



A Review of Shaun Gallagher: How the Body Shapes the Mind

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A Review of Shaun Gallagher,
How the Body Shapes the Mind

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REVIEW OF: Gallagher, S. (2005). *How the Body Shapes the Mind*. New York: Oxford University Press, 284 pp. ISBN: 284, 0199271941.

With *How the body shapes the mind*, Shaun Gallagher provides a general panoptic of the importance of the body in cognition, partly based on a series of articles published in the last ten years. Gallagher summarizes significant experimental results coming from a wide variety of domains: neuropsychology (e.g. deafferentation, aplasic phantom limbs, and schizophrenia), neuroscience (e.g. mirror neurons), developmental psychology (e.g. neonate imitation) and social psychology (e.g. communicative gestures). He uses these results to develop a theory of embodied cognition. His main goals here are (1) to describe body awareness in detail and (2) to investigate the influence of the body on self-consciousness, perception, language and social cognition. In the first part of the book, Gallagher emphasizes the need to distinguish between two kinds of systems for the body, the body image and the body schema. These systems have been often confused in the literature. In the second part, he tries to show that these body systems structure the way we perceive the world and the way we perceive other people. *How the body shapes the mind* is a very rich book that raises a lot of interesting questions. However, I will not be able to cover all of them and I will focus on two points: the nature of the body schema and the structuring role of the body.

What it is like to have a body

Do we have one single kind of system for representing the body? It does not seem so. The body can be viewed from many different perspectives (e.g. semantic, emotional, spatial, motor, tactile, visual, proprioceptive, etc.) and described in terms of many pairs of opposing properties (e.g. conscious/unconscious, conceptual/non conceptual,

dynamic/static, innate/acquired). This diversity has led to a widespread confusion about body representations, as noticed by Gallagher. In order to clarify the conceptual landscape of the study of the body, Gallagher provides a distinction between body schema and body image that cuts across all the previous distinctions. “A *body image* consists of a system of perceptions, attitudes, and beliefs pertaining to one’s own body. In contrast, a *body schema* is a system of sensory-motor capacities that function without awareness or the necessity of perceptual monitoring.” (p. 24). According to Gallagher, this distinction finds empirical ground in a double dissociation in neurology. Patients with personal neglect do not attend to the left part of their body. For instance, they shave or make up only the right side of their face. This would result from a disruption of their perceptual body image. Conversely, deafferented patients, who receive no tactile or proprioceptive information below the neck, are unable to move if they do not observe carefully what they are doing. Their body schema is severely impaired, replaced by a reflexive body image. We can summarize the main properties of the body schema and the body image as follow:

Body image	Body schema
Available to consciousness, even if only at the margin	Non-conscious
Personal level	Sub-personal level
Sense of ownership (<i>my</i> body)	Anonymous
Abstract and partial	Coherent and holistic
Distinguished from the environment	In interaction with the environment
Not involved in action, except in some cases	Involved in action
Deficits in personal neglect	Deficits in deafferentation

Despite their differences, the body image and the body schema share some common features. First, they are both multimodal. Gallagher underlines the importance of the interaction between vision, proprioception and touch in chapter three. The integration between interoception and exteroception plays an important role both for constructing the sense of ownership of one’s own body and for imitating the movements of other bodies. Second, body image and body schema are both partly innate, as indicated by the existence of phantom limbs in the congenital absence of limbs (ch. 4). Gallagher acknowledges the difficulty in interpreting aplasic phantom limbs, which could involve either an innate structural body image or innate hand-mouth coordination schemata.

Gallagher has played an important role in clarifying the literature about the body with his distinction between the body image and the body schema. The distinction is

mainly functional: the body schema is for action and the body image is for everything that is not action. However, further clarification can be achieved by disentangling the different components of each system. Indeed, each of the body systems is highly heterogeneous.

According to Gallagher, the body image includes body percept, body concept and body affect. But why does he group all these in a single category? While the pragmatic function of the body schema is clear, the unitary function of the body image is far from obvious and it is not explicitly explained by Gallagher. This unifying criterion is all the more necessary because there is a competing line of thought that suggests that there are *three* kinds of body representation: sensori-motor (or body schema), visuo-spatial (or body surface) and semantic (or body image) (Head and Holmes, 1911; Sirigu et al., 1991, Schwoebel & Coslett, 2005). This distinction is founded on neuropsychological dissociations between spatial disorders of the body (such as autotopagnosia) and semantic disorders of the body (such as body agnosia). There would be then not *two* but *three* body systems. However, this distinction leaves out the affective part of the body image. Does that mean that there would even be *four* kinds of body system? There may be a risk of an infinite multiplication of body representations, which would be pointless. The dual distinction as suggested by Gallagher remains a useful tool for designing experiments on the body. However, as long as Gallagher does not provide a systematic account of the function of the body image, he will not be able to argue for his view.

The unity of the body schema is also problematic. The question this time does not so much concern the existence of a unifying function but the underlying abilities involved in a sensori-motor schema. One may first notice that Gallagher defines the body schema as a set of capabilities. I have some difficulties in understanding what these capabilities are and Gallagher does not provide any help on this topic. He remains very vague about the components of the body schema. According to his view, the body schema is not a *representation* of the body for action. However, it seems that we do need information about the state of our own body if we want to move. Furthermore, we may be mistaken about our bodily state, and such mistakes would have consequences for our actions. This argues in favor of the existence of *pragmatic body representations* for action. One example of such pragmatic body representations, which is mentioned by Gallagher himself, is the sensory feedback about one's own body resulting from one's own movements. However, this is far from being the only component of the body schema.

Let's go back to the example of deafferentation, which has been developed in detail by Gallagher (ch. 2). Gallagher describes mainly the single case of IW, a patient who following a neuropathy, has lost all proprioceptive and tactile information below the neck, but who is still able to move, walk, and behave almost as if nothing happened. However, his movements are no longer automatic and require him to carefully pay attention to all the details. His only source of information about his body is visual. When he cannot see his movements, he loses contact with his body and cannot monitor his movements. He does not even know where his body is or what the posture of his limbs is. Gallagher concludes that IW has lost his body schema, which has been imperfectly replaced by his body image. This conclusion may be too extreme. There is indeed a lack of internal sensory feedback in IW, which greatly impairs his ability to move. However, we cannot reduce the body schema solely to proprioceptive and tactile information.

Therefore, we cannot assume an almost complete loss of the body schema in deafferentation. There is more in the body schema and I would like now to analyze these further components.

It is important to be explicit about what kind of information concerning the body that we need if we want to be able to move. In computational models of action (Wolpert, 1997), there is rarely any mention of the body *per se*. However, pragmatic representations of the body play a role at almost every stage of processing, and not only at the level of the sensory feedback. I would like to suggest the existence of two levels of pragmatic representation of the body, based on a distinction made by Jacob and Jeannerod (2003). Following the tradition opened by Milner and Goodale (1995), Jacob and Jeannerod distinguish semantic and pragmatic visual representations of a given object. In the latter case, the object is viewed as the goal of an action performed by an agent. There are two kinds of properties of the goal that may be represented for action. First, there are the basic perceptual features of the object such as its shape or its size (first-order pragmatic representation). Second, there is the function of the object, how to use a tool for instance (higher-order pragmatic representation). I would like to suggest that similarly we can draw a distinction between a first-order body schema and a second-order body schema.

The first-order body schema represents the perceptual features of one's own body that are necessary to know if one wants to move. It includes the posture of the body before and after the movement. It also includes the bodily posture predicted by the forward model, which can be compared to the final bodily posture in order to check whether the movement has been successful. It also includes some personal bodily constraints. The motor system needs to take into account the size of one's own limbs and their strength in order to program adequately the movement to perform. However, there is more in the body schema. One question remains open: how to use the body. The higher-order body schema represents a functional map of the body. Performing an action requires one to program which body part and which muscles to use for this specific movement. It also requires taking into account the kinematic constraints of the body, like the degree of freedom of the joints. For instance, the best pathway between two bodily postures is not necessarily the shortest one, because it may be physically impossible.

There are two further differences between these two kinds of body schema. First, one is a short-term representation, adjusting to each new posture, while the other is a long-term representation of the body. Second, the first-order body schema represents one's own body, it is highly specific to the agent's body. What is true of my bodily posture is not true of your bodily posture. In contrast, the higher-order body schema represents the human body in general, independently of whose body it is. What is true of my kinematic constraints is most of the time also true of your kinematic constraints.

In deafferentation, only the first-order body schema would be impaired. However, I claim against Gallagher that there is a component of the body schema that is preserved, namely, the higher-order body schema. Deafferented patients do not know their posture if they close their eyes, but they still know the kinematic constraints of their body. The mirror phenomenon of deafferentation would be apraxia. People with apraxia no longer know how to use their body to execute actions, but they retain information about their bodily postures and the size of their limbs. Interestingly, people with aplastic phantom limb are sensitive to kinematic constraints (Funk, Shiffrar & Brugger, 2005). These

results suggest that they have at least a higher-order body schema. Whether this schema would be innate or not it is difficult to decide. Indeed, the higher-order body schema in aplasic individuals may derive from observation of other people's bodily movements.

To sum up, Gallagher's effort toward clarification in the study of the body and its disorders has played a central role recently in the literature. His distinction between the body schema and the body image provides a promising approach, which needs to be deepened in further details. With the help of his theory of the body, Gallagher is ready to develop a full-fledged theory of embodied cognition.

The structural role of the body

Gallagher's main goal in his book is to argue for a theory of embodied cognition. This trend has been recently promoted by several philosophers like Andy Clark (1997) and Alva Noë (2004) and by neuroscientists like Francesco Varela (1991) and Antonio Damasio (1994) among others. Their main hypothesis is that mind, body, and world mutually interact and influence one another to promote an organism's adaptive success. The theory of embodied cognition can be considered as a reaction against the traditional computationalist view of the mind. The mind cannot be understood solely on the basis of logical rules of inner mental processes independently of the external environment. One must "put brain body and world together again" as Clark (1997) said. Gallagher does not argue against computationalism. Rather he argues against the Cartesian view of the mind, which gives absolute priority to the *cogito*, neglecting the role of the body. He intends to show that the embodiment of human beings simultaneously limits and prescribes the types of cognitive processes that are available to them. This influence is "prenoetic", prior to any kind of knowledge, unavailable to introspective consciousness. The body is not part of the content of our experiences, still it influences their nature and their perspective. Gallagher claims that the body shapes the mind at a fundamental basic level, even if it remains "behind the scene" (p. 141).

The specificity of Gallagher compared to other theorists of embodiment is that he provides first a theory of the body before explaining how the body shapes the mind. The chapter 6 is the key chapter, especially since it contains material that has not been published before. His main claim is that the way our body allows us to interact with the environment structures the way we perceive the self, the world and the others. Gallagher assumes that once one knows how the body schema shapes perception then one will know how it shapes the whole of cognition, as perception is the fundamental basis of cognition (p. 137). He focuses mainly on three domains: self-consciousness, intersubjectivity and language. He also briefly mentions a wide range of data that show the influence of the body. The relationship between the body and the cognitive domains is more or less strong. For instance, the sense of ownership and the sense of agency of one's own thoughts are only indirectly structured by the body, through emotions. Nevertheless Gallagher argues that the Husserlian temporal structure of the stream of thoughts follows the same principles as actions, which can be considered as a model of understanding. I will not go into the detail of each of the domains. I will rather analyze the different notions of embodiment used by Gallagher.

Surprisingly, Gallagher does not exploit his theory of the body in his theory of embodied cognition as fully as he could, and the links between the two parts of his work

are not always salient. More particularly, one may notice the diversity of body notions he refers to when talking about embodiment, which goes further than his distinction between the body schema and the body image. There are at least four implicit core notions of the body that he uses to describe how the body shapes the mind: (1) the organic body; (2) the spatial body, (3) the body schema and (4) the affective body.

(1) *The organic body*: Gallagher refers sometimes to the organic anatomical body in what he calls a “Neo-Aristotelian Neurobiology”. For instance, he shows the importance of upright posture in developing new capabilities (p. 147-148). He also describes the influence of physiological autonomic functions on cognitive and behavioural performances (p. 149-150). Similarly, when he addresses the Molyneux question, his reply is based on the neurophysiology of the visual system. The congenital blind man who regains his sight will not be able to distinguish the objects as such because of neuronal deterioration in the visual cortex (ch. 7).

(2) *The spatial body*: Gallagher also appeals to the idea of the body as a spatial anchor point. Human perception is encoded relatively to the location of the body in space. The external world is encoded in egocentric frames of reference, which can be eye-centred, head-centred or trunk-centred. The body provides a perspective on the world (p. 137-138).

(3) *The body schema*: Based on his theory of the body schema developed in the first part, Gallagher emphasizes the role of the body schema in structuring our interactions with the world and with ourselves. He endorses an ecological view of perception like Gibson (1979). Objects are perceived by the opportunities they provide to act on them. The world is constituted of affordances for the body (p. 141). Gallagher also endorses an ecological view of the self like Neisser (1988) (ch. 8). I recognize myself when I am moving. The sense of agency derives from the integration between afferent and efferent signals. The sense of ownership of one’s own body derives from the comparison between proprioception and vision. Finally, Gallagher shows how the body schema can influence the body image (p. 144).

(4) *The affective body*: Emotions are briefly mentioned in their role in pathological syndromes such as Capgras’ delusion, Cotard’s delusions, and delusions of control in schizophrenia (p. 151, 200-202). Emotions provide an affective tonality to our perceptual experiences and if this tonality is missing one may not be able to recognize perceptions for what they really are.

To sum up, there is a wide diversity of embodiment. The body structures experiences at different levels. One may notice here that there is almost no mention of the influence of the body image on cognition. It may be because the body image is available to consciousness and therefore, its influence is no longer prenoetic.

Gallagher’s emphasis on the wide range of cases of embodiment is important. However, the main conclusions, though interesting and worth some serious thought, could be better defended. One may regret that he does not seem to go beyond a mere descriptive list of cases of embodied cognition and leaves open the question of the unity of embodiment. Is there only one kind of embodiment or several kinds (which would be relative to the body notion he uses)? The book would have been even more interesting if

Gallagher had provided a unifying theoretical framework to understand how the body shapes the mind.

Overall, Gallagher's book is an interesting work for an interdisciplinary audience. He is one of the few philosophers to try to develop a real theory of the body. His conclusions are based on careful analysis of a vast amount of literature in neuroscience, psychology and neuropsychology, and he addresses several contemporary questions about the role of the body in cognition. Nonetheless, one may still ask at the end of the book: "What really shapes the mind? The body itself or the way we mentally represent the body?" In the latter case, it seems that we remain stuck inside the mind and we can wonder to what extent cognition is really embodied.

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