levels of data disclosure within MMORPG's environments with exactly 50% of respondents categorised as high level disclosers, however there was no statistical difference between genders or age groups.

There was a weak positive correlation between the hours of game play per week and levels of data disclosure ($r(N=188) = .150, p < .040$), illustrating that participants who engage in MMORPG environments for excessive periods of time could be more likely to disclose greater amounts of personal and sensitive data. Moreover, a significant positive correlation between levels of addiction to MMORPG's and levels of data disclosure was found ($r(N=188) = .286, p < .001$).

An analysis of variance (ANOVA) on disclosure across interaction between fellow gamers revealed that the more gamers interacted with online based friends the higher the levels of disclosure ($F(3, 184) = 3.323, p = .021$). Moreover, post hoc tests showed that gamers who interacted with only offline based friends disclosed significantly less than people who interacted with some or all online based friends (all $p < .02$).

Positive correlations emerged between the SDT subscales and levels of data disclosure. Indeed, analysis showed a positive correlation between relatedness and data disclosure ($r(N=188) = .432, p < .001$) and competence and data disclosure ($r(N=188) = .294, p < .001$). However no correlation was found between autonomy and data disclosure.

Positive correlations emerged between the impression management subscales and levels of data disclosure. Indeed, analysis showed a positive correlation between self-promotion and data disclosure ($r(N=188) = .347, p < .001$), ingratiation and data disclosure ($r(N=188) = .285, p < .001$) and intimidation and data disclosure ($r(N=188) = .257, p < .001$). However no correlation was found between supplication and data disclosure.

These findings support theories by Joinson [3] who found that the affordance of anonymity and hyper personal interaction encourages participants to disclose greater amounts of personal and sensitive information within online interactive environments.

5.6 Cultural Similarities and Differences

Given the global emergence of and subscription to MMORPG's, the results of the Singaporean sample were analysed against a previous dataset comprising of 357 European gamers [8] in order to reveal any cultural similarities and differences between European and Asian online gamers.

The average age of the European sample ($M = 25.7$ years, $SD = 4.32$) was marginally lower than the Asian sample ($M = 22.6$ years, $SD = 2.21$ years), and there was a greater male dominance (86%) in the European demographic.

The Singaporean dataset comprised a greater proportion of students (95%), whereas the European sample comprised a more even spread of full time employees (35%) and students (48%).

Time investment varied between samples. On average, European gamers spent 5.37 ($SD = 1.81$) days per week playing MMORPG's compared with their Singaporean counterparts who spent 4.69 ($SD = 2.17$) days per week gaming. Singaporean gamers appeared to spend more hours playing per weekday ($M = 4.42, SD = 5.43$) than their European counterparts ($M = 4.37, SD = 1.64$), however, European gamers invested more time in their game at weekends ($M = 5.72, SD = 1.25$) than did Singaporeans ($M = 4.48, SD = 3.31$).

The most played MMORPG in both samples was World of Warcraft, however a greater number of European gamers played WoW (67%) compared with Singaporean gamers (32%). Furthermore, aside from World of Warcraft, European gamers preferred subscription based games such as StarWars Galaxies (4%), Starcraft (3%) and Lord of the Rings (3%) whereas the majority of games (except World of Warcraft) played by the Singaporean sample (table 1) were subscription free.

Significantly more European gamers stated they would prefer to live in the online gaming world (53%) as opposed to the real world (47%) compared with Singaporean gamers (online gaming world, 31%, real world, 69%).

There was little variance in classified levels of addiction between samples with 77% of European gamers and 76% of Singaporean gamers classified as moderately addicted juxtaposed with 23% of European gamers and 24% of Singaporean gamers classified as highly addicted. Greater variance was observed in participants self perceived addiction with 76% of European gamers and 80% of Singaporean gamers reported moderate levels of online gaming addiction, as opposed to 25% of European gamers and 20% of Singaporean gamers who perceived themselves as highly addicted. In contrast to the gender differences

in levels of addiction observed in 5.2 (Addiction), no statistically significant differences between genders and levels of addiction were found in the European dataset. Furthermore a t-test on overall variance in average levels of addiction between sample sets found no statistically significant difference.

Marginal variance was found between sample sets in relation to interaction with fellow gamers. Indeed, 40% of European gamers and 41% of Singaporean gamers interact mainly with online friends and some offline friends, as opposed to 44% European gamers and 39% of Singaporean gamers interact mainly with offline friends and some online friends. The remaining 16% (European) and 20% (Singaporean) interacted only with friends who they knew offline in person. In addition, a greater variance was found between the European (31%) and Singaporean (40%) respondents who felt their relationship between their online and offline based friends were equally important to them.

Comparative analysis found a significant variance between sample sets with regards to issues discussed in game between players with 4% of European gamers versus 66% of Singaporean gamers only discussing game tactics and 96% of European gamers versus 34% discussing personal issues not related to the game.

Significantly more Singaporean gamers (67%) had previously met another gamer in person compared with European gamers (38%), however, in contrast, 20% of European gamers found the experience completely different to what they had expected it to be compared to 13% of Singaporean gamers.

Marginal variance was found between levels of data disclosure with 56% of European participants and 50% of Singaporean participants classified as high level disclosers.

In contrast to the positive correlation between the hours of game play per week and levels of data disclosure (5.5) found in the Singaporean dataset, no statistically significant difference was found in the European dataset. Interestingly, however, the European dataset yielded a much stronger positive correlation ($r(N=357) = .985 p < .001$) between addiction and data disclosure than the Singaporean dataset ($r(N=188) = .150 p < .040$). T-test analysis conducted on both datasets revealed no statistically significant differences in disclosure levels between age groups or disclosure levels between cultures. There was however differences on average disclosure levels between cultures with Singaporean gamers ($M = .612, SD = 1.465$) disclosing comparatively more than their European counterparts ($M = .000, SD = 1.000$) ($t(543) = -5.757, p < .001$).

6. Discussion and Conclusion

The present study examined the effect of addiction on levels of data disclosure within Massively Multiplayer Online Role Playing Game environments together with an assessment of gamers' vulnerabilities to exploitation and predation. Results demonstrated significant relationships between pathological gaming and high levels of personal and sensitive data disclosure.

The fact that the majority of respondents were full time university students (95%) aged between 22 and 29 years would account for the equal number of hours spent gaming during the weekdays and weekends. It is commonly acknowledged that students have more flexible work schedules during the week than an individual in full time employment. Indeed, this would also influence the physical location of home gaming computers, with many students only occupying one private student bedroom.

The majority of participants were very familiar with online interactive environments with 99% having used the Internet in the home for 3 or more years. To this end, the popularity and rapid embrace of online applications such as instant messengers, MMORPG's and social networking services highlights the shift change in communication preference.

The results found the single most popular online game to be World of Warcraft (32%), however there was a large distribution of favourite MMORPG's with 38% of gamers playing games which did not require a financial subscription. This supports findings in current literature which highlight Yee's different motivations for online game playing [35] and suggests that the majority of respondents are motivated by factors such as achievement, immersion and manipulation as opposed to factors such as relationship and escapism.

Almost two thirds of participants used 2 or more avatars in the MMORPG they played the most and just over half (56%) had previously gender-swapped their character. This supports previous findings of Hussain and Griffiths [47] who found that 57% of respondents previously gender swapped their character for reasons including escapism, avoidance of inappropriate behaviour from gamers of the opposite sex and receiving free gifts and powers. The previous and present findings highlight some of the ulterior motives behind gamer-to-gamer communications and the potential for exploitation.

Consistent with current literature, a significant proportion of respondents (31%) stated they would prefer to exist in a virtual world environment in place of the real world in which we exist today. Furthermore, a small but significant number of participants demonstrated high levels of emotional attachment to their avatar and had regretted selling it for real money. Mehwash

and Griffiths [48] point out that some university students may use online gaming as a coping mechanism when faced with temporary unpleasant emotional arousal stemming from high workloads (i.e. as a mood modifier).

Results revealed the most widely adopted impression management behaviour to be ingratiation and players found complementing and praising fellow gamers to be the most effective strategy for in game progression. Furthermore, this complements theories from Joinson [3] and Walther [41] on the effects of hyper-personal interaction and reciprocity. In addition, the unique structural characteristics of MMORPG environments forces collaboration and dependence between players which could perhaps influence high levels of ingratiation as peer-to-peer co-operation is an integral element of online gaming [1]. Self-promotion of one's own skills and abilities was perceived to be an effective behaviour strategy for a significant number of participants and this is consistent with studies by Yee [15] and Griffiths [35] who assert that different player roles require different qualities and attributes (e.g. a guild leader is more likely to exhibit self-promotion to elicit confidence from other guild members). Intimidation and supplication were found to be less frequently exhibited behaviours and these approaches would be considered somewhat detrimental to the formation and continuation of in-game relationships.

More than two thirds of participants (69%) were found to be experiencing high levels of psychological stimulation from online gaming. Autonomy was the most satisfied subscale with relatedness and competence being satisfied to an equal degree. These findings illustrate the realism and immersiveness of modern virtual environments and provide a further justification for excessive engagement.

In-game interactions amongst participants were varied with the majority of gamers (41%) interacting mainly with online friends they know only in-game and some real life friends. Furthermore, 40% of participants felt their relationship between their online and offline friends were equally important to them, which further illustrates the level of emotional investment in online gaming. In many cases, these online based friendships are particularly salient and intense in nature [41] resulting in high levels of trust being placed in complete strangers. Types of issues discussed provided further evidence of trust formation within MMORPG environments with over one third (39%) often giving advice on personal issues and one fifth (21%) frequently receiving advice on personal issues unrelated to the game. Moreover, a significant proportion (43%) occasionally followed advice on personal issues and further analysis revealed a positive correlation between giving more advice and receiving more advice, highlighting high levels of reciprocity. Other findings from previous studies also suggest that levels of disclosure are higher in online interactive environments than in face-to-face contact due to perceived accountability [1].

Just under one quarter of participants (24%) were classified as highly addicted pathological gamers with three quarters exhibiting moderate levels of addiction (76%). These findings were supported by the levels of self-perceived addiction which found that one fifth of gamers perceived themselves as highly addicted. Consistent with previous findings [25], further analysis found that males typically exhibited higher levels of addiction than females suggesting that motivations for engagement could indeed influence levels of addiction [35]. Surprisingly, there was no difference in the number of hours spent playing MMORPG's between participants classified as highly addicted and those classified as moderately addicted.

The study revealed high levels of personal and sensitive data disclosure amongst MMORPG subscribers with exactly half (50%) of respondents classified as high level disclosers. Furthermore, a positive correlation between the number of hours game play per week and levels of data disclosure illustrated that greater periods of playing time could induce a greater level of absorption and immersion in the game and lead to higher levels of self-disclosure. Moreover, a positive correlation between levels of addiction and levels of data disclosure further highlight the potential effect of behavioural addiction on levels of data disclosure. Further analysis found that relatedness and data disclosure were positively correlated and this is supported by previous psychological studies on human interaction [32], [39] who state that the stronger the association or connection an individual has with another, the greater the likelihood of self-disclosure. Unsurprisingly, no correlation between autonomy and data disclosure was found. Self-promotion, ingratiation and intimidation were all positively correlated with data disclosure. It is commonly acknowledged that self-promoting individuals are more likely to disclose more about themselves in order to impress others around them, however, the correlations between ingratiation, intimidation and data disclosure are an area for future research.

Cultural analysis between the Singaporean and European datasets highlighted several similarities and differences. Firstly the Singaporean dataset comprised a far greater proportion of students which is reflected in the number of hours spent playing their MMORPG per weekday. Indeed it is commonly acknowledged that the student lifestyle has greater flexibility on working hours in contrast to individuals in full time or part time employment. However, on average Singaporean gamers spent less time overall playing online games in comparison to their European counterparts.

World of Warcraft was the most played MMORPG in both datasets, however significantly more European gamers played the game compared to the Singaporean sample. To this end the majority of Singaporean participants who played alternative MMORPG's chose subscription free games, which is possibly due to student budget constraints.

Comparative analysis on lifestyle preferences indicated that European gamers are more motivated by the immersion factor [35] of MMORPG's than their Singaporean counterparts with over half of European respondents stating they would prefer to live in an online gaming environment.

Both datasets revealed very similar levels of classified addiction but a slight variance in self perceived addiction with ~5% of participants in both datasets believing themselves to be pathological gamers but not classified as addicted by the aforementioned addiction scales.

Surprisingly, a greater proportion of Singaporean gamers felt their relationship between their online and offline friends were equally important to them in comparison to their European counterparts. This finding is inconsistent with the indications from the comparative analysis on lifestyle preferences. Indeed, it would be reasonable to hypothesise that gamers who would prefer to live in an online gaming environment would consider their online relationships between online and offline friends to be equally important. However, the conflicting results do not support such a hypothesis.

The most significant variation was highlighted in participants responses to issues discussed in game. Significantly more European gamers discussed personal issues not related to the game compared to Singaporean issues. This is a positive indication of a cultural influence in that Asian individuals are more introvert than their western counterparts [49]. In contrast, a significantly higher number of Singaporean gamers had previously met an online based friend in person compared with European gamers. Gluck [50] asserts that highly skilled online gamers adopt a celebrity like status amongst peers and specialist online gaming cafés provide intensive training for individuals to become experts in playing MMORPG's. Given the popularity and desire for celebrity like status amongst the Asian culture, juxtaposed with the perceived ambient safety of Singapore as a country [51], it is not surprising that more gamers are willing to meet online based friends in person.

Variances in levels of data disclosure differed between datasets with Singaporean gamers, on average, disclosing comparatively more personal and sensitive data in game than their European counterparts. Whilst there was only a variance of 6% between Singaporean (50%) and European (56%) levels of data disclosure, the European dataset revealed a much stronger correlation between addiction and data disclosure compared with the Singaporean sample, highlighting both a greater level of immersion and addiction related disclosure amongst European gamers.

Comparative analysis between datasets provided little evidence to support any cultural influences on gaming addiction and consequential data disclosure. It is therefore concluded that in the case of the aforementioned studies, participant's culture and background had a minimal effect on in game behaviour.

Clearly, the present study has several methodological limitations. The survey included a somewhat modest number of gamers the majority of whom were university students. However, self-report surveys completed online are thought to increase honesty levels. The relatively low numbers of participants still produced highly significant results. The fact that all the participants were university students means that the sample was not representative of gamers, although demographic studies of gamers suggests that the gamers in this study were not that different from profiles reported elsewhere. The most likely reason for the relatively small number of participants was that the survey took a relatively long time to complete (approximately 30 minutes), and there was no incentive for doing so. To this end, it is important to recognise the possible sample biases when conducting a cultural comparative analysis.

From online fraud to paedophilia, it is commonly acknowledged that computer mediated communication has provided a myriad of avenues for exploitation [1], [42]. Indeed, the affordances of anonymity combined with the immersive nature of MMORPG's creates an environment on which emotion, isolation and the desire for celebrity-like status takes precedence over individual safety and the protection of personal and sensitive data. The present study suggests that levels of addiction to MMORPG's are directly related to levels of self disclosure and gamer personalities influence the types of character roles adopted. Furthermore, the preceding evidence suggests that the structural characteristics of MMORPG's are more immersive than traditional online interactive environments [1] and encourage end-users to disclose greater levels of personal and sensitive data. This places significant social responsibility on online gaming vendors to provide awareness raising information to subscribers on a) hours of game play b) risks of personal and sensitive data disclosure within MMORPG's and c) formation of intimate relationships in MMORPG environments. Online games are perceived as places of equality, trust and utopia, however, this study suggests that these environments could indeed be used as potential avenues for future exploitation.

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