

Embodied Cognition: The teenage years. A review of Gallagher, S. (2005). *How the Body Shapes the Mind*. Oxford: Oxford University Press. 294 pages.

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Embodied Cognition is growing up, and *How the Body Shapes the Mind* is both a sign of, and substantive contributor to this ongoing development. Born in or about 1991, EC is only now emerging from a tumultuous but exciting childhood marked in particular by the size and breadth of the extended family hoping to have some impact on its early education and upbringing. As family members include computer science, phenomenology, developmental and cognitive psychology, analytic philosophy of mind, linguistics, neuroscience, and eastern mysticism, just to name a few, EC has both benefited and suffered from a wealth of different and often incompatible ideas about who and what it is, what it should do with its life, even what language it should speak. Gallagher brings some cohesion and consistency to this situation, not by surveying and synthesizing these competing approaches, but by focusing on some fundamental issues, and carefully marshalling the evidence and developing the vocabulary to thoroughly consider them.

Gallagher's investigation relates to what is perhaps the single most important substantive claim of the EC paradigm, *the physical grounding hypothesis*, which says that the contents and operation of the mind are grounded in an agent's physical characteristics and embodied experience. In this context, "grounded in" means not just "made possible in virtue of", but at a minimum, "substantively influenced by"; the physical grounding hypothesis is not just physicalism. Moreover, the physical grounding hypothesis is to be distinguished from reductive neuroscience, for it is central to EC that the body has a special status in and for cognition at several material, organizational, and developmental levels; content does not reduce to neural firings. Thus, identifying these various significant aspects of embodiment, and their specific cognitive impact, is one of the most important research projects in EC. It is to this latter project that Gallagher's book makes its largest contribution.

Gallagher divides his interest in this project into two parts. The first part revolves around whether and how *awareness* of the body influences experience:

In regard to embodiment, I want to explore to what extent and in what way an awareness of my body enters into the content of my conscious experience? . . .
.Does intentional action, for example, involve an explicit or implicit awareness of the body? (p.2)

The second part concerns whether and how the body shapes experience by structuring the mechanisms *supporting* experience:

To what extent, and in what ways, are consciousness and cognitive (noetic or mental) processes, which include experiences related to perception, memory, imagination, belief, judgment, and so forth, shaped or structured *prenoetically* by the fact that they are embodied? (p.2)

It is clear from the outset that Gallagher's main interest in this book is in this second issue, and much of the book is spent establishing the claims found in its first paragraph:

In the beginning, that is, at the time of our birth, our human capacities for perception and behavior have already been shaped by our movement. Prenatal bodily movement has already been organized along the lines of our own human shape, in proprioceptive and cross-modal registrations, in ways that provide a capacity for experiencing a basic distinction between our own embodied existence and everything else. As a result, when we first open our eyes, not only can we see, but also our vision, imperfect as it is, is already attuned to those shapes that resemble our own shape. More precisely and quite literally, we can see our own possibilities in the faces of others. The infant, minutes after birth, is capable of imitating the gesture that it sees on the face of another person. It is thus capable of a certain kind of movement that foreshadows intentional action, and that propels it into a human world. (p.1)

Gallagher spends a good deal of time discussing the evidence for intermodal perception, for instance the fact that infants are capable of imitating facial gestures at birth (Meltzoff and Moore 1977). They don't have to *learn* to see, much less learn to interpret what they see in terms of their own motor possibilities; the motoric equivalent of a visually perceived facial gesture is already a part of their experience. Similarly, in an experiment in which infants were given one of two different pacifiers (one smooth, the other nubbed), and then shown both, the infants looked significantly longer at the pacifier they had felt (Meltzoff 1993). Evidence of this sort appears to support three important findings: first, that organized perception is possible from birth, second that there is natural, intermodal communication between different perceptual streams, and third that experience in one sense modality can educate and inform other sense modalities.

One interesting payoff from Gallagher's review and discussion of this evidence is a new, empirically grounded answer to Molyneux's question to Locke:

Suppose a man born *blind*, and now adult, and taught by his *touch* to distinguish between a cube and a sphere . . . Suppose then . . . the blind man be made to see: *quaere*, whether *by his sight, before he touched them*, he could now distinguish and tell which is the globe, which the cube? (Locke 1694: 186)

The answer turns out to be yes, in principle (due to intermodal perception) but no, in fact, (because of neuronal degeneration that occurs in the absence of visual stimulation).

As intriguing as this is, for it to amount to more than a corrective to the empiricist position and provide support for a specifically embodied alternative, Gallagher must go further, and establish that perception is intermodal *in virtue* of the fact that conscious perception is grounded in and structured by the physical and motoric capacities of the body. Insofar as there *is* no prenatal visual experience (but plenty of prenatal movement), then bodily movement and the structures supporting it do appear to be good candidates for the original agent of perceptual organization. Moreover, the alternative would seem to be an innate, but non-motoric organizational framework for perception that develops at the same time as motor control, but in the absence of much if any experiential input *other* than that relating to motor control (touch, proprioception, etc.). Thus, if it can be shown (a) that the motor system has an organizational framework, (b) that it is innate and present at birth, (c) that it is capable of serving as the organizational framework for perceptual awareness, then parsimony alone would tend to favor the embodied account of perceptual organization. Evidence that (d) it in fact *serves* this latter function would only strengthen the case.

Although the book can hardly be said to end the conversation, it must be admitted that Gallagher does a good job establishing claims (a) – (d). The support for (a) centers around a construct called the *body schema*. The body schema is a system of sensory-motor capacities, operating below the level of consciousness, that plays an important role in controlling movement. The body schema is to be sharply distinguished from the *body image*, which is an artifact of perceptual awareness of the body and therefore plays a different role in the conscious experience of the subject. Gallagher distinguishes the two not just conceptually, but with an empirical double-dissociation: in lateral neglect, a patient will ignore perceptions of one side of the body, not washing nor grooming nor dressing the neglected side. Yet motor abilities such as walking, or bimanual tasks like knot tying, can remain unaffected, suggesting that while the body image is altered or damaged, the body schema remains intact and functioning. Likewise, subjects who have lost all tactile and proprioceptive input below the neck cannot use the body schema for motor control. However, it is sometimes possible for them to learn to guide action using visual feedback, pressing the intact body image into new service.

The case for (b) is surprisingly involved, and centers primarily on the possibility of aplastic phantoms, that is, the *experience* of a limb in cases of congenital *absence* of that limb. It is clear that if the body schema is innate, then aplastic phantoms should be possible; but although there are reports of aplastic phantoms, the evidence behind them turns out to be in various ways problematic. Gallagher's case for aplastic phantoms is interesting but not entirely conclusive; however, his discussion is a model of philosophically astute examination of empirical evidence, and is worth reading on these grounds alone.

This brings us to the case for (c) and (d), which take up the bulk of the volume. Gallagher presents evidence for the role of the body schema in a range of perceptual and cognitive functions including the differentiation of self and other, awareness of agency, interpersonal communication and intentional interpretation (“mind-reading”). As might

be expected, a good deal of the discussion involves the *spatial* organization of perception, and the integration of the perceptual and motor space necessary for coherent action. Gallagher argues, first, that the fact that perception is perspectively spatial depends on an implicit reference to the spatiality of the body, second that this implicit reference to the spatiality of the body cannot be based on perceptual awareness of the body, on pain of regress, and finally that the body schema, along with proprioceptive, non-perspectival awareness of the body, can provide the required grounding.

Gallagher has been working on this topic for more than ten years, and it shows. Indeed, many researchers will wish they had had this volume before publishing their own work, not because it presents startling new findings that will undermine what has come before, but because the work is so precise, and lays out the terrain so clearly, that it is now possible to see what should have been said all along. This is at least in part because among the more valuable things that Gallagher offers here is a language with which to speak, including a set of carefully made distinctions and precisely formulated questions that will drive research forward for some time.

As I noted at the outset, the analytical framework and disciplinary vocabulary that Gallagher develops in the course of his investigations is both a sign of, and contributor to, the maturation of EC as a research field; other signs, such as the appearance of EC-friendly journals and degree programs, point to the same transition from revolutionary to normal science. Nevertheless, as EC continues to age, we should expect a series of fights over identity and independence, as its many parents seek to limit and control how it spends its time, who its friends are, and when (if ever) it gets the keys to the car. Meanwhile, slowly but surely, EC will come to resemble (although not replicate) the parents from which it is trying so hard to differentiate itself. When the day comes that it is time for EC to take over the family business—and that day is coming—the change in management and the differences it brings will be noticeable; and so will all the things that stay the same.

Locke, J. (1690). *An Essay Concerning Human Understanding*. (2nd edition 1694), ed. A.C. Fraser. New York: Dover, 1959.

Meltzoff, A. (1993). Molyneux's babies: Cross-modal perception, imitation, and the mind of the preverbal infant. In N. Elia, R. McCarthy and B. Brewer (Eds.) *Spatial Representation: Problems in Philosophy and Psychology* (pp. 219-35). Oxford: Basil Blackwell.

Meltzoff, A. and Moore, M.K. (1977). Imitation of facial and manual gestures by human neonates. *Science*, 198, 75-8.