On the Relationship between My Avatar and Myself

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Abstract

What is the relationship between avatars and the people they represent in terms of appearance and behavior? In this paper, we hypothesize that people (balancing motives of self-verification and self-enhancement) customize the image of their avatars to bear similarity to their real selves, but with moderate enhancements. We also hypothesize that virtual-world behavior (due to deindividuation in computer-mediated communication environments) is less restrained by normal inhibitions than real-world behavior. Lastly, we hypothesize that people with more attractive avatars than their real selves will be somewhat more confident and extraverted in virtual worlds than they are in the real world.

We examine these issues using data collected from Second Life residents using an in-world intercept method that involved recruiting respondents' avatars from a representative sample of locations. Our quantitative data indicate that, on average, people report making their avatars similar to themselves, but somewhat more attractive. And, compared to real-world behavior, respondents indicate that their virtual-world behavior is more outgoing and risk-taking and less thoughtful/more superficial. Finally, people with avatars more attractive than their real selves state that they are more outgoing, extraverted, risk-taking, and loud than their real selves (particularly if they reported being relatively low on these traits in the real world). Qualitative data from open-ended questions corroborate our hypotheses.

Keywords: Avatar appearance; avatar behavior; virtual worlds; self-concept; self-enhancement; self-verification; deindividuation.

In virtual worlds, people design 3D anthropomorphic digital representations of themselves called avatars.[1] Avatars mediate participant's interactions with each other and the environment. Avatars sit, walk, run, drive, fly, teleport, dance, and communicate with other avatars. The avatar is the "face" (and body) of a person within the virtual world. People can freely express themselves in the appearance of their avatars, limited only by their imaginations and the available technology.

A question arises as to whether, through their avatars, people project images of themselves that are similar to or dramatically different from their real-world images. In particular, are avatars more or less attractive than the people they represent? A related question arises as to whether virtual-world behavior is systematically different from (and possibly less inhibited than) real-world behavior. When connecting these two questions, a final question arises as to whether differences in appearance lead to differences in behavior. We consider these questions in this paper.

Questions such as these are important because virtual worlds have implications that go beyond how we play, to include how we buy, work, learn, and engage in group activities (Bartle, 2006; Balkin & Noveck, 2006). In the prominent virtual world Second Life, at least 126 real-life brands have some form of presence (be it in promotions, advertisements, market research, or service delivery; Barnes, 2007); more than 25,365 business are operated (mostly as stores, clubs, and property management companies; DMD, 2007); over 150 universities maintain campuses, buildings, classes, offices, or message-boards (with hyperlinks to Internet websites; Graves, 2008); and various public organizations and cultural groups utilize the environment for conferencing, public meetings, delivery of information, and performances or exhibits. Similar activities are evidenced in other worlds that focus on entertainment (e.g., World of Warcraft), creativity (e.g., Kaneva), children (e.g., Webkinz, Neopets, Club Penguin, and RuneScape), languages (e.g., Cyworld and HiPiHi), media (e.g., vSide), and education (e.g., ActiveWorlds and there.com). According to one estimate, 20 to 30 million people regularly participated in virtual worlds in 2006, spending an average of almost twenty-two hours per week within these spaces (Balkin & Noveck, 2006). Some even suggest that the 3D Internet will become as important to companies in five years as the Web is now (Driver et al., 2008), especially as efforts to build standard protocols to integrate virtual worlds mature (Shute, 2008). As activity grows in such avatar-mediated playgrounds and workspaces, it is increasingly important to understand how people represent themselves with their avatars and how virtual environments influence user behavior.

In this paper, we approach these issues by first framing avatar attractiveness in terms of two competing tendencies identified by social psychologists pertinent to self-concept and self-image: whether people act more in accordance with motives for *self-enhancement* or *self-verification*. We then consider how virtual- and real-world behavior differ by investigating how the computer-mediated environment of virtual worlds may affect people to behave in ways not normal for themselves, including reduced social and psychological inhibitions. Lastly, we look at the interaction between avatar attractiveness and behavior against research that has shown that more attractive people tend to be more confident, extraverted, and aggressive in many of their

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[1]The term "avatar" derives from the Sanskrit word "avatara," which means "incarnation." In the context of on-line virtual worlds, the term denotes a graphical object corresponding to the user's virtual body in the world. Neal Stephenson made this use of the term "avatar" popular in his novel Snow Crash (Stephenson, 1992).

behaviors than less attractive people (Langlois et al., 2000). We consider three hypotheses and test them using data collected through an in-world survey of participants in Second Life.

Past Literature

Avatar Appearance

The avatar's appearance has drawn wide research attention in recent years. Abundant effort has been devoted to understanding the influence of the avatar's appearance on individuals' judgments of the avatar with whom they interact (e.g., Dehn & Mulken, 2000; Nowak, 2004). The notion of avatar, in this research, includes not only human participants of a virtual environment embodied by digital representations, but also non-human virtual agents such as animated interface agents (i.e., computer programs that aid users in accomplishing different tasks on the computer). This research examines such issues as whether the presence or absence of an avatar image influences users' attitudes toward the virtual agent, and how anthropomorphism of the avatar (i.e., the avatar taking a human versus a non-human form) affects the perceived attractiveness and credibility of the person represented by the avatar.

However, limited work has been done investigating how users of virtual worlds tend to design their own avatars. Earlier work has indicated that despite the technological constraints, people prefer to have control over their avatar design (Schroeder, 2002). It has also been conjectured that avatars are likely to be very realistic, and that people tend to carefully choose the images of their avatars to represent the characteristics essential to their identities (Schroeder, 2002; Taylor, 2002). Nevertheless, we still lack empirical evidence to support these conjectures.

The rest of this section of the paper sets the theoretical background to understand how people tend to craft their avatars relative to their actual selves. Since the avatar is a proxy of a person in the virtual world – an "entire self-representation" (Yee & Bailenson, 2007) – designing the avatar appearance reflects how an individual projects his or her self-concept or self-image. To consider this, we review the literature on the two psychological processes pertinent to how people portray their self-concept or self-image. Whereas conventional wisdom considers these two factors as opposing processes, we build on a more recent integrative view that emphasizes the interaction of the two factors.

Self-enhancement.

Self-enhancement is a fundamental human tendency to "propel the ego upward" (Koffka, 1935). Self-enhancement theory is based on the notion that individuals are motivated to promote a positive self-concept and solicit positive feedback from other people, referred to as *simple self-enhancement*, and that those who hold negative self-views tend to distort personal information in a positive direction, referred to as *compensatory self-enhancement* (Hull, 1943; Kaplan, 1975). Sedikides et al. (2003) examined the moderating effect of cultural background on the self-enhancement motive, demonstrating that individuals from Japan (with a collectivistic cultural background) self-enhance on collectivistic attributes, whereas individuals from the U.S. (with an individualistic cultural background) self-enhance on individualistic attributes. This finding challenges the belief that the self-enhancement motive is pervasive only in individualistic cultures and renders support for the universality of the self-enhancement motive.

Self-verification.

In contrast to the preceding view, self-verification theory contends that people are motivated to maintain a consistent self-concept, preserve the truth about themselves, and seek objective feedback from others (Swann, 1987). People are motivated to self-verify because portraying one's self-concept in a stable, self-congruent manner helps avoid psychological and interpersonal anarchy, bolsters a person's confidence in predicting and controlling the world, and facilitates social interactions (Swann et al., 1989).

Interplay of Competing Motives.

On the basis of the observation that sometimes the same people seem to be subject to both self-enhancement and self-verification, some researchers propose to abandon an "either-or" approach in favor of a more reconciliatory view (Brown et al., 1988; Swann et al., 1989), suggesting that people are motivated simultaneously by self-enhancement and self-verification and that they will seek to satisfy both motives when possible.

In the same way that self-enhancement motives influence individuals' self-presentational strategies to create one's public image (Baumeister, 1982), we expect that participants tend to bias the construction of their avatars toward the direction of self-enhancement. At the same time, however, self-verification motives balance the self-enhancement motives, preventing the creation of an overly attractive avatar that is totally unrecognizable as the self.

Avatar Behavior

In virtual worlds, participants exhibit a spectrum of behaviors through their avatars, navigating, viewing the world, driving vehicles, purchasing products, constructing buildings, joining clubs, interacting with other avatars, etc. It is important to understand the code of behaviors in the virtual worlds – whether behaviors are rooted in the real world, or whether participants are prone to behave in highly deviant ways in virtual environments. Recent research has produced rich evidence that people's behaviors in virtual worlds tend to be congruent with those in the real world. Nevertheless, another line of research suggests that computer-mediated communication encourages individuals to break down their normal behavioral constraints, an effect known as deindividuation.

Two-way Transfer of Behaviors.

Existing literature provides empirical evidence of the similarity between individuals' behaviors in the real and virtual worlds. It has also been demonstrated that behaviors established in the real world are transferable to the virtual worlds, and *vice versa*.

Much of the research has been devoted to understanding whether social norms and social behaviors in the real world are transferred into virtual worlds. In particular, Yee et al. (2007) found, in an observational study of Second Life, that in a virtual world setting, male-male dyads maintain larger interpersonal distance and less eye contact than female-female dyads. In addition, as interpersonal distance decreases, they are less likely to look at each other. These findings are congruent with well-documented social norms in the physical world. In a similar vein, Bailenson and Yee (2005) replicated *the chameleon effect* in a virtual environment, i.e., just as people who engage in mimicry of verbal and nonverbal cues of group members tend to be more likable than non-mimickers, mimicking avatars are more positively perceived by participants in a virtual

environment than non-mimicking avatars. Furthermore, the fact that people prefer to talk to attractive or interesting looking people holds true in virtual environments where more attractive avatars are more sought after for communication (Suler, 1996).

There is also emerging research directed at investigating the transfer of behaviors from the virtual to the real world. For instance, Messinger *et al.* (2009) found that Second Life participants who are satisfied with virtual presentation of products are more likely to engage in real life shopping for the products using store, website, phone, or catalogue shopping. In addition, Cabiria (2008) demonstrated that marginalized populations such as gays and lesbians find therapeutic benefit by participating in communities in virtual worlds, and then transfering these benefits to their real lives.

In short, previous research suggests permeability of behavior between real and virtual worlds allowing people to maintain consistent behaviors across their real and virtual lives.

Deindividuation and Lessened Inhibitions.

Deindividuation is a state of loss of personal identity that can lead a person to behave in a manner not normal for that person. It often arises as a result of being immersed in a large group or from a feeling of anonymity. Research on computer-mediated communication (CMC) suggests that anonymity, reduced self-regulation, and reduced social feedback can lead to the conditions that are important for deindividuation (Kiesler et al., 1984). Anonymity and lack of social feedback in CMC environments are also considered to elicit a deindividuation state that helps people to overcome social and psychological inhibitions (Kiesler & Sproull, 1992). Joinson (2001) found that anonymous participants in computer-mediated discussions disclose significantly more information about themselves than people who engage in face-to-face discussions.

Deindividuation is also proposed to be a cause of anti-social behavior such as rioting (Zimbardo, 1969), or deviant pro-social behavior (Gergen et al., 1973). Diener et al. (1976) showed that trick-or-treaters who are granted the opportunity to steal candy are three times more likely to steal when they are sure of their anonymity.

One can argue that the use of avatars in virtual worlds has changed the conditions of early CMC environments, which relied heavily on text exchange. For instance, the enhanced visualization of interacting avatars can reduce the sense of anonymity and physical isolation, and bring back some elements of social feedback, e.g., by showing head nods, smiles, eye contact, or changing interpersonal distance. However, individuals who "hide" behind their avatars cannot be easily identified, allowing virtual worlds to provide a certain degree of anonymity. In addition, social feedback, such as nonverbal and paralinguistic cues, is constrained in scope in virtual worlds due to technological limitations, therefore, we expect participants of virtual worlds to experience some feelings of deindividuation.

Avatar Attractiveness and Avatar Behavior

Having considered avatar appearance and how virtual- and real-world behaviors may differ, a natural consideration is whether avatar attractiveness influences virtual-world behavior.

Previous research on people's physical appearance has suggested that attractive individuals have a higher level of confidence, and tend to be more extraverted and friendly than

less attractive people (Langlois et al., 2000). Taller individuals are perceived to be more competent than their shorter counterparts (Young & French, 1996). In a 3D virtual environment, Yee and Bailenson (2007) demonstrated that participants assigned a more attractive avatar of their same gender (regardless of their true appearance) maintain a shorter inter-personal distance with another avatar in a social interaction occasion; they also disclose more information about themselves than participants assigned a less attractive avatar. In addition, participants assigned a taller avatar negotiate more aggressively than those assigned a shorter avatar. This effect of avatar's appearance on behavior is referred to as "the Proteus effect" (Yee & Bailenson, 2007).

We diverge in one respect from the analysis of Yee and Bailenson (2007). Whereas participants in their study were assigned either a more attractive or less attractive avatar, we consider the attractiveness of participants' avatars *relative to their real appearance*. We then consider whether the use of an avatar more attractive than a person's actual self will induce a behavioral effect. Like Yee and Bailenson (2007), we are interested in whether there is a main effect of avatar attractiveness on a person's confidence and extraversion in a virtual world. We also consider an interaction effect whereby, if a person is unconfident or introverted in the real world, then having an attractive avatar may lead to a greater increase in their confidence and extraversion in a virtual world than for people who are confident and extraverted in the real world.

Hypotheses

In the context of the above literature, we now propose hypotheses concerning (1) the choice of avatar appearance, (2) virtual-world behavior (relative to real-world behavior), and (3) the interaction between these two issues.

Brown et al. (1988) and Swann et al. (1989) suggest the possibility that people balance the motives for self-verification and self-enhancement, and we believe that such interplay of motives may be particularly applicable in the context of choosing avatar attractiveness.

Hypothesis 1: Striking a balance between competing motives for self-enhancement and self-verification, we hypothesize that participants tend to customize the image of their avatars such that the avatars bear similarity to their real selves, but with moderate enhancements.

For our second hypothesis, we consider how virtual- and real-world behavior differ in terms of the theory of deindividuation in computer-mediated communication environments.

Hypothesis 2: From the literature on transferable behavior between real and virtual worlds and on deindividuation in CMC environments, we hypothesize that virtual-world behavior tends to be similar to real-world behavior, but less restrained by people's normal inhibitions.

Lastly, the interaction between avatar attractiveness and behavior reflects research that has shown that more attractive people tend to be more confident, extraverted, and aggressive in many of their behaviors than less attractive people (Langlois et al., 2000).

Hypothesis 3: We hypothesize that the use of an avatar more attractive than a person's true self will induce greater extraversion, and that the increase will be greatest when the person is low on extraversion in the real world.

Survey Methodology

To examine these hypotheses, we conducted a survey of Second Life (SL) residents using an intercept-style recruitment method. Each respondent was paid 150 Linden Dollars for completing the survey, which required 10 to 15 minutes, or a smaller amount if they dropped out before completing the survey.

For an intercept-style recruitment method, it is important to develop and use field avatars that attract participants who are most likely to provide valid responses. It has been shown that attractiveness and expertise are key factors in designing effective avatars to interact with online consumers. Attractiveness influences perceptions of likeability while the expertise of an avatar can influence perceptions of credibility (Holzwarth et al., 2006). We created four field avatars to recruit participants, two male and two female and ran a pre-test measuring the participants' perception of the survey avatars' level of credibility, attractiveness, expertise, and likeability. Our four avatars received high ratings on a 5-point scale for each measure.

To ensure that a diverse sample of participants was solicited, we used a randomized approach to decide which places our avatars would visit to recruit participants. Every possible three-letter combination between AAA and ZZZ was put into random order. Each letter combination was supplied to the SL "search place" function to yield a list of those places whose name or description contained that letter combination. Concatenating these search lists into one grand list, we selected every 10th place in the list to visit for 5-10 minutes and look for survey participants to recruit. We rotated use of the survey avatars so that each one visited approximately the same number of places. Our procedure allowed for randomization of letter-combinations, avatar order, and researcher order, while systematically visiting every n^{th} location. In order to make sure countries in different time zones were not penalized, data collection covered different times of the day, evening, and late night.

Survey respondents opened a web-based survey by "touching" a stationary board in a survey booth located on Flotsam Beach in SL (to which respondents were directed) or by touching a portable sandwich-board worn by our four survey avatars (see Figure 1). The survey began with a consent form and ended with debriefing and Linden dollar payout.
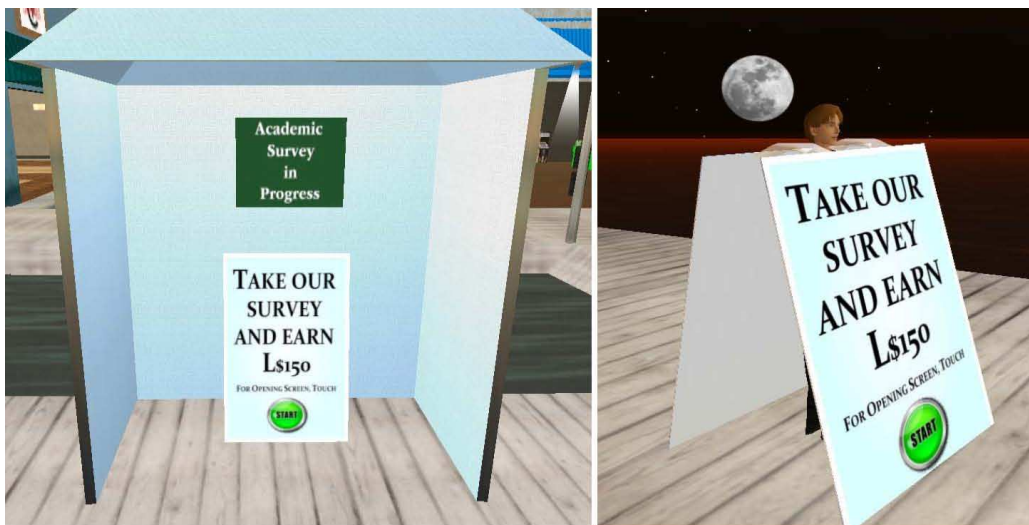

Figure 1. Our Survey Booth and One Survey Avatar with Sandwich board

Incomplete and non-serious (e.g., the response for 30 straight scale questions was '5') surveys were removed from the data. The analysis that we report in this paper consisted of 97 complete surveys. The average age of participants in the study was 30.5 years, with more than two-thirds falling between the ages of 20-36. Fifty-six percent of participants were female with more than 70 percent of participants making less than $60,000 annually and three percent earning over $100,000. Most participants had completed high school, their undergraduate degree, or spent some time in university or college (90%), while only three percent had graduated with a Masters or Ph.D. degree. Participants had, on average, 25.8 hours of leisure time per week and the frequency of country of origin was U.S. 53, Netherlands 8, Great Britain 5, Philippines 4, China 3, Malaysia 3, Belgium 2, Canada 2, Germany 2, Italy 2, others 9, and not available 4. These demographics very closely match the demographics of the overall SL population disseminated by Linden Lab, except that we have a somewhat disproportionately high representation from the U.S. (presumably because the solicitation process and survey were conducted in English).

From a methodological standpoint, this data collection approach may be of use for other scholars studying virtual worlds. For a review of the various other types of survey technologies employed in SL, see Bell et al, 2008. They also present a "Virtual Assisted Self Interviewing" (VASI) tool they developed to enable the collection of survey data within SL through a heads-up display that displays the questions to the interviewee and collects the answers which are then exported to a web application.

Survey Results

The data from our survey results support our three hypotheses concerning avatar appearance, virtual-world behavior, and the effect of avatar appearance on virtual-world behavior. First, most respondents make body and facial features for their avatars similar to, but with some improvements on, their real appearance. Second, respondents reported in-world behavior similar to, but somewhat less inhibited, than their real-world behavior. Third, people with avatars more attractive than themselves tended to be more outgoing, extraverted, risk-taking, and loud than their real selves (particularly if they reported being relatively low on these traits in the real world). Answers to qualitative open-ended questions corroborate our more formal tests.

Avatar Appearance

We examined our first hypothesis, that "participants customize the image of their avatars such that the avatars bear similarity to their real selves, but with moderate enhancements," in four ways (Tables 1 – 4).

Table 1.   Avatar Attractiveness in Relation to Self

"Is your avatar less or more attractive than your real self in the following dimensions?"
(1=less attractive and 7=more attractive)

	Mean	SD[1]	t-test[2]
Overall	4.80	1.32	**5.96**
Body	4.72	1.30	**5.40**
Hair	4.65	1.38	**4.64**
Eyes	4.53	1.32	**3.94**
Style of Clothes	4.86	1.47	**5.73**

[1] Stands for standard deviation.
[2] Against the null hypothesis of 4 (same attractiveness).
Significance at the .001 level is indicated in bold.

We asked respondents "Is your avatar less or more attractive than your real self in the following dimensions?" (see Table 1). If respondents only felt a motive for enhancement, their answers would be closer to 7 than they were. If respondents felt only a motive of self-verification, they would have answered 4 (which the t-test significantly indicates that they did not do). The answers on average indicate that people create avatars that are similar to themselves, but somewhat more attractive in body, hair, eyes, style of clothes, and overall.

We next asked respondents similar questions for age, weight, and height (see Table 2). When asked about avatar age in relation to their own, the modal response was "Same" but many more people answered "Younger" than "Older." If we assign a value of 1 for "Younger," 2 for "Same," and 3 for Older", then the average response would be 1.73, which is significantly less than 2 ("Same"). Generally, we may interpret that 63 people reflect a motive for self-verification and 30 reflect a motive for self-enhancement. (Note, however, that the evidence for self-enhancement may be conservative, if we consider that only 28 people in the sample were 35 years of age or older.)

Table 2. Avatar Features in Relation to Self

(1)	(2)	(3)			
"What is your avatar's age in relation to your own?"					
"Younger"	"Same"	"Older"	mean	SD	t-test[1]
30	63	4	1.73	0.53	**-4.97**
"What is your avatar's weight in relation to your own?"					
"Less"	"Same"	"More"	mean	SD	t-test[1]
38	53	6	1.67	0.96	**-3.38**
"What is your avatar's height in relation to your own?"					
"Lower"	"Same"	"Higher"	mean	SD	t-test[1]
15	50	32	2.18	0.91	1.91

[1] Against the null hypothesis of 2 ("same").
Significance at the .001 level is indicated in bold.

When we asked about avatar weight relative to their own and the modal response was "Same," but many more people answered "Less" than "More." Again, the average response (assigning a 1 to 3 coding) was 1.67, which is significantly less than 2 ("Same"). We might interpret this result as indicating that 53 reflected a motive for self-verification, and 38 indicate a motive for self-enhancement. Again, this may be conservative because with a mean age of 30.5 years, a large number of respondents may already perceive themselves to be at their ideal weight.

When we asked about avatar height relative to their own, the modal response was again "Same," and more people answered "Higher" than "Lower." The average response (assigning a 1 to 3 coding) was 2.18, which is only marginally significantly more than 2 ("Same") at the .06 level. We again interpret the result as indicating that 50 people reflected a motive for self-verification, and 32 indicate a motive for self-enhancement. The results for this case are a bit more ambiguous because, while men may prefer to be taller, women may not. Perhaps the lack of significance indicates more about individual differences in people's satisfaction with their real height than about a motive for self-enhancement.

In both parts of the survey described above, many people show evidence of self-verification. There is also evidence of self-enhancement, but the extent of self-enhancement in both Tables 1 and 2 appears to be quantitatively somewhat smaller. This could be explained by the possibility that respondents are already satisfied with the particular part of their physical self in question, in which case little enhancement would be necessary. In future research, it would be desirable to simply ask people whether they are happy with various aspects of their physical self, although this is a more sensitive topic for respondents. A less intrusive way to approach the balance that people strike between self-verification and enhancement is to re-ask the questions in Tables 1 and 2 slightly differently. We accordingly asked people elsewhere in the survey "Is your Avatar similar to or different from your real-self in the following dimensions?" (see Table 3)

Table 3. Avatar Similarity in Relation to Self

"Is your Avatar similar to or different from your real self in the following dimensions?"
(1=very different and 7=very similar)

	mean	SD	t-test[1]
Overall	4.54	1.63	**-14.79**
Age	5.22	1.49	**-11.75**
Weight	4.82	1.54	**-13.90**
Height	4.52	1.68	**-14.58**
Hair	4.43	1.86	**-13.56**
Eye Color	4.85	1.92	**-11.07**
Style of Clothes	4.65	1.84	**-12.56**

[1]Against the null hypothesis of 7 (very similar).
Significance at the .001 level is indicated in bold.

If people only felt a motive for self-verification, or if this motive completely dominated the motive for enhancement, then respondents would have answered close to 7 ("very similar") for many of the traits in Table 3. In fact, people very significantly answered less than 7 for each of the traits. Therefore, we conclude that people are not completely motivated by self-verification when creating their avatars. They make their avatars different from themselves quite consciously, and, according to Tables 1 and 2, often with somewhat more attractive features.

Our final way of assessing self-verification is to put the question directly to respondents. We asked people how close their primary avatar is to their real self (see Table 4 below for the five possible answers). We, accordingly, reject the hypothesis that respondents, on average, make their avatars "as close to your self as can be made," and we could not reject the alternate hypothesis that respondents make their avatars "a mix of similar and unrecognizable features to your real self." This explicitly displays only a partial motive for self-verification.

Table 4. Avatar-Self Relationship Overall
"Overall, would you say that your primary avatar is (check one):"

	Count	Answer
(1)	14	As close to your real self as can be made.
(2)	22	Generally recognizable as your real self.
(3)	33	A mix of similar and unrecognizable features to your real self.
(4)	23	Mostly not recognizable as your real self.
(5)	5	As far from your real self as can be made.

mean	SD	t-test[1]
2.82	1.634	**11.02**

[1]Against the null hypothesis of 1 ("same").
   When tested against the null hypothesis of 3 ("mix") the t-statistic is -1.06.

Taken together, Tables 1 through 4 provide support for our hypothesis that "participants tend to customize the image of their avatars such that the avatars bear similarity to their real selves, but with moderate enhancements." Tables 3 and 4 also isolate the tendency toward self-verification and show that this motive is only partially in effect. Tables 1 and 2 show that when people diverge from self-verification they go in the direction of enhancement.

Virtual-World Behavior

We examine our second hypothesis, that "virtual-world behavior tends to be similar to real-world behavior, but less restrained by people's normal inhibitions," by asking questions of the form shown in Table 5.

Table 5. Question Format: Comparison of Virtual and Real Behavior
"Please rate your behavior on the following dimensions in SL and in real life:"

	Shy				**Outgoing**	
In Second Life	1	2	3	4	5	NA
In Real Life	1	2	3	4	5	NA

This layout anchored 1 on the scale as "Shy" and 5 as "Outgoing". Automated input validation coding was used in the web-survey interface to assure that respondents clicked on only one button for each row and completed both rows. Respondents were also asked to look over their entered responses before clicking on a button indicating that a screen was complete.

Table 6. Comparison of Virtual and Real Behavior

"Please rate your behavior on the following dimensions in SL and in real life:"

		1	2	3	4	5	sample size	mean	SD	t-test[1]
Shy (1)/Outgoing (5)	SL	0	14	29	29	25	97	3.67	1.02	**2.24**
	RL	4	18	34	24	17	97	3.33	1.10	
Introvert (1)/Extravert (5)	SL	2	10	27	44	13	96	3.58	0.93	1.51
	RL	4	11	38	31	12	96	3.38	0.99	
Risk Averse (1)/Risk Taking (5)	SL	3	12	27	29	24	95	3.62	1.09	**2.64**
	RL	4	20	35	24	12	95	3.21	1.05	
Reserved (1)/Loud (5)	SL	1	14	45	27	9	96	3.30	0.87	1.85
	RL	2	25	41	21	7	96	3.06	0.93	
Superficial (1)/Thoughtful (5)	SL	2	5	23	40	27	97	3.88	0.95	**-2.43**
	RL	0	2	15	44	36	97	4.18	0.76	

[1]Test of the equality of the two means (two-sided, two samples with different unknown variances). Significance at the .05 level is indicated in bold.

Using this question format, respondents were asked to rate their behavior on five dimensions in Second Life and in real life, including Shy/Outgoing; Introvert/Extrovert, etc., as shown in Table 6. This table summarizes all the data so collected along with the mean response for each scale. For example, on average, respondents rated their behavior in Second Life as 3.67 out of 5 on a Shy-Outgoing scale, while they rated their behavior in real life as 3.33 out of 5. Finally, the table reports the applicable t-test that compares these two mean estimates.

We see that subjects report that their behavior is significantly more "Outgoing" in SL than in the real world. Subjects also report being more "Risk Taking," more "Superficial," and more "Loud" (although the latter effect is only significant at the .07 level). These results are consistent with our hypotheses about the general similarity (i.e., convergence) of real and virtual-world behaviors, but that virtual-world behavior tends to be less inhibited than real-world behavior.[2]

These results are corroborated by respondents' answers to the open-ended question "Describe how anonymity in SL influences your behavior." Many responses indicate that people are less inhibited in SL:

> …makes me a tad braver to do things i wouldn't normally do...allows me to try things I'm afraid to in RL...I can do things in sl that I would not normally do…I can talk to other people easier…can look how I want to and not be as worried that people will judge me…I can wear clothes I would not wear in rl…I'm able to do things I wouldn't in rl…It allows me to be more carefree about certain choices I

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[2] We also separated the sample into residents of SL for 6 months or more ("Veterans") and residents of SL for less than 6 months ("Newbies"). The effects shown in Table 6 for the scales Shy/Outgoing, Risk Averse/Risk Taking and Reserved/Loud were replicated for Veterans (at the .1, .05, and .1 levels, respectively), but not for Newbies (for whom the tests were not significant at the .1 level).   Interestingly, the effect found overall for Superficial/Thoughtful is replicated for Newbies (at the .05 level), but not for Veterans.   We also found in SL that, as compared to Newbies, Veterans are more Outgoing, Extraverted, Risk-Taking, Loud, and Thoughtful (at the .05 level or better).   But in real life, there is not a significant difference between veterans and newbies for most of these traits.   Whether veterans learn this behavior, or self-select for it, is an open question.   This interesting line of inquiry merits future consideration, and we thank an anonymous reviewer for suggesting this.

make…can be more bold…can be more frank…it sure allows to do things I would not try in RL…i get to be myself but much more interesting and a lot more flirty…nice to not be seen for my RL looks…more open…more social…can be more bold…more open…

Although people report being less inhibited, these comments do not manifest a "Dr Jekyll and Mr Hyde" schism between real and virtual-world behavior. This is reinforced by responses of individuals who indicate relatively little change:

…it doesn't really; I don't play a character that doesn't represent how I actually am…it doesn't…it doesn't really, because even though i see pixels there are real people behind them…real emotions…no influence…none so far…not …not a lot as i don't see the point in changing too much of who i am to fit in…not influences…not much …nothing…nothing special.

Taken together, both our quantitative and qualitative data are consistent with the hypothesis that participants' virtual-world behavior is similar to their real-world behavior, but less restrained by their normal inhibitions.

Influence of Avatar Appearance on Virtual-World Behavior

We now examine our third hypothesis that "the use of an avatar more attractive than a person's true self will induce greater extraversion [i.e., a main effect], and that the increase will be greatest when the person is low on extraversion in the real world [i.e., an interaction effect]."

Table 7 reports the outcome of regressing behavioral traits in SL (such as "Outgoingness") on both the associated behavioral traits in the real world and a measure of avatar attractiveness. The *dependent variables* consist of the measures of virtual-world behavioral traits summarized in Table 6 (in the rows labeled "SL"). The first *independent variable* in each of these regressions consists of the measures of real-world behavior traits summarized in Table 6 (in the rows labeled "RL"). The *second independent* variable in each of these regressions is the measure of "Avatar Attractiveness Overall" reported in Table 1. Table 7 also includes the product of these later two variables as an *interaction effect*.

Table 7. Regression Models: Influence of Avatar Attractiveness on Virtual Behavior[1]

	Behavioral Trait in Second Life (Dependent Variable)				
	Outgoing	*Extravert*	*Risk Taking*	*Loud*	*Thoughtful*
Associated Behavioral Trait in Real Life[2]	**0.92** (17.15)	**1.04** (17.88)	**0.89** (10.81)	**1.08** (18.93)	**0.84** (21.60)
Avatar Attractiveness[3]	**0.33** (5.69)	**0.13** (3.18)	**0.19** (3.52)	**0.09** (2.48)	0.10 1.12
BTRL:AA[4]	**-0.059** (-3.526)	**-0.035** (-2.503)	-0.018 (-1.300)	**-0.032** (-2.434)	-0.004 -0.185
R-Squared	0.95	0.95	0.90	0.95	0.69
Res. Std. Err.	.85	0.83	1.26	0.75	0.97

[1]Significance at the .05 level or better is indicated in bold.   t-statistics are shown in parentheses.
[2]If the "Behavioral Trait in Second Life" is "Outgoing" [in Second Life], the Behavioral Trait in Real Life" is the measure Outgoing [in Real Life], and similarly for the other four columns. The variables are those reported in Table 6.
[3] This is the variable "Overall Avatar Attractiveness" summarized earlier in Table 1.
[4]*BTRL:AA* is the product of the variables in the first and second rows. This is an interaction term.

If our hypothesis is true, we should find a positive main effect associated with avatar attractiveness and a negative coefficient (relatively small in absolute value) for the interaction term. To be consistent with the previous section, we also expect a positive main effect associated with the behavioral trait in real life.

Our first result is that the coefficients on avatar attractiveness (i.e., the main effects) are indeed significantly different from zero and positive in the first four regressions. Thus, using a more attractive avatar leads to more outgoing, extraverted, risk taking, and loud behavior in Second Life. This is consistent with the first part of the third hypothesis that "the use of an avatar more attractive than a person's true self will induce greater extraversion." This replicates Yee & Bailenson's (2007) findings from controlled experiments in virtual lab environments, although in the avatar-mediated setting that we examine of Second Life, people can choose the appearance of their own avatars.

Our second result, consistent with the previous section, is that the coefficients on the associated behavioral traits in real life are positive, significant, and generally close to 1. Indeed, if we left out all the terms involving avatar attractiveness, the previous section suggests that these coefficients would be greater than 1.

Our final result, for three of the regressions, is that the interaction terms are negative and significantly different from zero. This is consistent with the second part of our third hypothesis that the use of an avatar more attractive than a person's true self will induce extraversion which is "greatest when the person is low on extraversion in the real world". This goes beyond Yee & Bailenson (2007), who look at the main effect of changing the avatar appearance, but who do not consider possible interaction with the real person's underlying behavioral traits (e.g., extravertedness).

To understand such interaction effects, we consider the following example. If we condition on a value for "Outgoingness" in real life of 1, it can be shown that raising Avatar Attractiveness from 1 to 7 increases the predicted value of "Outgoingness" in SL from 1.191 to 2.817, which is more than double. (We make this calculation using the values in Table 7 for the column labeled "Outgoing".) If, instead, we condition on a value for "Outgoingness" in real life of 5, then raising Avatar Attractiveness from 1 to 7 increases "Outgoingness" in SL from 4.635 to only 4.845, which is a much smaller percentage increase. The other equations yield similar interpretations.

Conclusions and Future Lines of Inquiry

This paper has considered the relationship between avatars and the people they represent in terms of appearance and behavior. We found that people, balancing motives for self-verification and self-enhancement, customize their avatars to bear similarity to their real selves, but with moderate enhancements. We also found that virtual-world behavior is similar to real-world behavior, but somewhat less restrained by normal inhibitions. Lastly, we found that people with more attractive avatars than their real selves are more confident and extraverted in virtual worlds than they are in the real world, particularly those who have low confidence and are introverted in the real world.

Although our results are useful, we acknowledge limitations of our data, including reliance on self-reports and small sample size. Similar limitations arise for related Netnographic methods (Kozinets, 2002). We hope that future work will address these limitations, including consideration of the following lines of inquiry:

- Why do people maintain multiple avatars? Are they cultivating multiple virtual selves, just as many people cultivate a "work self" and an "informal self" in real life? And in how many worlds do people keep avatars?

- How often and for what reasons do people make changes in their avatars?

- How do people choose their avatars' names? To what extent does choosing a name support self-verification (when avatar names are borrowed from real names or nicknames) or self-enhancement (when avatar names have positive connotations)?

- To what extent do the hypotheses in this paper about self-verification and self-enhancement carry over to virtual worlds different from Second Life? In particular, do the objectives of an environment (when they are fixed by virtual world designers and not at the discretion of participants) influence the choice of avatar appearance?

Overall, because of the accelerating use of avatar-mediated environments, it is desirable for us to understand people's relationships with their avatars, both how people set the appearance of their avatars and whether and how behavior changes in avatar-mediated environments.

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