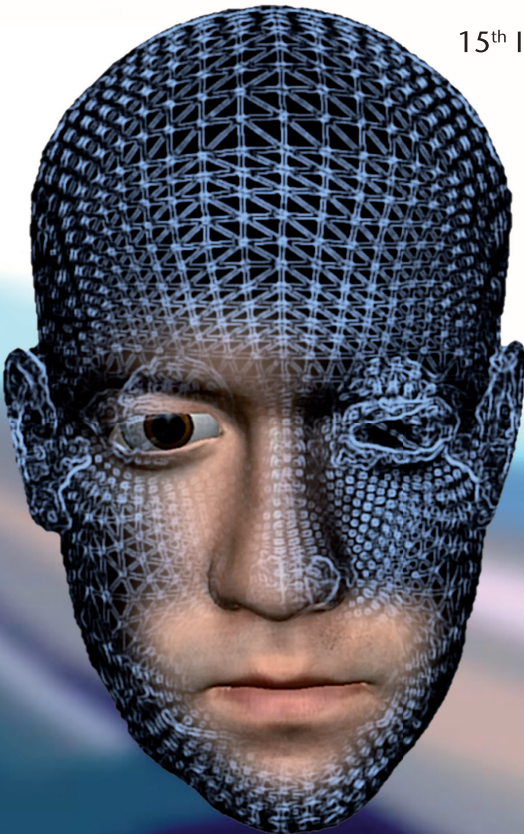


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Challenging Presence

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The Spawn of Presence: Examining the Relationship between Presence and Self-Presence

Rabindra Ratan¹ & Young June Sah¹

Abstract. The concept of presence has been under intense study and has led to, among other things, the identification of its various dimensions. One of these dimensions, self-presence, refers to the psychological connection between an avatar user and the avatar. This study investigates the relationship between presence and self-presence in order to ascertain the value of adding the concept of self-presence as a separate and distinct construct in evaluating media use effects. Drawing upon a self-presence framework which is comprised of three subfactors (body, emotions, and identity) of user-avatar connections (Ratan, 2012), this study tests for convergent and discriminant validity between presence and these subfactors of self-presence. In an experiment, participants played a video game and reported presence and self-presence in a post-questionnaire. The results suggest that presence was positively related to two of the three subfactors of self-presence (body and emotion), but also that all three subfactors are distinct from presence. This indicates that the subfactors of self-presence have unique value in understanding the experience of avatar use in virtual environments and video games. Thus, this study calls for the consideration of the self-presence framework as an additional and distinct construct in future investigations of media use effects.

Keywords. Presence; self-presence; avatar-body integration; convergent validity; discriminant validity

Introduction

As media have become rich in their modalities and increasingly interactive in their operations (Biocca, 1997), the concept of presence has provided fruitful insights into the understanding of media use effects (Ravaja et al., 2006; Regenbrecht, Schubert, & Friedmann, 1998; Tamborini & Skalski, 2006). A large volume of studies has conceptualized and investigated the practical importance of presence (c.f., Biocca, 1997; Lee, 2004; Lombard & Ditton, 1997; Riva, Waterworth, & Waterworth, 2004), and a number of scholars have offered exhaustive typologies of presence (e.g., Biocca, 1997; Lee, 2004; Lombard & Ditton, 1997; Slater, 1999). Scholars have furthermore focused on a particular dimension of presence, self-presence, for its theoretical significance in understanding the effects of avatar use (e.g., Ratan, 2012), and examined the practical implications of harnessing such effects in interactive media (e.g., Fox, Bailenson, & Binney, 2009). Given the rich body of knowledge already generated in this new field, we can now advance toward a deeper understanding of the concepts of presence and self-presence. Specifically, we can investigate whether these concepts are unique and distinct enough to contribute additional approaches to evaluating media use effects.

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An empirical examination of the relationship between the concepts of presence and self-presence should show these two concepts to be positively related, given their common origin, but it should also show them to be distinct, given their differing theoretical foci. This study tests for such relatedness and distinction and draws upon a three-factor framework of self-presence (Ratan, 2012).

Being in the Game or Being the Avatar: From Presence to Self-Presence

Video games and virtual worlds provide an immersive experience. Players often do not realize the artificiality of a game environment and experience the virtual environment as if it were real. Moreover, when the players are represented by anthropomorphic representations in the virtual environment (i.e., avatars), the players may experience the avatar as part of themselves (or vice versa) in the game environment. How do these two seemingly similar experiences differ from each other? Previous studies on presence introduced the distinction between the psychological experience of being in the virtual environment (presence) and the psychological experience of using the avatar within the environment (self-presence). Biocca (1997) and Lee (2004) indicated that the concept of self-presence describes a psychological state in which an individual engages with an avatar as if it were part of or a replacement for the individual. In other words, as the term indicates, self-presence is the experience of the self as present in an avatar. In effect, the distinction between presence and self-presence is that the former involves engagement with the virtual environment as a whole and the latter, engagement with the avatar.

Although the concept of self-presence is based in thorough theoretical foundations, neither Biocca (1997) nor Lee (2004) offered much guidance for operationalization, and so subsequent research has provided incomparable results (c.f., Behm-Morawitz, 2013; Jin & Park, 2009; Ratan, Santa-Cruz, & Vorderer, 2007). A recent explication attempts to address this problem and offers a self-presence framework founded on three subfactors (Ratan, 2012) which are based on the neurological construct that defines three distinct, though interrelated, components of the self: body, emotions, and identity (Damasio, 1994, 1999). From this neuroscientific perspective, the body (or body schema) is an individual's perception of what constitutes her physical body as separate from her environment; emotions are an individual's awareness of the body's physiological responses to its environment (e.g., arousal); and identity is an individual's collective memory of her actions and emotions. Self-presence is thus the extent to which an avatar 1) is perceived as integrated with an individual's body schema (body-level self-presence), 2) causes emotional responses through interactions with the virtual environment (emotion-level self-presence), and 3) reflects the individual's identity outside of the virtual environment (identity-level self-presence; Ratan, 2012). Using the new self-presence framework, Ratan (2012) introduced the Self-Presence Questionnaire, a scale to measure the three subfactors. Body-level self-presence questions ask about the extent to which a mediated self-representation is integrated into body schema. For example, "When using your avatar, to what extent did you feel like you could reach into the virtual environment through your avatar?" Emotion-level self-presence questions gauge the extent of emotional responses to virtual interactions. For example, "When scary events happened to your avatar, to what extent did you feel afraid?" Identity-level self-presence questions measure how strongly one aspect of a self-representation is related to another aspect of the individual's identity. For example, "To what extent is your avatar's appearance related to some aspect of your identity?" The full questionnaire can be found in the Appendix.

Using the scale, previous research has found the three subfactors – body, emotion, and identity – to be distinct from but interrelated with each other (Ratan & Hasler, 2010). Other research has provided some support for the construct validity of the individual facets. For example, identity-level self-presence has been positively associated with avatar customization (Ratan & Hasler, 2011), while body-level self-presence has been associated with playing fast-paced first person shooter games compared to slower-paced roleplaying games (Ratan, 2011a).

While the previous studies documented the distinctiveness across the subfactors of self-presence, no study has investigated the relationship between presence and the subfactors of self-presence. When developing a new concept, it is important to establish that the concept is similar to other concepts that are theoretically related (i.e., convergent validity), but also distinct from such other concepts sufficiently enough to justify the use of the new concept (i.e., discriminant validity). Thus, the present study aims to test for the convergent and discriminant validity between presence and the three subfactors of self-presence. As described above, the concept of presence relates to the psychological experience of a virtual environment as a whole, while self-presence relates to the experience of using an avatar within the virtual environment. Given the similar origin of these two concepts and further, that the avatar and the virtual environment are inherently linked in that an avatar cannot be used outside of a virtual environment, the two concepts are likely to be related. However, there are many potential elements of the avatar-use experience that could be independent of the experience within the larger virtual environment. For example, a virtual environment may be highly realistic, and thus induce a strong sense of presence, but the user may interact with the avatar in ways that are perceived as more or less natural (e.g., via a symbolic or gestural interface) regardless of the realism of the environment. Thus, we expect that presence and self-presence are experienced similarly but also distinctly, as articulated in the following two hypotheses:

Hypothesis 1: A test of convergent validity between the concepts of presence and self-presence will find that presence is positively related to each subfactor of self-presence.

Hypothesis 2: A test of discriminant validity between the concepts of presence and self-presence will find that presence is distinct from each subfactor of self-presence.

Method

Design and Sample

The experiment described here is part of a dissertation project by the first author that included some elements that are not relevant to the examinations in this article. Specifically, the experimental conditions in this 2 (avatar customization: customized vs. generic) x 2 (avatar gender: male vs. female) between-subjects design are not directly relevant to the theoretical examinations in this article, but they did facilitate variance in the participants' experience of the self-presence subfactors. Further, the participant pool was restricted to right-handed females due to a research question about gendered stereotypes that is not relevant to the current examination. The participants were 64 undergraduate students from a large western university between the ages of 18 and 28 ($M = 19.83$, $SD = 2.07$).

Procedure and Materials

Upon entering the lab, participants were instructed to read and sign an informed consent form. They were then asked to complete a short demographic survey. After that, they were introduced to *Swordplay* in *Wii Sports Resort*, a children's sword dueling game in which the player swings the controller ("Wii mote") to control a blunt sword and to knock an opponent off a platform. This game was chosen because it provides cues that likely induce self-presence, such as a natural control interface, a hybrid first- and third-person perspective, and replays of the avatar at the end of each round, all of which are useful reminders of the avatar representing the participants in the video game.

Before playing the video game, all participants spent up to five minutes creating an avatar. Those assigned to the female-avatar condition were told to make the avatar similar to themselves,

whereas those in male-avatar condition were told to build the avatar to represent a male version of themselves. Furthermore, if the participant was in the customized avatar condition, she used the avatar she customized in the game. If the participant was in the generic avatar condition, she was given a generic avatar matched to her gender condition to play the game. The participants then played the video game for about 10 minutes and then completed a post-questionnaire.

Survey Measures

The post-questionnaire included measures of presence and self-presence (see Appendix). The presence measure was taken from an existing scale (Fox et al., 2009), though only seven of the ten original items were used due to high theoretical similarity between the three unused items and the present operationalization of self-presence (e.g., "To what extent do you feel you embodied the avatar?"). Responses were given on a 5-point scale. The seven items combined into a composite measure ($\alpha = .87$) for analysis ($M = 2.55$, $SD = 0.71$). The self-presence measure was taken from the questionnaire mentioned previously (Ratan, 2012). Because self-presence is a new concept and the questionnaire items relatively untested, the items representing each subfactor of self-presence were chosen based on a principal-axis factor analysis with an oblique rotation (given the expected theoretical similarity between the subfactors; Kim & Mueller, 1978). The items that loaded poorly for each given factor or cross-loaded between factors (using .6 in the Structure matrix as the threshold) were removed, leaving 13 items that formed three distinct factors. These factors were consistent with the body, emotion, and identity subfactors of self-presence and had Eigenvalues of 4.71, 1.37, and 2.41, respectively. Tables 1 and 2 contain the pattern and structure matrices, respectively. Based on these results, composite measures of the individual subfactors of self-presence were created using only the items that were retained in the factor analysis. Cronbach's alpha for the body-level self-presence measure was .89, for emotion-level self-presence was .77, and for identity-level self-presence was .80.

Results

The results illustrate that the concepts of presence and self-presence are closely related but also distinct psychological states. A zero-order one-tailed Pearson correlation analysis indicated that the measure of presence was positively related to body-level self-presence, $r(64) = .43$, $p < .01$, and emotion-level self-presence, $r(64) = .43$, $p < .01$, but not to identity-level self-presence, $r(64) = .14$. Thus, Hypothesis 1 (convergent validity between presence and the self-presence subfactors) was partially supported. Discriminant validity (Fornell & Larcker, 1981) between presence and the three subfactors of self-presence was examined by comparing the squared correlations between the given pairs of constructs to the average variance extracted (AVE) for these pairs of constructs, computed with a path analysis software (Ringle, Wende, & Will, 2005). The AVE values for presence and body-level self-presence (0.53 and 0.78, respectively), for presence and emotion-level self-presence (0.53 and 1.06, respectively), and for presence and identity-level self-presence (0.41 and 0.91, respectively) were higher than the squared correlation between the two constructs in each pairing (0.36, 0.19, and 0.02, respectively). Thus, each subfactor of self-presence was distinct from presence, supporting Hypothesis 2 (discriminant validity between presence and the self-presence subfactors).

Discussion

This study examined the relationship between presence and the three subfactors of self-presence during avatar use within a children's sword-fighting video game with gestural controls. The correlation analyses supported convergent validity between presence and both body- and emotion-level self-presence, but not with identity-level self-presence.

Table 1. Pattern Matrix

	Factor		
	1	2	3
BODY_arm_stretched	0.84	-0.11	0.01
BODY_reach_into	0.79	-0.04	0.04
BODY_extension_of	0.69	0.03	0.08
BODY_part_of	0.65	0.19	0.16
BODY_hand_inside	0.62	0.15	0.09
EMOTION_arousing	0.11	-0.01	0.74
EMOTION_scary	0.13	0.04	0.56
EMOTION_sad	0.31	-0.06	0.51
IDENTITY_skin_color	-0.20	0.72	0.34
IDENTITY_race	-0.12	0.71	0.22
IDENTITY_clothing	0.03	0.69	-0.08
IDENTITY_appearance	0.29	0.68	-0.18
IDENTITY_name	0.14	0.65	-0.16

Table 2. Structure Matrix

	Factor		
	1	2	3
BODY_arm_stretched	0.82	0.08	0.29
BODY_reach_into	0.80	0.15	0.32
BODY_extension_of	0.75	0.36	0.43
BODY_part_of	0.73	0.20	0.34
BODY_hand_inside	0.69	0.30	0.34
EMOTION_arousing	0.37	0.14	0.77
EMOTION_scary	0.34	0.17	0.61
EMOTION_sad	0.48	0.09	0.61
IDENTITY_skin_color	0.08	0.74	0.39
IDENTITY_race	0.12	0.72	0.30
IDENTITY_clothing	0.38	0.72	0.04
IDENTITY_appearance	0.15	0.68	0.05
IDENTITY_name	0.22	0.65	0.00

Further, the analyses supported discriminant validity between presence and all three subfactors of self-presence. Together, these results support the larger construct validity of self-presence and suggest that the subfactors of self-presence have unique value in understanding the experience of using virtual environments and video games.

An investigation of the innate characteristics of the subfactors of self-presence sheds light on why presence has convergent validity with body- and emotion-level self-presence but not with identity-level self-presence. Body-level presence describes the feeling of an avatar as an extension of the participants' physical body (e.g., "When playing the game, how much do you feel like your avatar is an extension of your body within the game?") or as a window projecting the participants' bodily operation to the game environment (e.g., "When using your avatar, to what extent do you feel like you can reach into the game through your avatar?"). The more the players experience body-level self-presence, the more they feel their body or parts of the body reside in the game environment. As a result, the less they are likely to experience the game as a non-mediated context and a more natural environment. Thus, given that presence has been described as the "perceptual illusion of non-mediation" (Lombard & Ditton, 1997, p. 9), it follows that body-level self-presence and presence are positively related.

Also, emotion-level self-presence describes the extent to which the players experience emotional responses that are consistent with the avatar's interactions (e.g., "When sad events happen to your avatar, to what extent do you feel sad?").

Similar to the reasoning with body-level self-presence, if participants perceive the game as non-mediated, they would experience the events that happen to the avatar as though they were happening to themselves and thus would show stronger emotional responses to the events (i.e., emotion-level self-presence). Interestingly, however, presence and identity-level self-presence (e.g., "To what extent is your avatar's appearance related to some aspect of your personal identity?") were not related. This suggests that people may feel presence regardless of whether the avatar reflects their identity, or conversely, may imbue the avatar with characteristics that reflect identity regardless of whether they experience presence in the environment. This can be explained in that there are many popular presence-inducing virtual environments that do not allow any avatar customization (e.g., video games with existing character identities), and further, there are many popular media that allow users to convey their identities but do not provide any presence-inducing technologies (e.g., social networking sites). This suggests that it may not be useful to think of identity-level self-presence as a subfactor of self-presence but instead as a construct that is more closely related to identification and customization. Taken together, these results imply that presence is not related to the abstract, conceptual identity-level connection to the avatar, but to perceptual embodiment afforded by body-level and emotion-level responses in a virtual environment or video game.

In addition to supporting convergent validity, the results supported the discriminant validity between presence and the three self-presence subfactors. This is most notable for the body- and emotion-level subfactors of self-presence, given that they were both found to be positively related to presence. As they are also distinct from presence, these results signify the importance of considering these self-presence subfactors in presence research. In previous studies, presence or unidimensional self-presence have been employed as a sole approach to capturing the subjective experience caused by avatar use in a virtual environment. This approach can now be deepened to more comprehensively investigate the ways in which the virtual environment and the avatar may affect the experience both similarly and distinctly.

Considering that currently, interactive media employing avatars (e.g., video games or virtual reality) adopt a wide range of strategies to induce strong media effects (e.g., customization, gestural interfaces), important benefits may arise from understanding the unique and distinct effects of presence and self-presence with its subfactors. For example, it seems reasonable to assume that gestural game interfaces (e.g., motion controllers) are likely to increase self-presence at the body-level, given that such control over an avatar is more natural and/or likely to engage the user's whole body in the experience. Future research that examines such effects may benefit by considering the role of presence and the three subfactors simultaneously. Alternatively, given that these constructs were found to be distinct, such research could focus on the role of a single subfactor of self-presence and isolate the associated effects. In such cases, it would be important to note the origins of the construct in the frameworks of self-presence and presence, but may also be valuable to divest the association with these origins so that the concept could be more deeply theorized on its own. For example, the role of body-level self-presence in the use of gestural game interfaces may be largely distinct from presence and the other subfactors of self-presence. By reinforcing this distinction, perhaps by changing the name of the concept from body-level self-presence to avatar-body integration, research may discover new elements of this construct that are largely irrelevant to the other subfactors of self-presence.

All of these implications should be treated with some caution, given that they are drawn from a single study that is not free of limitations. Most notably, the population sample only included females.

This hinders the ability to generalize the conclusions, especially because previous research has found differences in reporting of self-presence between females and males (Ratan, 2011b). But even if the external validity of this study is in question, this study's support of the construct validity of self-presence (via convergent and discriminant validity) is consistent with previous research on self-presence in other types of mediated environments (e.g., Ratan & Hasler, 2011), and thus suggests that the relationships found here between presence and self-presence may be similar in other environments. In order to test this claim, future research that includes measures of both presence and self-presence should also check for and report both convergent and discriminant validity.

In conclusion, this study contributes to an understanding of the larger concept of presence by examining its relationship with the concept of self-presence which is expanded to include its three subfactors. The results indicate that the two concepts are similar, which corroborates their similar origins, but also distinct. This suggests that research that includes presence as a construct of interest may clarify uncertain effects and yield deeper insights by also considering the self-presence framework. In other words, this study calls for the inclusion of the self-presence and its subfactors in future investigations of the effects of playing video games or using virtual environments, for media that both induce some amount of presence and facilitate avatar use.

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Appendix

Presence Measure (adapted from Fox, Bailenson, & Binney, 2009)

1. To what extent were you involved with the video game environment?
2. To what extent did you feel surrounded by the video game environment?
3. To what extent did the Mii seem real?
4. To what extent did you feel immersed in the video game environment?
5. To what extent did you feel like you were inside the video game environment?
6. To what extent did it feel like you visited another place?
7. How much did the video game environment seem like the real world?

Response options for all: [not at all/somewhat/moderately/very/extremely]

Self-Presence Questionnaire (Adapted from Ratan, 2012)

Body-Level Self-Presence

1. When playing the game, how much do you feel like your avatar is an extension of your body within the game?
2. When playing the game, how much do you feel your avatar is a part of your body?
3. When using your avatar, to what extent do you feel like you can reach into the game through your avatar?
4. When using your avatar, to what extent do you feel like your arm is stretched into the game through your avatar?
5. When playing the game, to what extent do you feel like your hand is inside of the game?

Response options for all: [not at all/somewhat/moderately/very much/absolutely]

Emotion-Level Self-Presence

1. When sad events happen to your avatar, to what extent do you feel sad?
2. When scary events happen to your avatar, to what extent do you feel afraid?
3. When arousing events happen to your avatar, to what extent do you feel aroused?

Response options for all: [not at all/somewhat/moderately/very/extremely]

Identity-Level Self-Presence

1. To what extent is your avatar's appearance related to some aspect of your personal identity?
2. To what extent does your avatar's name represent some aspect of your personal identity?
3. To what extent is your avatar's race related to some aspect of your personal identity?
4. To what extent is your avatar's clothing related to some aspect of your personal identity?
5. To what extent did your avatar's skin color represent some aspect of your personal identity?

Response options for all: [not at all/somewhat/moderately/very much/absolutely]