

Self-representation through Online Avatars in Major Online Contexts Among Chinese University Students

Jiayang Wei^{1,*}

¹Department of Applied Psychology, the Chinese University of Hong Kong, Shenzhen, China

*Corresponding author: jiayangwei@link.cuhk.edu.cn

Abstract. The feature of applying avatars is prevalent across different types of online activities. Avatar creation has inevitably become an important research topic due to its use in representing different identities, facilitating digital communication, and investigating body image problems. It has been studied that the standard and the idealization of avatar creation can differ across contexts. Besides, the research tools involved such as the Big Five Inventory and the research hypotheses around demographical characteristics strike the importance of cross-cultural factors. However, few studies of avatar creations have been conducted based on the Chinese population or referring to Chinese online platforms. Hence, the author addresses this research gap by examining (1) the self-representation and idealization of physical, demographical, and personality attributes through avatar creation, (2) differences in this self-representation and idealization across major online Chinese contexts, (3) the relationship between the idealization of avatars and body image attitudes among Chinese university students. The author analyzed data from 92 university students and found different levels of self-representation through avatars in the physical and demographic attributes. Moreover, a tendency for university students to idealize themselves through online avatars for both physical attributes and personality traits was observed. Furthermore, this self-representation and idealization mostly did not differ across contexts as previous studies concluded. Overall, this study reflects values in exploring avatar creation strategies across different cultures, providing pilot information and insights for further studies focusing on self-representation, avatar creation, and body images in virtual environments.

Keywords: Avatar creation; self-representation; big five inventory; online contexts; body image.

1. Introduction

Inherently defined as digital representations of users' digital environments, online avatars have been put to use in more and more online contexts such as online streaming, role-playing games (RPG), non-RPG games, social networking, and the metaverse [1]. Applications including WeChat, QQ, and TikTok, as the top twenty used applications in China, have features for avatar creations in the form of either pictures or models [2]. Avatar creation could be related to self-needs such as self-fulfillment and self-expression, user-avatar relationships manifested in self-identity formation, and body image-related explorations and interventions [3-5]. However, very little research has been done on self-representation through online avatars in cross-cultural areas. Zimmermann et al. conducted a holistic investigation into self-representation through avatars across six different online contexts, which provided examples for this area of research [6].

1.1 Self-representation and avatar creation

As representations of the users in digital environments, avatars can take many forms such as three-dimensional models and computer-generated pictures of bots and humans [1, 7]. Two theories had been constantly involved in the discussion of self-representation through online avatars: self-discrepancy theory by Higgins and impression management theory by Mummendy [8-9]. Self-discrepancy described the discrepancy between the actual/own self, connoted as the self-concept, and the ideal self, emphasized by the representations of an individual that contains a certain ideal state [8]. This ideal state can consist of multiple aspects or qualities, for example, identity, knowledge, and experiences as self-to-self-idealized or others-to-self-idealized aspects, and expression, disclosure, and affirmation as self-to-others-idealized aspects [10]. Impression management theory, however,

characterizes the phenomenon that people tend to present the idealized and positive self as much as possible [6]. Hence, it was assumed that through avatar creation, people minimize the discrepancy between the ideal self and the actual self [11]. Several studies had been conducted to examine either the discrepancy or the idealization, or the standards of avatars creation and its relationships to self-representations. In Sibilla & Mancini's review, user-avatar relationships were categorized into four dimensions: physical aspects, self-concept, self-needs, and identifications [3]. These dimensions were tackled by comparing physical characteristics, personalities, and intentions including different multilevel self-phenomena, and avatar identifications respectively [3, 4, 10]. Results showed that most studies were related to the context of video gaming, and in this context, people tend to strive for idealizing themselves through avatars [3]. Besides, this idealization is related to their actual selves as well since data from the avatars provided could predict the actual self [6]. However, how people create avatars based on themselves could differ in different situations. For example, Ducheneaut et al. revealed the high-fidelity avatar creation system to be one of the potential factors that affect users' motivation of reproducing themselves in avatars [12]. Meanwhile, Böffel & Müsseler's experiment on avatar ownership during instructions also elaborated a similar effect [13]. Besides the potential bias elicited by the fidelity of the testing environment, it is also notable that different selections of measurements might produce different results. For, example, longer versions of the Big Five Inventory (BFI) required more time and lead to more polluted and invalid data. This is due to exhaustion caused by redundant questions as observed by the author, and shorter versions of BFI draw fewer qualities into attention even though they have the advantages such as requiring less cognitive effort and obtaining validations for online contexts [6].

Cross-cultural factors are also to be taken into account in studies of avatar-user relationships. It has been pointed out that avatars' design and facial expressions were based on the assumption that these expressions were interpreted widely and similarly across different cultures [14]. However, personality ideals, personality baselines, and their elasticity to gender differ between cultures [15, 16]. Thus, it is reasonable to speculate that avatar idealization manifested in physical characteristics and personality traits differ across cultures. Taking the above messages into consideration, the author formulated hypotheses according to Zimmermann et al.'s design, with additions to measuring the avatar idealizations of physical and demographic characteristics since it has not been examined in avatar creations from Chinese backgrounds [6].

H1. The physical and demographic information measured as gender, age, height, weight, hair color, skin color, tattoo history, and physical attractiveness regarding avatars, the actual self, and the ideal self is intercorrelated.

H2. The personality traits chosen are idealized for avatars.

H3. The levels of avatar idealization in personality traits differ between different contexts including social networking with friends and family members, a single-play game without any specific ending, and social networking with strangers.

H4. The physical and demographic information chosen for avatars is idealized.

H5. The levels of avatar idealization in physical and demographic information differ between different contexts.

H6. The traits of Openness and Neuroticism chosen for created avatars show lower between-subject variances than the traits of Openness and Neuroticism chosen for the actual self and the ideal self.

H7. The homogeneity of between-subject variances of all five personality traits chosen for avatars, the actual self, and the ideal self vary in three different contexts.

1.2 Avatar creation in different contexts

In addition to the six different contexts exhibited in Zimmermann et al.'s experiment, the author generated a context of single-player games without any specific endings [6]. This context is important since it examined Bente et al.'s conclusion that the co-presence of multiple users is one of the factors that mediate communication through avatars [17]. Deriving from this conclusion, notable differences

in avatar research arise from the ideal self's context from the self-discrepancy theory: ideals were formed with one's own wishes and others' wishes. It would be interesting to construct a context where avatar-mediated communication and the co-presence of other users are not available [9]. Apart from this, since Bente et al.'s conclusion is based on avatars in social networking, the author presents two different social networking contexts symbolizing two types of frequently used social platforms in China [2, 17].

1.3 Avatar idealization and body image attitude

According to Higgins (1987), negative emotions arise from the discrepancy between the actual self and the ideal self. Studies concerning both body image and online avatars have been majorly surrounding the effect of virtual avatars' experiences on body image attitudes, explorations on virtual ideals, and relative interventions [5, 18-21]. Specifically, lower body image satisfaction is related to the virtual avatar experience, which could relate to Higgins's reference to negative emotions [18, 8]. Moreover, men's body change behavior was found to be predicted by user-avatar disparity [20]. Less research has examined the relationship between avatar idealization and body image dissatisfaction and body flexibility.

Besides, Bessière et al. claimed people could be using avatars to minimize self-discrepancy [11]. Nevertheless, people could also be creating avatars based on their perceived selves, which is an idea closer to body image, since the personality characteristics can be out of range between the ideal self and the actual self [6]. Otherwise, body image studies have emphasized cultural effects and media effects [22]. Thus, it would be beneficial for filling in the empirical gap. Regarding Higgins's notion of negative emotions, Bessière et al.'s claim, and the cultural factors, the author formulated hypotheses that examine the user-avatar discrepancy's relationship with body dissatisfaction, body flexibility, and body appreciation [8, 11].

H8. The levels of avatar idealization in physical and demographic information are related to body image attitude.

2. Methodology

2.1 Participants

The author conducted an online experiment in the form of serial questionnaires with the software Credamo. The questionnaires were released on multiple major Chinese platforms including QQ, WeChat, and Douban. Participants were recruited from the above platforms following the snowball sampling method. Criteria for starting the experiment involved a minimum age of 18, an undergraduate, graduate, or postgraduate student in progress, and a full understanding of the informed consent. The consent included these criteria, a notion that stated participants are free to quit the experiment for any reason, and a brief introduction of the experiment as manipulation. Participants were also made aware that the data were for research purposes. This information was on the first page of the experiment and required a scrolling-down movement and a wait of 10 seconds to proceed to the next page. A total of 6 additional questions irrelevant to the experiment were inserted to screen out participants who were rushing to the end without carefully completing the experiment. These questions consisted of basic facts and common sense of Chinese culture and knowledge of how the world works. Besides, the correct answers were suggested. For example, participants were asked how many letters there are in modern English and suggested choosing 26. This helped increase efficiency in screening polluted data. Moreover, a WeChat account is left as contact information for any suggestions and feedback. This experiment had been improved once.

Overall, 92 participants completed the experiment without being screened out either manually by the author due to contradicting answers or automatically by the inserted questions of validation. Due to the limited distribution during questionnaire releases, the participants are mostly females. The data of 92 participants (84.8% female, $M_{age} = 20.91$, $SD_{age} = 2.12$) were gathered for the analyses. All participants are randomly assigned to one of the three contexts by Credamo: social networking with

friends and family members on a small and private platform ($n = 31$, 90.3% female, $M_{age} = 20.87$, $SD_{age} = 2.14$), single-player games without certain endings ($n = 36$, 77.8% female, $M_{age} = 20.83$, $SD_{age} = 1.99$), and social networking with strangers on a large and open platform ($n = 25$, 88% female, $M_{age} = 21.08$, $SD_{age} = 2.33$).

2.2 Measures

All information including physical and demographic data and personality traits regarding their imagined avatars, actual self, and ideal self were collected by self-report. The author also collected body image attitudes at the end of the experiment.

The physical and demographical information included a culturally-revised version of Zimmermann et al.'s variables: gender (female, male, or others), age (in years), height (in centimeters), weight (in kilograms), hair color (black, blonde, brown, grey, bald, or other colors including partial or complete hair dye and highlights), skin color (close to fair, close to yellow, close to tanned, other flesh colors undescribed, or other non-flesh colors including complete or partially skin-tone procedures, daily consistent color paints), tattoos (never, have had small tattooed, or have had large tattoos), and physical attractiveness [6].

The personality traits were evaluated using the Chinese Big Five Personality Inventory-15 (CBF-PI-15) [23]. This multiple-item scale was developed by Zhang et al., and it has been validated in more than 10738 adult samples of whom have Chinese origins [23]. The CBF-PI-15 is made up of 15 Likert-scaled items (from 1 = "totally disagree" to 6 = "fully agree"), three items for each personality trait. The Cronbach's α of CBF-PI-15 for each trait regarding avatars, the actual self, and the ideal self in this sample of 92 participants is neuroticism ($\alpha = 0.82-0.89$), conscientiousness ($\alpha = 0.74-0.81$), agreeableness ($\alpha = 0.82-0.91$), openness ($\alpha = 0.87-0.90$), and extraversion ($\alpha = 0.70-0.83$). The internal consistency has been verified as acceptable by Zhang et al.'s analyses examining the α and the mean inter-item correlation [23]. A more detailed exhibition of the Cronbach's α of CBF-PI-15 of this study regarding the three different contexts is available in the Supplement File. The experiment had been revised and adopted the CBF-PI-15 instead of its longer version after receiving thirty pilot samples. Reflecting convenience and time-saving, this revision decreases the possible cognitive efforts caused by filling out long and repeated questionnaires.

The author surveyed body image attitudes using three scales: the short form of the Chinese version of the Body Image Acceptance and Action Questionnaire (C-BI-AAQ-5) translated and validated by He et al., the Body Appreciation Scale (BAS-2) translated and validated by Swami et al., and the Eating Disorder Inventory --- Body Dissatisfaction Subscale (EDI-BD) translated and validated by Tseng et al. [24-26]. The Cronbach's α for C-BI-AAQ-5, BAS-2, and EDI-BD in terms of the whole sample are 0.82, 0.89, and 0.87 respectively.

2.3 Design

This experiment is a 3×3 design. The author measured the physical and demographic information and personality traits regarding created avatars, the actual self, and the ideal self in three contexts (social networking with friends and family members on a small and private platform, single-player games without certain endings, and social networking with strangers on a large and open platform). The body image attitudes were measured only about the actual self, but also across the three contexts. Participants were randomly assigned to one of the three contexts by Credamo when they opened the site of the survey. The study started with an independent page displaying consent and the research goal. Participants were informed that this study is to investigate the criteria for creating online virtual avatars. Then different instructions were distributed to three different contexts. Considering the potential unfamiliarity with creating online virtual avatars, the instructions involved three screenshots showing the user page of Memoji as references. Then participants were guided to imagine the process of creating avatars in one of three specific contexts:

Social networking with only friends and family members on a small private platform where they use avatars to share daily stories and connect with each other so as to strengthen emotional bonds.

A single-player game without certain endings where participants play for pure fun, relaxation, and exploration. This game consists of several genres of games such as strategy, role-playing, action, card, pure narrative, adventure, etc. This game is an offline game run by both computers and mobile phones.

Social networking with mostly strangers on a large and open platform where participants can share information of any kind in the form of music, image, video, text, and links with each other by creating a thread, commenting, or messaging. This platform encourages the formation of communities.

The rules for creating avatars were underlined in the instructions. Participants are told to create avatars with purposes and actions aligning with the contexts. Meanwhile, it was made clear that the avatars participants created would represent themselves, and users in the platforms used avatars as well (excluding the second context). All information on the avatars was modified by filling in this survey and no external tool such as a real-time avatar creator was implemented. The screenshots of the three instructions in Chinese can be found in Supplement File.

Following instructions, the three groups of participants completed the experiment in the same order: physical and demographic information and CBF-PI-15 for avatars firstly, the actual self secondly, and the ideal self thirdly. At last, C-BI-AAQ-5, EDI-BD, and BAS-2 were filled out in sequence. The author provided the option to review instructions for creating avatars when participants began with the CBF-PI-15 for their avatars. Guidance for different scales was presented accordingly. The only difference between the three groups was the specific instructions for creating avatars.

2.4 Analyses

All analyses were conducted through SPSS 26. First, the author applied Spearman correlation analysis to the age, height, weight, and physical attractiveness variables to examine H1. Besides, cross tables were used for gender, hair color, skin color, and tattoo history.

One sample t-test was used to examine the idealization of personality traits of avatars (H2) by testing the idealization level of avatars. This idealization level of avatars was obtained following Zimmermann et al.'s and Bessière et al.'s methods [6, 11]. Then, the author conducted one-way ANOVA to the idealization level of avatars in personality traits considering the contexts as the independent variable (H3).

Similarly, the idealization of avatars in age, weight, and height is analyzed. Weight and height idealizations were both separately examined by pair-sampled t-test and tested by pair-sampled t-test after computing the Body Mass Index (BMI). One-way ANOVA was employed for differences in idealizations of avatars in age, weight, height, and physical attractiveness after calculating the discrepancy. Idealization and its differences between contexts in gender, hair color, skin color, and tattoo history were inspected via cross tables (H4 & H5).

Next, the author utilized the Pitman-Morgan test powered by how2stats to investigate the potential differences of between-subject variances in personality traits between avatars, the actual self, and the ideal self. The homogeneity of between-subject variances in different contexts was also analyzed in this way (H6 & H7) [27].

Finally, the idealization level of avatars in physical and demographic information and in personality traits, and body image attitude were collected for Spearman correlation analysis (H8).

3. Results

3.1 Physical and demographic information of avatars, the actual self, and the ideal self (H1)

Considering the whole sample, the author found significant positive correlations between avatars, the actual self, and the ideal self in height (all $r_s \geq 0.552$, $p_s < 0.001$), weight (all $r_s \geq 0.446$, $p_s < 0.001$), and physical attractiveness (all $r_s \geq 0.337$, $p_s \leq 0.001$). Meanwhile, as shown in Table 1, significant positive correlations were also manifested about age in the avatar-actual-self-pair ($r = 0.334$, $p = 0.001$) and the actual-self-ideal-self-pair ($r = 0.218$, $p = 0.037$), but not in the avatar-ideal-

self-pair ($r = 0.137$, $p = 0.194$). This could be due to the restricted range of age among participants. More detailed correlation analyses across three different contexts showed that the results and significance of these correlations differ among contexts (check Supplement File).

Table 1. Spearman correlations regarding age, height, weight, and physical attractiveness between the avatar, the ideal self, and the actual self

	Age		Height		Weight		Physical attractiveness	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Avatar/actual self	0.334	0.001	0.552	<0.001	0.446	<0.001	0.337	0.001
Avatar/ideal self	0.137	0.194	0.698	<0.001	0.583	<0.001	0.585	<0.001
Actual self/ideal self	0.218	0.037	0.637	<0.001	0.648	<0.001	0.379	<0.001

Table 2. Cross-tables for numbers (frequencies per column) of the genders regarding the avatar, the actual self, and the ideal self

		Avatar			Actual self			Ideal self		
		Male	Female	Others	Male	Female	Others	Male	Female	Others
Avatar	Male	12 (100%)	n/a	n/a	11 (78.6%)	1 (1.3%)	0 (0.0%)	10 (58.8%)	1 (1.4%)	1 (50%)
	Female	n/a	78 (100%)	n/a	3 (21.4%)	75 (96.2%)	0 (0.0%)	7 (41.2%)	70 (95.9%)	1 (50%)
	Others	n/a	n/a	2 (100%)	0 (0.0%)	2 (2.6%)	0 (0.0%)	0 (0.0%)	2 (2.7%)	0 (0.0%)
Actual self	Male	11 (91.7%)	3 (3.8%)	0 (0.0%)	14 (100%)	n/a	n/a	11 (64.7%)	2 (2.7%)	1 (50%)
	Female	1 (8.3%)	75 (96.2%)	2 (100%)	n/a	78 (100%)	n/a	6 (35.3%)	71 (97.3%)	1 (50%)
	Others	0 (0.0%)	0 (0.0%)	0 (0.0%)	n/a	n/a	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Ideal self	Male	10 (83.3%)	7 (9.0%)	0 (0.0%)	11 (78.6%)	6 (7.7%)	0 (0.0%)	17 (100%)	n/a	n/a
	Female	1 (8.3%)	70 (89.7%)	2 (100%)	2 (14.3%)	71 (91%)	0 (0.0%)	n/a	73 (100%)	n/a
	Others	1 (8.3%)	1 (1.3%)	0 (0.0%)	1 (7.1%)	1 (1.3%)	0 (0.0%)	n/a	n/a	2 (100%)

Moreover, most participants chose the same gender for avatars and the ideal self as their actual selves as illustrated in Table 2. This pattern was consistent across contexts (Supplement File). In terms of hair color, only 44.6% of the participants chose their actual hair color for avatars and 52.2% of the participants chose their actual hair color for their ideal self. According to Table 3, a total of 58.1% of participants with black hair attributed colors other than black for their avatars. This included 20% for the option of other colors including partial or complete hair dye and highlights. Overall, participants tended to have different hair colors in avatars and ideal selves from their actual selves. However, this result was limited to participants with black hair (80.4%) and brown hair (14.1%), since additional options show rather low frequencies (2.2% blonde, 0.0% grey, 0.0% bald, and 3.3% other options).

Table 3. Cross-tables for numbers (frequencies per column) of hair colors (partial) chosen by participants for the avatar, the actual self, and the ideal self

		Avatar				Actual Self				Ideal self			
		Black	Blonde	Brown	Others (other colors including partial or complete	Black	Blonde	Brown	Others	Black	Blonde	Brown	Others
Avatar	Black	34 (100%)	n/a	n/a	n/a	32 (43.2%)	0	1 (7.7%)	1	28 (68.3%)	2	3	1
	Blonde	n/a	14 (100%)	n/a	n/a	13 (17.6%)	1 (50%)	0	0	7	4 (28.6%)	1	1
	Brown	n/a	n/a	11	n/a	3 (4.1%)	1 (50%)	7 (53.8%)	0	1	3	6	0
	Grey	n/a	n/a	n/a	n/a	6 (8.1%)	0	0	1	1	1	0	2
	Bald	n/a	n/a	n/a	n/a	1 (1.4%)	0	0	0	0	0	0	0
	Others	n/a	n/a	n/a	26 (100%)	20 (27%)	0	5 (38.5%)	1	4	4 (28.6%)	1	15 (78.9%)
Actual self	Black	32 (94.1%)	13 (92.9%)	3	20 (76.9%)	74 (100%)	n/a	n/a	n/a	40 (97.6%)	10 (71.4%)	6 (54.5%)	14 (73.7%)
	Blonde	0	1	1	0	n/a	2 (100%)	n/a	n/a	0	1	0	1
	Brown	1	0	7	5	n/a	n/a	13 (100%)	n/a	1	3	5 (45.5%)	2
	Grey	0	0	0	0	n/a	n/a	n/a	n/a	0	0	0	0
	Bald	0	0	0	0	n/a	n/a	n/a	n/a	0	0	0	0
	Others	1	0	0	1	n/a	n/a	n/a	3 (100%)	0	0	0	2
Ideal self	Black	28 (82.4%)	7 (50%)	1	4	40 (54.1%)	0	1 (7.7%)	0	41 (100%)	n/a	n/a	n/a
	Blonde	2	4	3	4	10 (13.5%)	1 (50%)	3 (23%)	0	n/a	14 (100%)	n/a	n/a
	Brown	3	1	6	1	6 (8.1%)	0	5 (38.5%)	0	n/a	n/a	11 (100%)	n/a
	Grey	0	1	1	1	3 (4.1%)	0	2 (15.4%)	1 (33.3%)	n/a	n/a	n/a	n/a
	Bald	0	0	0	1	1 (1.4%)	0	0	0	n/a	n/a	n/a	n/a
	Others	1	1	0	15 (57.69%)	14 (18.9%)	1 (50%)	2 (15.4%)	2 (66.7%)	n/a	n/a	n/a	19 (100%)

Table 4. Cross-tables for numbers (frequencies per column) of skin colors (partial) chosen by participants for the avatar, the actual self, and the ideal self

		Avatar			Actual self			Ideal self		
		Fair	Yellow	Tanned	Fair	Yellow	Tanned	Fair	Yellow	Tanned
Avatar	Fair	77	n/a	n/a	37 (97.4%)	37 (78.7%)	2	70	6	0
	Yellow	n/a	11	n/a	0	10 (21.3%)	0	2	9	0
	Tanned	n/a	n/a	3	1 (2.6%)	0	2	2	0	1
Actual self	Fair	37	0	1	38 (100%)	n/a	n/a	35	2	0
	Yellow	37	10	0	n/a	47 (100%)	n/a	35	12	0
	Tanned	2	0	2	n/a	n/a	4 (100%)	3	0	1
Ideal self	Fair	70	2	2	35 (92.1%)	35 (74.4%)	3	75	n/a	n/a
	Yellow	6	9	0	2 (5.3%)	12 (25.5%)	0	n/a	15	n/a
	Tanned	0	0	1	0	0	1	n/a	n/a	1

Regarding skin color, most of the participants with yellow skin chose fair skin color for their avatars and ideal selves. While most participants with fair skin color retained their actual skin colors for avatars and their ideal selves. Limitation to fair and yellow actual skin colors notwithstanding, these results generally revealed a fair skin preference in participants. Results were shown in Table 4 and the Supplement File. Concerning tattoo history, most of the participants insisted on actual tattoo histories for avatars and their ideal selves, as indicated in Table 5. Overall, the author observed high coherence between the avatar, the actual self, and the ideal self for height, weight, physical attractiveness, gender, and tattoo history, which supported H1. However, other variables showed lower congruence. Age showed little correlation with a potential reason for having a restricted range. Hair colors were diversified in avatars and ideal selves. Skin color demonstrated a tendency towards fair skin.

Table 5. Cross-tables for numbers (frequencies per column) of tattoo history chosen by participants for the avatar, the actual self, and the ideal self

Avatar	Actual self	Ideal self
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		(Yes, have had) large- area tattoos	(Yes, have had) small- area tattoos	Never/ No	Large- area tattoos	Small- area tattoos	Never /No	Large- area tattoos	Small- area tattoos	Never/ No
Avatar	Large-area tattoos	6	n/a	n/a	0	1 (20%)	5 (5.7%)	2	3	1
	Small-area tattoos	n/a	20	n/a	0	4 (80%)	16 (18.4%)	2	14	4
	Never/No	n/a	n/a	66	0	0	66 (75.9%)	0	8	58
Actual self	Large-area tattoos	0	0	0	0 (0.0%)	n/a	n/a	0	0	0
	Small-area tattoos	1	4	0	n/a	5 (100%)	n/a	2	3	0
	Never/No	5	16	66	n/a	n/a	87 (100%)	2	22	63
Ideal self	Large-area tattoos	2	2	0	0	2 (40%)	2 (2.3%)	4	n/a	n/a
	Small-area tattoos	3	14	8	0	3 (60%)	22 (25.3%)	n/a	25	n/a
	Never/No	1	14	58	0	0	63 (72.4%)	n/a	n/a	63

3.2 Idealization of personality traits and differences in idealization levels across contexts (H2, H3)

The author conducted a one-sample t-test with a compared mean of 0 against the levels of idealization. Scores on personality traits had been reversed before the analysis. It should be noted that positive data in the idealization of neuroticism presented affirmative idealization, whereas negative data in the idealization of agreeableness, openness, and conscientiousness indicated affirmative idealization. However, extraversion had not an idealized vector in this calculation: the idealization of a personality trait = its avatar-discrepancy – its self-discrepancy = (ideal self – avatar) – (ideal self – actual self) = actual self – avatar. On the level of the whole sample, the author discovered that avatars were idealized for neuroticism, $t(92) = 5.822, p < 0.001, d = 0.61$, conscientiousness, $t(92) = -2.373, p = 0.02, d = -0.25$, openness, $t(92) = -8.236, p < 0.001, d = -0.86$. These significant idealizations were not found on extraversion, $t(92) = 1.599, p = 0.113, d = 0.17$, and agreeableness, $t(92) = -1.803, p = 0.075, d = -0.19$. This result partially supported H2.

Next, one-way ANOVAs were applied to each personality trait with contexts being the independent variable to test the contextual effects on the level of idealization of avatars. The results showed no main effect of contexts for the idealization of avatars regarding all five traits.

3.3 Idealization of physical and demographic information and differences in idealization levels across contexts (H4, H5)

Discrepancies between avatars and the actual self with respect to age, height, weight, physical attractiveness, and BMI were calculated before conducting one sample t-test. Results included significance avatar-idealization on weight, $t(92) = 2.778, p = 0.007, d = 0.29$, physical attractiveness, $t(92) = -10.422, p < 0.001, d = -1.09$, and BMI, $t(92) = 4.662, p < 0.001, d = 0.49$, but on height, $t(92) = -1.552, p = 0.124, d = -0.16$, and age, $t(92) = -0.511, p = 0.611, d = 0.0533$. This result partially supports H4.

As for hair color, skin color, tattoo history, and gender, the author first compared cross tables and selected hair color and skin color for analyses, given that participants with black hair tended to idealize their hair color and participants with yellow skin tended to idealize their skin color as displayed in Table 3 and Table 4. For hair color, only participants with black hair were chosen for analysis. The idealization in hair color was calculated as avatar minus ideal self. If the result was zero, the idealization of avatars in hair color stood. Those who had identical hair colors for the ideal self and actual self were excluded before calculation. Out of 74 participants with actual black hair, 40 perceived black as the hair color for their ideal self. Taking these 40 cases out of consideration, the author obtained 34 cases where participants had black hair while choosing other colors for their ideal selves. Among these 34 cases, 19 participants chose identical colors other than black for their avatars and ideal self. This demonstrated partial support for H4 since cases with identical hair colors for the ideal self and actual self already was not sure to be counted. Similarly, regarding 47 participants with yellow skin, 12 chose yellow for their ideal self. Excluding these 12 cases, 33 (70.2%) participants choose identical skin colors for their avatars and their ideal selves. This expressed a rather strong extent of avatar idealization in participants with yellow skin. Overall, H4 was incompletely supported.

Next, one-way ANOVA was performed to detect the effect of contexts on age, height, weight, physical attractiveness, and BMI. No significant difference was observed (all $0.045 \leq F_s \leq 1.197$, all $p_s \geq 0.307$). Meanwhile, the effect of context on gender, hair color, skin color, and tattoo history was examined by frequencies of idealized cases. Restricted to analyses of participants with black hair and participants with yellow skin, idealized cases presented frequencies of 5, 12, and 2 for hair color, and 10, 13, and 10 for skin color in contexts one, two, and three respectively. This meant context had a main effect on the avatar-idealization of hair color among participants with black hair. On the whole, the above results reflected very limited evidence of H5.

3.4 Between-subject variances and their contextual differences in personality traits regarding avatars, the actual self, and the ideal self (H6, H7)

The author analyzed the between-subject variances of each personality trait regarding both the whole sample and the three different contexts separately. Specifically, the significance test is done using the Pitman-Morgan test powered by how2stats [27]. The data is shown in Figure 1 and can be found in Supplement File as well.

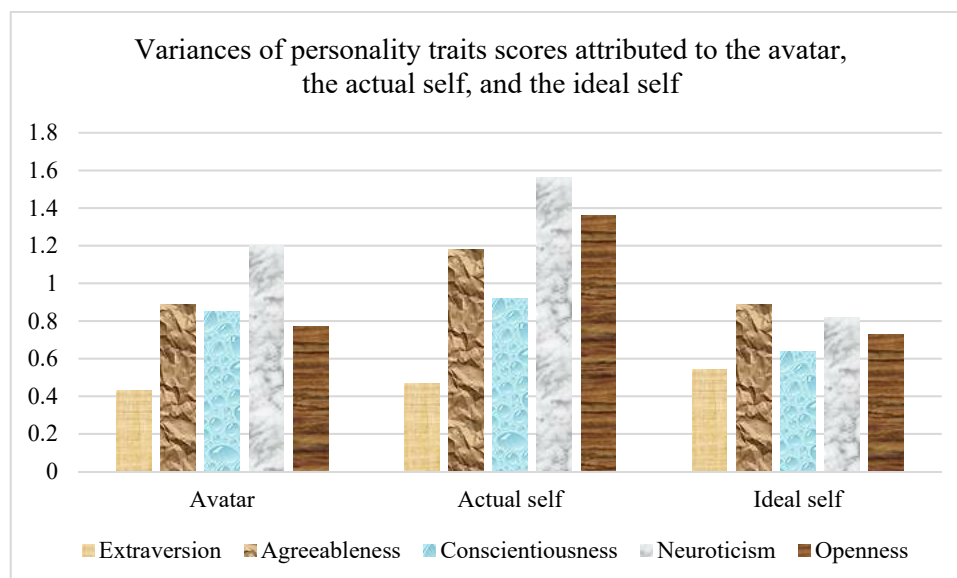


Figure 1. Variances of personality traits scores attributed to the avatar, the actual self, and the ideal self

The personality variances difference regarding the whole sample is only significant for 4 pairs of comparisons involving the neuroticism trait and the openness trait. Variances of the neuroticism trait chosen for avatars are significantly higher ($T = 2.13, p = 0.036$). Also, variances of N of the actual self are significantly higher than the ideal self ($T = 3.32, p = 0.001$). Meanwhile, variances in the openness trait were lower for avatars compared with the actual self ($T = 3.25, p = 0.002$), and were higher for the actual self compared with the ideal self ($T = 3.28, p = 0.002$). These results provided fragmentary support for H6.

More fine-grained analyses of the contextual differences in the variances of the personality traits across avatars, actual self, and ideal self were exhibited in the Supplement File. First, the author looked at the differences between avatars and the actual self, only openness showed significantly lower variances for avatars. This was affirmative in contexts one and three, namely, social networking with friends and family members, Pitman's $T(25) = 2.07, p = 0.048$, and social networking with mostly strangers, Pitman's $T(25) = 2.5, p = 0.02$. However, the homogeneity of variances of avatars' openness stood, meaning the indifference between openness in avatars and the actual self in the single-player game context was not manipulated through avatars but through the actual self (check Supplement File).

Next, differences between avatars and the ideal self were focused on. Only neuroticism in context three, social networking with mostly strangers exhibited larger variances for avatars, Pitman's $T(25) = 2.41, p = 0.024$. As for differences between the actual self and the ideal self, both neuroticism, Pitman's $T(25) = 2.25, p = 0.034$, and openness, Pitman's $T(25) = 3.62, p = 0.001$, displayed higher variances for the actual self in the third context, social networking with mostly strangers.

3.5 Idealization of avatars in physical and demographic information and personality traits and its relation to body image attitudes (H8)

The author used previously calculated avatar-idealization of BMI, weight, height, and five personality traits to perform spearman correlation analyses with three different scales referring to body image attitudes. Due to the alternate reverse-scoring of body dissatisfaction adopted by the author, it should be noted that lower scores on EDI-BD meant higher body dissatisfaction in this study. With respect to the whole sample, results revealed that the idealization of BMI was positively correlated with body dissatisfaction ($r = -0.405, p < 0.001$) measured by EDI-BD and body appreciation level ($r = -0.267, p = 0.01$), but not with body flexibility ($r = -0.163, p = 0.119$) measured by C-BI-AAQ-5. These correlations were also true when examined in contexts 1 and 2, but not in 3. Besides, the author discovered a significantly positive relationship between the

idealization of openness and body appreciation ($r = 0.303, p = 0.003$) and a significantly negative relationship between the idealization of openness and body dissatisfaction ($r = 0.361, p < 0.001$). More specific analyses could be found in the Supplement File.

4. Discussion

This study explored the preferences and differences in self-representation through online virtual avatars by comparing them to information on the actual self-representation and the ideal self-representation.

4.1 Main findings

First, the author investigated the relations between avatars, the actual self, and the ideal self in terms of their physical and demographic information. Consonant positive correlations were found for height, weight, and physical attractiveness, but not for age. This moderately replicated results from Zimmermann et al. [6]. Besides, the age restriction for university students embodied in the age range could be one of the reasons that no age was not significantly intercorrelated between avatars, the actual self, and the ideal self. The exact effect is to be studied. Moreover, the gender and tattoo history attributed to the avatars were in congruence with those attributed to the actual self. However, the hair color and skin color partly displayed inconsistency between the avatars and the actual self. This inconsistency in skin color attribution could be the manifestation of the fair skin tendency among Chinese women since the participants consisted of mostly women. As for hair color, it could be because the avatars were created also for aesthetic reasons and for explorations towards the ideal self [3, 28]. Overall, the weight, height, and gender of the avatar were based on the actual self with enhancements, as also forwarded by previous research [6, 20]. While skin color and hair color might support the unsupported hypothesis mentioned by Zimmermann et al. that emphasized the tendency of trying out new identities [6].

Second, the author discovered an idealization of avatars in some of the personality traits and in some of the physical and demographic characteristics. Idealized representation of avatars was found regarding openness, neuroticism, and conscientiousness on the level of the whole sample. Interestingly, openness was found more idealized than neuroticism to be the most idealized trait. Reflecting less openness in the actual self of Chinese, this finding enriched the socially psychological value of Zimmermann et al.'s findings that openness showed no significant idealization whereas neuroticism had the highest degree of idealization [6, 15]. Furthermore, no significant differences were found regarding the contextual effect of the idealization of avatars for all five personality traits. This was not aligned with Zimmermann et al.'s findings, either [6]. Potential reasons could be different social backgrounds, different age groups, and different gender distribution.

Third, the idealization of physical and demographic characteristics was evaluated. Idealization was significant for weight, BMI, and for partial cases of skin color. Moreover, through the frequency table, the author discovered the cross-context effect on hair color idealization, which registered that the idealization of hair color is more frequent in the single-player game context.

Next, the between-subject variances between avatars, the actual self, and the ideal self exhibited significant differences only in some pairs of comparisons on openness and neuroticism. Continuously revealing cultural differences, openness showed significantly lower variances in avatars. This was also not in accordance with Zimmermann et al.'s results that personality traits excluding agreeableness all presented lower variances for avatars [6].

Last, the author hypothesized the existence of a correlation between the avatar-idealization of physical and demographic characteristics and body image attitudes including body flexibility, body dissatisfaction, and body appreciation. The avatar-idealization of BMI significantly expressed a positive correlation with body dissatisfaction and a negative correlation with body appreciation. Meanwhile, after taking idealization in personality traits into consideration, the idealization of

openness was found to be positively correlated with body appreciation, and negatively correlated with body dissatisfaction. These findings were not replicated within contexts.

4.2 Strengths, limitations, and further improvements

This study presents moderately replicated results to Zimmermann et al.'s study conducted in Germany, and such a study in the interest of online avatars and self-representation has not been presented in Chinese backgrounds. Above this, the author improved Zimmermann et al.'s design by adding pictures of the avatar creation process to aid understanding, since it had been shown that visualization of avatars could have effects on perceptions in digital environments [29]. Besides, body image attitudes were linked to the idealization of the self-representation of avatars, which has not been innovated and achieved in previous studies. Furthermore, the author provided insights into differences in results related to the specific age range, educational status, and cultural background, which should also be considered for future research.

This study has its limitations: First, it adopted CBF-PI-15 as the measurement for personality traits, whose validity in terms of avatars and ideal self has not been established [23]. Second, the participants were limited to university students compared to Zimmermann et al.'s participants ($M_{age} = 28, SD = 11$) [6]. This short range of age could have an effect on correlational analysis. Third, when calculating the avatar idealization of personality traits, the author followed the previous calculation, which presents a lack of effect from the ideal self since it accounts for only the distance between and vector of avatar-actual-self discrepancy (idealization = actual self – avatar). In cases where there were multiple peaks of idealization and where data were evenly distributed around the idealization point, such a calculation could fail. Fourth, this study does not obtain high test power for grouping effects, indicating significant between-group effects could be missed. Furthermore, avatars were created in this study merely through guidelines and multiple-choice questions, and the author did not look into practical behaviors regarding each context.

5. Conclusion

This study has aided to complete the empirical gap in the present study from the cross-cultural perspective. In the Chinese cultural background, the author found a tendency for university students to idealize themselves through online avatars for both physical attributes and personality traits. Besides, the idealizations of personality traits and most of the physical attributes do not differ across contexts such as social networking and single-player gaming. However, the idealization of hair color appeared to be higher in the single-player gaming context, which could be referring to the sense of unboundedness. Moreover, the author found correlations between the idealization of BMI and body dissatisfaction and between the idealization of BMI and body appreciation. With the rise in the use of online avatars in games, social networking, online streaming, and metaverse, avatar creation would be more and more important as an indicator and a research tool for self-representation in different online contexts in different cultures. Thus, this study presents a piece of pilot information for research on avatar creation across contexts in the Chinese background and relinks avatar creation with body image problems, providing a basis for solving self-image problems and virtual worlding constructions. Further studies can improve by enlarging the sample size, including various online contexts, equalizing gender distributions, and enabling more engaging avatar creation processes.

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