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ORIGINAL ARTICLE

The "book problem" and its neural correlates

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Abstract Presence research can tell us why we feel present in the real world and can experience presence while using virtual reality technology (and movies and games) but has strikingly less to say on why we feel present in the scenes described in a book. Just how is it that the wonderful tangible detail of the real world or the complexity of digital technology can be matched and even surpassed by a story in a paperback book? This paper identifies a range of potential neurological solutions to this problem (and the "real world" and "dream" problems for good measure). We consider Jeannerod's *neural simulation of action*, Grush's *emulation theory of representation* and Rizzolatti's work on *mirror neurons* as being candidate solutions to the "book problem". We conclude by observing that these potential solutions further underline the "purpose" of presence is to act in the world whether it is real, virtual or solely in our imaginations.

Keywords Book problem · Narrative · Mirror neurons

1 Introduction

> Telepresence emphasizes the importance of high–quality sensory feedback and suggests future instruments that will feel and work so much like our own hands that we won't notice any significant difference. Minsky 1980

Presence was originally thought of as either the consequence of physically being-in-the-world or the product of digital technology which substitutes the "real" for the "virtual and synthetic" whether this is virtual reality, games, movies or other digital technology. Early definitions of presence included (the still relevant) "being there" (variously, Held and Durlach 1992; Sheridan 1992; Zeltzer 1992), the perceptual illusion of non-mediation (Lombard and Ditton 1997); "a mental state in which a user feels physically present within the computer-mediated environment" (Draper et al. 1998) or "The subjective experience of being in one place or environment, even when one is physically situated in another", (Witmer and Singer 1998).

To these initial dis-embodied definitions have been added a role for the body in integrating these sensory inputs (e.g. Whitehead 1925/1997) or by identifying presence as being an aspect of embodied cognition (Schubert et al. 1999). At this point, this more or less approximates to Minsky's vision of telepresence.

Presence is also recognised as being situated and contingent, so that we can also reasonably add to this incrementally growing definition a place for autobiographical and episodic memory. For example, we remember walking into the kitchen at home (and being present there) or the VR lab at work (to conduct a study). This recognition of the importance of memory enables us to make sense of the experiences we are having both as *who* we are and *what* we are doing today (e.g. Riva et al. 2004). The purview of presence has been further extended to include Riva's most recent work on the role of motor behaviour and presence (Riva 2012), so that presence is recognised as being central to physical behaviour. However, even the most refined and carefully articulated account of presence still recognises that it is a consequence of and is dependent on the interpretation of sensory input. Our senses connect us with the

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