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### The Explanatory Value of the Active Body for Perceptual Consciousness.

In this position paper, I highlight some problems concerning the role of the active body for cognition and consciousness. Sensory substitution research provides interesting case studies for the thesis that it is the integrating of information into a modal-specific action-perception-cycle that constitutes the kind of conscious experiences associated with this modality. The upshot seems to be that activity in a specific sense organ and the associated brain areas is neither necessary nor sufficient for the qualitative experience in question. Given these findings, I argue that the role of the body for cognition and consciousness has to be investigated within the framework of processes and actions. Furthermore, I argue that one has to take seriously the different time-scales addressed in evolutionary, developmental, learning and functional explanations and the different ways in which these explanations refer to the body. Research on sensory substitution especially helps to differentiate and raise awareness of those differences by addressing questions such as brain plasticity and novelty of qualitative experiences enabled by 'new' artificial sensory devices.

The idea that the active body plays a crucial role in constituting sensory experience has long been around in philosophy. As early as 1896, John Dewey opposed the classical picture of sense perception as being simply an initializing element of a serial process that culminates in central cognizing and that might lead to output-action. According to the view attacked by Dewey, perception and action merely constitute input and output for the cognizing organism.<sup>1</sup> Furthermore, within the traditional view, the quality of perceptual experience is primarily determined by the 'delivering' sense organs and the efferent nerve-system. Dewey wanted this picture to be put upside down and thus emphasizes the importance of the body's interaction with its environment for the quality of experience: "Upon analysis, we find that we begin not with a sensory stimulus, but with a sensori-motor coordination, the optical-ocular, and that in a certain sense it is the movement which is primary, and the sensation which is secondary, the movement of body, head and eye muscles determining the quality of what is experienced. In other words, the real beginning is with the act of seeing; it is looking, and not a sensation of light." (Dewey 1896, 358-359) Instead of simply pointing to the body or bodily states per se, Dewey highlights movement and activity of the body as primary elements.

A related concept of the role of the body in cognition can be found in contemporary enactivist accounts of perceptual consciousness (Hurley 1998, Noë 2004). At the heart of such accounts lies the negative claim that the intrinsic character of neurological events does not provide the means to explain experiential quality: "What determines and controls the character of conscious experience is not the associated neural activity." (Noë 2009) Rather, the proponents of such theories refer to the larger setting in which those experiences occur and attempt to take seriously the coupling of the body with the environment.<sup>2</sup> The remark of Dewey cited above can help to mark a point of divergence between a

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<sup>1</sup> "The older dualism between sensation and idea is repeated in the current dualism of peripheral and central structures and functions;" (Dewey 1896, 357); cf. also the critique of the so-called Sandwich-Model in: Hurley 1998.

<sup>2</sup> Sensory substitution systems concerning vision, like TVSS, seem to provide interesting insights with respect to the questions of what exactly determines the specific quality of experience. Subjects report perceptual experiences and behave in a certain way that can be related to a sensory modality, but they do it without making use of the associated sense organs. They rather gain visual experience by successfully exercising tasks that are peculiar to vision (see Bach y Rita & Kerzel 2003, 594). Additionally functional neuro-imaging studies show evidence for reorganization of brain areas that formerly have not been associated with the sense modality in

moderate and a strong enactivist position: A strong enactivist position states that conscious experience *is* action, *is* skilful mastery and is not merely enabled by this mastery or, as Dewey claims, in some respect “secondary” to it.

Besides the need to relate to action and processes as constitutive elements of perceptual quality, enactive theories contain an implicit claim about the material basis those processes supervene on. Two points I think are important here: First, the alterable machinery of conscious experience has to be conceived of as extended to bodily and environmental elements. The specific modal content of a perception is, as sensory substitution research seems to prove, determined by this interaction of body and environment and as such constrained by our specific bodily constitution.<sup>3</sup> But second, I argue, it is crucial to accomplish a cautious separation of different time-levels in order to evaluate the different explanatory needs when referring to bodily, neural and worldly elements. One can detach an evolutionary, a developmental, a learning and a functional (‘here and now’) time perspective, which allows for accessing different design elements active in embodied agents. These levels have been systematically differentiated in biology for a long time and have found their hands-on-counterpart in research done in embodied computing (see Pfeifer & Bongard 2007, cap. 3.5), where the construction of embodied intelligent agents allowed for new design principles that exceeded the planned interventions of the designer, who works at the functional level alone.

I cannot elaborate on these time levels here. But in a nutshell the account I propose for the explanatory role of the active body for perceptual consciousness comes down to the following: The body is defined as enabling specific feedback loops that are constitutive for the qualitative experience an organism undergoes in establishing ‘ecological control’ on the functional time scale or ‘ecological balance’ on evolutionary, developmental and learning time scales (Pfeifer & Bongard 2007, Clark 2009, cap. 1). Since, as I would argue, ecological control is derived from ecological balance, the contribution of the body in determining perceptual consciousness can only be understood through examining the organism’s dynamic relations to the ‘affordable’ patterns of its environment within larger time-scales.

Within this context, research on sensory augmentation might help us to focus on specific time related elements in the goal-driven bodily motor engagement necessary to constitute perceptual experience. As has been pointed out, such research makes explicit the role of the active learning time scale and the engagement in whole action-perception cycles for such experiences. Experiments done with TVSS and a tactile third-eye thus might help us understand the specific role of the body in determining the intermodal differences and intramodal changes in perceptual experience, especially concerning the time scales of learning and development. One general preliminary result derived from work in this area might be that with respect to these time scales the boundaries and perspectives our body constitutes for us are to a large extent alterable. And it might be just this alterability - and the fact that we embrace such changes seemingly so easy - that defines the kinds of minds we are.

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question. This might be evidence that it is not an attributed brain area or synchronized neural assemblies that constitute the correlate of a specific modal experience. "TVSS effects a new external intermodal mapping from distal sources of visual input to peripheral tactile inputs and on to the somatosensory cortex. As a result, the qualitative expression of somatosensory cortex after adaptation appears to change intermodally, to take on aspects of the visual character of normal qualitative expressions of visual cortex" (Hurley & Noë 2003, 142-143) Yet those results are at least inconclusive since there is conflicting evidence that visual information made available to congenital blind subjects leads to activity in ‘visual areas’ formerly not active.

<sup>3</sup> Limiting the scope of analysis to ‘internal’ events, as for example is done in NCC-research in the cognitive neurosciences, merely begs the question of the constitution of those mental states over time. On the basis of this assumption one should oppose claims (Prinz 2009, 425) that so far no elements outside the brain have been found that “co-vary with conscious states in content and time-course”.

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