Presence Theory

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Presence is arguably as old as humanity, but it drew formal scholarly attention beginning in the 1970s, and that attention has expanded rapidly as technology has evolved since then. The International Society for Presence Research defines presence, a term shortened from telepresence, as

> a psychological state or subjective perception in which even though part or all of an individual's current experience is generated by and/or filtered through human-made technology, part or all of the individual's perception fails to accurately acknowledge the role of the technology in the experience. Except in the most extreme cases, the individual can indicate correctly that s/he is using the technology, but at *some level* and to *some degree*, her/his perceptions overlook that knowledge and objects, events, entities, and environments are perceived as if the technology was not involved in the experience. (International Society for Presence Research, 2000)

Although there are a large number of variations in the literature, and some scholars use the term presence to refer to an objective property of people or objects (i.e., whether they are present or not) or to experiences unrelated to technology (see Lombard & Jones, 2015, for a detailed review), this is an inclusive definition of presence as telepresence. While much of the scholarly focus has been on the illusions provided by virtual, augmented, and mixed reality, by robotics, and by other technologies that are relatively unavailable to the public, presence experiences are common. They occur when we read a book or watch a TV program or film and get lost in the world and people of the story; when we play a videogame or go on a ride at a theme park and feel like we're part of the fictional world; when we see certain paintings and photographs and are convinced they're "real"; when we use computers, interactive toys, cars, and other machines and treat them as if they have their own personalities and will; when we use a telephone, videoconferencing services such as Facetime and Skype, or high-bandwidth, room-sized telepresence systems and feel as if we're actually with the people in other locations; and in many other contexts.

While scholars have identified many types of presence, the most prominent types are spatial presence, in which mediated environments are perceived as nonmediated, and social presence, in which mediated actual or artificial social entities are perceived as being present.

Technology and content creators are designing, and we are encountering, presence experiences in an increasingly wide set of contexts including entertainment, education and training, business, health, journalism, art, exploration, accident and disaster rescue, military conflicts, politics, social activism, and many others. Most of the

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experiences are enjoyable or at least efficient, and those that are uncomfortable often have other benefits, such as new understanding of unpleasant realities. In large part because they involve a degree of misperception, some presence experiences also raise profound ethical issues. And the technologies and associated products represent a huge financial investment by nations, businesses, and individuals. So it is important for researchers to better understand what exactly presence is, how it occurs, and how it can and should be used to affect us.

Although presence theory has evolved considerably and continues to do so, it is at a relatively early and fragmented stage and requires additional development and testing by researchers. Rather than a criticism, this represents an exciting challenge.

Theoretical frameworks for spatial presence

Theoretical frameworks that account for spatial presence range from the simple *two-pole and three-pole models* to the detailed and complex *measures, effects, conditions* model and the *capacity limited, cognitive constructionist* model. Steuer's (1992) sensory model of presence was the first widely applied framework, while the attentional model of Draper, Kaber, and Usher (1999) was the first to focus on the integration of work from cognitive psychology. In addition, the *focus, locus, sensus* and *layers of presence* models take the broadest approach to presence, accounting not only for how mediated environments are perceived but also for how we come to feel present in nonmediated reality.

Two-pole model and three-pole model

As Biocca (2003) pointed out, the assumptions in early presence research were that media users are "present" in one of two spaces: their actual physical space or a technology-created, virtual one. The two-pole model, which separates the physical and the virtual space, is a highly accessible approach through which researchers can start thinking about presence. But, although its simplicity is a strength, the model has limited value since it does not capture or explain the complex psychological responses of people experiencing spatial presence.

To address the role of psychological processing, Biocca (2003) suggested adding "mental imagery space" to the two-pole model. Thus, in the three-pole model, a person's sense of spatial location shifts between physical, virtual, and mental spaces. Cues in each of these spaces, particularly the virtual and physical environments, automatically draw a person's limited cognitive resources for attention. The attentional shifts direct and update the person's overall sense of presence, which at times can be divided between the three spaces and at other times is unitary. Spatial telepresence takes place as a result of shifts toward the virtual space.

Focus, locus, sensus

The focus, locus, sensus (FLS) model (Waterworth & Waterworth, 2001) includes three conceptual dimensions. Each of the dimensions has two extremes and the three dimensions work together to explain people's mediated and nonmediated experiences.

The first dimension of the FLS model is focus, with the two extremes of "presence" and "absence." When a person focuses on the present, external environment via perceptual (concrete) processing, presence is said to rise. On the other hand, instead of paying attention to the current external environment, when a person starts to focus on "internal" conceptual (abstract) processing, presence will diminish and absence will rise.

The second dimension of FLS is locus, with the two extremes of the "real world" and the "virtual world." This dimension captures the degree to which a person's focus is on mediated versus nonmediated stimuli and so is most related to telepresence. When we directly experience the real environment, we are close to the "real world" extreme, and, when we use media (anything from a telescope to virtual reality) to experience the environment, we are close to the "virtual world" extreme of this dimension.

The third dimension is sensus, with the two extremes of "conscious" and "unconscious." The Waterworths used the process of learning a language as an example to illustrate that, when our arousal level rises, as when we first learn a complex task, sensus (working with focus) leads us to be conscious of our environment (or our mediated experience). On the other hand, when our arousal level is low, or, in other words, when we habituate to an experience or task, we will be closer to the unconscious sensus extreme.

In the FLS model, presence refers to a focus on the external environment, whether mediated or not, but processing toward the "presence" extreme of focus and the "virtual world" of locus represents telepresence effectively, and the model provides a larger context for evaluating all experiences.

Layers of presence

The layers of presence model, by Riva, Waterworth, and Waterworth (2004), builds on the FLS model, proposing three levels that parallel the evolution of the self (Damasio, 1999). "Proto presence" involves "perception-action coupling," which leads to accurate perceptions of the distinction between one's self and everything else (the nonself), through movement within and interaction with the environment; "core presence" involves "selective attention" toward the sensorial environment, which leads to awareness of the distinction between the self and the current environment and tasks; and "extended presence" involves verifying the significance of experienced events to the self, through intellectual and emotional stimuli judged to be real. Optimal presence occurs when the processes involved in each of the layers work together to focus on a situation in the external world, whether mediated or not. As with FLS, this model accounts for a wide variety of mediated and nonmediated experiences.

Attentional model of spatial presence

Draper, Kaber, and Usher (1999) argued that the key to creating effective spatial presence experiences is designing telepresence technologies to mimic the sensory and behavioral patterns of the corresponding nonmediated experiences. This similarity allows the user to expend minimal attentional resources to operate the interfaces and reduces the user's awareness of the roles of the technology.

The attentional model suggested an important guideline for creating ideal telepresence systems based on user-centered design; the guideline is especially useful for designing systems for remote operations, virtual training, and entertainment. ~~One~~ On the other hand, it does not clearly explain which attentional factors contribute to spatial cognitions (Hartmann et al., 2015), and it does not account for circumstances in which people learn and become accustomed to computer-generated interfaces (as well as nonmediated physical tools).

Sensory model of presence

Steuer (1992) identified two factors that determine telepresence: vividness and interactivity. Vividness refers to the amount of detail in the mediated environment and the number of sensory input channels (sight, sound, touch, etc.) provided by the technology. So vividness includes both depth and breadth. Interactivity refers to the extent to which users can alter the mediated experience. The components of interactivity are the speed of response, the range of changes that can be made, and the degree to which the affordances for making changes correspond with—are naturally mapped to—the way we'd make the changes if the environment were not mediated.

Steuer argued that the "representational power" in vividness and interactivity of a telepresence system drives users' feelings of presence because it reduces the ramifications of being fully immersed in virtual environments, and that this power is independent of contextual and individual differences that also affect presence.

Measures, effects, conditions model

Wirth et al. (2007) proposed a cognitive model of spatial presence in their project "Presence: Measurement, Effects, Conditions." In the measures, effects, conditions model, spatial presence is activated through a two-step process. First the person's cognitive system allocates attention to construct a mental model of the environment called a *spatial situation model*; the model is developed automatically based on the spatial cues the person encounters and their own memories and cognitions regarding spaces. In the second step, the spatial situation model is used to construct and test one or more hypotheses regarding what should be adopted as the primary egocentric reference frame (PERF)—in other words, what kind of space the person is located in. If the *reality-as-PERF* hypothesis is repeatedly tested and supported, the cognitive system determines that the person is not in a mediated space, while if the alternative *medium-as-PERF* hypothesis is adopted the system determines that the person is in a media-generated environment and the person experiences spatial presence. Various other characteristics of the medium and the user have an influence as well, supporting or impeding the processes that lead to spatial presence.

Although many of the details of the model and the assumptions that underlie it are difficult to test, it is a rigorous effort to integrate theoretical approaches from psychology and communication and "unpack" exactly how spatial presence is formed.

Capacity limited, cognitive constructionist model of presence

The capacity limited, cognitive constructionist (CLCC) model proposed by Nunez (2007) was designed following many experimental tests to address a series of five challenges he identified for any successful model of presence; these include the "book problem" (Biocca, 2003), which questions how a well-constructed, simple, highly symbolic, and abstract text can produce a rich sense of immersion in another environment. The central tenet of the complex CLCC model, which contains a series of separate cognitive modules each with their own components and operating processes, is that each person constructs his/her own experience of any environment by referring to previous knowledge of similar situations and by interacting with the current situation; presence is a side effect of the model structure.

According to Nunez (2007), individuals first receive external stimuli from the physical environment (mediated or not) via "sensory cortices." A subset of stimuli from those available at the sensory cortices are selected and a "stimulus attenuator" guides attention to the most relevant perceptual stimuli. Working memory then processes the inputs from the stimulus attenuator and information is taken from there to the "folk physics" module and the "folk psychology" ~~modules~~ for evaluation. The folk physics module stores information about physical properties such as mass, velocity, and spatial arrangement, and the folk psychology module stores information about psychological properties such as mental states and intentionality. If these modules can't successfully process the information from working memory, it is sent to media decoders that translate it into semantic meaning based on media-specific knowledge; if the modules can successfully process the information, it either is immediately delivered to "procedural memory" for selection of a motor action or is sent to declarative memory for semantic processing. In the end, the motor control system responds to the ~~physical~~ stimulation.

Nunez suggested that, in CLCC, presence (whether in mediated or nonmediated space) is a dynamic model state that can be understood as consisting of "the creation of a semantic bias which permeates the model" and "the construction of the current environmental situation in working memory" (2007, p. 106). While it includes elements explicitly identified as not being subject to testing, the CLCC is another very rigorous and sophisticated theoretical unpacking of the cognitive processes behind the subjective perception of spatial presence.

Theoretical frameworks for social presence

Theoretical frameworks that account for social presence focus on how individuals sense and interact with social actors in both mediated and nonmediated environments. Early theories of *social presence and media richness* centered on how the qualities of a medium afford users a sense of others, specifically in an organizational setting. The *levels of social presence* model focuses less on the medium and more on the cognitive processing that creates the user's subjective perceptions. *Parasocial interaction* concerns the illusion of social connection we often feel with people we encounter in one-way media, such as TV

actors, hosts, and news anchors. Theories regarding *self-presence* and *presence in novel bodies* describe and explain how a person can come to feel connected not with other people but with representations of themselves, for example avatars in video games and virtual worlds. Finally, the *media equation* and *media are social actors* frameworks consider how and why we often respond to media themselves, from computers to robots, as social entities. While these frameworks are more diverse and limited in their focus than most of the spatial presence frameworks, they together account for a wide variety of phenomena in which we overlook the true nature of our social interactions via media and technology.

Social presence and media richness

Social presence theory provides a way to understand how people feel connected to others in mediated communication contexts. The term social presence was introduced by Short, Williams, and Christie (1976), who referred to it as "the salience of the other in a mediated communication and the consequent salience of their interpersonal interactions" (p. 65). Social presence is the result of the sounds, sights and physical contacts between two people (or more), and is influenced by perceived intimacy and immediacy, which tend to be lower in mediated communication.

Daft and Lengel (1986) were among those who suggested that the ambiguity in mediated communication, and the resulting reduced social presence, result from the limited richness of mediated communication. Higher bandwidth media (e.g., high-definition images and spatial audio carried through high-capacity networks) are said to allow more social cues to be conveyed than low-bandwidth media (e.g., a text message), leading to greater social presence.

Social presence and media richness have been applied to communication in organizations, encouraging the use of high social presence media for some types of communication (e.g., high-stakes, emotional discussions) and low social presence media for others (e.g., relaying of routine information).

Levels of social presence

Biocca and Harms (2002) suggested that there are three levels of social presence. The lowest level is the perceptual level, at which people can detect and be aware that communication counterparts exist and are present—that is, that the two (or more) people are copresent. A number of social cues can activate this sense of copresence. For instance, visual cues that match a particular person we know, and even a series of scattered dots that faintly suggest a human shape, can activate the perceptual level of social presence.

The next, and higher, level is the subjective level. Here more active cognitive processes are used. Individuals show increased attentional engagement and reach deeper emotional states, and comprehension and behavioral interaction with communication counterparts are activated.

The dynamic and intersubjective level of social presence is the highest level of social presence, where individuals are aware of others' social presence and their mutual presence. When people experience this level of social presence, they think of their

relationships with their communication counterparts. A valuable aspect of this theory is its applicability across all forms of mediated and face-to-face communication and interactions with actual and artificial entities.

Parasocial interaction

While social presence usually refers to two-way or multiway communication, one type of presence that most of us have experienced occurs when the communication is only in one direction. In 1956, Horton and Wohl proposed the concept of parasocial interaction to describe the way audience members perceive a "simulacrum" of a face-to-face (two-way) interaction with radio and TV personalities and hosts, whom Horton and Wohl called personas. They noted that TV personas in particular often face and directly address the audience, speaking to the camera as if talking directly and personally to the viewer.

Audience members can observe and interpret the gestures and voices of the persona and over time may come to think they "know" the persona more intimately and closely than others do. An illusion of intimacy can be developed, leading to a parasocial (again, one-way) relationship. Horton and Wohl noted several strategies that encourage parasocial interaction and relationships, including repeating familiar gestures and conversation styles, using informal speech patterns, and technical choices such as the use of subjective camera views. Subsequent research has found that parasocial presence phenomena are common and extend to news anchors, soap opera and reality TV stars, and people in website and virtual reality interfaces (Kim & Sundar, 2012).

Theory of self-presence

Self-presence refers to an experience of feeling like one is connected to an avatar or other representation of oneself in the world created by technology (Lee, 2004). For example, when people play computer games they often feel like they are the characters in the game, and they may feel "pain" when their character is hurt in the game.

Based on presence scholars' studies of how people describe their media experiences and Damasio's (1999) three levels of self (proto, core, and autobiographical or extended), Ratan (2012) identified three types of self-presence: proto self-presence, core self-presence, and extended self-presence.

Proto self-presence occurs when the mediated representation of self is incorporated into the user's body schema; in other words, the avatar or other representation is at some level perceived as being an extension of the user's body. Core self-presence occurs when the interactions of the mediated representation of self and mediated objects (or people) lead to affective responses—in other words, when the user feels emotions as his/her avatar interacts with the mediated or virtual world. For example, a video game that provides players a strong core self-presence would make players feel happy about their avatars' success (e.g., killing a monster) or feel upset about their avatars' failure (e.g., being killed by an enemy).

The third type of self-presence is extended self-presence, which occurs when users extend their identity, including their personality and memories, to the mediated representation of themselves; in other words, they believe, at some level, not only that their avatar's body is part of their own body but also that their avatar's identity is their own.

A framework of presence in novel bodies

An interesting emerging area of presence scholarship involves using virtual reality to alter how we perceive our own body and thereby how we interact with our environment. Building on theories of embodied cognition (Anderson, 2003), Won et al. (2014) argued that individuals could experience the presence of virtual bodies of a kind that have never been inhabited by humans in the real world.

In a famous demonstration of this effect called the rubber hand illusion (Botvinick & Cohen, 1998), people watching an artificial hand located near their own hand and being touched by a person or object come to feel as if it is their own hand that is being touched. This is an example of how our perception of our body and its interactions in an environment can be modified. Won et al. (2014) suggested that people use body schema to incorporate technological artifacts as functional extensions of their bodies. Won et al. (2014) identify "users' adaptability to novel bodies in virtual reality" (p. 62) as an example of "homuncular flexibility" and argue that this flexibility allows users to accept and control an avatar body that does not match their own. Although it takes time to generate the sense of control, Won and her colleagues demonstrated the effect in multiple studies, in one case creating the illusion for virtual reality users that they had a body with three arms.

Media equation

In their book *The Media Equation*, Reeves and Nass (1996/2002) described evidence from a series of studies showing that users have (sometimes surprising) social responses to communication technologies. They argued that individuals' interactions with computers and televisions are fundamentally social and natural and that, despite the fact that we know these technologies are designed by people and built by companies from circuit boards and screens, we treat them in subtle ways as if they were living social actors with free will and personalities of their own. In other words, as with all forms of presence, users overlook the role of technology in their media use experience.

The studies Reeves and Nass highlighted and others that were conducted later involved selecting a social science finding about how people respond to each other or to the natural environment and then cutting out the role of "person" or "environment" and replacing it with "media" in a new test. Using this approach, the researchers demonstrated that individuals apply politeness rules to computers, providing more positive assessments when a computer asks them to evaluate its own performance than when asked by one computer to assess the performance of a second computer. Other studies showed that users apply the idea of selfness versus otherness to computers, with performance evaluations of one computer by another seen as more accurate than a

computer's self-evaluation. As we prefer other people with similar personalities to our own, introverts preferred a computer with a voice with the characteristics of introverts (lower speech rate, lower volume level, lower fundamental frequency, and lower pitch range) while extraverts preferred computers with extravert voices (Nass & Lee, 2001). And users mindlessly apply gender stereotypes to computers, reporting that evaluation is more valid, and dominance more desirable, from a computer with a male voice than one with a female voice. Users even reported that computers with female voices know more about topics such as love and relationships, whereas those with male voices know more about technical subjects (Nass, Moon, & Green, 1997).

Reeves and Nass (1996/2002), and then Nass and Moon (2000), explained that this type of presence occurs because human brains have not (at least yet) evolved to distinguish between nonmediated and mediated experience. They used "mindlessness" to explain individuals' social responses to media, arguing that, when a computer displays humanlike attributes, users tend to neglect the machine's asocial nature and focus on the social cues of the interaction. Though people are aware that computers are not humans, they mindlessly apply social rules to computers.

Media are social actors

Before formally proposing the media equation, Nass and his colleagues in the 1990s proposed something called the computers are social actors (CASA) paradigm, which refers to individuals' social responses specifically to computers (Nass, Steuer, & Tauber, 1994). Of course, today, people are surrounded not just by computers (and televisions, clocks, cars, and others) but by many emerging media technologies including Apple's Siri and various competitors; smartphones and tablets; interactive global positioning navigation systems, some with customizable voices; interactive toys, mechanical pets, and robots; personal home assistants such as Amazon's Echo; and many more. In order to better understand how technologies trigger social responses, Xu and Lombard (2016) developed the media are social actors (MASA) paradigm.

The MASA paradigm features 10 propositions that future researchers can test. The propositions highlight the potential of human-made technology to evoke social responses based on combinations of primary (not necessary but sufficient) and secondary (not necessary or sufficient) social cues, and various individual and contextual factors. Based on the mindlessness explanation for social responses as well as the anthropomorphism explanation, which acknowledges the more active tendency to imbue neutral stimuli with social characteristics, the propositions outline the role of the number of cues and their similarity to human characteristics. As an example, the final proposition holds that, all other conditions being equal, the quality of cues (primary vs. secondary) plays a greater role in evoking social responses than the quantity (number) of cues.

As an extension of the CASA paradigm and media equation, the MASA paradigm suggests more detailed theoretical mechanisms and applies them to a new, broader range of technologies to help us better understand when and why we overlook their true nature and treat these media technologies as social actors.

Conclusion

Each of the theoretical frameworks for spatial and social presence offer important insights and to varying degrees provide detailed and testable explanations for certain types of presence experiences. Some have received more attention, and more supportive research evidence, than others. Researchers have also gathered considerable evidence in a variety of contexts that can be marshaled to evaluate existing and new presence theories (see Cummings & Bailenson, 2016).

But, as noted in the introduction to this entry, presence theory is still fragmented and at an early stage of development. The ultimate goal is a smaller set of theories that together are more comprehensive (account for more forms of presence across more people in more contexts), that are successful in both predicting and explaining presence phenomena, and that are as parsimonious and straightforward as possible while generating testable and falsifiable propositions and raising provocative new research questions regarding presence. That goal is and will likely remain out of reach in the near term, but all progress toward it (including each of the frameworks reviewed here) is valuable given the rapidly evolving roles of presence technologies and experiences in our lives.

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SEE ALSO: Attention and Awareness; Interactivity; Parasocial Interaction and Beyond: Media Personae and Affective Bonding; Perception of Reality; Virtual and Augmented Reality

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ABSTRACT

Presence (shortened from telepresence) occurs when media users in some way overlook the role of technology in their experience; it is increasingly common and takes place with media from novels to videoconferencing to virtual reality. A variety of theoretical frameworks have been proposed to understand spatial presence (in which a mediated environment seems to not be mediated) and social presence (in which mediated actual or artificial people or characters seem to be present). The development of presence theories, including the many reviewed here, is at an early and fragmented stage but represents an exciting and important challenge for scholars.

KEYWORDS

immersive media; media psychology; presence; self-presence; social presence; spatial presence; telepresence; virtual reality