

SELF-ENDORSING VERSUS OTHER-ENDORSING IN VIRTUAL ENVIRONMENTS

The Effect on Brand Attitude and Purchase Intention

Sun Joo Ahn and Jeremy N. Bailenson

ABSTRACT: Self-endorsing—the portrayal of potential consumers using products—is a novel advertising strategy made possible by the development of virtual environments. Three experiments compared self-endorsing to endorsing by an unfamiliar other. In Experiment 1, self-endorsing in online advertisements led to higher brand attitude and purchase intention than other-endorsing. Moreover, photographs were a more effective persuasion channel than text. In Experiment 2, participants wore a brand of clothing in a high-immersive virtual environment and preferred the brand worn by their virtual self to the brand worn by others. Experiment 3 demonstrated that an additional mechanism behind self-endorsing was the interactivity of the virtual representation. Evidence for self-referencing as a mediator is presented.

Modern-day consumers are inundated with advertising appeals, and it has become more difficult for advertisers to persuade their audiences as they learn to ignore even the most aggressive of appeals. Researchers recognize the need to shift advertising strategies and argue that virtual environments will fill this need (Lombard and Snyder-Duch 2001). Virtual environments are technologically synthesized sensory information that make the environment, and their contents seem real (Blascovich et al. 2002). Compared to traditional media, virtual environments better engage consumers and reproduce real-use experience (Grigorovici 2003), offering superior control and tailoring of messages (Tam and Ho 2006).

Virtual platforms enable novel advertising strategies, such as allowing users to create an avatar that incorporates the user's actual face to virtually dress and accessorize the self avatar before making the purchase. The benefits of using the self rather than a generic avatar to persuade the user may seem intuitive, but merits scientific investigation in that the comparison between the self and the typical avatar in an advertising context has not received empirical confirmation to date. More important, the underlying mechanisms behind this form of promotion, as well as its boundary conditions, deserve scientific attention.

The focus of the current study is on the advertising strategy we term *self-endorsing*. Self-endorsing involves incorporating the consumer within an advertisement, depicting the self endorsing a brand or product. The current experiments seek to

empirically test the influence of self-endorsing compared with other-endorsing (i.e., endorsing by a typical, but unfamiliar, other person) within low- and high-immersive virtual environments. This work contributes to the theoretical framework of self-referencing (i.e., relating newly accepted information to the self) by investigating the underlying mechanism of self-endorsing.

ADVERTISING IN VIRTUAL ENVIRONMENTS

The current dialogue on advertising in virtual environments is largely based on *interactivity* and *presence*. Interactivity refers to a characteristic of a medium in which the user can influence the form or content of the mediated experience (Heeter 2000; Lombard and Ditton 1997). Interactivity in the context of advertising is important because it allows users to become a part of the persuasive process. In addition, compared with traditional media, interactivity in online advertisements leads to better product knowledge and positive brand attitudes (Li, Daugherty, and Biocca 2002), as well as high audience involvement (Fortin and Dholakia 2005). In fact, the simple inclusion of an avatar on a Web site has been shown to lead to favorable attitude and high purchase intention toward the product (Holzwarth, Janiszewski, and Neumann 2006).

High interactivity in a medium increases the sense of *presence*, the psychological state of feeling that the virtual experience is real (Lombard and Ditton 1997). In the marketing

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context, consumers can experience presence while interacting with three-dimensional products on Web sites (Biocca et al. 2001; Edwards and Gangadharbatla 2001; Li, Daugherty, and Biocca 2001). When users feel a heightened sense of presence and perceive the virtual experience to be real, they are more easily persuaded by the advertisement (Kim and Biocca 1997).

The differing degree, or the objectively measurable property of presence, is called *immersion*. Immersion is the extent to which media are capable of delivering a vivid illusion of reality using rich layers of sensory input (Slater and Wilbur 1997). Therefore, different levels of immersion (objective unit) lead to different experiences of presence (subjective unit), and both concepts are closely related to interactivity. Web sites are considered to be low-immersive virtual environments because of limited interactive capacity and lack of richness in sensory input, which decreases the sense of presence, whereas virtual reality is considered a high-immersive virtual environment because of its ability to reproduce perceptual richness, which heightens the sense of feeling that the virtual experience is real.

Another differentiating aspect of virtual environments is that they offer plasticity of the appearance and behavior of virtual self-representations. It is well known that virtual selves may or may not be true replications of physical appearances (Farid 2009; Yee and Bailenson 2006), but users can also be faced with situations in which they are not controlling the behaviors of their own virtual representations (Fox and Bailenson 2009). In other words, a user can see him- or herself using (and perhaps enjoying) a product he or she has never physically used.

Based on these unique features of virtual platforms, the current study aims to explore the effect of viewing a virtual representation that may or may not look like the self, endorsing a brand by use. We also manipulate the interactivity of endorsers within virtual environments to provide evidence for the mechanism behind self-endorsing.

THE SELF-ENDORSED ADVERTISEMENT

Recent studies have confirmed that positive connections between the self and brands can be created by subtle manipulations, such as mimicry of the self's nonverbal behaviors (Tanner et al. 2008). The slightest affiliation between the self and the other can lead to positive brand evaluations. In a study by Ferraro, Bettman, and Chartrand (2009), an unfamiliar in-group or out-group member was portrayed in a photograph with a water bottle bearing a brand name. The simple detail of the person wearing a baseball cap with the same school logo (i.e., in-group affiliation) triggered participants to choose the brand associated with the in-group member.

Thus, the self-brand relationship significantly influences brand attitude, but self-endorsing has not received scientific

attention to date, arguably because it was not easy to implement before the onset of virtual environments. Prior research has studied the effectiveness of different types of endorsers and their influence on the persuasiveness of advertisements (Friedman and Friedman 1979; Stafford, Stafford, and Day 2002), but the self was not considered in these investigations as a possible source of endorsement.

However, there is the possibility that the currently sporadic use of self-endorsing (e.g., www.myvirtualmodel.com) will increase dramatically. For instance, personalized recommendations are being sent to consumers based on online "footsteps" of prior purchases (Tam and Ho 2006). Furthermore, Google has spearheaded keyword search advertising, which displays text advertisements in real-time based on search words (Jansen, Hudson, and Hunter 2008), and Yahoo has begun to display video and image advertisements based on search words (Clifford 2009). Considering the availability of personal images on the Web due to the widespread employment of social networking sites, the idea of self-endorsing may spread quickly. An advertiser could replace the endorser shown in the image advertisement called by search words with the user to create a self-endorsed advertisement. Thus, the timely investigation of the influence of self-endorsing on users, as well as its mechanism, is imperative.

Based on positivity biases related to the self (Baumeister 1998; Chambers and Windschitl 2004), self-endorsing may be a powerful persuasion tool. However, there may be instances when using the self in an advertisement may not be effective, such as when the virtual representation does not look like the consumer and the consumer fails to identify with the representation. Self-endorsed advertisements may also lose persuasiveness when movements of the representation are not synched with the actions of the consumer.

Another type of endorser that researchers are increasingly focusing on is the typical user endorser. Typical endorsers have an advantage in that they appeal to the similarity of product usage with the average user. For instance, highly attractive models are not always effective compared with normally attractive models, even for beauty-enhancing products (i.e., acne treatment), when users perceive that the highly attractive models do not need those products (Bower and Landreth 2001). Moreover, with the advancement of the Internet, typical endorsers are becoming more influential via online testimonials (Lee, Park, and Han 2006; Wang 2005).

In the current studies, we compared the influence of typical endorsers (i.e., *other-endorsing*) and self-endorsers on brand attitude and purchase intentions. In addition to investigating the effects of self-endorsing, this work extends results of earlier studies on the effectiveness of different types of endorsers and makes important theoretical contributions by studying self-referencing as an underlying mechanism of self-endorsing.

THE SELF AND THE SELF-REFERENCING EFFECT

Individuals tend to prefer and learn information better when the information involves the self in some way. This is the *self-referencing effect* (Rogers, Kuiper, and Kirker 1977). For instance, Kuiper and Rogers (1979) showed that participants rated self-referent adjectives more easily (e.g., “Does this adjective describe you?”) than other-referenced adjectives (e.g., “Does this adjective describe him?”), and the time it took for the participants to answer the self-referencing task was significantly shorter than the time required for other-referencing.

Studies that explored the self-referencing effect in advertising contexts investigated how the combination of visual and textual cues influenced persuasive messages. A study by Debevec and Romeo (1992) demonstrated that although self-referencing generally resulted in more favorable attitudes, the highest ratings came from visually displaying only the product (compared with using an unfamiliar endorser) with verbal cues with the second-person pronoun “you.” One of Debevec and Romeo’s arguments for the underperformance of a “typical” but unfamiliar endorser is that the participants were unable to identify or assimilate themselves with the unfamiliar endorser presenting the product. If so, then showing the participants themselves posing as endorsers for a product in an advertisement should resolve this issue.

However, only a small number of studies have experimented with concepts relevant to self-endorsing. Meyers-Levy and Peracchio (1996) manipulated first- and third-person perspectives of the photograph used as their advertisement stimuli, but participant photos were never incorporated. Another study, although not in an advertising context, found that children as young as five years old are influenced by self-referencing with the use of their own photographs (Sui and Zhu 2005). In this experiment, a photograph of the child’s face was juxtaposed with a figure, such as a tree. Children were able to recall the figure that they saw with their own photo better than the figure seen with an unfamiliar other. Thus, the mere presentation of a photograph of the self can be a powerful device for eliciting self-referencing effects, even in very young children.

The process of self-referencing may not be deliberate and conscious. That is, merely linking an individual with inanimate objects can elicit favorable attitudes. People prefer items they own (Beggan 1992) and display stronger attraction toward self-owned than other-owned possessions (Nesselrode, Beggan, and Allison 1999) even when random assignment is made clear (i.e., explicit random assignment of items labeled “your new possession” or “a person’s possession”). Also, arbitrary categorization of self-relevant words with brand-relevant words created a self-referencing “link” between the self and the brand without supplementary information about the

brand (Perkins, Forehand, and Greenwald 2005). If arbitrary incorporation of the self’s virtual representation in an advertisement can trigger self-referencing effects by seeing the self use and endorse a brand, it would be meaningful to study how self-endorsing influences brand preferences in terms of brand attitude and purchase intention.

OVERVIEW OF EXPERIMENTS

Three experiments tested the effect of self-endorsing and the mediation by self-referencing within low- and high-immersive virtual environments. Experiment 1 was conducted within a low-immersive virtual environment (i.e., the Internet) to compare the main effect of self-endorsing and other-endorsing. In addition, two channels of media, picture, and text were compared to study how effective each medium is to deliver self-endorsed messages. Based on results from the first experiment, Experiment 2 sought to compare self- and other-endorsing in a high-immersive virtual environment (i.e., virtual reality) and to confirm whether the positive influences of self-endorsing on brand attitude and brand association would replicate using a different medium. Experiment 3 aimed to expand the results from Experiment 2 by manipulating two potential mechanisms behind self-endorsing: identification (mere assignment of an avatar) and interactivity (controlling an avatar).

EXPERIMENT 1

Experiment 1 was an initial test of whether self-endorsing would create a preference toward an unfamiliar brand compared with other-endorsing, and whether self-endorsing would be more powerful via visual or verbal channels. Comparing different channels of media and their relative persuasive influence is an important theoretical question that has been explored by various disciplines. Similar manipulations have been studied in the contexts of false memory production (Garry and Wade 2005), attitude and memory of brand information (Childers and Houston 1984), and advertising effectiveness (Stafford 1996). Thus, we directly compared self- and other-endorsing using photo stimuli (*photo self-endorsing*: virtual self-endorsing a brand in a visual advertisement; *photo other-endorsing*: virtual other-endorsing a brand in a visual advertisement) and self- and other-endorsing using text stimuli (*text self-endorsing*: using the second-person pronoun “you” in a text advertisement; *text other-endorsing*: using the third-person pronoun “they” in a text advertisement).

Hypotheses

Whereas the typical, but unfamiliar, endorser featured in advertisements failed to involve the audience with the advertisement (Debevec and Romeo 1992), self-endorsing may trigger

self-referencing and facilitate the establishment of a self-brand relationship. Accordingly, we predicted:

H1a: Self-endorsing would result in more positive brand attitude than other-endorsing.

H1b: Self-endorsing would result in higher purchase intention than other-endorsing.

Self-endorsing may be presented via visual or verbal media. Based on earlier findings that pictorial stimuli may be more effective and persuasive than text (Childers and Houston 1984; Childers, Heckler, and Houston 1986), we hypothesized that self-endorsing would be more powerful when presented visually than verbally. Consequently, we proposed:

H2a: Photo self-endorsing would result in more positive brand attitude than text self-endorsing.

H2b: Photo self-endorsing would result in higher purchase intention than text self-endorsing.

Finally, we collected an indirect measure of self-referencing by gauging the association created between the self and the brand. If the mere categorization of self-relevant and brand-relevant words can establish self-referencing “links” (Perkins, Forehand, and Greenwald 2005), then self-brand association should become stronger with greater self-referencing. Under the assumption that self-referencing is the mechanism behind self-endorsing, brand association would be high when self-endorsing triggers strong self-referencing links between the self and the brand. Thus, we proposed:

H3: Compared with all other conditions, photo self-endorsing would establish stronger self-brand association.

Design

Four brand names were selected to create the advertisements. These brand names were actual brands from Europe or Asia, but not necessarily for soft drinks. We chose these brands to eliminate any kind of affinity or bias people may have toward a familiar brand name. The four selected brand names were similar in length and began with different letters of the alphabet: Cassina, Fentora, Nanaco, Ternio.

The main variables of interest were identity (self versus other) and medium (photo versus text), which were manipulated in a 2 × 2 within-subjects factorial design. Using a Latin square method, we ensured that each condition appeared in each of the four serial positions an equal number of times. Moreover, the order of brand, order of condition,¹ and pairing of brand with condition were counterbalanced equally across participants according to the Latin square. Therefore, the “other endorsers” presented in the photo other-endorsing condition were unfamiliar same-sex participants in the partici-

pant pool assigned in the Latin square so that each participant became an “other endorser” for another participant exactly once in the experiment.

Dependent Measures

Brand Attitude

This three-item scale measured brand attitude following each advertisement stimulus by asking participants the following: “How strongly would you recommend this brand to your friend?” “How much did you like the brand?” and “How would you describe your attitude about this brand?” Ratings were measured with five-point Likert scales with content-specific labels. To balance out order preference in responses, the order of the Likert scale was reversed for one of the questions. Because the three items displayed high reliability with Cohen’s α above .80, responses were averaged into a single score to facilitate discussion in the Results section.

Purchase Intention

A single-item question asked participants how likely they were to buy the product after seeing the advertisement. A fully labeled five-point Likert scale was used.

Brand Association

The extent to which the different experimental conditions generated self-brand association as a result of self-referencing was measured with a forced-choice question regarding the brand. Directly following treatment, the participants were asked, “Which brand do you associate yourself with the most?” and were given the four brand names from which they had to choose one. Prior studies on self-referencing have used comparable methods to assess the degree to which an advertisement was self-referenced (Debevec and Romeo 1992).

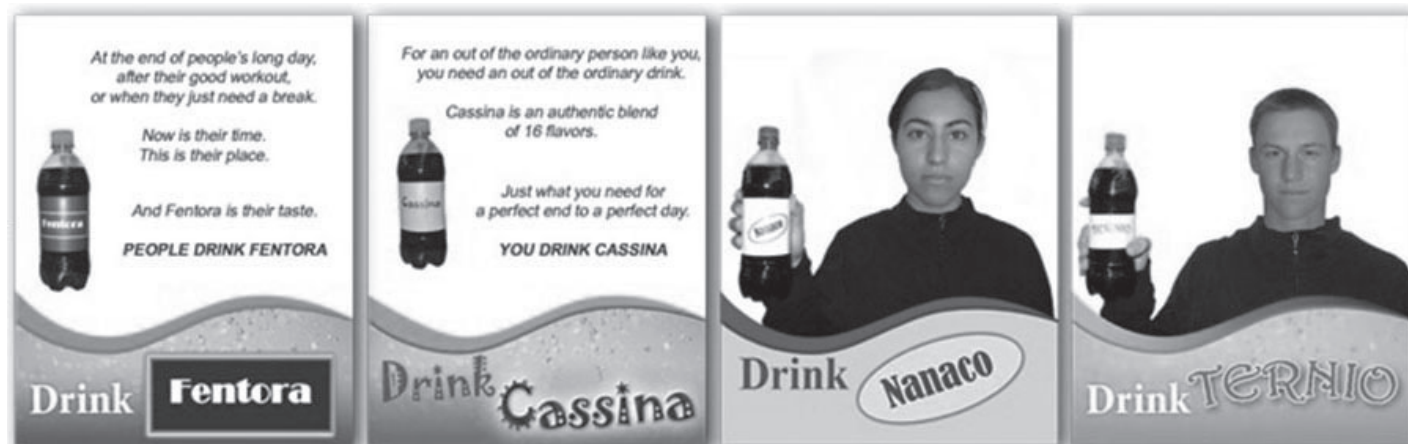
Purpose

The final question on the survey was a measure of possible confounds by demand characteristics and asked participants to guess the purpose of this experiment: “What do you think the purpose of this experiment was?” The responses were coded dichotomously (1 = correct, 0 = incorrect) by two coders and averaged, with Cohen’s κ value above .80.

Stimulus

The construction of the photo-endorsing conditions involved virtually processing participant photos using Adobe Photoshop CS2. Participant heads were “cut” out from each photo and

FIGURE 1
Sample Advertisement Stimuli for the Photo- and Text-Endorsing Conditions in Experiment 1



then “pasted” on to the template model’s body. The end product displayed the template model’s body with the participant’s face endorsing a soft drink of a particular brand. Different templates were made for three ethnicities (Asian, Caucasian, African American) and two sexes (female, male) to best match the head and the body of the endorser.

For the text conditions (text self-endorsing, text other-endorsing), contents were kept identical to the template used for the photo conditions except that the endorsers were replaced with a brief advertisement copy using either a second-person pronoun (“you”) or a third-person pronoun (“they”) or “people.” The text copy replaced the endorser’s location in the advertisement. With the exception of this substitution, all other content in the advertisement template remained the same, including product position, logo position, and the logos and colors used.

Figure 1 displays samples of the stimuli provided during the experiment.

Participants

Participants were recruited from a pool of graduate and undergraduate volunteers, as well as community members with similar age distributions. A total of 80 participants (41 male, 39 female; age $M = 22$, age $SD = 3.05$) were selected and recruited by e-mail. Thirty-three of these participants identified themselves as white/Caucasian, 21 as Asian, 12 as “other,” 7 as African American, and 7 as Latino(a)/Hispanic.²

Procedure

The participants received an e-mail with a URL that began the experiment. The URL connected to a Web site with instructions about the experimental task. Each participant

viewed four advertisements, one of each condition, following the order designated by the Latin square. Each advertisement was followed by questions on brand attitude and purchase intention. Participants then went on to the next advertisement stimuli to repeat this procedure four times. At the end of the experiment, participants were asked the brand association and purpose questions.

Results and Discussion

Brand Attitude

We ran a repeated-measure ANOVA (analysis of variance) with brand attitude as the dependent variable, and medium (photo versus text) and identity (self versus other) as repeated-measures independent variables. The main effect of identity ($F < 1$, $\eta^2 = .04$) and the main effect of medium ($F < 1$, $\eta^2 = .02$) were not significant, failing to support H1a. The interaction between identity and medium was significant, $F(1, 79) = 9.20$, $p < .01$, $\eta^2 = .10$. A paired t -test was run to compare brand attitudes elicited by photo self-endorsing and text self-endorsing. Results indicated that the brand attitude elicited by photo self-endorsing was significantly higher than the brand attitude elicited by text self-endorsing, $t(79) = 2.75$, $p < .01$, $d = .44$, supporting H2a. Also, the effect size of the main effect of identity, although nonsignificant, merited further investigation. A paired t -test comparing photo self-endorsing and photo other-endorsing was also significant, $t(79) = 3.07$, $p < .01$, $d = .35$. This implies that self-endorsing elicits more positive brand attitude than other-endorsing, but only when it is presented through a visual medium.

Means and standard difference for the dependent measures are given in Table 1.

TABLE I
Means and Standard Deviations of Brand Attitude and Purchase Intention in Experiment I

Identity	Medium		
	Photo	Text	Total
Brand attitude			
Self-brand	2.78 (.99)	2.41 (.83)	2.60 (.69)
Other-brand	2.36 (.80)	2.51 (.88)	2.44 (.70)
Total	2.57 (.66)	2.46 (.67)	
Purchase intention			
Self-brand	2.57 (1.21)	2.24 (1.12)	2.41 (1.17)
Other-brand	2.00 (.95)	2.23 (1.07)	2.12 (1.01)
Total	2.29 (1.08)	2.24 (1.10)	

Purchase Intention

We ran another ANOVA with purchase intention as the dependent variable. The main effect of identity was significant, $F(1, 78) = 6.35, p < .05, \eta^2 = .08$, with the self-brand yielding higher purchase intentions than the other-brand. This result confirms H1b. The main effect of medium was not significant ($F < 1, \eta^2 = .003$). The interaction between identity and medium was significant, $F(1, 78) = 7.37, p < .01, \eta^2 = .09$. A paired *t*-test was run to compare the purchase intention elicited by photo self-endorsing and text self-endorsing. Results indicated that the purchase intention elicited by the photo self-endorsing condition was higher than the text self-endorsing condition, $t(79) = 1.83, p = .07, d = .20$, supporting H2b.

Thus, individuals liked and wished to purchase brands that were endorsed by the self more than those endorsed by an unfamiliar other, particularly when the self-endorsement was presented through a visual medium. Also, for promoting unfamiliar brand names of low-involvement products such as soft drinks, photo self-endorsing was more effective than using typical but unfamiliar endorsers or text advertisements. Although effect sizes were relatively small, significant practical benefits can be obtained when a sizable audience is targeted, as is possible with digital advertisements.

Brand Association

When asked to choose the brand that they associated with the most, 45 out of 80 participants chose the brand name linked with the photo self-endorsed brand; 14 chose the text other-endorsed brand; 12 chose the text self-endorsed brand; and 9 chose the photo other-endorsed brand. A multinomial test was run as an omnibus test to check whether these numbers were significantly above the expected proportion of chance (equal distribution of selection among four brands). Pearson's test revealed that among the four categories, only the num-

ber of participants who chose the photo self-endorsed brand was significantly higher than chance, $\eta^2(3, n = 80) = 42.3, p < .001$.

Next, pairwise comparisons were made using the Goodman (1965) formula on confidence intervals for differences in multinomial proportions. The null hypothesis was that proportions are equal across all conditions ($p_1 = p_2 = p_3 = p_4$) and the alternative hypothesis was that self-referencing would trigger participants to establish the highest brand association with the photo self-endorsed brand ($p_1 > p_2, p_3, p_4$). If the observed difference of proportions falls outside the confidence interval (95% *CI* = $-.096, .096$), we can reject the null hypothesis. The observed difference of proportions for all pairwise comparisons against the photo self-endorsing condition (p_1) fell outside the confidence interval, $p_1 - p_2 = .38; p_1 - p_3 = .41; p_1 - p_4 = .45$, indicating that participants felt most associated with the photo self-endorsed brand, confirming H3.

Although brand association was not a direct measure of self-referencing, it indirectly supported self-referencing as an underlying mechanism and established a basis for further investigation of the self-referencing effect as a mediator.

Purpose

To test whether demand characteristics may have influenced the results, we ran the same ANOVAs with brand attitude and purchase intention scores as dependent variables, medium and identity as repeated-measures independent variables, and purpose as a between-subjects factor. A total of 28 participants had some idea of the correct purpose of the experiment, whereas 52 of them did not. All interactions with the purpose variable (i.e., identity \times purpose, media \times purpose, identity \times media \times purpose) were not significant, indicating that brand attitude and purchase intention did not differ between participants who correctly guessed the purpose of the experiment and those who did not. Had participants been influenced by demand charac-

teristics, we should have observed different results for those who were aware of the purpose and those who were not.

EXPERIMENT 2

We further investigated self-endorsing in a high-immersive virtual environment (high IVE). Experiment 2 aimed to replicate the effect of self-endorsing on brand attitude observed in Experiment 1 in high IVE. The operation of self-endorsing was enhanced by having the self avatar actually use the brand, whereas use was only implied in Experiment 1.

Hypotheses

Thus, we predicted:

H4: Self-endorsing would result in more positive brand attitude than other-endorsing.

H5: Self-endorsing would create stronger self-brand association than other-endorsing.

Design

Participants were placed in a virtual room, where they were instructed to interact with another person, which was an avatar operated by the computer. The main within-subjects variable was the brand used by the self (self-brand) versus the brand used by an unfamiliar other (other-brand). Use was manipulated by having the participants' avatars wear a shirt with a brand name on it and the participants seeing another avatar wearing a shirt with a different brand name. Thus, the participants were exposed to self- and other-brand names during the experiment. Two brands from Experiment 1 were chosen: Nanaco and Fentora.

In the virtual room, participants saw the world in first-person perspective and were able to look down at their shirt with brand logos on the sleeves and on the chest. In the high-immersive world, participants were able to move their arm in the physical space and watch the virtual arm of their avatars move in sync. The movement of the physical hand was tracked in x , y , and z space, and based on this information, the position of the virtual arm was continuously updated to create the feeling of embodiment between the participant and his or her avatar.

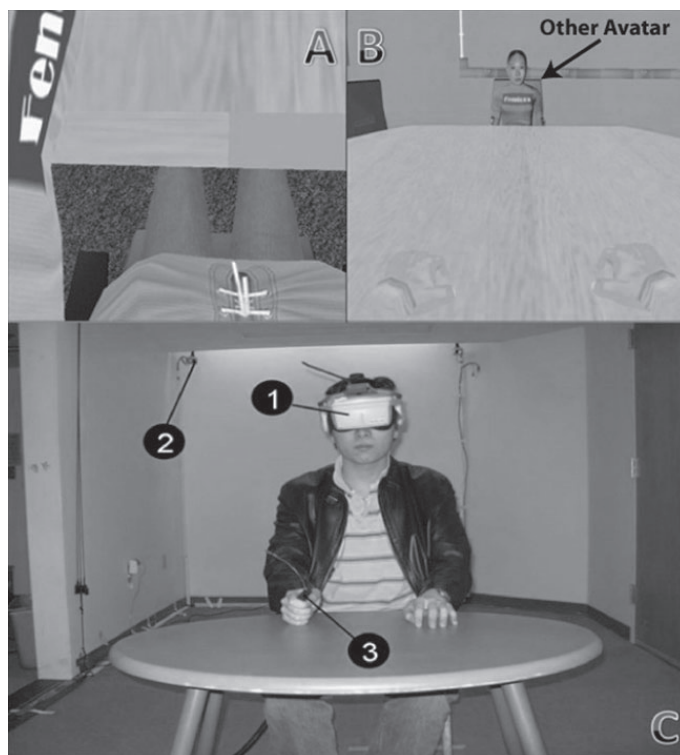
Figure 2 depicts sample screenshots of the virtual world and the experimental setup.

Dependent Measures

Brand Attitude

This measure was taken from Experiment 1.

FIGURE 2
Experimental Setup for Experiment 2



Notes: Panel A displays the avatar embodied by the participant in the virtual reality environment, from the participant's view. Panel B displays the other candidate sitting across the table, from the participant's view. Panel C shows the setup in which the participant dons a head-mounted display (1). An optical marker that the participant holds in his or her hand (3) is tracked by four cameras in the corners of the room (2), providing high-resolution data about the arm movement in the X, Y, Z, space. A rendering machine assimilates these data streams to create the appropriate visual output (i.e., avatar's arm movement) for every move made by the participant's hand.

Brand Association

This measure was taken from Experiment 1 with a choice of either the self- or the other-brand.

Purpose

This was measured and coded in the same way as Experiment 1.

Participants

Participants were recruited from a West Coast university. Eighty students participated (47 male, 33 female; age $M = 21.09$, age $SD = 4.18$), 41 of whom identified themselves as white/Caucasian, 19 as Asian, 12 as African American/black, 6 as Latino(a)/Hispanic, and 2 as "other."

Apparatus

Participants were placed in a high IVE by donning a head-mounted display (HMD) through which they were able to view the stimulus. The HMD was an nVisor SX with dual 1,280 horizontal \times 1,024 vertical pixel resolution panels. Sensing equipment tracked users' motions (e.g., moving their arm) so that a realistic visual depiction of the environment could be updated constantly based on their movements. Vizard 3.0 software was used to assimilate tracking and computer image generation.

Procedure

Participants wore the HMD and entered the virtual world. The virtual setup was a conference room that had a table with chairs at either end. This was replicated in the physical world by setting up a table with a chair. In the laboratory, the participant was guided to sit at this table with his or her arms resting on top, and this physical posture of the participant was matched by his or her avatar in the virtual world.

To allow participants to feel the control they had over their avatar, the researcher took them through simple arm movements (i.e., move arm up and down), during which participants noted their avatar's arm moving in sync with their physical arm. The participant was also encouraged to take note of the other person sitting across from them. The other person was a computer-controlled, same-sex, same-ethnicity avatar. To ensure that the participants noticed the self- and other-brands, they were told to read both of the brands out loud. The interaction lasted for about two minutes and consisted of the other avatar asking the participant generic questions (e.g., about hobbies, hometown, interests, etc.). After the exposure, they were taken out of the virtual world and asked to complete survey questions.

Results

Brand Attitude

A paired *t*-test was run to test the significance of the difference between self and other brand attitudes, comparing the two levels of the within-subjects variable, identity (i.e., self versus other). We ran a one-tailed test because our hypothesis based on findings from Experiment 1 predicted a clear direction of the results. As expected, the difference between identity was significant, $t(79) = 1.95, p < .05, d = .22$, with the brand attitude for the self brand being significantly higher than the brand attitude for the other brand ($M = 2.88, SD = .79$ versus $M = 2.68, SD = .69$). This confirms H4 and replicates the main effect of avatar identity from Experiment 1, implying the robustness of self-endorsing in both high and low IVEs.

Brand Association

Brand association was tested again as an indirect evidence of self-referencing. Of the 80 participants, 64 chose the self-brand, and 16 chose the other-brand. An exact binomial test with the null at .5 was run to confirm that the number of participants who chose the self-brand (i.e., felt higher brand association for the self-brand) was significantly higher than those who chose the other-brand. The result was significant, $\eta^2(64, 80) = 27.61, df = 1, p < .01$, supporting H5 and replicating the influence of self-endorsing on brand association from Experiment 1. This further presents indirect evidence for self-referencing as the underlying mechanism.

Purpose

To test whether correct knowledge of the purpose of the experiment confounded the results due to demand characteristics, brand attitude scores for the self- and other-brands were compared with repeated-measures ANOVA, including purpose as a between-participant factor. Coded responses revealed that a total of eight participants knew the correct purpose of the experiment, whereas 72 of them did not. The interaction between identity and purpose was not significant, $F(1, 78) = 2.05, p > .1$, indicating that knowledge of the experiment's purpose did not influence the significant difference between self- and other-brand attitudes. As in Experiment 1, this result discounts the possibility of demand characteristics.

EXPERIMENT 3

Experiment 3 delved further into the process of self-endorsing within high IVEs by separating identification (i.e., simply assigning a virtual self) from interactivity (i.e., linking physical behavior with virtual behavior). Identification with an assigned avatar is an important concept in this study, as it is a prerequisite for self-referencing (i.e., self-referencing cannot occur without a "self"). Prior studies have shown that participants demonstrate behavioral changes expected of a randomly assigned avatar, regardless of similarity with the physical self (Yee, Bailenson, and Ducheneaut 2009). For instance, a participant wearing an unfamiliar but attractive avatar is more confident in approaching strangers. Similarly, self-endorsing may be effective in our studies because participants identify with their assigned self avatars.

However, the influence of interactivity should be parsed out from the influence of identification because it is a novel factor of high IVE, which yields a higher sense of involvement and better attitude toward the experience compared with traditional media (Edwards and La Ferle 2003). To this extent, the results of Experiment 2 may be driven by participants identifying with the assigned avatar and referencing the avatar

as the self, or alternatively, by the participant interactively controlling the avatar.

Experiment 3 varied interactivity and identification in three separate conditions: participants controlling the avatar identified as the self, controlling the avatar identified as the other, or controlling neither. By doing so, we learn more about the fundamental processes behind the effects from the previous study as well as create a boundary effect to test the limits of self-endorsing. Moreover, an enhanced scale directly measured the degree of self-referencing triggered by self-endorsing.

Hypotheses

In this experiment, we pitted interactivity against identity by controlling the source of interactivity (self, other, none). As identification was a given factor in all of the conditions by explicit assignment of a self avatar, we expected to see different results of self-endorsing in the three interactivity conditions only if interactivity overrode the process of identification. Thus, there were two competing hypotheses for the results of self-endorsing:

H6a: Self-endorsing would lead to higher brand attitude and purchase intention than other-endorsing across all interactivity conditions (identification is more important than interactivity).

H6b: Self-endorsing would lead to higher brand attitude and purchase intention than other-endorsing in only the self-interactive condition (interactivity is more important than identification).

In addition, rather than using brand association as an indirect measure of self-referencing, self-referencing was directly measured using a more elaborate set of questions. In relation to H6, there were also two possibilities of self-referencing:

H7a: Self-endorsing would trigger a higher level of self-referencing than other-endorsing across all interactivity conditions (identification is more important than interactivity).

H7b: Self-endorsing would trigger a higher level of self-referencing than other-endorsing in only the self-interactive condition (interactivity is more important than identification).

Finally, we aimed to confirm directly that self-referencing mediates the relationship between different methods of endorsing and brand attitude:

H8: Self-referencing would mediate the relationship between endorsing and brand attitude.

Design

The experimental setup was identical to Experiment 2. Two brands from Experiment 1 were chosen—this time, Nanaco and

Ternio—to ensure that specific brand names were not confounding our results. The only difference in design was the inclusion of a between-subjects condition—interactivity. Participants were randomly assigned to three conditions of interactivity: self-interactive (participants controlled the right arm of the self avatar), other-interactive (participants controlled the right arm of the other avatar), and no-interactivity (participants had no control over the avatars). To further reduce possible confounds of demand characteristics, we implemented a cover story that explained the purpose of the experiment as testing the recall of another person's information shared during a virtual interaction.

Dependent Measures

Manipulation Check

A four-item manipulation check confirmed the successful operationalization of interactivity. Two fully labeled five-point Likert scale items asked participants to note how much they felt in control of the self avatar and how much they felt the self avatar moved in sync with the physical body (control self). Two items asked the same question on interactivity about the other avatar (control other).

Brand Familiarity

To check that the brand names used in the experiment were unfamiliar to the participants, an item asked participants whether they were familiar with the brands before the experiment. None of the participants indicated prior familiarity with the brands.³

Brand Attitude, Purchase Intention

These measures were taken from Experiments 1 and 2.

Self-Referencing

Five-items were taken from the self-referencing scale developed by Debevec (1995), which is an enhancement of the self-referencing scale used by Debevec and Romeo (1992). Items measured how much the brand made participants think about personal experiences with shirts, the extent to which the brand made participants focus their thoughts on themselves, how personally relevant the brand was to the participants, how much the brand helped participants picture themselves wearing the shirt, and how much the brand helped participants picture themselves giving the shirt to a friend.

Participants

Participants were recruited from a West Coast university. Seventy-one students participated (25 male, 46 female; age

$M = 20.51$, age $SD = 1.98$). Thirty-one identified themselves as white/Caucasian, 13 as Asian, 11 as African American/black, 10 as Latino(a)/Hispanic, and 6 as "other."

Apparatus

The same apparatus from Experiment 2 was used.

Procedure

The procedure was identical from Experiment 2. To allow participants to feel the control (or no control) they had over the avatar, the researcher took them through simple arm movements. In the self-interactive condition, participants noted their avatar's arm moving in sync with their physical arm; in the other-interactive condition, participants saw the other avatar's arm moving in sync with their physical arm; and in the no-interactivity condition, participants saw that neither of the avatars' arms moved in sync with their physical arm. After the exposure, they were taken out of the virtual world and asked to complete survey questions.

Results and Discussion

Manipulation Check

To confirm the successful manipulation of interactivity for each condition, a univariate ANOVA was conducted first with control self as the dependent variable and interactivity as the independent variable. The test was significant, $F(1, 68) = 13.70$, $p < .01$, $\eta^2 = .29$. Post hoc analysis using Tukey's HSD (Honestly Significant Difference) method indicated that participants in the self-interactive condition felt significantly more in control of the self avatar ($M = 2.91$, $SD = .93$) than participants in the other two conditions (other-interactive: $M = 1.89$, $SD = .93$; no-interactivity: $M = 1.68$, $SD = .73$).

The same test was conducted for control other as the dependent variable, yielding a significant result as well, $F(1, 68) = 28.02$, $p < .01$, $\eta^2 = .45$. Post hoc analysis using Tukey's HSD method indicated that participants in the other-interactive condition felt significantly more in control of the other avatar ($M = 2.61$, $SD = .66$) than participants in the other two conditions (self-interactive: $M = 1.28$, $SD = .56$; no-interactivity: $M = 1.40$, $SD = .76$).

Means and standard difference for other dependent measures are given in Table 2.

Brand Attitude and Purchase Intention

We ran a repeated-measures ANOVA with brand attitude as the dependent variable, identity (self versus other) as the

repeated-measures independent variable, and condition as the between-subjects factor. The main effect of identity was not significant ($F < 1$, $\eta^2 = .004$). The interaction between identity and condition was significant, $F(1, 68) = 5.24$, $p = .01$, $\eta^2 = .13$. Paired t -tests between the conditions showed that the attitude toward the self-brand was significantly higher than the other-brand in the self-interactive condition, $t(22) = 2.11$, $p < .05$. At the same time, brand attitude for the other-brand was significantly higher than the self-brand in the other-interactive condition, $t(22) = -1.96$, $p = .06$, supporting H6b and confirming identification without interactivity as a boundary condition. It should be noted that this interaction was mainly driven by the difference in brand attitude toward the self-brand between conditions. There were no mean differences for the other-brand across conditions.

For purchase intention, as seen in Table 2, all participants in the other-interactive condition gave the lowest possible ratings for the self-brand. Because there was no variance in responses among participants in this condition, a nonparametric test based on rank order with the χ^2 distribution as laid out by Brunner and Puri (2001) was conducted in the place of an ANOVA. The analysis of variance-type statistic (ATS) value derived with this method is equivalent to the F -test with infinity for the numerator degrees of freedom.

Results indicated that the main effects of condition (ATS = 2.62, $p > .05$) and identity (ATS = .72, $p > .05$) were not significant. Again, the interaction between identity and condition was the only significant effect, $ATS(1.91, \text{infinite}) = 7.47$, $p < .01$. Rank means showed that in the self-interactive condition, the self-brand ($M_r = 76.05$) was ranked higher than the other-brand ($M_r = 69.04$), and that in the other-interactive condition, the self-brand ($M_r = 50.00$) was ranked lower than the other-brand ($M_r = 73.50$) in the other-interactive condition. Pairwise comparisons confirmed that the interaction was driven by the other-interactive condition (condition 1 versus condition 2: $F[1] = 10.54$, $p < .01$; condition 1 versus condition 3: $F < 1$, $p > .1$; condition 2 versus condition 3: $F[1] = 9.77$, $p < .01$). This further supports H6b and implies that active control of a representation (i.e., interactivity) is more important than simple assignment of one in terms of creating brand preference such as attitude and purchase intention.

In particular, every participant in the other-interactive condition expressed unanimously negative purchase intentions with regard to the self-endorsed brand. This may be interpreted as the other-brand gaining higher attitude and purchase intention than the self-brand, but at the same time, implies a backfire of self-endorsing in the other-interactive condition, confirming that identification without interactivity with the self avatar is a boundary condition for self-endorsing.

TABLE 2
Means and Standard Deviations of Brand Attitude, Purchase Intention, and Self-Referencing in Experiment 3

Identity	Conditions			
	Self-interactive	Other-interactive	No-interactivity	Total
Brand attitude				
Self-brand	1.77 (.56)	1.38 (.31)	1.52 (.48)	1.56 (.49)
Other-brand	1.57 (.48)	1.61 (.67)	1.58 (.51)	1.58 (.55)
Purchase intention				
Self-brand	1.52 (.59)	1.00 (.00)	1.44 (.65)	1.32 (.55)
Other-brand	1.39 (.50)	1.43 (.73)	1.28 (.46)	1.37 (.57)
Self-referencing				
Self-brand	1.90 (.83)	1.63 (.83)	1.48 (.57)	1.66 (.76)
Other-brand	1.58 (.61)	1.51 (.64)	1.42 (.42)	1.50 (.56)

Self-Referencing

We ran a repeated-measures ANOVA with self-referencing as the dependent variable and the same repeated-measures independent variable and between-subjects factor. The main effect of identity was significant, $F(1, 68) = 8.08, p < .01, \eta^2 = .11$, with higher self-referencing felt for the self-brand than for the other-brand across conditions. This supports H7a. The interaction between identity and condition was not significant ($F < 1, \eta^2 = .05$).

The effect size of the interaction was worth a closer inspection, however. Paired t -tests between conditions revealed that the main effect of identity was mainly driven by the self-interactive condition, $t(22) = 3.70, p < .01$. But self-referencing between self- and other-brands did not differ significantly in the other-interactive condition. Thus, although identification alone may seem sufficient to trigger higher levels of self-referencing, closer inspection yields that only the self-interactive condition, in which participants had both identification and interactivity with the self avatar, was the driving force behind the results.

Mediation Analyses

Following the procedures for testing mediation with within-subjects designs proposed by Judd, Kenny, and McClelland (2001), we first tested each measure of self- and other-brand attitude scores by regressing self-referencing on the attitude scores. The level of self-referencing was significantly related to brand attitude scores—self-brand, $t(69) = 6.83, p < .01$; other brand, $t(69) = 5.28, p < .01$ —with higher self-referencing associated with higher attitude scores.

Next, the attitude score difference (A_D) between self- and other-brands was regressed on the sum (SR_S) and difference

(SR_D) of the self-referencing measures of self- and other-brands, while the sum of self-referencing scores was centered to aid interpretation: $A_D = -.08 - .03 SR_S + .44 I_D$. Again, only I_D was significant, $t(68) = 3.39, p < .01$, indicating that self-referencing mediated the effect of self-endorsing on brand attitude. This confirmed H8.

Based on the results of the self-referencing measure, it can be said that the mediation of self-endorsing and brand attitude by self-referencing is only relevant in the self-interactive condition where interactivity was paired with identification. In the other-interactive condition, interactivity without identification failed to trigger the true process of self-endorsing mediated by self-referencing, despite higher attitude and purchase intention for the other-brand than the self-brand. Thus, identification alone via assignment of a self avatar is not sufficient and must be paired with interactivity for effective self-endorsing.

GENERAL DISCUSSION

High and low immersive virtual environments offer optimal flexibility and control, and may become the platform of the future for advertisements and for scientific investigations of consumer psychology. The current study empirically confirmed that self-endorsing, a new form of advertising strategy that presents the self as an endorser by using the brand, is an effective mode of persuasion. Furthermore, the three experiments incrementally demonstrated that the favorable brand attitude and purchase intention triggered by self-endorsing is mediated by the self-referencing effect. Our results contribute to the theoretical advancement and practical applications in the field of advertising and psychology largely in the following ways.

First, Experiment 1 demonstrated that avatars need to look like the consumer to trigger high brand attitude and purchase

intention from self-endorsing and that simple photographs can induce these effects. As avatars refer to representations of humans, photographs are also avatars with high form similarity but low behavioral similarity, by nature of static and low-immersive virtual environments (Bailenson et al. 2008). This extends prior findings that similarity in facial features leads to favorable attitude toward others (Bailenson et al. 2008).

Experiments 2 and 3 were conducted in high-immersive virtual environments to replicate the results of the first experiment and to confirm that identification without interactivity serves as a boundary condition of self-endorsing. Also, interactivity alone led to higher brand attitude and purchase intention, but failed to involve mediation by self-referencing. Consequently, favorable brand attitudes triggered by interactivity or self-endorsing are results of two different processes. For the full effect of self-endorsing to take place in high-immersive virtual environments, identification or interactivity alone are not sufficient and must be paired. Based on the collective evidence from all three experiments, we may conclude that physical similarity with the consumer or identification paired with interactivity is needed to accrue the benefits of self-endorsing, depending on the immersive nature of the virtual environment.

Implications from these results offer potential for advertisers that goes above and beyond the rudimentary results found in controlled laboratory experiments. The self-endorsed advertisement in these experiments were strictly controlled for scientific investigation and may come off as a gimmick, but can be applied in countless other ways in practice. Considering the explosive growth of virtual platforms such as Second Life, advertisers may offer consumers the opportunity to use products virtually. By seeing the self avatar (identification) use a product and its brand (interactivity), users are likely to cultivate more favorable brand attitude and purchase intention via self-endorsing than by seeing other avatars use other products and brands.

Finally, the concept of self-endorsing presented here is based on identifying with an assigned self avatar and seeing it use a brand. If earlier studies demonstrated that self-referencing can be triggered by arbitrary categorization of self-relevant and brand-relevant words (Perkins, Forehand, and Greenwald 2005), the current experiments showed that *seeing* the self avatar arbitrarily linked with a brand is even more powerful than these text manipulations. In addition, self-endorsing implies that the link between self and brand may not be as elaborate as researchers once thought. In fact, earlier research on self-referencing has noted that self-referencing aids information acquisition and recall because the self is a well-developed and often-used construct with a superior organization scheme (Symons and Johnson 1997). It is likely that when information is referenced with the self, the familiarity of the mental schema frees up cognitive resources to focus more on the brand.

These experiments shed light on the process of self-endorsing and the mediating role of self-referencing, but leave room for further investigations. Because these studies explored the visual effect of the self's virtual representation, advertisement stimuli were strictly controlled for other persuasive factors such as message content regarding product benefits. It would be interesting to study whether the strength of argument of product benefit messages will influence user decisions in the context of self-endorsing. Also, future research should employ manipulation checks of stimuli presented through different media to eliminate the possibility that photo self-endorsing was effective simply because it was a stronger manipulation than text self-endorsing. Moreover, ethnic differences have been found to influence advertisement attitudes and purchase intentions, and self-referencing mediated these ethnicity effects (Martin, Lee, and Yang 2004). In the same way, future research should explore the effect of ethnicity on self-endorsing.

In sum, self-endorsing is a perhaps instinctive process that triggers favorable attitude toward products and brands associated with a virtual representation that an individual identifies as the self and has active control over. This effect can also take place in low-immersive virtual environments such as online Web sites with limited interactivity when the avatar looks like the self. When it becomes a matter of "your" word against "mine" (even if it is virtual), I win, as long as I can see and control myself.

NOTES

1. Dependent variables were tested again, including the order of stimuli presentation as a factor to test the possibility of demand artifacts influencing our results. No significant results were observed in these tests, offering evidence against demand characteristics.

2. Twenty out of the 80 participants in Experiment 1 were paid in cash, whereas the rest received class credit for participation. The dependent variables were tested again to check whether a different form of payment affected the results. No significant results were observed, confirming that the different form of payment did not confound results. All participants in Experiments 2 and 3 received class credit for participation.

3. To test the influence of vividness of experience on self-endorsing, 16 items adapted from presence scales used in previous studies (Bailenson and Yee 2007; Nowak and Biocca 2003) assessed the subjective measure of presence. Presence levels did not differ significantly across conditions, however, and the results are not discussed further.

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