

The Strata of Presence: Evolution, Media, and Mental States

J A Waterworth, G Riva and E L Waterworth

Extended Abstract

Summary

We present an evolutionary account of the psycho-neurology of presence, highlighting three component layers: proto presence, core presence, and extended presence. We suggest that the layers emerged through evolution, but all contribute to common survival goals: distinguishing what currently lies outside the organism from that which is within, and ensuring that attention is directed towards significant external events. Different media address different layers, and the technological trend is to address all layers to some extent – as in immersive virtual environments. We suggest that the degree of experienced presence depends on how well the three layers are integrated, how *focused* they are on the same information (Riva and Waterworth, 2003). The three layer model of presence allows us to explain and predict the effect of different types of media on the level of presence. We interpret this in terms of varying psychological states that may arise in relation to media: *absence*, *presence*, and *hyperpresence*. We further suggest three ways in which mediated hyperpresence may be realised: *digital participation*, *mediated flow*, and *embodied immersion*.

The Three Layers of Presence

In its earliest evolutionary form presence was the sense that something was happening outside the organism in the here and now, something that could affect the organism, as opposed to being part of the organism. Initially, this may have been based in sensation (in proto consciousness) of something acting on the organism's boundary with the environment (Humphrey, 1992). Later on in evolutionary (and neurological) terms, sensation led to perception, and presence emerged as the feeling (in core consciousness) of being in an external, perceptible world in which things happen in relation to the organism. Later still, internal modelling (in extended consciousness) allowed attention to be directed towards non-present, imagined worlds, experienced as being inside the organism (specifically, in the head: Velmans, 2000). To be useful in assessing possible scenarios, presumably their main evolutionary purpose, these imagined events evoke similar emotional responses as external events would, but not the same feeling of presence.

Once we could imagine situations and events, it then became advantageous to discriminate imagined, internal, hypothetical worlds from perceived events in the physical, external world – a discrimination that we suggest is based on the evolved form of presence. It is interesting to note that there may have been an intermediate period when this discrimination was not reliably made in this way (Jaynes, 1976, 1990), and when internal thoughts were perceived as the commands of Gods. But as consciousness extended to encompass both the outside world and an evolving internal, conceptual world, the survival advantages for organisms still reliably able to make this discrimination are obvious, and presence emerged in its current, evolved form. By this evolutionary view, presence does not discriminate between the real and the virtual, but between the internal and the external.

Proto presence is our term for the most primitive layer, which corresponds to the earliest development of a sense of self versus other. It can be identified with the proto consciousness of sensation and of proprioception, of the body's orientation and of what is happening at the body boundary. *Core presence* can be identified with perception of an external world surrounding the body, of things in space in the proximity of the body in the here and now. *Extended presence* relies on memory and imagination and relates what is happening in the present to stored knowledge from past experiences, but which may also be about possible futures.

Presence in Media

Our evolutionary perspective suggests that presence is a phenomenon that precedes media. In both mediated and natural presence, the three layers – and the way they interact – determine the nature of the experience. Because we are always in the real world, even when engrossed in media or in thought, proto presence is probably never totally divorced from the current physical situation and state in which we find ourselves. Most mediated experiences do not attempt to address the individual at the level of proto consciousness, since the technical demands of eliciting presence are less the higher the layer invoked.

Conceptual media such as books, spoken voice radio programmes, and so on, address only extended consciousness, and are technically simple to produce. Moving down from extended to core consciousness, the technological demands on the medium increase. Whereas the machinery of conceptual modeling is abstract and relatively slow, perceptual models and the predictions they provide must be created fast, since this core level is evolutionarily designed to support what may be very rapid interactions with the real world. To mimic this natural interactivity involves rapid response times between a medium and its user, and often involves detailed inspectability of aspects of any displayed information. More generally, information must be displayed in concrete forms that can be accepted by core consciousness as realistic.

Proto presence has the most demanding technological requirements, and is the last of the three layers to be addressed through media. It functions at the level of proprioception, spatial and internal monitoring, which may reflect the primal role of these processes in the evolution of consciousness (e.g. Sheets-Johnstone, 1998). As yet, our ability to simulate the demands of this layer is far from complete. In a virtual world this is sometimes known as "spatial presence" and requires the tracking of body parts and appropriate updating of displays. Core presence is based largely on vividness of perceptible displays. This is equivalent to "sensory presence" (e.g. in non-immersive VR) and requires good quality, preferably stereographic, graphics and other displays. Core consciousness is the pivot for judgments that something from the world outside is impacting on the self, on the life of the organism. If proto consciousness is integrated with core consciousness, proto presence will be involved and this layer will strengthen the overall sense of presence. The extent to which these two levels are integrated produces what is usually called degree of immersion. Extended presence requires intellectually and/or emotionally significant content. Integrating the three layers amounts to fooling the system into a conviction that something significant is happening to the self in the here and now.

Evolution has not equipped us to feel the difference between what is really present externally and what we perceive as present because of technological mediation. We can mostly tell the difference with existing virtual environments because of technical, or formal, limitations in the way the environment is coupled to the organism. But still, virtual realities do attempt to engage the organism in the same ways that the real world does, and they are more or less successful in this.

The Mental States of Presence

If presence is really an evolved psychological mechanism, it should exist independently of a given medium. More in particular, presence cannot be considered as a simple response to media.

This approach has three important corollaries:

- *in the real world the level of presence is not the same in all the situations.*
- *there are exceptional situations in real life that have the highest possible level of presence*
- *it should be possible to design mediated situations that elicit exceptionally high presence*

Our three-layer, evolutionary model of presence suggests that maximal presence arises when proto consciousness, core consciousness and extended consciousness are focused on the same external situation or activity. Maximal presence thus results from the combination of all three layers with an abnormally tight focus on the same content (see Figure 1).

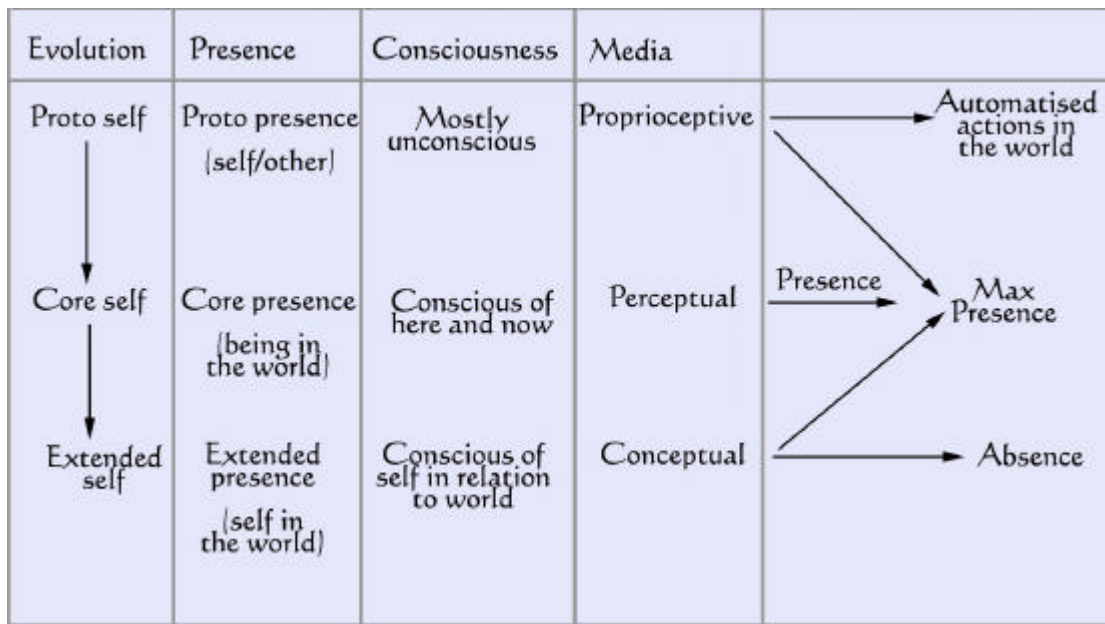


Figure 1 – Layers, media and states

Normal, everyday levels of presence arise from a split of attentional resources between layers of differing content, with some attention being directed to the current external situation. Minimal presence results from a lack of integration of the three layers, such that attention is mostly directed towards contents of extended consciousness that are unrelated to the present external environment. We have termed this psychological state *absence* (Waterworth and Waterworth, 2001).

To maximize experienced presence in virtual environments we must design in a way that allows integration of the three layers (see Figure 1). As we have seen, this is technically demanding at the lower levels. We need to provide as much immersion as possible, integrating proto (spatial) and core (sensory) presence. To integrate extended presence, the events and entities experienced in the virtual environment must have significance for the participant. For us then, maximal presence arises from an optimal combination of form and content. The form must provide the means for a convincing bodily and perceptual illusion, but the content should be integrated with (and so attract attention to) the form for the illusion of mediated presence to happen convincingly. Unlike Biocca (2003), we do not think we always feel presence when attending to something, internal or external, nor that the internal and external are always competitive in producing presence. On the contrary, the internal, “imaginal” content may either enhance or detract from the overall sense of presence. An example of enhancement is a typical computer game, where game designers strive to ensure that content and form are well integrated.

We can identify at least three ways of eliciting maximal presence (also called hyperpresence): *digital participation*, *mediated flow*, and *embodied immersion*. In these situations, the organism responds as if what happens in a mediated environment is real, in the fullest sense, and of immediate significance.

Digital participation can arise if we design a role for the participant as a performer in a drama (Nath, 2001). It appears that if the performer becomes emotionally or intellectually engaged by the events in an appropriately immersive environment, extremely high levels of presence can be achieved (Waterworth et al., 2002). A feature of this state of participation is a corresponding loss of self-consciousness. Not that the self is not present – in some sense it is maximally so – but that an internal model of the self is not a main focus of attention. In this respect, digital participation resembles mediated flow.

Csikszentmihalyi (1977, 1990, 1994) defined “flow” as an optimal state of consciousness characterized by a state of concentration so focused that it amounts to absolute absorption in an activity. According to this author (Csikszentmihalyi, 1977) when a subject is in a flow state “(he) shift into a common mode of experience when they become absorbed in their activity. This mode is characterized by a narrowing of the focus of awareness, so that irrelevant perceptions and thoughts are filtered out; by loss of self-consciousness; by a responsiveness to clear goals and unambiguous feedback; and by a sense of control

over the environment...it is this common flow experience that people adduce as the main reason for performing the activity” (p72). Starting from this definition, different authors tried to define mediated flow in an operational way. According to Trevino & Webster (1992), flow represents the extent to which (a) the user perceives a sense of control over the computer interaction, (b) the user perceives that his or her attention is focused on the interaction, (c) the user's curiosity is aroused during the interaction, and (d) the user finds the interaction intrinsically interesting

Embodied immersion is our term for a style of immersion that uses bodily movements not only for consciously-monitored control over the environment, as in standard HCI, but also for more direct, automatised inputs from the immersant. The pioneering work in this area was carried out by Char Davies (2003). In *Osmose*, for example, breath and balance is used to control navigation, while in *Ephémère* visually dwelling on a portrayed “organic” form causes it to age before the eyes of the immersant. As with the examples above, this style of mediated experience can result in a loss of self-consciousness, though in this case it tends to be more contemplative and less activity oriented.

Conclusions

These examples illustrate a general point. Immersive environments are unique amongst media in their ability to produce a sense of presence as high as the maximal levels experienced in the physical world. But, as in the physical world, immersion does not guarantee presence. If what is happening is not of interest or importance to the individual, the layers of presence will not be integrated and the person will tend to become absent (in life, the absent-minded professor is the archetypical example). Immersion, if appropriately implemented, gives a potential for exceptional presence not provided by media that only address one layer. But one can be more or less present in any environment. Content is the key.

References

- Biocca, F (2003). Can we resolve the book, the physical reality, and the dream state problems? Presentation at *EU Presence Research Conference*. Venice, Italy. May 7, 2003.
- Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: HarperCollins.
- Davies, C (2003). Landscape, Earth, Body, Being, Space and Time in the Immersive Virtual Environments *Osmose* and *Ephémère*. In Malloy, J, (ed.) *Women in New Media*. Boston, USA: MIT Press.
- Jaynes J (1976, 1990). The Origin of Consciousness in the Breakdown of the Bicameral Mind.
- Humphrey, N (1992). *A History of the Mind*. New York: Simon and Shuster.
- Nath, S, (2001). *Emotion Based Narratives: A New Approach to Creating Story Experiences in Immersive Virtual Environments*. MA Thesis, Central Saint Martin's College of Art and Design, London, UK.
- Riva, G and Waterworth, J A (2003). [Presence and the Self](#): a cognitive neuroscience approach. *Presence-Connect*, 3 (3), posted 07-04-2003.
- Sheets-Johnstone, M. (1998). Consciousness: A Natural History. *Journal of Consciousness Studies*, 5 (3) 260-294.
- Trevino, L. K., & Webster, J. (1992). Flow in Computer-Mediated Communication. *Communication Research*, 19(5), 539-573.
- Velmans, M (2000). *Understanding Consciousness*. London: Routledge.
- Waterworth, J. A., & Waterworth, E. L. (2001). Focus, Locus, and Sensus: The three dimensions of virtual experience. *Cyberpsychology and Behavior*, 4(2), 203-213.
- Waterworth, J. A., Waterworth, E. L. and Westling, J. (2002, 9-11 October). *Presence as Performance: the mystique of digital participation*. Paper presented at Presence 2002: Fifth Annual International Workshop on Presence, Porto, Portugal.