



What is embodiment? A psychometric approach

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Abstract

What is it like to have a body? The present study takes a psychometric approach to this question. We collected structured introspective reports of the rubber hand illusion, to systematically investigate the structure of bodily self-consciousness. Participants observed a rubber hand that was stroked either synchronously or asynchronously with their own hand and then made proprioceptive judgments of the location of their own hand and used Likert scales to rate their agreement or disagreement with 27 statements relating to their subjective experience of the illusion. Principal components analysis of this data revealed four major components of the experience across conditions, which we interpret as: *embodiment of rubber hand*, *loss of own hand*, *movement*, and *affect*. In the asynchronous condition, an additional fifth component, *deafference*, was found. Secondary analysis of the *embodiment of rubber hand* component revealed three subcomponents in both conditions: *ownership*, *location*, and *agency*. The ownership and location components were independent significant predictors of proprioceptive biases induced by the illusion. These results suggest that psychometric tools may provide a rich

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method for studying the structure of conscious experience, and point the way towards an empirically rigorous phenomenology.

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1. Introduction

What is it like to have a body? The sense of one's own body, variously termed "embodiment" (Arzy, Overney, Landis, & Blanke, 2006), "coenaesthesia" (Critchley, 1953), "bodily self-consciousness" (Bermúdez, 1998; Legrand, 2006), or "corporeal awareness" (Berlucchi & Aglioti, 1997; Critchley, 1979), has often been described as a non-conceptual, somatic, form of knowledge, different in kind from other types of knowledge (e.g., Kant, 1781/2003; Bermúdez). In addition, many authors have suggested embodiment is a necessary prerequisite for other types of sensation and knowledge (Kant, 1781/2003; Johnson, 1987; Lakoff, 1987; Merleau-Ponty, 1945/1962; Piaget, 1937/1954). On that view, embodiment would be the cornerstone of mental life, the "storm-center" of experience as James (1905) put it. The sense of one's own body is also intimately related to the sense of self, and is often taken as the starting point of individual psychological identity (Casam, 1997; Edelman, 2004). However, recognition of the importance of embodiment has not been matched by theoretical clarity about what embodiment is or involves. Neurological and neuropsychological investigations have generally provided a framework for embodiment by proposing dissociations between different subcomponents of body representation, such as *body image* and *body schema* (e.g., Gallagher & Cole, 1995; see also Head & Holmes, 1911/1912). Use of these terms, however, has been plagued by confusion, disagreement, and inconsistent usage (cf. Gallagher, 2005; Poeck & Orgass, 1971). This confusion arises in part because the sense of embodiment is both rich and complex on the one hand, and elusive and hard to describe on the other (Gallagher, 2005; Haggard & Wolpert, 2005).

The phenomenological tradition, has provided rich descriptive characterizations of embodiment, and has used it as a starting point for theories of the self (e.g., Merleau-Ponty, 1945/1962). However, it has not offered the operational working definitions and measures needed for rigorous empirical research. What is needed is a more systematic, and principled approach to decomposing the bodily self. Such a project should have two aims. First, it should produce theoretically useful and clearly dissociable subcomponents of embodiment. Second, it should generate testable predictions about human experience which can be directly measured. The present study provides an initial step towards these goals, by applying psychometric methods to structured introspective reports of a conscious experience of embodiment. If embodiment is a coherent psychological construct, rigorous measurement and analysis should clarify what it is, and what its subcomponents are.

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