Review of: "Brain Patterns Shaping Embodied Activities of Their Bodily Limbs in Perception and Cognition"

Zsuzsanna Kondor[1]

1 Research Centre for the Humanities

Potential competing interests: No potential competing interests to declare.

Shaping or Intertwining? Remarks on *"Brainets" Shaping the Embodied Activities*

Zsuzsanna Kondor

The thesis of the paper is: “enactivism in all its forms reverses the conventional order of things. It is not the embodied sensorimotor actions that shape and configure brain patterns, but rather the "brainets" (synchronizations of neural activities between different brains) that configure or shape a physical and biological body ("Körper") as a living body ("Leib"). The authors attempt to prove it by (i) illuminating the “Behaviourist fallacy”, (ii) clarifying the action-perception relation, and (iii) demonstrating the implausibility of phenomenal externalism. To prove that *brainets* shape embodied activities, the authors rely on the distinction between practical and theoretical knowledge, some findings by neuroscience, and some thought experiments.

The present review focuses on the difference between the ideas of shaping and intertwining. Shaping is meant considering what bears the constitutional role regarding the mind; it is the *lived body* and phenomenal experiences, or the brain and its socially extended network, etc. In the case of intertwining, the constitutional role is not dedicated to one or other participants of a process, but rather each participant is considered indispensable and inseparable from the others. The paper by Pereira et al. challenges some of the provocative suggestions of enactivist approaches; however, I will suggest the arguments are mostly based on various misunderstandings of enactivist endeavours and implicit presuppositions, such as what can be described in representational terms, entails representations; and scientific evidence can be interpreted exclusively in accordance within the framework of the experiment design – to name a few in general. I will follow the structure of the paper and concentrate on the leitmotif mentioned above.

Preliminary*: Brainets* unexplained

The idea of the shaping potential of the “synchronization” of individual brain activities gained support from various approaches. We can think of the so-called *social brain hypothesis*, which suggests that the unique character of human cognitive capacity is based on its social-bound engagement. That is, the organizational and communicational burden of the community invoked special expressive, organizational, and perspective skills, which resulted in a highly organized and predominant neocortex (see Dunbar 1998). Different conceptions of the evolution of consciousness, such as Graziano’s

attention schema theory (Graziano & Kastner 2011, Graziano 2014) and social cognitive neuroscience (Adolphs 2007), assume hominoids are socially deeply integrated. The various theories of cognitive evolution, based on Dunbar's (1998) social brain hypothesis (Donald 1991) or on the enactive approach (Malafouris 2013), are established on the assumption that humans are socially embedded. Representational inventions understood either cognitively (Donald) or expressively as providing new epistemic access to the environment (Malafouris 2007) are socially bound.

In the paper, the key notions of the arguments, such as theoretical knowledge, mental representation, brain-drivenness, and phenomenal experience, are not anchored socially. Notwithstanding, the chosen counter-example scenarios, learning how to play the piano, how read notes, or play football, are social institutions. But in the case of basic cognitive skills, the primordial function of theoretical knowledge is neither clarified nor tied to the *brainet* as the formative force of sensory-motor activities.

The behaviourist fallacy

Behaviourist fallacy is criticized in terms of practical vs. theoretical knowledge. The authors suggest that the *know-how*, or in terms of the enactivist approach motor skills depend on "various forms of propositional knowledge". This proposal is thought to be proven by examples of everyday life: the case of João Carlos Gandra da Silva Martins the Portuguese pianist, Julian Pinto football player, and the Alzheimer's disease. Martin, the talented pianist after an injury lost the capability of playing piano with his right hand. The primary motor cortex's right hand-related areas were injured, and other parts remained intact. After different shifts in his recovery, Martin worked as a successful conductor. Pinto, due to an accident suffered from paraplegia but by an exoskeleton could play again. These cases compared with Alzheimer's disease, provide the ground for concluding, as the authors suggest, that theoretical knowledge made it possible to play the piano and kick the ball again with surgical and external aid. The question asked and answered by the authors: "[W]hat can Martin still know how to play? The answer is quite intuitive: he still knows how to play because knowing how to play is propositional knowledge (the thesis of Stanley and Williamson), even if he can no longer play".

Considering the examples, I call attention to two issues: (i) Proponents of enactivism do not deny the possibility of having and sometimes relying on theoretical knowledge. But suggests bodily experience (a kind of practical knowledge) is primordial. That is, we learn how to walk or tie shoelaces by practice, but it does not mean we cannot learn it by description or describe how to do it. However, narrating and then following it would be greatly tiresome. (We can think of the laborious engineering of artificially reproducing simple moves.) Accordingly, learning how to play the piano does not mean that the pianist knows that when seeing a note, she should hit that key with exactly that power – not to mention the complete mechanism of the motor movement. She must know which note belongs to which key and other instructions' signs, but it will not result in an accurate Bach interpretation. The hand movements, the dynamics, and the rhythm are due to a smooth application of certain motor contingencies. This does not mean the piano player has no theoretical knowledge. It means rather, that the pianist has some knowledge of how to hit a key – because she knows how to move her fingers, hands, and arms to fulfil a goal – she knows the signs and notes and rules and how to apply them and maybe she learned some history of music, therefore knows the Goldberg Variations are built upon such and such motives and it suggests a particular dynamics, etc. But knowing what a children's song is built upon is based on some early experiences,

and these experiences will help to determine the tone and tempo.

(ii) Some pathological cases nicely demonstrate that certain practical skills are accessible while the related theoretical knowledge is not to the patient and vice versa. That is, there are cases providing evidence the theoretical/conceptual and the pragmatic are detached. Such a split happens in some cases of associative visual agnosia. Jacob and Jeannerod (2003) refer to observations that report “the fact that patients with object-recognition disorders may still be able to normally use objects to perform everyday actions”. (2003: 81) This gained importance from the perspective of their representational theory of the visual mind that argues for a dual model of visual processing. Relying on anatomical and cognitive psychological pieces of evidence, they suggest, there are two pathways: one is devoted to visual percepts in the service of further cognitive processing which can be resulted in theoretical knowledge, and the other is in the service of action. In the case of associative visual agnostics, despite an intact visual system, there is no understanding of what is seen: patients cannot recognize and name the object yet can draw it and describe its form and some visual details, but not able to tell how to use them, yet “the tacit knowledge of the basic functionality of the object can be preserved”. (Ibid.)

This theory of the visual system provides evidence theoretical and practical are not necessarily based upon each other, and in some cases, motor capacities are surely not anchored in theoretical knowledge. They are hardwired and, importantly, are based on everyday experiences. Hard-wiredness can be understood in terms of anatomy. Additionally, as brain plasticity demonstrates, we can build and fix neuronal connections with exercise. (The authors refer to Ramachandran, whose theory of phantom pains relies on the neuronal connections built up with intact limbs. I will return to this topic later.)

In light of (i) and (ii) remarks, I suggest the examples’ interpretation is one-sided and ignores important distinctions. The question of "how to play Bach" is a broad question. It involves the knowledge of a theme as it requires certain dynamics, as well as how finger movements relate to a certain loudness, note, etc. There can be a huge amount of theoretical knowledge in the background but this knowledge in the case of a pianist becomes manifest through the hands and fingers of the piano player. (As compared with an art critic who transforms the acoustic phenomena into words in accordance with certain aspects of musicology.) That is, we should say, after the injuries, Martin only theoretically, in terms of propositions, knows how to play the piano, but cannot play the piano because the implementation of sensorimotor laws became impaired. And also, it is difficult to answer the question: Where starts and ends practical and theoretical knowledge in the case of enacting notes?

From a methodological point of view, the argument is built upon the distinction between know-how and know-that; and presupposes a one-direction relationship between the two. If we presume that even the most basic motor task implies theoretic knowledge of, e.g., how to kick the ball, it can be easily demonstrated with an exoskeleton, physical disability vanishes with the help of theoretical knowledge. In my view, the soccer player relied on his earlier experiences, hence hard-wired patterns he gained before the injury. The exoskeleton physically enacted the knowledge of his body, not his theoretical knowledge. It is very implausible to consider playing soccer by a description of minute details, such as how to kick a ball in a given situation. When we learn how to hit a ball, we need to practice hitting the ball, we receive advice on how to perform it; with the instructions of a trainer we may gain some time, but it is not instead of building bodily skills. A

theoretically well-prepared football player probably will not be successful if physical exercise is missing.

Alzheimer's diesis is exactly the other way around. Because of the loss of memory, mostly theoretical knowledge, and similar to associative agnosia, the patient does not remember and recognise persons, scenes, or melodies, but many times can continue the melody and after a short time behaves as used to with the things and persons around her.

That is, according to scientific reports, motor skills can work without the support of any theoretical knowledge; the proponents of enactivism do not deny the possibility of theoretical knowledge underlying practical knowledge; and anyone would propose "that know-how is practical knowledge without propositional meaning". We can describe how to do things. Furthermore, knowing how to do something and being able to do something is not the same. Pinto's case clearly demonstrates the misunderstanding: because the connection between the limbs and the brain was disrupted, the football player could not play. But with an exoskeleton, he can play again. It is not because know-how is built upon knowing-that, as the authors believe. It is because earlier bodily practice created a neural pattern in the brain and for a while, it remained intact despite the disruption of the brain-limb connection.

Authors suggest that "metaphysically constitutive" are the brain circuits but not the sensory-motor contingencies. I think sensory-motor contingencies are the result of certain bodily practices. Repeated and slightly modified movements in accordance with the circumstances and the environment (the piano's keyboard or the field) and the body are indispensable to creating brain circuits. These neural connections can exist because earlier brain-limb connections were intact. Enactivism suggests motor activity is primordial. (Gallagher (2005: 94ff.) refers to the importance of prenatal movements.)

Brain-body relation

The authors suggest "it is up to the brain to shape the biological body (Körper) as a living body (Leib)", and "the representations of the body as a living body enable embodied actions". Pereira et al. provide three experiments by which they attempt to demonstrate their argument is right.

In the first experiment, two different bodies in separate spaces with the same neural network are to prove that neither perception nor bodily action has constructive power, but neuronal patterns are decisive. In the second experiment, the *brainnet* was applied for non-human primates supplemented with a brain-machine interface. The experiment resulted in almost the same conclusion as the first, i.e., "the same body is not necessary for tactile experience: Bodies can vary, as well as the spaces they occupy in the same experience. The relationship between any perception and the body itself is metaphysically contingent." An additional result suggests that the extended mind theory is right because the artificial machinery is successfully incorporated, accordingly, the "mind/brain incorporates various artefacts by representing them as my living body parts".

My objection to these conclusions is that an artificially shared neural network which is to organize two different perceptive and motor apparatuses (rats or non-human primates) does not prove that perception and bodily activity are contingent. If it is a *brainnet* meant, as it is, it is obvious that they are synchronized as if it were one and the same body that perceives and acts. If both rats have access to the same stimuli via the shared neural network it is clear that the rat that cannot see

with her eyes the lever act as if she could see it.

The third experiment attempts to prove that “not the body shapes the mind but the brain that shapes the living body”. The authors rely on experiments of rubber hand illusion and phantom limb pain. First, let me clarify some important terms.

In the Husserilan, terminology the *body* (*Körper*) refers to the body as an object, like tables and glasses in our environment. The *lived body* (*Leib*) refers to our own body as we experience it. Similarly, *body image* – according to Gallagher’s terminology – can be considered as a mental image of our body, i.e., it is built on our different ideas. In contrast, *body schema* is rooted in our bodily experiences: it helps us to decide whether we are capable of executing such and such a sequence of moves or not. “A *body image* consists of a system of perceptions, attitudes, and beliefs pertaining to one’s own body. In contrast, *body schema* is a system of sensory-motor capacities that function without awareness or the necessity of perceptual monitoring” (Gallagher, 2005: 24). If we merge the two vocabularies, we can say that *body image* more or less depicts our *Körper*; while *body schema* pragmatically provides access to *Leib*.

The authors consider *body schema* as a “non-conceptual representation of a biological body” generated subliminally by the brain. Regarding studies of phantom limb pains, they ask “how can we understand so-called phantom pain without assuming representational contents?” and “where would the contact [with the world] be in the case of phantom pain?” They describe the phenomenon as follows: “the brain continues to perceive the amputated limb, i.e., it represents it as part of the body schema or body representation”. Using representational terminology important details are covered.

When it is about representations in the brain, generally we need to understand it as a neural network activation pattern. This neural activity can be grasped with brain imaging technology. But, importantly, the representation of our own body (body image) is based on different kinds of representations, such as beliefs, percepts, and memories. That is, mental and public representations are used as if they would be the same kind.

Similarly, if we try to abandon representational terminology, the puzzle of phantom limb pain disappears. If someone loses one limb of her earlier intact body, fixed neural patterns can remain for quite a long time after the amputation. As Ramachandran nicely described, the missing input of the amputated limb provokes the brain to create stimuli on its own. With a mirror considerable success can be reached because in the mirror the missing limb appears to move and, as visual and motor areas are linked, there is no more need for generating stimuli by the nervous system.

The proponents of enactivism do not deny the importance of the role brain plays in any kind of activity. However, they suggest movements and any kind of action have to be viewed as a process within which the different instances (such as the body, the social and physical environment, and the brain) are intertwined. If any part of the play is removed, or taken out of context, the whole process will be modified. Because the components of a process are tightly intertwined, the question of “which part of the whole constitutes metaphysically a bodily movement” is hardly comprehensible. When the gaze is redirected, the neuronal state changes in many ways, and so does the percept of the close environment. If we take out from the whole, let’s say, the perceptual apparatus, and attempt to order stimuli-vision-brain-motor reply into a causal order, each of the participants is bereft from the dynamics of a perception-action loop, and cover the meaning of the whole process. Merleau-Ponty called attention to the distorting character of scientific investigation as follows: “The

psychologist always tends to make consciousness into just such an object of observation" (Merleau-Ponty, 1964, p. 58), and described the object of science as being "defined by the mutual exteriority of parts and processes" (Merleau-Ponty, 1963, p. 9). None deny that scientific inquiry cannot avoid analysis, and analysis requires the separation of distinguishable parts. But, in accordance with the endeavour of some philosophical enterprises, if the target is to describe things as they work, it is important to keep in mind these distortive mechanisms. In my view, enactivist approaches attempt to minimize the burden of representational terminology not calling into question their necessity in certain cognitive engagements.

Phenomenal externalism

In the last section, where phenomenal externalism is in focus, there are some mistakenly owed proposals to enactivism and some unnoticed sliding regarding the evidence and the conclusion.

The question of what consequences and gains we can have if we think in terms of enaction in the case of phenomenal consciousness is not, indeed, elaborated well enough in the literature. But there are some fundamental aspects that we should keep in mind: the distinction between externalism and internalism in the case of enactivism is different than in more traditional approaches, and a methodological difficulty consists in the underdetermined way of concluding.

Let me reconsider the examples of the paper. The authors suggest that "it is false that there can be no perceptual differences if there are no differences in sensorimotor activities". First, there is no proponent of enactive approach who does not agree: the world around us can change independently from us. Second, this fact does not entail that "[i]t is wrong to assume that differences in perception also presuppose differences in embodied sensorimotor activity". It is an important pillar of enactivism that learning and applying sensory-motor contingencies are based on the relation between action and perception. O'Regan's (2011) book nicely describes how we can rely on this close relationship if we need to differentiate between phantasm or dreaming and a vivid situation. Obviously, changes in the environment that are not in our focus will not alter our motor behaviour. Though, in some cases, as the term *grabbiness* (O'Regan, 2011: 31) suggests, even these changes can modify motor activity.

Another important suggestion of the article is "the theory of phenomenal externalism in enactivism seems implausible since the best available evidence suggests that neural patterns rather than extracranial embodied actions determine the phenomenal character of experience is determined." If we suppose that eating and drinking have no physical effect on our bodily skills and performance – what goes against mundane experiences – then we should agree. But, this is not the case. The example of the side effects of drinking wine does not touch the phenomenal experiences of the protagonist. Rather, it takes into consideration how he looks from the outside. The phenomenal quality of his perception is on a par with his behaviour; however, his perception is under the influence of alcohol. But, the role of the brain in cognition and phenomenal consciousness is not called into question by any proponents of enactivism.

The final example is not convincing because it misses the target. In an experiment, it was "discovered that the similarity between neural patterns was more consistent with the perceived similarity of the odor than with its chemical similarity. Therefore, neural similarity seems to be the only factor that allows us to understand phenomenal similarities between odors." If neural patterns are more similar to the phenomenal percept than the odour's chemical parameters, it says

something about our olfactory mechanism but not about the relationship between chemical relations and conscious processes. We can have access to odours merely through the olfactory sensory apparatus. This apparatus mediates between the external stimuli and the neural network. The odour (with its chemical parameters), the sensory apparatus, and the conscious percept provide the phenomenal quality of the odour. Hence, it does not prove that exclusively neural machinery determines the phenomenal character of taste.

Another distortion can be observed in Oscar's, a winemaker's case. Before the discovery of the underlying difference in DNA and some variance in chemical components the two kinds of grape, the wine made of each grape type were thought to be the same because the difference by smell and taste was not detectable. Tastes and smells are much less describable by words. The minute differences and the evanescent character of odours, savours, and aromas make them hardly accessible to others. And, like qualifiers in language, shared knowledge has a considerable impact on opinion formation. Like in the previous case, it is not clear how this story relates to phenomenal consciousness. Maybe, Oscar will be more attentive to nascent and diminutive differences in tastes and smells when he knows there are two different kinds of wine, hence he should feel the difference. But with a different epistemic background, the minute differences are not so conspicuous. As the time scale plays an important role (tasting wines without, and later with some information), the answer to the question of whether phenomenal duplicates imply agency duplicates, is yes. That is, Oscar without, and then with the knowledge of the existence of an assumed extinct grape-kind, is not the same. The holistic approach, proposed by Merleau-Ponty and also some proponents of enactivism, makes questionable thought experiments that ignore history.

Conclusion

Concluding, the authors refer to Merleau-Ponty and Nöe suggesting "[i]f they are right, we could perform brain transplants soon, just as we perform liver, kidney, and even heart transplants, without changing our numerical identity as persons". It can be right only if the authors are right, viz., if the brain, more precisely *brainnets* constitute the establishment of phenomenal experiences and motor skills. However, it is not clear how *brainnets* provide these. Based on the examples and scientific evidence we can read in the paper, the conclusion cannot be as demanding as the authors expect.

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