

SENSORIMOTOR AND ENACTIVE APPROACHES TO CONSCIOUSNESS

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Abstract

According to the sensorimotor approach, perceptual experience is something we do, not something that happens in us. That is, having perceptual experience is fundamentally a matter of engaging with our environments in particular ways. We will argue that the sensorimotor position should best be seen as a form of identity theory. Unlike in the classical identity position however, the sensorimotor approach identifies conscious experience, not with internal or neural processes, but with bodily processes in spatially and temporally extended interactions with environments. After having considered some of the most common objections to the sensorimotor view of perception and perceptual awareness as something we do, we will compare the sensorimotor approach with other enactivist positions, namely Mind/Life Continuity Enactivism, and Radical Enactivism.

1. Introduction

What is it like to have a sensation of red, or to consciously see a blue car parked in the street?

On established philosophical understandings of the relation between the mental and the

physical, these questions concern how it is possible for brain states or inner representations to give rise to phenomenal feel.

According to the sensorimotor approach to perceptual experience, the pressing philosophical questions about phenomenal feel are answerable only if it is recognized first that such experience essentially is “something we do, not something that happens in [us]” (O’Regan and Noë 2001b: 80). That is, if it is understood that having perceptual experience is fundamentally a matter of engaging with our environments in certain ways. Forgetting that perceptual awareness is something we do and instead aiming for an understanding of perceptual experience in terms of inner neural or representational events only invites, insist sensorimotor theorists, further unsolvable problems about how these events give rise to consciousness.

This paper will be devoted to unpacking the sensorimotor thesis that experience is something we do, and explicating how it helps to deal with the philosophical problem of consciousness. The key to understanding the sensorimotor position, so we propose, is to recognize it as a form of identity theory. Like the early mind/brain identity theorists, the sensorimotor approach holds that the solution to the philosophical problem of phenomenal experience lies in realizing that phenomenal experience is identical with something which, while at first sight might seem different, turns out not to be different after all. Like the classical identity theorists, sensorimotor theorists reject the claim that identities can and need to be further explained once identification is made. Sensorimotor theorists consequently oppose the idea that there is a genuine scientific issue as to why the identity relation between experience and what perceivers do holds. However, unlike other identity positions, the identification proposed by the sensorimotor approach is wide. That is, conscious experience is identified, not with

internal or neural processes, but instead with bodily (including neural) processes in spatially and temporally extended interactions with environments.

However, if experience is identified with doing, there is a further issue about what are the conditions needed for the appropriate doings to be possible. In *Mind-Life Continuity (MLC) Enactivism* (Thompson 2007), it has been argued that consciousness can occur only when and where the organisation of life is present. After briefly discussing the relation of the sensorimotor approach with MLC enactivism, we will also compare the sensorimotor approach with Radical Enactivism, according to which basic perception is contentless and argue that considerations of coherence should push the sensorimotor approach to endorse Radical Enactivism. Adding to replies to other standard criticisms of the sensorimotor approach which we give earlier in the paper, we will end by showing how our construal of the sensorimotor approach to consciousness can be used to reject the criticism often made against sensorimotor theory, namely that by invoking the environment in its account of consciousness, the sensorimotor theory deepens, rather than overcomes, the philosophical problem of consciousness.

2. Sensorimotor sensation and perception

The sensorimotor approach to perceptual experience is built on the idea that “experience is something we do, not something that happens in [us]”. But what exactly does this mean?

Consider the having of a sensation. Having a visual sensation of red, so the approach holds, is a matter of perceptually engaging with the environment. But such an engagement only

constitutes the perceiver's visual experience if the perceiver is sensitive, adapted or attuned to particular sensorimotor contingencies. Sensorimotor contingencies are lawful patterns in the way stimulation changes, including the lawful ways in which stimulation for a perceiver changes as a function of the perceiver's bodily movement. In the case of light and vision, for example, sensorimotor contingencies concern the ways in which light interacts with objects, with other light and with perceivers. The sensorimotor contingencies typical for red thus include the lawful ways in which light of a particular constitution gets reflected by particular surfaces, how the reflection changes when the constitution of the light changes, how the reflection differs along different angles of perception and how the reflected light differentially affects receptors on a perceiver's retina.

This reveals that the sensorimotor approach construes the having of a red sensation in terms of bodily interaction with certain surfaces (or, occasionally, lights) in ways that are adapted to or attuned to the relevant sensorimotor contingencies. A perceiver's being attuned to such contingencies shows, for example, in the fact that she still has the same experience when only the illumination but not the surface changes—the phenomenon known as colour constancy. Another example of attunement is when the same colour is experienced when the perceiver moves and the surface comes to stimulate a different part of the retina. The paradigm case of experiencing red, so the sensorimotor contingency approach holds, is thus one in which the agent perceptually engages with an object in its environment in ways that are appropriately sensitive to the sensorimotor contingencies typical for red objects.

The sensorimotor approach accounts for the quality of sensory modalities as a whole in the same way in which it accounts for the quality of particular sensations. That is, what gives visual experience the quality of seeing, as different from hearing, is that seeing is a specific

way of interacting with the environment, subject to its own particular sensorimotor contingencies. Closing your eyes will interrupt your vision but not your hearing, for example. Standing on your head will invert your visual experience but not your auditory experience.

The sensorimotor approach consequently offers a recipe by which to analyse any qualitative aspect of perceptual experience. Such sensorimotor analysis proceeds by characterizing the specific kind of interaction that the experience is to be identified with. Consider the perceptual experience of objects. Typically, when one perceives an object, one has only a partial view of it. Nevertheless, one's experience relates to the complete object, not to only the fragment that is currently in view. The sensorimotor approach explains that one relates to the whole object through one's sensitivity to the changes in stimulation that would happen if one were to move with respect to the object. So, for example, one will not be surprised by the how one's visual experience changes when one moves around the object. Also, if one would grasp the object, one's hand aperture would be appropriate to the orientation of the unseen parts of the object. As with the case of sensation, conscious perceptual experience is understood in terms of what perceiver's do and can do if and when they engage with their environments, in a way that is adapted to the relevant sensorimotor contingencies.

Crucially, sensorimotor theorists claim that understanding sensation and perception as doings holds decisive advantages over explaining sensation and perception in terms of internal neural or representational events. Sensorimotor theorists acknowledge that neural processes are involved when, say, a sensation of red is felt. Still, they insist that the conscious quality of having the sensation cannot be adequately understood in terms of such processes. The same position has also been adopted with respect to inner representational events. Sensorimotor theorists reject the idea that the phenomenology of being perceptually related to unfaced parts

of an object can be explained in terms of the activation of internal mental representations that ‘stand for’ these parts. O’Regan and Noë (2001a: 939–40) illustrate their stance by commenting on an extensive list of contemporary proposals for the mechanisms alleged to explain the generation of consciousness. These include, for example, a ‘commentary’ system situated somewhere in the fronto-limbic complex (taken to include the prefrontal cortex, insula and claustrum; cf. Weiskrantz 1997: 226); “coherent oscillations in the 40–70 Hz range, which would serve to bind together the percepts pertaining to a particular conscious moment” (Crick and Koch 1990); “a quantum process in neurons’ microtubules” (Hemeroff 1994); and “reentrant signaling between cortical maps” (Edelman 1989). O’Regan and Noë claim all these examples raise the following issue:

“A problem with proposals of this kind is that they do little to elucidate the mystery of visual consciousness (as pointed out by, for example, Chalmers 1996). For even if one particular mechanism — for example, coherent oscillations in a particular brain area — were proven to correlate perfectly with behavioral measures of consciousness, the problem of consciousness would simply be pushed back into a deeper hiding place: the question would now become, why and how should coherent oscillations ever generate consciousness? After all, coherent oscillations are observed in many other branches of science, where they do not generate consciousness. And even if consciousness is assumed to arise from some new, previously unknown mechanism, such as quantum-gravity processes in tubules, the puzzle still remains as to what exactly it is about tubules that allows them to generate consciousness, when other physical mechanisms do not.” (O’Regan and Noë 2001a: 939–40)

This passage shows that O’Regan and Noë object to a number of proposals to understand consciousness in terms of specific inner (neural) processes. It also offers their grounds for

such rejection, namely that all such proposals invite the further question as to why the particular inner process proposed gives rise to, or generates, consciousness (O'Regan 2011: 97 raises the same point). However, if this criticism of internalist approaches to consciousness is correct, then one may wonder why the sensorimotor approach is not itself susceptible to a similar critique. For why is the idea that the qualitative aspects of sensation and perception should be understood as doings not itself vulnerable to the worry that there is a gap between, on the one side, consciousness, and on the other side, doings? If there is such a gap, then one can ask: why should engaging with the environment perceptually give rise to consciousness at all? Also, one can ask: why should *this* particular doing or action generate *this* particular sensation and/or perception? In what follows, we will show how the sensorimotor approach provides the means to tackle this criticism and so deal with these questions.

3. Sensorimotor identity

Getting a grip on how the sensorimotor approach to experience allows us to answer questions about an alleged gap between experience and doing requires that we first clarify what exactly is the proposed account of experience and its relation to doing. However, this is complicated by the fact that the canonical writings in which the sensorimotor approach has been expressed leave room for more than one interpretation (O'Regan and Noë 2001a,b). This has not gone unnoticed by commentators such as Gennaro (2017), who wonders:

“What exactly is the view? Sometimes it is unclear. On the one hand, it often sounds like a stronger identity or constitutive claim is being made about the relationship between

sensorimotor skills and consciousness. “Perceptual experience . . . *is* an activity of exploring the environment drawing on knowledge of sensorimotor dependencies and thought” (Noë 2004: 228) and “perceptual experience *just is* a mode of skillful exploration of the world (Noë 2004: 194). Again: “Visual experience is simply not generated [in the brain] *at all*. Experience is not the end product of some kind of neural processing” (O’Regan 2011: 65). On the other hand, there are many examples of a much more modest causal or dependency claim. “I have been arguing that, *for at least some experiences*, the physical substrate [vehicle] of the experience *may* cross boundaries, implicating neural, bodily, and environmental features” (Noë 2004: 221) and “experiencing a raw feel *involves* engaging with the real world” (O’Regan 2011: 112). “ (Gennaro 2017: 85-86).

We propose to resolve this possible lack of clarity by taking the sensorimotor proposal that experience is doing to be an *identity claim*, similar in some respects but dissimilar in others, to the identity claims made by the classical mind/brain identity theorists Ullin Place and Jack Smart, (Place 1956; Smart 1959). This reading, so we will attempt to show, allows for the most viable form of sensorimotor theory, and is consistent with the bulk of the canonical sensorimotor writings.

According to this reading, sensorimotor theorists, like the classical mind/brain identity theorists, propose that the solution to the mind/body problem lies in *identifying* what might seem like otherwise different relata. And as was the case for classical identity theorists, this enables sensorimotor theorists to declare that there are no further issues concerning the relation between the mind and the body, since identities do not stand in need of further explanation. However, in contrast to classical mind/brain identity theorists, sensorimotor theorists propose that sensations and perceptions should be identified with, not brain

processes, but instead wide, environment-involving activities (see also Hutto and Myin 2013, chapter 8; Myin 2016).

Let us first quickly address the idea that is shared by the mind/brain identity theorists and the sensorimotor approach, namely that identities don't stand in need of explanation. According to this idea, asking for an explanation of why E happens when C happens only makes sense if E and C are not identical. In such a case, one may wonder how the occurrence of C makes possible the happening of E. For example, C might be a mechanism that produces E. By contrast, if C and E are identical, then the question as to why E occurs when C occurs becomes the question as to why E occurs when E occurs, or why C occurs when C occurs. In other words, once C and E are understood to be identical, then it no longer makes any sense to wonder why E occurs when C occurs.

Of course, even in the case of an identity, one might think the question about how C gives rise to E does make sense if one is not aware of the identity between C and E. One could be puzzled, for example, about why Clark Kent's footprints were at the same spot as Superman's footprints. One might then conjecture that perhaps the two cooperated and then ponder about their motives for doing so. But even in this case, the only genuine questions involving distinct relata and how they relate concern conceptions of Superman and Clark Kent, not Clark Kent and Superman themselves. After all, Clark Kent and Superman remain one and the same person even if you are entirely ignorant of this fact and mistakenly take your thoughts about Superman to be about someone different from your thoughts about Clark Kent.

Summing up: the central claim of the sensorimotor approach, we propose, is that perceptual experience is identical to a bodily activity, within which sensitivity, adaptivity, or attunement to sensorimotor contingencies is displayed. Our interpretation is in line with the beginning of O'Regan and Noë:

“We propose that seeing is a way of acting. It is a particular way of exploring the environment. (...). The experience of seeing occurs when the organism masters what we call the governing laws of sensorimotor contingency.” (O'Regan and Noë 2001a: 939)

We have emphasized that identifying experience with activity leads to the conclusion that further questions as to how experience and activity are related no longer make sense. This is congruent with the way in which O'Regan and Noë compare their account with developments in physics. They write:

“In understanding the epistemological role of the present theory, an analogy can be made with the situation facing nineteenth-century physicists, who were trying to invent mechanisms by which gravitational or electrical forces could act instantaneously at a distance. To solve this problem, Faraday developed the idea of a field of force, which was, according to Einstein, the single most important advance in physics since Newton (cf. Balibar 1992). But, in fact, the idea of a field of force is not a theory at all, it is just a new way of defining what is meant by force. It is a way of abandoning the problem being posed, rather than solving it. Einstein's abandoning the ether hypothesis is another example of how advances can be made by simply reformulating the questions one allows oneself to pose.” (O'Regan and Noë, 2001a: 949)

However, as noted earlier, while appealing to the same abstract logic of identity, the identity claim at the center of the sensorimotor approach fundamentally differs from the sort of identity claim made by classical identity theorists. For the sensorimotor approach identifies perceptual experience, not with neural processes, but rather with bodily activity. Indeed, with respect to the identification of the mental and the neural, sensorimotor theorists take a diametrically opposed position to classical identity theory.

Classical identity theorists have claimed that the identification of the mental with the neural settles issues of how the physical generates the experiential (see in particular Smart 1959). Contrarily, sensorimotor theorists posit that such classical identification does exactly the opposite: it invites unsolvable generation issues. According to sensorimotor theorists, the reason such unsolvable problems arise is that the identification proposed by the classical theorists is wrong headed: experience is identified, not with what it actually is identical with, i.e. bodily activity, but instead with what is only a necessary condition for it, i.e. neural processes. According to this sensorimotor critique, one can't identify a property displayed by a system with the activity of part of that system, even when the systemic property always involves that part's contribution. If one does make this mistaken identification, then unsolvable problems arise, that is, problems that are logically or conceptually flawed.

Invoking an analogy, O'Regan and Noë argue that one should not single out the beating heart as the "biological correlate" for life. Such a move would, they state, invite the problem of how the beating heart, all by itself, can *generate* life. Yet even though the beating heart is quite clearly necessary for its owner's life:

“(n)either the beating heart, nor any other physiological system or process, or even the sum of all them, generate life. Being “alive” is just what we say of systems that are made up in this way and that can do these sorts of things” (O’Regan and Noë 2001a: 1018).

The same goes for the thinking about perceptual experience in terms of neural correlates. While neural events form a necessary condition for such experience, they nonetheless provide the wrong “targets” for making identifications, since identifying neural events with experience will always invite the further question: how can such neural events, all by themselves, generate experience? By contrast, identifying experience with doings prevents any such generation question from arising. The reason is that this identification is in fact the right one to make: doings are precisely the “sorts of things”, to paraphrase from the quote above, that perceivings are. Engaging in particular doings simply *is* what it is to have perceptual experience.

That an identification of experience with doings makes more sense than an identification with internal happenings can be further argued for by comparing and contrasting answers to the following question: what distinguishes perceptual experience from other kinds of experiences, such as imagination, or thought?

Consider perceiving first. When you see an object, your movements will bring into view different parts of the object. Closing your eyes will interrupt your seeing it. Moreover, when something suddenly changes, as when the color on part of the object would suddenly change to a very different color, this would draw your attention to the spot on the object where the change has happened. Now consider imagination or thought. When you visualize an object in imagination, or simply think about that object, neither your bodily movements nor changes

that can happen to the object impact in the same way. For example, the real life counterpart to your imagined object might be annihilated and yet you can still continue to imagine that object or think about that object.

This contrast between perceiving and imagining or thinking reveals that perceptual experience has a profile that can be characterized in terms of “bodiliness” and “grabiness” (see O’Regan and Noë 2001b; O’Regan, Myin and Noë 2005a,b). The ways you move your body will affect what you perceive (bodiliness) and changes in the object you perceive will grab your attention, such that you will perceive those changes (grabiness). Contrarily, visually imagining or simply thinking about that same object has no such bodiliness or grabiness. According to the sensorimotor approach, it is this difference in sensorimotor profile that ensures that perceptual experience has the specific quality of being perceptual, or has “perceptual feel”.

Note that bodiliness and grabiness are characteristics of the interaction between perceivers and their environments, that is, characteristics of doings. Bodiliness and grabiness concern how the perceiver’s activity effects the environment (and thereby further activity) and how the environment affects the perceiver’s activity. By tracing back the conscious quality of “being perceptual” to bodiliness and grabiness, sensorimotor theorists analyse the quality in terms of specific ways of doings. As before, sensorimotor theorists argue that such an analysis holds advantages over an analysis which invokes internal (neural or representational) factors.

For example, suppose that there is some neural correlate typical of interactions, which involve bodiliness and grabiness. Call this neural correlate N. Further suppose that N never occurs in cases of imagining or thinking. The sensorimotor theorist will argue that N nonetheless offers

an inferior explanation for the feel of perceiving (versus the feel of imagining or thinking) than an explanation in terms of bodiliness and grabbiness. For N raises the sort of generation question posed before: why does N give rise to the quality of “being perceptual”? A satisfactory answer to that question, insists the sensorimotor theorist, must require invoking N’s role in interactions that have bodiliness and grabbiness. But then one is back to the sensorimotor position.

The same holds true for explanations in terms of internal representations. It might be proposed that some experiences are “perceptual” because they carry a label, mark or code. Some brain events, in other words, get tagged as being perceptual and the tag should be understood as the representation “this is perceptual”. However, without a detailed and convincing story about how such labels actually work, little ground is gained by invoking such a representational story. For while a possible explanans is pointed at, this explanans is tailor made to have exactly those properties that provide the explanation. Yet the fact that the explanans has these properties is all we know about it. What has been invoked, that is, is an unexplained explainer.

Moreover, even if a story about how the label in question represents could be told, such that our hitherto unexplained explainer would then be explained, such a story would have to mention bodiliness and grabbiness, or other interactive factors, which are characteristic of being perceptual. For what makes perception perceptual is what the label represents. In other words, even under these conditions, we end up very close to the sensorimotor theory, and need to invoke its explanantia or something very much like them.

4. Objections and replies

Despite these arguments in favor of the sensorimotor approach, many opponents have rejected the sensorimotor approach without giving it due theoretical consideration. For such opponents, the imagined or actual existence of vivid perceptual-like experience in imaginations, dreams, hallucinations, or through direct stimulation of the brain provides simple but conclusive empirical proof that the sensorimotor identification of experience with doings is mistaken (see Gennaro 2017: 85-86 for a formulation of this worry; Block 2005; Prinz 2006). Such phenomena are taken to run counter to the identification of experiences with doings because they are possible without any movement at all. Indeed, a completely paralyzed person could have them. Apart from not demanding movement, such experiences are not voluntary: they happen to us, whether we want it or not. This provides an additional reason, claim some, for concluding that these experiences can't be doings.

The sensorimotor theorist will deny however that phenomena like dreams run counter to the identification of experience and doings, and instead argue that the sensorimotor approach contains resources to explain the particular characteristics of dreams—characteristics that are in fact left unexplained by rival approaches. The key to getting a sensorimotor grip on phenomena like dreams is to point out that they are, like all other other experiences, embodied and embedded. Dreams are embodied in the sense that they are dreamt by persons, who are bodies, and it is the same body that perceives and acts during the day that then dreams during the night. Evan Thompson in a recent book which treats of enactivism and, inter alia, dreaming, invokes an ancient image from the Indian *Upanishads*: “like a great fish swimming back and forth between the banks of a wide river, we journey between waking and dreaming. The image hints of deeper currents beneath the surface while allowing for intermediate areas and eddies where waking and dreaming flow into each other.” (Thompson 2015: 110).

Moreover, what persons dream is only partly contingent. People dream of their mothers, brothers, and friends, in ways determined by their unique personal relations to them, and in situation types the dreamers desire or fear. Dreams are moulded by personal feelings, anxieties and preferences. They take place, and can only be understood when they are considered against the background of a person's "active life" (Noë 2004: 231).

If dreams thus are embedded in a personal situation, then they are tied to the specifics of the immediately occurring surrounding circumstances as well. Dreamers hear the fire wagon speeding by when their alarm sets off, and, if Nietzsche is to be believed, "the man who ties two straps around his feet, for example, may dream that two snakes are winding about his feet" (Nietzsche 1878/1986, section one, aphorism 13). Of course, interaction with the environment in dreams is severely restricted: after all, we have closed our eyes and don't see our surroundings. Sensorimotor theorists have argued however that this restriction of perceptual interaction in dreaming holds the key to understanding the particular characteristics and dynamics of dreams.

For example, the lack of perceptual interaction between the dreamer and its environment might explain why whole series of bizarre changes can be experienced when dreaming. The perceptual experience of a horse, unless one is at the movies or so, won't turn into the perceptual experience of a cat because the flow of stimulation from a horse remains the flow of stimulation from a horse, even if it (the horse), or the perceiver, moves. But when experience is only minimally conditioned by such flow, nothing then stands in the way of such a transformation (See Noë 2004: 213-214; O'Regan, Myin and Noë 2005b: 62-64; O'Regan 2011: 66; Dennett 1991, chapter 1, who makes related points).

The claim that perception-like experience is possible without movement, be it in dreams, hallucinations, paralysis, or just when standing still, only runs against the sensorimotor idea that experience is a doing if we further assume that all doings involve movement. But this assumption is false. For it is a mistake to confuse doings with moving or making movements. In fact, one can do very specific things by arresting any movement. Think about obeying a police officer's order to stand still, or what a statue artist does to make money. Interestingly, it seems people only don't act out their dreams because they are physiologically prevented from doing so—their muscles being temporarily and selectively paralyzed during REM sleep, by known neurophysiological mechanisms (Brooks and Peever 2012). In that sense, dreams can be considered doings whose movements are prevented from occurring—and in rare occasions, when the physiological mechanisms sub-serving the prevention fail to function, people do, with much danger to themselves and their surroundings, in fact act out their dreams (Howell and Schenck 2015).

Another reason why dreams, or hallucinations—a fortiori when these are imagined to be induced by directly stimulating the brain (as in the classic studies by Walter Penfield 1975; for comparable experiments using transcranial magnetic stimulation, see Hallett 2000)—can be considered to run against the sensorimotor view of experiences as doings is that they occur involuntarily. They seemingly “happen to us”, rather than “something we do”. As such, they are on a par with a much wider class of perceptual, or perception-related experiences, including bodily feelings such as pains, twinges or itches, or sensations of the sensory modalities like vision, hearing or smell. We have to do nothing, apart from keeping our eyes open, to receive perceptual impressions from the world. And pain strikes us, often very much

against what we want. This leads to the question as to how this apparently passive nature of such experiences can be reconciled with the sensorimotor idea of perception as a doing.

It is important to realize however that many of our doings are provoked, rather than intended with conscious premeditation. Still they are things we do. Consider for example a person that swears when he accidentally hits his thumb while hammering a nail in a beam, or a person that shouts, “take care” or “watch out!” when a teammate comes running into him when playing sports. This swearing and shouting are things the person does, despite not being planned, or wanted. What makes them a person’s doings are rather that they are learned reactions, arising from, and grounded in this person’s history. Moreover, they take place as part of the person’s interactions with his environment. They are reactions to a specific situation. Yet, as the examples of shouting, “take care” or “watch out!” clearly show, they can be forward-looking and anticipatory.

A promising lead to follow for sensorimotor theorists, so we think, would be to view sensory experiences in analogy to such acts. Feeling pain, feeling the tactile sensation of being stroked by a feather or seeing red could then be seen as adaptive anticipatory bodily reactions of an organism to specific kinds of environmental offerings. These anticipatory reactions are grounded in evolutionary history, but they also form part of a person’s or organism’s contextualized engagement with their current situation, in a way that is sensitive to “cognitive, emotional and evaluative contributions” (Ben-Zeev 1984). Such analysis can be fruitfully applied to pain. Aaron Ben-Zeev, for example, cites Melzack in order to underscore the personal nature of pain:

“The psychological evidence strongly supports the view of pain as a perceptual experience whose quality and intensity are influenced by the unique past history of the individual, by the meaning he gives to the pain-producing situation and by his ‘state of mind’ at the moment... In this way pain becomes a function of the whole individual, including his present thoughts and fears as well as his hopes for the future”. (Melzack 1973: 48)

The claim that pain is situationally and personally sensitive is further indicated by the finding that as many as 37% of the patients arriving at an emergency clinic reported a period, normally of about an hour but in some cases lasting up to nine hours, of absence of the experience of pain after the injury — a finding lending support to the fact that athletes and soldiers sometimes succumb to serious injury, but they report being unaware of the pain until the end of the competition or battle (Beecher 1956). The picture of pain as purely passive, that is, as an impersonal event an organism simply “undergoes” as a result of inflicted damage consequently appears fundamentally flawed. Moreover, pain is anticipatory: it sometimes already happens before damage occurs. That is, rather than being invariably a reaction to actual tissue damage, pain also occurs whenever there is the threat of tissue damage (Melzack 1996; Moseley 2007; Wall 1999). In those cases, it seems pain’s evolutionary rationale is to steer the organism away from activity that will inflict damage. The anticipatory character of pain is also discernible at the neural level. It has been shown that nociceptive neurons in area 7b of the monkey brain respond with increasing strength to temperatures between 47 and 51°C, which is just below the level at which tissue damage occurs (Dong et al. 1994).

Though further work is of course needed, conceiving of sensory experience—both sensation and perception -along these lines seems both promising and congruent with the existing sensorimotor literature (see O’Regan and Noë 2001a,b; some of the points made in Myin and

Zahidi, in press). Sensory awareness of red becomes an anticipatory embodied interaction pattern provoked by and specific to environmental conditions or sensorimotor contingencies, which prepares and disposes the perceiver to interact in ways appropriate to how the conditions or sensorimotor contingencies have varied in the past, for example, as a function of movement. Similarly, perceiving a particular object is an embodied anticipatory interaction, forged and attuned by situations in which the same sensorimotor contingencies have occurred again and again—seeing the frontside of a cube is being ready to deal with its hidden sides, for example.

In fact, it is now possible to say how a sensorimotor identity theory answers the question posed in the opening phrase of this paper, namely what it is like to see red. It is to be identical to a creature that shows a phylo- and ontogenetically acquired interaction pattern adapted to the circumstances that forged such reaction. Moreover, it is equally possible to see how the sensorimotor approach accounts for perception-like awareness in circumstances in which the environmental part of the normal environment is missing, as in dreams. In such cases, parts of the interactive pattern occur and make it seem to the subject that perception occurs. But such perception-like experiences are different, that is, they lack the solidity of genuine perceptual experiences, because they are not directly regimented by environmental regularities.

5. Other enactive approaches

“Enactivism” is a term that encompasses a wide variety of approaches to mind and experience. These various approaches all share the view that action and interaction are at the basis of all (human and animal) mentality. The enactive nature of experience is, for example,

central to the particular brand of enactivism proposed and defended by, among others, Francesco Varela and Evan Thompson. According to Mind/Life Continuity (MLC) Enactivism, as we'll call it, living beings have unique organizational properties, "and the organizational properties distinctive of mind are an enriched version of those fundamental to life. Mind is life-like, and life is mind-like" (Thompson 2007: 128). For MLC Enactivism, this principle is true of all living beings, from language using creatures such as ourselves, right down to single cellular organisms, such as bacteria. There is thus a deep-seated continuity between mind and life. To be alive is to have a mind, albeit (in the case of single cellular organisms) a very primitive one.

This raises the question as to what extent MLC Enactivism is compatible with the sensorimotor approach, or if in fact it runs entirely counter to it. Answering this question depends upon those conditions needed for the doings to occur, doings that, according to the sensorimotor approach, experiences are identical to. If only living beings can engage in activity that deserves to be called a "doing" (in the sense which the sensorimotor approach uses this term), then the sensorimotor approach is a de facto brand of MLC Enactivism. Alternatively, if nonliving systems, for example artificial agents that do not share the organizational properties typical of life, are capable of such doings, then the sensorimotor approach is not compatible with MLC Enactivism. In any case, MLC enactivists have drawn attention to the fact that the sensorimotor contingencies that shape consciousness do not occur as free-floating patterns, but are rather regularities in the embodied interactions of living organisms with their environments. Moreover, they have argued that in order to provide a more complete treatment of consciousness, the sensorimotor approach "needs to be underwritten by an enactive account of selfhood or agency in terms of autonomous systems."

(Thompson 2005: 417; Di Paolo, Buhrmann and Barandarian 2017 for providing an account of agency).

Hutto and Myin (2013; 2017) have also defended a brand of enactivism, which they term Radical Enactivism. They have argued that many forms of cognition exist which do not involve content, where content is defined in terms of the having of truth or accuracy conditions. Hutto and Myin's proposal runs counter to ideas about perception and cognition that have become standard in philosophy and cognitive science, such as that perception always involves representing the world to a subject in a way in which the world is or could be. Hutto and Myin object that we currently don't have reasons to endorse the idea that cognition and perception always involve contentful representation. Moreover, they hold that we don't need to appeal to such contentful representations anyway, since perception, and the way in which perception interacts with other forms of cognition, can be explained without invoking content (see chapter 7 of Hutto and Myin 2017).

To assess whether sensorimotor enactivism should (as argued in Hutto 2005 and Hutto and Myin 2013, Chapter 2; see also Loughlin 2014) embrace Radical Enactivism, it is helpful to consider why Radical Enactivism rejects content in the case of basic perception. Radical Enactivism opposes invoking content in such cases because it rejects unexplained explainers. If one wants to invoke content in characterizing perception, and in explaining the role perception plays in further cognitive activities, then one should have a story about how content comes about and how it has effects qua content. Crucially, such a story must be about content, and not about something else—for example correlation, or isomorphism—that is merely stipulated to be content.

Recall the above account of the sensorimotor stance on internal representations as a means to explain perceptual phenomenology. Representations were rejected because they either contained an unexplained explainer or could be assimilated to the sensorimotor approach. As such, Radical Enactivism and the sensorimotor approach both oppose the invoking of representations for the same reason, namely because they are assigned the role of explainers yet they themselves are not explained.

However, while the sensorimotor approach and Radical Enactivism both reject internal representations, they do so in different contexts. Sensorimotor theorists reject representations when they are proposed to explain consciousness. Radical enactivists reject representations when they are proposed to explain cognition. Theoretically, it might be possible for a sensorimotor theorist to reject representations for explaining consciousness, while still holding on to representations for the sake of explaining cognition. Yet though such a position is theoretically possible, it is only plausible if there are good reasons to hang on to representations for cognition. *Prima facie*, it might seem that explaining an organism's sensitivity to sensorimotor contingencies might provide such a reason. But an organism's sensitivity to sensorimotor contingencies means nothing more than that its engagements with the environment are adapted to the fact that certain sensorimotor regularities occur. Explaining such adaptation simply requires appealing to the regularities themselves, an organism's adaptation to them, and how they are underwritten by bodily and neural changes. In her recent book on vision, Nico Orlandi states this point very clearly

“The embedded view understands internal biases of the visual system as neuro-physiological responses to environmental pressure that perform a certain function, not as representations. (...) It favors explanations that make essential reference to the environmental

conditions under which vision occurs, and under which it evolved. We see edges when exposed to discontinuities in light intensity because edges are the typical environmental causes of such discontinuities—and because they are advantageous for us to see. We don't know anything, either implicitly or explicitly, about these environmental contingencies, prior to studying vision.” (Orlandi 2014: 102 -103)

The fact that representations are not required to explain sensitivity to sensorimotor contingencies further supports our proposal that the most coherent and theoretically elegant option for the sensorimotor theorists is to endorse Radical Enactivism (a conclusion reached on different grounds in Silverman, forthcoming; see also Di Paolo, Buhrmann and Barandiaran, chapter 2).

5. Conclusion

We have construed the sensorimotor approach to perceptual consciousness as proposing that episodes of perceptual awareness are identical to the engagement of organisms with their environments in ways that are sensitive, adaptive or attuned to sensorimotor contingencies. However, the fact that such doings are wide, or environment-involving, has been used to promote a prominent criticism of the sensorimotor approach to consciousness, namely that such an approach is deeply flawed. For example, Prinz (2006) has claimed that if it is indeed hard to understand how neural correlates can generate phenomenal experience, then not only it is no advance to appeal to bodily interaction with an environment, it actually compounds our original problem. For whereas previously we needed to explain how neural correlates generate experience, now we need to explain how neural correlates *plus* bodily interaction

with an environment generates phenomenal experience. Going outside the head to explain experience is deemed by Prinz as nothing more than a “fools errand”.

Yet our construal of the sensorimotor approach demonstrates why this criticism is misplaced. For the sensorimotor approach, in our view, is precisely not the claim that brain plus body and environment generates experience. It is instead the claim that perceptual experience is something people (and animals) do. This is to identify experience with doing and so prevent possible generation questions from arising in the first place. We can thus clear away the sorts of unsolvable issues that have previously dogged investigations into consciousness (notably the Hard Problem of Consciousness) and thereby target those genuine empirical and theoretical issues that consciousness can raise. That they can lead us away from principally intractable problems and so clear the road for real progress reveals, so we propose, the true merit of sensorimotor and enactive approaches to consciousness.

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REFERENCES

- Balibar, F. (1992) *Einstein 1905. De L'éther aux quanta*. Paris: Presses Universitaires de France.
- Beecher, H.K. (1956) Relationship of significance of wound to pain experienced, *Journal of the American Medical Association* 161(17): 1609-1613.
- Ben-Zeev, A. (1984) The Passivity Assumption of the Sensation-Perception Distinction, *The British Journal for the Philosophy of Science* 35(4): 327-343.
- Block, N (2005). Review of Alva Noë, *Action in Perception*. *Journal of Philosophy*, 102: 259-272.
- Brooks P. J., Peever J H (2012). Identification of the Transmitter and Receptor Mechanisms Responsible for REM Sleep Paralysis. *Journal of Neuroscience*, 32(29): 9785-9795
- Chalmers, D. J. (1996) *The conscious mind: In search of a fundamental theory*. Oxford University Press.
- Crick, F. and Koch, C. (1990) Toward a neurobiological theory of consciousness. *Seminars in the Neurosciences* 2: 263–75.
- Dennett, D C (1991) *Consciousness Explained*. Boston, MA: Little, Brown and Co.

Di Paolo, E, Buhrmann, T and Barandiaran, X (2017). *Sensorimotor Life: An Enactive Proposal*. Oxford University Press.

Dong, W.K., Chudler, E.H., Sugiyama, K., Roberts, V.J. and Hayashi, T. (1994) Somatosensory, multi-sensory and task-related neurons in cortical area 7b (PF) of unanesthetized monkeys, *Journal of Neurophysiology* 72: 542–564.

Edelman G. M. (1989) *The Remembered Present*, New York: Basic Books.

Gennaro, R (2017). *Consciousness*. London: Routledge.

Hallet, M. (2000) Transcranial Magnetic Stimulation and the human brain, *Nature* 406 (6792): 147-150.

Hameroff, S. R. (1994) Quantum coherence in microtubules: A neural basis for emergent consciousness? *Journal of Consciousness Studies* 1 (1): 91–118.

Howell MJ, Schenck CH (2015) Rapid Eye Movement Sleep Behavior Disorder and Neurodegenerative Disease. *JAMA Neurology* 72 (6): 707-12.

Hutto, D. (2005) Knowing what? Radical versus conservative enactivism, *Phenomenology and the Cognitive Sciences* 4 (4): 389–405.

Hutto, D. and Myin, E. (2013) *Radicalizing Enactivism. Basic Minds without Content*, Cambridge MA: The MIT Press.

----- (2017) *Evolving Enactivism: Basic Minds Meet Content*, Cambridge MA: The MIT Press.

Loughlin, V (2014) Sensorimotor knowledge and the radical alternative. In Bishop J, M and Martin, A, O (Eds), *Contemporary Sensorimotor Theory, Studies in Applied Philosophy, Epistemology and Rational Ethics*, New York: Springer..

Melzack, R. (1973) *The Puzzle of Pain*, New York: Basic Books.

Melzack, R. (1996) Gate control theory: on the evolution of pain concepts, *Pain Forum* 5: 128–138.

Moseley, G.L. (2007) Reconceptualising pain according to its underlying biology, *Physical Therapy Reviews* 12: 169–178.

Myin, E. (2016) Perception as something we do, *Journal of Consciousness Studies*, 23(5-6): 80-104.

Myin, E and Zahidi, Z (in press) Sensations, Routledge Encyclopedia of Philosophy Online.

Nietzsche, F. (1878/1986) *Human, All Too Human: A Book for Free Spirits*. Trans. R. J. Hollingdale, Cambridge University Press, 1996

Noë, A. (2004) *Action in Perception*, Cambridge MA: The MIT Press.

O'Regan, J. K. (2011) *Why Red Doesn't Sound Like a Bell: Understanding the feel of consciousness*, Oxford University Press.

O'Regan, J.K., Myin, E. and Noë, A. (2005a) Sensory consciousness explained (better) in terms of bodiliness and grabbiness, *Phenomenology and the Cognitive Sciences*, 4 (4): 369–387.

----- (2005b), Skill, corporality and alerting capacity in an account of sensory consciousness, *Progress in Brain Research*, 150: 55–68.

O'Regan, J.K. and Noë, A. (2001a) A sensorimotor account of vision and visual consciousness, *Behavioral and Brain Sciences*, 24 (5): 939-1031.

----- (2001b) What it is like to see: A sensorimotor theory of perceptual experience. *Synthese* 129 (1): 79-83.

Orlandi, N. (2014) *The Innocent Eye: Why Vision is Not a Cognitive Process*, Oxford University Press.

Place, U.T. (1956) Is Consciousness a Brain Process?, *British Journal of Psychology*, 47 (1): 44–50.

Penfield W. (1975) *The Mystery of the Mind: A Critical Study of Consciousness and the Human Brain*, Princeton University Press.

Prinz, J. (2006) Putting the brakes on enactive perception. *Psyche* 12 (1): 1–19.

Silverman, D. (in press) Bodily skill and internal representation, *Phenomenology and the Cognitive Sciences*.

Smart, J.J.C. (1959) Sensations and Brain Processes, *Philosophical Review* 68 (2): 141–156.

Thompson, E. (2007) *Mind in Life: Biology, Phenomenology, and the Sciences of the Mind*, Harvard University Press.

Thompson, E. (2015) *Waking, Dreaming, Being: self and consciousness in neuroscience, meditation, and philosophy*. New York: Columbia University Press.

Wall, P.D. (1999) *Pain: The Science of Suffering*, London: Weidenfeld & Nicolson.

Weiskrantz, L. (1997) *Consciousness Lost and Found: A Neuropsychological Exploration*. Oxford University Press.

FURTHER READING:

Di Paolo, E, Buhrmann, T and Barandiaran, X. (2017). *Sensorimotor Life: An Enactive Proposal*, Oxford University Press. (Combines Sensorimotor and Mind/Life Continuity Enactivism, in a manner congenial to Radical Enactivism too).

Hutto, D. and Myin, E. (2013) *Radicalizing Enactivism. Basic Minds without Content*, Cambridge MA: The MIT Press. (The Radical Enactivist manifesto).

Noë, A. (2004) *Action in Perception*, Cambridge MA: The MIT Press. (Alva Noë's further elaboration of the sensorimotor contingency approach).

O'Regan, J. K. (2011) *Why Red Doesn't Sound Like a Bell: Understanding the feel of consciousness*, Oxford University Press. (Kevin O'Regan's further elaboration of the sensorimotor contingency approach).

O'Regan, J.K. and Noë, A. (2001a) A sensorimotor account of vision and visual consciousness, *Behavioral and Brain Sciences*, 24 (5): 939-1031. (The classic original statement of the sensorimotor contingency approach).

Thompson, E. (2007) *Mind in Life: Biology, Phenomenology, and the Sciences of the Mind*, Harvard University Press. (An extensive presentation and defence of Mind/Life Continuity Enactivism)