

The relationship between player's value systems and their In-game behaviour in a massively multiplayer online role-playing game

Abstract: This study examines the relationship between player's value systems based upon the Emergent Cyclical Levels of Existence Theory by Clare W. Graves (Graves, 2005) and their actions in playing a massively multiplayer online role-playing game. Online survey data from 1,577 players of the Ghost II containing value systems and demographic variables were paired with their behavioural metrics within the game world and analysed for this study. A number of positive correlations were found between the score of Red value system and the in-game metrics that were collected to represent their playing behaviour. Participants that scored high on the Red value system also tend to spend more real money in the game, level up their character and ability as quickly as possible, and seek other achievement in the forms offered by game world. These characteristics for fun, power and immediate gratification are also predicted by the Red value system in Clare W. Graves' model. With this work, we show that there is a correlation between in-game behaviour and real-life behavioural attitudes as modelled by the Emergent Cyclical Levels of Existence Theory. The finding provides valuable information on how to better design, evaluate and understand enjoyment in games. By understanding a player's behavioural attitude within a game, we can design game mechanics and situations to facilitate personal transformation through game playing.

Keywords: Massively multiplayer online role-playing games; Value system; Online behaviour; Emergent Cyclical Levels of Existence Theory

Introduction

MMORPGs (massively multiplayer online role-playing games) have become the most popular game genre in China, and represent a revolution of considerable financial, social and cultural impact. It was shown that the total gaming market revenue of China had increased to US\$18.5 billion in 2014, and MMORPGs accounted for about a third of it (China Gaming Industry Report, 2014).

Personality, which reflect the behaviours that define and characterise each individual, have been recognised as one of the key components to understanding both the uses and effects of video games. Previous research has shown that personality can explain an amount of variability in game genre preferences (Christina, 2013) and played a large role in the **affective response to video game** (Schwark et al., 2013). Existing research has also revealed a link between personality and motivation for playing online games (Jeng & Teng, 2008; Park et al., 2011), and a connection between individual's personality and playing behaviour online (Yee et al., 2011; Tekofsky et al., 2013). The diversity of player behaviours within game world also offers unique opportunities to study the relationship between personality and game playing, and MMORPGs are "a gold mine of personality data" (Yee, 2006).

However, there has been relatively little research involving personality of player and their in-game behaviour. What is more, most of the current gaming research tends to be based on self-reported data obtained from the players using interviews, surveys, or ethnographic observations. To address these limitations we should pay more attention to longitudinal data collected directly from games, which provides us with a solid empirical foundation to better understand these complex virtual worlds. Studies about China MMORPGs players are also still scarce, and a better knowledge of this is to be hoped, given that China players are the largest MMORPGs user group in the world.

In the present study, we wanted to examine the relationship between player value systems as conceptualised by the personality theory of Clare W. Graves (Graves,

2005) and their behaviour in a MMORPG in China. This research will add significantly to this field and may enable the game industry to create more engaging and targeted games.

Personality and In-Game Behaviour

Individuals who play video games can choose not only which game to play but also which action to take in a particular game. While some simple games allow only a limited number of actions, MMORPGs provide a diverse of choices and options. Player can level up their characters through completing quests and killing monsters, seek to learn new skills, collect virtual money and acquire more powerful equipments. They can also group together or compete with many other players who coexist in a shared game world. MMORPGs differ dramatically from single-player or small multi-player online games in the vast number of participants able to play together, and in a persistent game world which continues to evolve after the player is offline. Therefore, players can choose different in-game behaviour freely and have different motivations, interests and playing styles in MMORPGs (Bartle, 1996; Nick, 2006).

The personality has a strong influence on how people think and behave in the real world, and should, therefore, also influence their in-game behaviour as well. The response to video game is primarily based upon the relationship between the presentation of the game content and the interpretation occurring within the mind of the player (Kiili & Lainema, 2010; Nacke & Lindley, 2008). The experiential interpretation of the player is constructed based upon their unique belief (Kultima & Stenros, 2010), and the entire experience of a video game is heavily affected by players' world view (Yu et al., 2012). Existing research has also shown players behaved much the same in online games as they do in the real world (Bayraktar & Amca, 2012). The patterns of neurons arising from virtual experiences are very similar to those arising from physical threats (Mukamel, 2010; Blascovich & Bailenson, 2011). Because the players are personally invested in their avatars and the environment, the game playing is thought to be a personally revealing activity (Yee et al., 2011).

The studies conducted on the connections between the personality of the player and their behaviours in MMORPGs are still very rare. However, some earlier research has focused on the related topic of relationship between personality and playing behaviour in other game genres. Using Myers-Briggs Type Indicator (MBTI) test and a questionnaire on playing habits and gaming purchases, Bateman and Boon explored personality as a way to better understand game playing, and how such information can affect game design, which informed the concept of Demographic Game Design (DGD) (Bateman & Boon, 2006). By administering the Five Factor Model personality test, value survey and a questionnaire about how participants played the game, Griebel found both the personality traits and values correlated with specific game play behaviour in the Sims 2 (Griebel, 2006). Other related studies tried to explore the game play as a tool to assess the personality profile of an individual, and they also set out to identify the correlations between personality and play behaviour. Lankveld correlated the game behaviour within the game of Neverwinter Nights to scores on the personality questionnaire of 44 participants, and demonstrated that all five traits of the Five Factor Model have an effect on players' in-game behaviour (Lankveld et al., 2011). Tekofsky investigated the correlations between Five Factor Model personality traits and playing behaviour data of Battlefield 3 provided by a database of their game statistics and found that play style correlated significantly to players' personality (Tekofsky et al., 2013).

The existing research has also revealed several meaningful correlations between Five Factor Model personality traits and in-game behaviours in World of Warcraft. Yee's study firstly examined the link between personality and in-game behaviours in a MMORPG, and found many behavioural cues in the game World of Warcraft were related to personality traits of the Five Factor Model (Yee et al., 2011). For example, Extraverts prefer group activities over solo activities, and players that scored higher on Openness have more characters and complete more exploration achievements. The score on Agreeableness was positively correlated with the total number of performing friendly visual interactions such as hug emote, and negatively correlated

with the number of killing more players in player-versus-player combat. Yee also indicated that these behavioural indicators among MMORPGs can be used to infer a player's personality traits. But since their study did not get access to the official database of War of Warcraft from Blizzard who developed and run the game, only general behavioural metrics that have little to do with core game mechanics were found and analysed, such as sum of hugs and waves, ratio of need rolls and ratio of healing done. Though these cues still allow them to explore the personality expression in online games, the finding cannot explain and anticipate the key playing performance. In contrast, McCreery found no significant correlations between Five Factor personality traits and corresponding sets of in-game behaviour in World of Warcraft, such as correlation between the Agreeableness trait and a set of pre-defined "agreeable" behaviour (McCreery et al., 2012). However, as acknowledged by McCreery, the validity of the behaviour sets they defined were not analysed, and it is not clear whether the items in each set form appropriate and reliable scales. And also the sample size ($n = 39$) in their study may have been too small. So their study may underestimate the possible relationships between player personality and in-game behaviour in World of Warcraft. In a more recent study, Worth conducted a survey on the players' personalities of World of Warcraft and their different behaviours within the game (Worth et al., 2014). Significant correlations were found between HEXACO (Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness to Experience) personality traits and in-game behaviour. For instance, Social Player-versus-Environment activities positively correlated with Extraversion, and Helping and Immersion activities were positively correlated with Openness to Experience.

To conclude, the nature of the link between personality and in-game behaviour in MMORPGs has not been clarified clearly. In particular, a considerable amount of research has focused on the Five Factor Model of personality. However, what was not taken into consideration is that players' tasting and their game practices can change across different time and context. The Five Factor Model proposed that underlying

personality traits of an individual are stable and fixed, and the existing research based upon this model are unable to explain players' changing tastes in relation to their personality. Other kinds of trait theory (HEXACO) and typology theory (MBTI) of personality have come into same doubt, since their assumption is that personality traits or types are stable. The horizontal psychological typologies merely identify stylistic differences and are unable to explain players' changing tastes in relation to their personality. McLuhan stated that games are collective and social reactions to the main drive or action of a specific culture, and when cultures change, so do previously accepted patterns of games (McLuhan, 1994). Additionally, the limited number of research now available for studying personality and in-game behavior overlook more precise information related to game mechanics. Much research has relied on survey, self-edited game level or public database of game to record and analyze players' behavior, but not used commercial game data (also live player data sets).

Value Systems Model of Graves and Measurement Instrument

Clare W. Graves performed decades of empirical research between the 1950s and the 1970s regarding what is mature human personality and concluded in a framework of human development he named the Emergent Cyclical Levels of Existence Theory (Graves, 2005). After his death in 1986, Graves' academic achievements were adapted to the model of Spiral Dynamics, the most authoritative theory on value systems, and introduced to a wider audience by his students and successors Beck and Cowan (Beck & Cowan, 1996). In the meantime, a considerably number of other studies and books have appeared, referring to Graves' model or Spiral Dynamics, described a wide range of extensive applications in which the value systems could be used (Wilber, 2001).

Graves pointed out that human nature is an open, constantly evolving system, and humans construct new conceptual model of the world in response to the interaction of external conditions with internal neuronal systems (Graves, 2005). Graves referred to these states of equilibrium between environmental problems of living and neurological coping systems as levels of existence or value systems. The value systems are the

primary term we used here, which are considered to be modes of adjustment for coping with the perception of the reality of the world.

Graves identified eight core value systems consisting of a set of world views, a hierarchy of needs and corresponding behaviour, which can be found in individual as well as in societies and cultures. The development of value systems occurs in a fixed order as shown in Table 1. Each value system is designated by pairs of letters from Graves's original terminology, while the first letter stands for the neurological system and the second for the existential problems (Graves, 2005). Beck and Cowan designated a different colour for each value as symbol in their Spiral Dynamics Model, which has been widely accepted and used (Beck & Cowan, 1996).

TABLE 1 Summary Of Value Systems

Level and Label	Means Values	Nature of Existence	Basic Theme
1th AN (Beige)	None	Automatic	Express self as if just another animal according to the dictates of one's imperative psychological needs
2th BO (Purple)	Traditionalism	Tribalistic	Sacrifice self to the way of your elders
3th CP (Red)	Exploitation	Egocentric	Express self, to hell with the consequences, lest one suffer the torment of unbearable shame
4th DQ (Blue)	Sacrifice	Deferentialistic	Sacrifice self now in order to receive reward later
5th ER (Orange)	Scientism	Materialistic	Express self for what self desires, but in a fashion calculated not to bring down the wrath of others
6th FS (Green)	Sociocentricity	Personalistic	Sacrifice now in order to get acceptance now
7th GT (Yellow)	Accepting	Cognitivist	Express self for what self desires, but never at the expenses of others and in a manner that all life, not just my life, will profit
8th HU (Turquoise)	Experiencing	Experientialistic	Adjust to the realities of one's existence and automatically accept the existential dichotomies as they are and go on living

And in the development process, the new value systems will merely establish subordination of the older ones, not eradicate them. For example, when the Purple system takes over, the Beige is still there and subordinated in it. The new value

system includes and transcends the previous ones, thus forming a natural hierarchy, and there is a mixture of value systems at work in each person all the time.

As indicated by Graves, when in a certain development state, a human would have opened only certain systems for coping, and has his own hierarchy of needs around a core value system (Graves, 2005). He would think, feel and be motivated in manners appropriate to the state of his centralisation, and have biochemical characteristics and a state of neurological activation particular to it. As Graves said, “his emotions, ethics and values, biochemistry, state of neurological activation, learning-systems, preference for education, management and psychotherapy are all appropriate to that state”, and moreover, “he would have to respond negatively to forms of education, management and therapy not appropriate to the state of his centralization” (Graves 2005, p.29-30).

Graves’ theory has evident implication in the analysis of responses to video game, and its’ substance resides on revealing different sets of worldviews players place on their decisions and actions. What is more, Graves’ theory suggested the value of individual is an evolving and always-open-to-change system, which moves beyond the assessment of fixed horizontal dimensions and type indicators of the individual personality. For example, according to Graves’ model, we not only know that a person is operating on the Blue but that he came from the Red and could move up to the Orange. Compared with Five Factor Model or other personality theory, this valuable information permits us to understand the player personality in relation to not only current game playing but also their changing tastes.

A number of efforts have been made to develop instruments for assessing a person’s position in the levels of Human Existence hierarchy (Hurlbut, 1979; Lee, 1982; Roberts, 2010; Dobbelstein & Krumm, 2012). Graves himself also noted these kinds of tests and admitted that some have had a measure of success. He commented that the developers of the instrument must comprehend his theory and understand what is to be assessed. Those who have tried to develop instruments should be based “not

on what the person thinks but how s/he thinks, not on what people do or what they believe but how they do what they do, and how they believe that which they do believe” (Graves, 2005, p69).

The CultureView (<http://5deepvitalsigns.com/products/instruments/cultureview-series/>) is derived from the original work of Clare W. Graves and built upon the work of Don Beck. It was developed and owned by Don Beck and originated in paper form in 1997. In 2001, it was converted to electronic form by Don Beck and Christopher Cooke jointly. Don Beck first met Clare W. Graves in 1975 shortly after his Emergent Cyclical theory was published in 1974. He worked with Clare W. Graves closely until Graves' death in 1986, and then continued to spend many years adapting the work of Graves. CultureView developed by Don Beck, therefore, seemed one of the most qualified instruments to assess individual's value system based on Clare W. Graves' theory. Since 2001, the CultureView instrument has over 12,000 electronic completions globally, and has been translated to many different language versions including English (UK), Dutch, Korean, German, and Spanish.

Methods

We are interested in understanding if there is a relationship between the value systems of players and their later in-game behaviour. With an innovative mixed methodology, this study brings together methodological approaches from self-report survey and game metric technique. Participants recruited from the game Ghost II firstly completed an initial survey about value systems and then the value profile was paired with their behavioural metrics within the game world.

Chinese translation of the CultureView and Verifying

Under the consent by Don Beck and Christopher Cook, we employed a Chinese translation of the CultureView to assess value systems of players in this study. The Beige stage is not included in the measurement of CultureView, since it is a sub verbal level and therefore can't be examined by verbal test. In 2013, the CultureView

was just upgraded to a version including some new items for assessing Turquoise state. However, the people centered in Turquoise are only 0.1% among the whole population as estimated by Don Beck (Beck & Cowan, 1996), and more items will demand a high time investment of the participants. Therefore, we decided to use the original version (CSo) of CultureView to assess the six core value systems from Purple to Yellow.

The score of CultureView provides insight into 8 indicators of personal mindset, including Coping Mechanisms, Cultural Fit Factor, Perception of Society's Priorities, Perception of Organisational Priorities, Change Patterns, Readiness for Change, Executive Change Intelligences, and Patterns of Thinking. Table 2 lists representative statements of CultureView for six selected value system.

TABLE 2 Representative statements of six stages of ECLET from CultureView

Level and Label	Representative statement
2th BO (Purple)	A "caring parent" supervisor who takes care of us Preserves traditions, customs, festivals while protecting our groups
3th CP (Red)	A boss who is tough but lets me be tough, too Spunky, risky, bold, daring, often rebellious
4th DQ (Blue)	Loyal, dependable, ordered, with firm convictions and beliefs Treats everybody by the same rules and is stable and dependable
5th ER (Orange)	Manoeuvre strategically to land on top Thinks strategically and is competitive so we can be successful
6th FS (Green)	Warm, open, inclusive, with focus on feelings and community Join with others to share and care
7th GT (Yellow)	Be Authentic by integrating natural functions and flows Self-reliant, autonomous, flexible, with multiple interests

After translating to Chinese, the CultureView was tested among people who can speak both fluent English and Chinese. 10 participants firstly completed the English or Chinese version randomly, and then were invited to complete the other corresponding version. After each testing, the correlation was calculated between English and Chinese items, computing Pearson Correlation for the items of continuous variables and Chi-Square Tests for the items of nominal variables. If the result is not significant ($P > 0.05$), the translation of those items will be revised and be brought to one more

tested again with another 10 participants. Totally, 4 sessions of testing were conducted to make sure that each item translated to Chinese is significantly correlated with the original English item.

We then examined the test-retest reliability of the Chinese version with 20 participants, and they completed the CultureView twice with an interval of one week. Among the 81 questions tested here, 87.65% of items were significantly correlated between two tests, showing good reliability of the questionnaire.

Finally, an online version of CultureView with Chinese items translated and tested was created, and used to assess the value systems of Chinese players in the present study.

Ghost II

As shown in Fig. 1, Ghost II (<http://nie.163.com/en/qn2.html#aw>, NetEase Inc., China), a 3 dimension Real-time MMORPG, is currently the widely popular online game available commercially in China. Early in 2011, just 131 days after it was released, the total number of registered players was announced as over 12 million. And Ghost II was ranked as one of the Top Ten Domestic MMORPG in 2012 and 2013 by Chinese game media.



Figure 1 Ghost II

Ghost II is a free-to-play game, in which players pay for in-game items. The game playing of Ghost II is designed around a huge number of different quests or raids, which refer to a specific in-game adventure or endeavour. There are countless objectives and game contents for players to achieve and explore, including getting to the next level, acquiring rare items and being part of a story. Ghost II not only allows task related activities for achievement but also provides a rich context for social experience. Players are encouraged in different ways to communicate and collaborate with other players, and regroup in massive guilds. PvP (player-vs-player) activities are also provided from one-to-one duels to large 20 vs. 20 battlegrounds.

Administration of the Online Survey and Game Metric

With the permission of the NetEase Company that developed and runs Ghost II, the linkage of CultureView survey was presented to the player within the game world directly, and all data was automatically collected and stored via the online survey system of NetEase.



Figure 2 Online Survey within Game

The data collection took place over a period of one week, and all respondents were not paid or compensated for their participation. As shown in Fig. 2, when players first

logged in during this period, a message appeared and invited them to complete the online survey. When clicking the link to the survey included in this message the participants were taken to a website to submit their data online. The message appeared only once and was not presented again when this character logged on next time. Also this research limited the survey and invitation message to characters above 15 levels in order to ensure we could gain sufficient information about in-game behaviour from the higher level characters and also to not interrupt the game play of new players. The data form collected in this study contained: items of CultureView questionnaire, gender, age, income, areas of residence, occupation, education background, character identity number of player, IP address of respondent, completion time.

This research had access to the official database of Ghost II in order to collect data of the participant's actual in-game behaviour. Player character ID was used as the key for game metrics retrieval, and the players' self-report data containing demographic and value system variables was paired with their character profile created by data mining. Overall, what a player says and does at all times is precisely recorded in MMORPGs, and we can track nearly all actions through the analysis of game logs. However, we cannot extract all possible variables for analysis in this research, and a basic grasp of the game mechanics of Ghost II is necessary. This study limited the game metrics to a meaningful and manageable subset of longitudinal behavioural data. The in-game behaviour data reviewed here was the core game performance statistics of Ghost II and also covered a wide range of behaviours, such as the character level, playing time, the quality of equipment, achievement score, the amount of PvP activities, friendship and guild membership, etc. A full list and description of the behaviours recorded and analysed here has been presented in the Table 3. All the metrics data recorded here is tracked since the character was first created and were cumulative over a long time.

TABLE 3 In-game Behaviour in Ghost II

	Variables	Description
1	Playing time	Total online time (minutes) in game since the character was created
2	Consumption	Total real money (China Yuan) spent in game for virtual items since the character was created
3	Character level	Level of current character
4	Wushan gem level	Level of Wushan gem, an item for enhancing equipment
5	Character ability score	Reflecting comprehensive ability of character
6	Achievement Point	Total number of achievement player has completed
7	Ranking of ability among friends	Ranking among the friend list player added
8	Equipment score	Sum of all equipment item scores
9	Ability Practice	Number of times player has leveled up character skill and ability
10	Number of friends	Total number of present friends added
11	Goodwill point	Gaining through grouping and helping lower level player
12	Guild level	Level of guild belonged to
13	Guild point	Contribution to guild by finishing quest or activities
14	Dueling point	Number of winning in duel with players
15	Player killing point	Number of killing other player maliciously
16	Guanning battleground score	Gaining through Killing against other player and winning a battle in battleground
17	Pet score	Pet is a little functional but largely decorative companion
18	House score	Reflecting player house's construction that is mainly for decorating and vanity
19	Narrative point	Count of completing main storyline quests
20	Marriage	Married or not
21	Mentorship	In a mentorship or not
22	Character Class	Character class participant choose

Results

Data Filters and Sampling

Online survey suffers from a low completion ratio, since responding is anonymous and it may be viewed as an interruption to the operation or participants' game play. Thus, a data filter was applied in order to maximise the integrity of the final result. We first excluded data with any missing information in the items of CultureView

questionnaire, and we ended up with 6,625 participants' data that was fully completed. Secondly, duplicate responses were found and excluded by comparing IP addresses. Because one player may be playing with multiple avatars at the same time and complete the survey more than once, only the first submission from a same IP address was included for further analysis in order to ensure the result is about real players and not virtual characters. The rate of duplicate responses was trivial, and only 73 responses were excluded in this phase. Finally, 1,125 participants who overused the same response on the CultureView items were removed, such as inputting 7 across nearly all items. This excluded the participants with a biased response style to ensure the result from only individuals who were serious about filling in their data. In total, 5,427 participants were left in the sample after the three filters were applied. Their average time for completing the questionnaire was 21 minutes.

Given the large sample (N=5,427) of online survey result, it will need more time and energy to do data mining for each participant's playing action, and as we all know, there is also a risk for large sample that a significant result will be found in most cases even just with a very weak correlation. To reduce the work load of game metric and limit the increased risk of large sample in correlation calculating, 30% of the instances (N=1,577) were selected randomly by random sampling process of SPSS through the whole data sets for following game metric analysis, which is not so large but also ensures the sampling representativeness for this research.

Participant demographics

The majority of respondents (58.8%, N=1,577) are male, and over one-third of them (36.5%) are aged between 19 and 22 years, and 29.5% study for or achieved a bachelor degree. Overall, 28.2% of participants registered as a full time student, 7.6% worked in technology or research occupations, 5.9% worked in sales occupations, and 5.7% worked in production occupations. 31.1% of them earned no monthly income, and 23.4% had a monthly income between 3,001 to 5,000 RMB (China Yuan). Participants' locations were spread out across 33 different provinces and regions of China, and Zhejiang (12%), Guangdong (10.1%), and Jiangsu (9.8%) had the three biggest portions.

Most participants had extensive prior experience with online games. More than 40 per cent had played online game over 4 years, 18.1% from 2 to 3 years, 16.1% from 3 to 4 years. The game experience of participants covered nearly all popular MMORPGs available in the Chinese market. Prior to Ghost II, over 10 per cent played League of Legends mostly, 9.1% played Fantasy Journey to the West 2 mostly, 8.3% played CrossFire mostly, and about 5 per cent played War of Warcraft mostly.

Correlation analysis between Value Systems and In-Game Behavior

The primary intent of this study was to test whether there would be significant correlations between scores on each of the six different value systems of the individual and their in-game behaviour in Ghost II. Since the purpose is to identify the value systems of players, we only focused on the scores of Coping Mechanisms measure by CultureView, and the scores collected about transition zones between value systems are not considered and analyzed here. The Coping Mechanisms reflect an individual's value systems on operating and measure how they think rather than what they think as emphasized by Clare W. Graves. 1,577 participant's scores on each of the six value systems measured here were paired with their playing behavior data in Ghost II and then the correlation for each of these was investigated.

A series of Person's r correlation test was performed between scores on the six value systems measured by CultureView and 15 continuous player behavior variables recorded by game metrics. Person's r analysis was also applied to determine the correlations between the score of value systems and 2 dichotomous variables of marriage and mentoring relationship of players, since we can use Person's r to calculate Point-biserial correlation. 4 ordinal variables of character level (15 to 150 level), Wushan gem level (1 to 20 level), guild level (1 to 5 level) and ranking among friends (1 to 200) were examined their correlations to value systems through Spearman's r .

The correlations with p values < 0.05 are considered to be significant and Table 4 lists the total number of significant correlations per value system. No significant

correlations were revealed between in-game behaviour and scores on the Purple or Yellow value systems, all p values >0.05.

TABLE 4 Correlations between Value Systems and Player Behaviour

	Variables	Purple	Red	Blue	Orange	Green	Yellow
1	Total playing time	-.003	.036	.047	.005	.036	.020
2	Total consumption	.030	.077(**)	.041	.064(*)	.027	.024
3	Character level	.017	.064(*)	.034	.034	.028	.028
4	Wushan gem level	.022	.071(**)	.022	.039	.032	.034
5	Character ability score	.011	.063(*)	.039	.035	.049	.037
6	Achievement Point	.004	.042	.031	.007	.058(*)	.026
7	Ranking of ability among friends	.018	.015	.036	.008	.041	.026
8	Equipment score	.023	.061(*)	.043	.034	.049	.036
9	Ability Practice	.008	.053(*)	.037	.027	.049	.034
10	Number of friends	-.002	.028	.025	.008	.048	.041
11	Goodwill point	-.004	.023	.064(*)	.015	.035	.018
12	Guild level	.033	.047	.012	.033	.016	.002
13	Guild point	.023	.020	.046	.003	.042	-.003
14	Dueling point	.016	.022	.006	.039	-.009	.009
15	Player killing point	.004	-.005	.001	.006	.002	-.013
16	Guanning battleground score	.004	.018	.025	-.027	.029	-.019
17	Pet score	.010	.061(*)	.031	.042	.047	.043
18	House score	.019	.028	.023	.007	.051(*)	.023
19	Narrative point	.005	.066(**)	.029	.023	.033	.020
20	Marriage	-.012	-.015	.004	.018	-.024	.010
21	Mentorship	-.020	-.019	-.013	-.017	.010	.017

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

Below, we describe the significant results revealed here by value systems.

Red

Of the six value systems measured here, Red provides the most and strongest correlations with in-game behaviour of the player. As defined by Clare W. Graves, the theme of the Red state is to express self and to hell with the consequences (Graves, 2005, p225). The people operating at the Red level are “egocentric, impulsive and hedonistic” and “for him the best answer to any problem is the one that brings him immediate pleasure regardless of what happens to anyone else.” (Graves, 2005, p237) The motivation is for power, fun, and control, and the belief is “might-is-right”.

People centered in this state begin to view self as a powerful being, and seek a form of existence with which he can explore and manipulate is world.

Players who scored high on Red tend to prefer advancing in the game as quickly as possible. They spent more real money to buy in-game items (2), which is the main indicator of devotion to the game for a free-to-play game. Their character level (2) increases gradually with the scoring on the Red. They had a higher Wushan gem level (4) and equipment score (8), showing that they seek to become powerful and acquire rare items that other players may never don't have. The Wushan gem is a core game mechanic of Ghost II, which can be used to level up the property value of equipment and items, and so contributes a lot to promote the total ability of the character. Players can buy Wushan gems by paying real money directly within the game, and can also acquire them through completing some quests and raids.

The ability score (5) were also high, and they completed a higher number of ability practice (9), which means they spent a lot of time and money to improve or optimise their own character. They even had a high score on their pet (17), which provides some helping with fighting but mainly as a customisation. They completed the main storyline and gained more narrative point (19), which can be used to level up present skills or acquire new skills. They enjoyed making constant progress and gaining priority in the forms offered by the game.

Blue

The primary value of the Blue state is to sacrifice now to get reward later. People here control their impulses, and easily defer to a higher authority. They also follow certain rules which are considered to offer a clear sense of right and wrong.

Individuals who scored high on the Blue value system gained more Goodwill points (11), which is a reward for grouping with a lower level player and helping them to kill monsters or complete quests.

Orange

According to Clare W. Graves' model, the people of Orange state seek self-achievement and try to find the best solution through rational thought. They value the accomplishments and enjoy the process of competition.

In terms of game playing performance, the individual who scored high on the Orange value system also spent more real money within the game (2). No other significant correlations were found between Orange score and other achievement indicators of virtual behaviours such as character level or equipment score.

Green

As seen by Graves, in the Green state, people concerned with inner peace and group recognition. They are derived by the need for community, equality and unity. Individuals that scored high on Green had a high score of achievement point (4), showing they have a diverse of different interests within game. And they were attracted by the house system (17) of the game, which is mainly used for customization and display purpose.

Beside the correlation analysis, the impact of character class on value systems was assessed using a one way analysis of variance (ANOVA). The analyses revealed that there was a significant difference on the score of Red across ten character classes (N=1,577, F=1.90, Sig.=0.048<0.05). For example, Swordsman scored highest on the Red followed by the archer, which are both classes of material attack.

The correlation coefficient, such as Pearson's r , only reveals the relationship between two variables, and a multiple regression could allow us to better examine the value system in its' relation to more than one behavioral variables. Six linear multiple regressions were conducted on each of the value systems with 11 behavioral variables as predictors which correlated significantly with value system as shown in Table 4. We used an Entry method, which forces all 11 predictor variables in to the model simultaneously. As results in Table 5 indicate, only the multiple regressions for

Red ($p < .01$) and Orange ($p < .05$) were significant, and other four regression models were all not significant ($p > .05$). It is suggested that we can infer a player's Red or Orange value system statistically using playing behaviors within game world. For instance, the best predictors of Red value system was the Wushan gem level ($\beta = .205$, $p < .001$) followed by the Total consumption ($\beta = .095$, $p < .001$). However, the regression value is low (R Square = .019), which means that only 1.9% of variance in Red scores can be predicated by 11 playing behavioural variables.

TABLE 5 Multiple regressions on six value systems

Variables	R	R ²	Adjusted R ²	F	P
Purple	.081	0.007	.000	.944	.497
Red	.139	.019(**)	.012	2.793	.001
Blue	.100	.010	.003	1.427	.154
Orange	.125	.016(*)	.009	2.273	.010
Green	.080	.006	-.001	.905	.534
Yellow	.067	.004	-.003	.641	.794

** Correlation is significant at the 0.01 level (2-tailed)

There may be additional aspects that impact playing behaviours. As displayed in Table 6, the mediation effect of demographic variables on the relationships between value systems and in-game behaviours was examined using the causal steps. It was found that the age completely mediates the relationship between the Red and pet score, and partially mediates the relationship between the Red and consumption, character level, Wushan germ level, character ability, equipment score and narrative point. And the age also partially mediates the relationship between the Blue and Wushan germ level and relationship between the Orange value and consumption.

The income level has a complete mediation effect on the relationship between the Red and consumption and Wushan germ level, and a complete mediation effect on the relationship between the Orange and consumption.

TABLE 6 Mediation Effect of Demographic Variables on the Relationships between Value Systems and In-game Behaviours

Predictor	Dependent variable	β	Predictor	Dependent variable	β	Mediation effect
Red	Consumption	.078**	Red	Consumption	.069**	Partial
	Age	.089**	Age		.100**	
Red	Character level	.069**	Red	Character level	.057*	Partial
	Age	.089**	Age		.144**	
Red	Germ level	.075**	Red	Germ level	.070**	Partial
	Age	.089**	Age		.055*	
Red	Character ability	.062*	Red	Character ability	.053*	Partial
	Age	.089**	Age		.108**	
Red	Equipment	.061*	Red	Equipment	.052*	Partial
	Age	.089**	Age		.103**	
Red	Pet	.058*	Red	Pet	.050	Complete
	Age	.089**	Age		.096**	
Red	Narrative	.068**	Red	Narrative	.056*	Partial
	Age	.089**	Age		.130**	
Blue	Germ level	.054**	Red	Germ level	.048	Complete
	Age	.108**	Age		0.056*	
Orange	Consumption	.064*	Orange	Consumption	.054*	Partial
	Age	.107**	Age		.100**	
Red	Consumption	.075**	Red	Consumption	.053	Complete
	Income	.150**	Income		.144**	
Red	Germ Level	.072*	Red	Germ Level	.057	Complete
	Income	.108**	Income		0.95**	
Orange	Consumption	.064*	Orange	Consumption	.034	Complete
	Income	.209**	Income		.145**	

** p< 0.01; * p<0.05.

Discussion

Through pairing players' value systems from self-report data with their actual behaviours recorded by game metrics, we explore and explain the relationships between value systems and playing behaviour in a MMORPG. To the data, the

current study is the first attempt to investigate the links between Clare W. Graves' construct and players' in-game behaviour.

Conclusion

The consumption in the game has a positive relationship with Red and Orange which means that increases in the scores of those two value systems correspond to more real money spent for the virtual items contained in Ghost II. Both Red and Orange value systems are viewed as externally oriented (expression self to control the world) and strive for self-achievement, and so, a possible explanation for them to purchase virtual items is that the items give users a performance advantage. As shown by other researchers, there is a link between the virtual item purchases with real money and motivations of playing for advancement, advantage in competitive settings and self-expression, and enhancing playing performance is regarded to as the main driver of real-money spending in games (Lehdonirta, 2005, 2009). There is a positive relationship between Goodwill point (gaining through grouping with players who are 15 levels lower than themselves) and Blue value system, where higher scoring of Blue corresponds to an increase in helping others. A key characteristic of Blue value systems that seems to be supported by this preference is caring about other people and giving support. Both achievement point and house score have a positive relationship with Green value systems. Regarding the positive relationship of achievement point, it means that the people scored higher on Green have a wide range of different interests because the achievement point is the sum of total achievements of leveling up characters, completing quests, competing with others, making friends, joining guilds and exploring new maps. They also show an interest on the house systems which have more decorative value than functional value. All these suggested that players scored higher on Green (internally oriented) pay more attention on their own inner interest and uniqueness as anticipated by the ECLET.

We find that up to eight playing behaviours are positively correlated with the score of Red value system, which accounted for the largest number of significant relationships between the value system and playing features, covering nearly all key game

performances from consumption, character level, Wushan gem, character ability, equipment, ability practice, pet system to narrative point. This finding reveals that the Red value system is the most important one to explain and anticipate game playing. Players who scored high on the Red value system tend to commit a considerable amount of money on the game, seek powerful items and equipment, and level up their character and skills as quickly as possible. Don Beck previously noted that video games are a safe place where the Red can go for fun and adventure (Beck & Cowan, 1996, p218), because the game environment allow them to behavior as they would normally do in real life and create a scenario with settings that support who they are and how the world works for them. As we noted here, only significant relationships between Red and achievement within the game were found, and no significant links were observed between Red and social interaction or casual playing such as making friends, joining guilds, pet or house system. The features of the Red value system, such as preferring instant gratification, valuing violence and no sense of shame, match the core play dynamics of video games well, where advancement, competition with monsters or other players, impatience and impulsive reactions are presented and reassure the behaviours, feelings and tendencies of Red value.

Content personalization and system customization based on a user's personality factors have long been interests to the HIC research (van Velsen, et al., 2011) and game development. This finding has important implication for the game design, since it provides valuable information for game designers to understand and meet the need of target user as accurately as possible. The links between value systems and online consumption can be applied to the designing of virtual items that ultimately generate the revenues for the game, and help to determine who would potentially be the customer for the virtual items in question and how to match their needs and wants better, which has become a main concern of the game designer and player model research (Hamari and Tuunanen, 2014). For example, for the user scored high on Red, the virtual goods should be presented in a simple, concrete, and visual manner, and short-term benefits they will bring immediately should be stressed.

Another possibility directly applicable to game design would be to use inferred learning styles of players as modelled by their certain value system to minimise the learning curve involved to master game play. Every game starts with a training session in which the participants learn how to perform the various actions that are necessary to play the game. The design of these tutorials is essential for retaining new users and to a certain extent, determines the success of a commercial game. As is shown here, the players express more characteristics of Red value systems within their game playing. As maintained by Graves, the people operating at the Red state cannot learn by punishment, because they do not feel or comprehend punishment (Graves, 2005, p236, p238). They find their way through learning only by positive reinforcement, and learning takes place best when the reward is presented soon after they do what we want them to do. As for designing game tutorials, we should not give any punishment such as death of character or loss of experience points if an error is made by the new player. Designers should simply ask the player to start again until the desired operation is achieved and then give them the rewards immediately. Also, the individual here has a very short attention span, and you must have everything structured (Graves, 2005, p236). In the tutorials design, we should ensure every minute is laid out and always put something in front of a player in order to hold them right there. They move from a 60 second playing session to the next playing session and if there is any pause in this flow, it will distract their attention and they may leave the game.

The marketing and promotion program for the game industry will also benefit greatly from identifying target users since it helps to develop more effective advertising and recruit new players as cost-effectively as possible. When a person is centralized in one value system, she or he would respond most positively to advertising which are congruent with that value. For example, for the Blue value system, advertising should emphasize on the testimonial by an authority figure, and the content should be concrete and dogmatic. For players themselves, this finding can be used to recommend what game elements they would enjoy according to their unique value

systems, therefore making sure their game experience is positive. Comprehending the player profile will help designers to better design and understand enjoyment of games, and support the evaluation of design choices, resulting in a more engaging game experience.

The finding in the present research also shed further light on what is the next generation game, which is a key question of the game industry that has raised an intense debate for a long time. As revealed here, the features of Red was expressed most in the present game. **The value system next to Red is Blue, and should we also move on to the Blue game as the next generation genre?** Graves himself deeply believed “higher levels are better than lower levels” (Graves, 2005, p482-483), because each movement up the levels of value systems has resulted in an increase in the degrees of behavioural freedom. Blue movements are forged from conditions of chaos, deprivation, and suffering in the Red state, and seek meaning and purpose of living in a more orderly world (Beck, 1996, p226). The Red’s egocentric impulsiveness was replaced by the sacrifice self for deferred reward. As we can see, from the earliest video game Space War to today’s massive online game War of Warcraft, all the goals set for their players were to kill monsters or collect as many resources as possible. The fun of playing video games mainly came from more powerful skill and ability, higher levels and weapons. Players are killing their way to the next map of the game world, finishing endless quests one by one, to get immediate gratification. The next generation of Blue game may be anticipated, where playing through violence, impulses and clout will be replaced by playing through patience, obeying orders, finding purpose, and doing duty.

Except for feeding the industry, the long term implications of this research will be huge. **The results show the possibility of inferring users’ value systems based on their activity traces within the game.** Traditional personality assessment methods such as behavioural measurement, observation and questionnaire may suffer from many weaknesses including ambiguity, high cost and reliability. The games could be used as an alternative method of establishing personality profiles of the individual (Lankveld et al., 2011). Video

games combined the strength of traditional personality assessment tools by quantifying behaviour, automating observations and side-stepping self-report, and what is more, it offers a high ecological validity (Tekofsky et al., 2013). Yee believed that MMORPGs are a platform to develop unobtrusive personality assessment tools (Yee, 2011). The game experience can also be further used to facilitate personal transformation on their level of existing as defined by Graves, while media content can engage the user's awareness and mind. Griebel indicated that skills used in a virtual world would be naturally translated into real lives of players, and suggested that the game might be a useful instrument in training people to develop certain skills (Griebel, 2006). As admitted by Graves, the difficulty in training the Red man is that we do not have someone there to "give them an immediate reward when they do what we want them to do" (Graves, 2005, p237). But, in a digital game, players can be rewarded immediately once they achieve the goal set by the game designer. Instead of placing the individual in potentially mortal danger, the game playing for transformation will highlight the underlying negative belief structures in a safe way. By storing awareness acquired through game experience, individuals can slightly moderate their future value system and world view in real world situations which has the same underlying structure and pattern.

Limitation and future research

We noted the correlations calculated here are low and as according to the effect size classified by Cohen, most of our finding would be "small effect" ($r \leq .10$) (Cohen, 1992). However, Meyer disagreed with this standard by a meta-analysis of correlation research in the psychology, medicine and everyday life, and argued that we should reconceptualize effect size magnitudes since many variables reported account for only about 2% to 9% of the variance in a criterion (Meyer et al., 2001). For example, he found that the correlation between aspirin and reduced risk of death by heart attack was $r = 0.02$ and the correlation between chemotherapy and surviving breast cancer was $r = 0.03$, but the finding is still considered relevant. When correlating personality assessment tools with relevant behaviors in real life, small effect sizes were also observed. For example, it was shown that the correlation between Extraversion test

scores of Five Factor Model and success in sales was at $r = 0.08$, and the correlation between Minnesota Multiphasic Personality Inventor (MMPI) score and prison misconduct was at $r = 0.07$.

Additionally, existing research about the correlations between Five Factor Model personality traits and the participants' gaming behaviour also showed small effect sizes, and most correlations reported before have an effect size of $r < 0.10$ (Yee et al., 2011; Tekofsky et al., 2013). Yee discovered that over 60 per cent of significant correlations between scores on five personality traits of FFM with behavior variables in War of Warcraft was at $r < 0.10$ with only three correlations with $r > 0.15$. For example, the number of death in dungeons correlated significantly with score on Extraversion at $r=0.06$. In line with this, Tekofsky noted almost all significant correlations they revealed between the 100 IPIP (International Personality Item Pool) scores of FFM and the 173 playing behavior variables in Battlefield 3 have a small effect size of $r < 0.1$, and only the 17 correlations was at $0.10 < r < 0.15$ among all 4,442 significant correlations yielded in their result.

In conclusion, the effect sizes of our findings are magnitude enough and are equal to or greater than the effect sizes reported in other similar research. There are multiple sources that influence players' actions within a game, including peer pressure, previous experience, time available, friendship and cultural background. Although statistical relations were obtainable, the personality of a player may be at best one variable among many that needed to be considered for explaining gaming behavior. Higher effect sizes may be found between personality and playing behaviour in future study if we take into account of more variables and have a better controlled experiment process. The small effect sizes of correlations were partly due to the large sample size of present research. As Meter stated, the research conducted with small sample have lower statistical power and often yield higher effect sizes.

Further work can be done building on this study, and continue to expand the understanding of the relationships between the personality and playing features. As

mentioned before, players' tastes will evolve and change, and as they do so their personality characteristics should reflect those transformations. A longitudinal study is recommended to track players' changing values and their game tasting. Another interesting direction of research is to investigate what other variables play a role in playing behaviours. For instance, it has been shown that purchasing virtual items online could be affected by income level and age, and they may be shaped by other demographical variables such as buying habits, cultural background or user identification (Wang et al., 2015).

One major limitation of the present study is that the results may be slightly biased by recruiting participants and gaining metrics from only one game. It is unclear whether the relationship we found here can also be generalised to other game players. Though the background of our sampling reflected the game player population in general, more studies are recommended to gather data from additional games to increase the generalisation. Another limitation may be the bias of cultural influences, since only the data of Chinese players was collected. In future study, it would be helpful to do a cross-cultural comparison within game players. And finally, we relied on the set of variables that Ghost II recorded. It is possible that other unrecorded variables, such as logged chat, may be even more predictive of value systems.

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