Predicting Players' Consuming Tendency for Different Props by Big Five Personality Traits

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Abstract—**Does your personality determine what props you would like to buy in online games? The present study addressed this question through conducting an online survey that aimed to test how players' consuming propensity to certain types of in-game props relates to their big five personalities. The online survey contained questions from Big Five Inventory (BFI-44) that tested on big-five personality traits (openness, conscientiousness, extraversion, agreeableness, and neuroticism) and questions that tested on participants' willingness to pay for props that serve different purposes (social, aesthetic, and combat). Results showed that only openness-to-experience was negatively related to players' buying tendency of socialization props and no significant relationship was found between other personality traits and consuming tendencies. The current study is one of the first few studies that investigate a player's consuming behavior in relation to their personality. It provides insights for game companies to increase their understanding of players and their consumption characteristics. More future research in this area will facilitate game companies to optimize their in-game props design and marketing strategy.**

Index Terms—**Big-five personality traits, virtual goods, consumer behavior.**

I. INTRODUCTION

Video games have been one of the fastest growing industries in China. In the recent decade, the sales revenue of it has increased from 0.9 billion to 209.7 billion (Pacific Securities, 2021). There are three traditional revenue models for video games. Buy-to-play (B2P) applies to video games that can only be played after purchasing with no subsequent fee for playing the game. Pay-to-Play (P2P) applies to video games that charge based on how much time players spend on games. Free-to-play (F2P) applies to games that are free to enter but must pay to access additional content. Recently, there is a new revenue model that requires players to watch a bunch of advertisements to unlock more content and it applies mostly to casual games. Among the four major revenue models, F2P is the most popular model and earns the greatest acceptance by Chinese players. However, the F2P model requires game companies to fully understand what are the things that players are willing to pay and how much they are willing to pay for the props. The current article aims to address the question by analyzing the relationship between players' consuming tendency and their personalities.

II. LITERATURE BACKGROUND AND HYPOTHESIS DEVELOPMENT

A. Literature Review

In a virtual world where behaviors are not bounded by realistic restrains, players can take their ways to interact with the world. While hunting and farming may be important for some players to ensure their survival, other players may put greater emphasis on aesthetic values or enjoyment. It will be difficult to categorize all players to a fixed type because their behaviors can be complicated and malleable within different contexts. However, as shown in Fig. 1, Bartle still offered us a hint on understanding players' types based on two dimensions – acting/interacting and players/world. He postulated four major types of players in multiplayer online games (including MUDs and MMORPGs) based on their preferences for activities in the game.
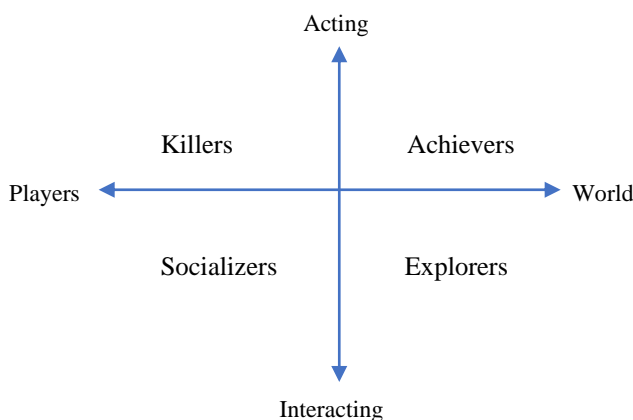

Fig. 1. Bartle taxonomy of player types.

According to Bartle [1], achievers prefer to gain points, levels, equipment, and other concrete measurement indicating game success. Explorers like digging around, discovering new areas, and finding a hidden easter egg. Killers thrive on competition with other players and harassing other players. Socializers attain enjoyment through friendly interaction with other players to feel a sense of love and belonging. Subsequently, research has sustained the belief that players vary in their in-game characters and behaviors. Past studies have shown that players, based on their differences in age, gender, race, and other important demographical elements, could behave in very diverse ways. For instance, Yee *et al.* [2] used behavioral and demographic data from 1,037 World of Warcraft players which found that male players and younger players are more into competitive and high reward activities such as person-versus-person (PVP) combat and raids, whereas female players and older

players prefer non-combat activities such as exploring and working on professions.

Though having demographical information may allow us to take a closer guess on players' in-game behaviors, personality trait perhaps is another important and unignorable variable in explaining players' behaviors. Worth and Book [3] surveyed 198 players of World of Warcraft on their personalities and frequency of different behaviors within the game. In-game behaviors were categorized into six scenarios: player-versus-player (PVP), Social Player-versus-environment (PVE), working, helping, immersion, and core content. The finding suggested that the personality of a player is closely related to certain in-game behavior. For example, extraversion is positively related to PVE activities, and conscientiousness is positively related to work activities. Besides, the relationships are consistent with real-world personality-behavior relationships. Worth and Book's findings provided evidence on how personality traits might affect people's in-game behavior. However, another important game behavior, consumer behavior, is often overlooked by empirical research studies but worth a thorough investigation.

Players' consuming behavior matters a lot to game companies' survival. Though we do not have direct research evidence related to a player's personality concerning her/his consuming preference for virtual goods, we may develop our hypothesis from past studies centering on personality and real-life behaviors, since it is demonstrated by Worth and Book [3] that people's in-game personality-to-behavior relationship is consistent with their real-life personality-to-behavior relationship.

B. H1. Extraversion Positively Relates to Players' Tendency of Consuming Virtual Goods that Meet Social Demand

Extraverted people are likely to be highly sociable and involve infrequent interpersonal contacts [4]. Jeng and Teng [5] tested extraversion under online game scenarios to see how it was related to teamwork motivations. The regression analysis result showed that players' extraversion personality traits positively related to teamwork motivations. Given that teamwork and cooperation are important to players with a high extraversion personality trait, we would hypothesize that such players are more willing to pay for virtual goods that meet social demand.

C. H2. Neuroticism Positively Relates to Players' Consuming Tendency of Purchasing Virtual Goods that Render Them Competitive

Jeng and Teng [5] suggest that neuroticism was found to be negatively related to teamwork motivation. According to Bartle's taxonomy of player type, players with higher neuroticism are more likely to fit into the "killer" category. "Killer" thrives on the competition with other players and prefers fighting them to scripted computer-controlled opponents. Given "killers" are highly motivated to compete with other game players, we would assume that they have a higher willingness to pay for props that increase their competence. Therefore, we would assume that neuroticism positively relates to players' consuming tendency of purchasing virtual goods that render them competitive.

D. H3. Openness-to-Experience Relates Positively to the Consuming Tendency of Buying Virtual Goods for Aesthetic Values

Silvia *et al.* [6] found that though openness to experience is generally not seen as an emotional trait, it is proved to be an essentially aesthetic trait and could be extended into deeper aesthetic states. In their studies, participants viewed images of nature and rated their experience related to awe, wonder, and fascination. Later, they would listen to a song with qualities known to evoke awe and rate their feelings. Openness to experience predicted the experience of awe in both scenarios while the other four personality traits had much smaller effects. The study showed that openness to experience could be related to people's aesthetic states. Based on the finding, we hypothesized that players with high openness-to-experience will be more willing to pay for virtual goods that possess aesthetic values.

III. METHODOLOGY

A. Participants

208 participants volunteered to finish our online survey. A trap question was used in the survey to identify respondents who were not paying attention to our survey. Besides, we also checked and eliminated answers that take uniform patterns (e.g., give 1 score for all questions), which resulted in only 75 qualified answers. Among the 75 participants, 72% were females and 28% were males, as shown in Fig. 2. The majority of our participants were aged between 18 to 24 and had an education level of bachelor, as shown in Fig. 3 and Fig. 4. 44% of their preference for games fell on MOBA games, while 21% preference fell on FPS games and 20% fell on RPG games. 97% of the participants spend less than 20 hours a week playing games, as shown in Fig. 4, Fig. 5, and Fig. 6.
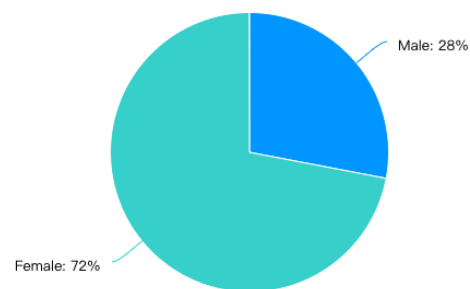

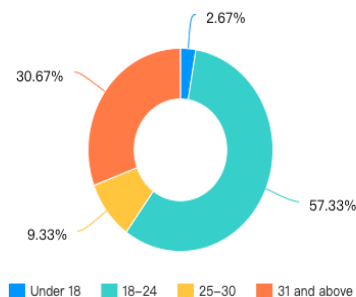Fig. 2. Participants gender distribution.

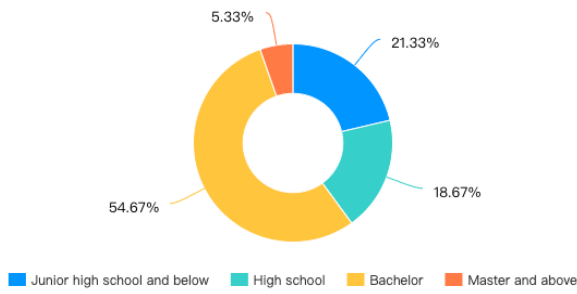Fig. 3. Participants age distribution.

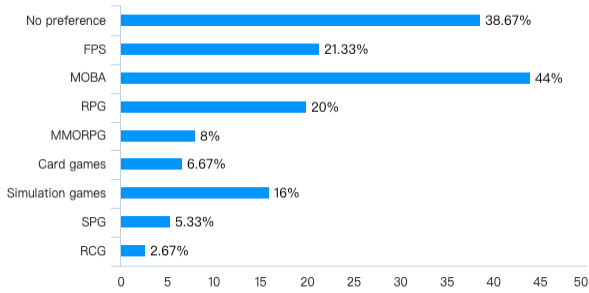Fig. 4. Participants education distribution.

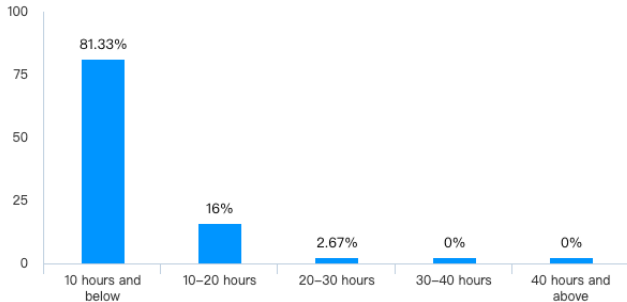Fig. 5. Participants game preference distribution.

Fig. 6. Distribution of participants' weekly spending time on games.

B. Measures

1) Big Five Inventory (BFI-44)

BFI-44 is a 44-item inventory that measures an individual on the Big Five dimensions of personality [7]. Each of the factors is then further divided into personality facets. The Table I below shows each of big five personalities as well as its correlating traits. BFI-44 is a reliable inventory that has been broadly used in the personality psychology field to quantify people's big five personalities.

TABLE I: BIG FIVE INVENTORY (BFI-44)

Big Five Dimensions	Facet (and correlated trait adjective)
Extraversion vs. introversion	Gregariousness (sociable)
	Assertiveness (forceful)
	Activity (energetic)
	Excitement-seeking (adventurous)
	Positive emotions (enthusiastic)
	Warmth (outgoing)
Agreeableness vs. antagonism	Trust (forgiving)
	Straightforwardness (not demanding)
	Altruism (warm)
	Compliance (not stubborn)
	Modesty (not show-off)
	Tender-mindedness (sympathetic)
Conscientiousness vs. lack of direction	Competence (efficient)
	Order (organized)
	Dutifulness (not careless)
	Achievement striving (through)
Neuroticism vs. emotional stability	Self-discipline (not lazy)
	Deliberation (not impulsive)
	Anxiety (tense)
	Angry hostility (irritable)
	Depression (not contented)
	Self-consciousness (shy)
	Impulsiveness (moody)
	Vulnerability (not self-confidence)
Openness vs. closedness to experience	Ideas (curious)
	Fantasy (imaginative)
	Aesthetics (artistic)
	Actions (wide interests)
	Feelings (excitable)
	Values (unconventional)

(Chart created from John & Srivastava, 1999) [8]

2) Consuming tendency of virtual goods

Player's consuming tendency of virtual goods was divided into 3 main categories: virtual goods that foster player's combating abilities (e.g., weapon, equipment, level), virtual goods that promote socialization with other players (e.g., resurrection, wedding), and virtual goods with mere aesthetic value (e.g., fancy cloth, mount, furniture). To avoid participants being confused by the terms, we specified our questions by asking how much they are willing to pay for 3 commonly used props from each category. Our design included questions like "for online games, how much you are willing to pay for a better weapon?", "for online games, how much you are willing to pay for a resurrection prop that will help other players?", and "for online games, how much you are willing to pay for clothing?"

IV. RESULTS

A. Extraversion and Tendency of Consuming Virtual Goods That Meet Social Demand

According to a previous study, extroverted players are likely to involve infrequent interpersonal contacts [4]. Thus, we hypothesized that extraversion should be positively related to play's willingness to pay for virtual goods that serve socialization functions. However, as shown in Table II, no significant correlation was found between extraversion score and consuming tendency of socialization goods (p=0.161).

TABLE II: CORRELATION BETWEEN EXTRAVERSION AND SOCIALIZATION GOODS

		Extraversion score	Consuming tendency of socialization goods
Extraversion score	Pearson Correlation	1	-0.164
	Sig. (2-tailed)		0.161
	N	75	75
Consuming tendency of socialization goods	Pearson Correlation	-0.164	1
	Sig. (2-tailed)	0.161	
	N	75	75

B. Neuroticism and Consuming Tendency of Virtual Goods that Render Competitiveness

Based on previous studies, we developed a hypothesis that

neuroticism should be positively related to players' willingness of buying virtual goods that enhance their combating ability. However, as shown in Table III, a p-score of 0.5 suggests that there is no significant correlation between the two variables.

TABLE III: CORRELATION BETWEEN NEUROTICISM AND COMBATING GOODS

		Neuroticism score	Consuming tendency of combating goods
Neuroticism score	Pearson Correlation	1	0.079
	Sig. (2-tailed)		0.500
	N	75	75
Consuming tendency of combating goods	Pearson Correlation	0.079	1
	Sig. (2-tailed)	0.500	
	N	75	75

C. Openness-to-Experience and Buying Virtual Goods for Aesthetic Value

Our hypothesis predicted that openness-to-experience should relate positively to a player's higher willingness to pay for goods that possess aesthetic value, but Table IV illustrates that no significant correlation was found based on our data (p=0.067).

TABLE IV: CORRELATION BETWEEN OPENNESS AND AESTHETIC GOODS

		Openness score	Consuming tendency of aesthetic goods
Openness score	Pearson Correlation	1	-0.213
	Sig. (2-tailed)		0.067
	N	75	75
Consuming tendency of aesthetic goods	Pearson Correlation	-0.213	1
	Sig. (2-tailed)	0.067	
	N	75	75

TABLE V: CORRELATION BETWEEN OPENNESS AND SOCIALIZATION GOODS

		Openness score	Consuming tendency of socialization goods
Openness score	Pearson Correlation	1	-0.325**
	Sig. (2-tailed)		0.004
	N	75	75
Consuming tendency of socialization goods	Pearson Correlation	-0.325**	1
	Sig. (2-tailed)	0.004	
	N	75	75

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

However, we did find a significant correlation between openness-to-experience and consuming tendency of socialization goods (p=0.004), as shown in Table V. Data suggests that they are negatively related, which means a player's higher score in the openness-to-experience trait indicates a lower willingness to pay for virtual goods that serve socialization purposes.

We quantified the negative relationship between openness-to-experience and consuming tendency of socialization goods through linear regression. As shown in Fig. 7, their relationship could be represented as: Consuming tendency of socialization goods = 10.71-1.24 * Openness.
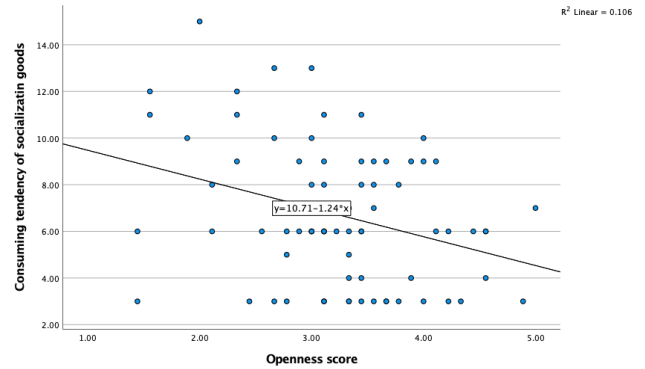

Fig. 7. Regression equation.

V. DISCUSSION

The results showed that only openness-to-experience was negatively correlated with the propensity to purchase social-functional props, and there was no significant relationship between other personality traits and consumption tendencies. The higher the trait level of openness-to-experience a player possesses, the lower her/his willingness to pay for socially functional props there will be.

Based on previous studies, this research established three hypotheses. However, results from our data showed that all three hypotheses were not scientifically tenable. However, through data analysis, we found an unexpected relationship between openness-to-experience and buying tendency of socially functional props. Data suggested that openness to experience was negatively related to the buying tendency of social goods (p=0.004).

We do admit that our study could be flawed in some ways. For example, we received answers from 208 participants, but only 75 were paying attention and not giving the same score for all questions. Our questionnaire design might be too long for most participants to keep up with. Also, the current ways of eliminating unqualified answers might not be powerful enough. If we took answering time and other methods into account, there could be even less qualified responses for the study. Besides, because of convenience sampling, our data were mainly based on Chinese young female players who spend less than 10 hours weekly on games. Having more diversified groups in gender, age, and cultural backgrounds will benefit the study and may lead to a different conclusion than the current one.

VI. CONCLUSION

In this paper, the personality characteristics of players are divided into five categories: openness, conscientiousness,

extraversion, agreeableness, and neuroticism. The game consumption is divided into 3 categories (fashion, mount, weapon appearance, etc.), social function (worship, marriage, team, horn, etc.), competitive function (equipment, refining, gem, etc.), This paper studies whether personality is related to the consumption tendency of some virtual goods in the online game world. The results show that only openness-to-experience had a negative relationship with players' tendency to buy social props, while other personality traits have no significant relationship with consumption tendency. It means that as one is holding a more open attitude towards new experience, she/he will less likely to purchase social-functional in-game props. The current article is one the first few articles studying the relationship between personality and virtual goods consumption behaviors. With more future research in this area, it will help game companies to understand their players better and develop more profitable marketing strategies.

CONFLICT OF INTEREST

The author declares no conflict of interest.

AUTHOR CONTRIBUTIONS

Zihan Zhao conceived of the present idea, designed the research, analyzed the data, made the graphs. Zihan Zhao wrote the whole article and approved the final version.

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