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How are the spatial characteristics of the body represented? A reply to Pitron & de Vignemont

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ABSTRACT

In their article, Pitron and de Vignemont (2017) provide an insightful and well overdue discussion of the relationship between long-term body representation models and Alice in Wonderland syndrome. Here, I supplement their discussion with a number of observations. First, I present a cautionary note regarding the interpretation of experiential changes in body size as reflective of changes in the content of body representations. Second, I show how their evidence contradicts an alternative model of body representation arising from research into anorexia nervosa—the "LTB" hypothesis. Finally, I highlight a significant issue with their proposed co-construction model.

1. Introduction

One of the ways in which we can understand cognitive processes is by studying the ways in which they break down. Specifically, we can study mental disorders which involve impairment of the relevant mechanisms. This general methodology has had significant influence and success in the understanding of how we cognitively represent our own bodies. Somatoparaphrenia, deafferentation, anosognosia for hemiplegia, phantom limbs: the list of conditions which have been used to draw conclusions about how we represent our bodies is expansive. In their recent paper, Pitron and de Vignemont (2017) carry on this tradition, albeit through the discussion of an unduly overlooked condition: Alice in Wonderland syndrome (AIW).

In light of a number of reports from patients suffering from AIW, they discuss three possible body representation models. In this essay, I introduce these within the context of the distinction between short-term and long-term body representation content. I discuss their patient reports and offer a cautionary note regarding the inference from changes in experience of body size, to changes in long-term body image content. I then discuss evidence from research into anorexia nervosa (AN) which undermines the "independence" model, as Pitron & de Vignemont present it. In its place, the "LTB" variation of the independence model has been suggested, whereby both the body image and schema rely on a *shared* representation of spatial characteristics. I go on to discuss how the proposed evidence from AIW undermines this LTB model. Finally, I assess their own preferred "co-construction" model, highlighting a significant issue.

2. Three potential models

Within body representation literature, a distinction exists between two kinds of information: short-term and long-term. Short-term information is delivered by afferent receptors: joint position, tendon tension and the like. In contrast, long-term information refers to the spatial characteristics of the body (i.e. size and shape), which aren't directly and consistently available via afferent signals (de Vignemont, 2014). In their paper, Pitron and de Vignemont (2017) focus on this latter category of content, specifically addressing how such content is *stored*.

Before continuing, I offer some clarifying remarks regarding the short-term/long-term distinction.[1] These terms refer to the *usual* mode of such content. Given that joint position and tendon tension change often (as we move our bodies) and the brain is directly coupled to these changes, any instance of short-term content will generally have a short existence, as it is soon replaced by new incoming input. On the other hand, the spatial characteristics of our bodies change slowly (along with the growth of our bodies) and there is no direct sensory coupling with such change, so such content generally preserves for longer periods of time. However, this

[1] Thanks to a reviewer for pushing me on this.

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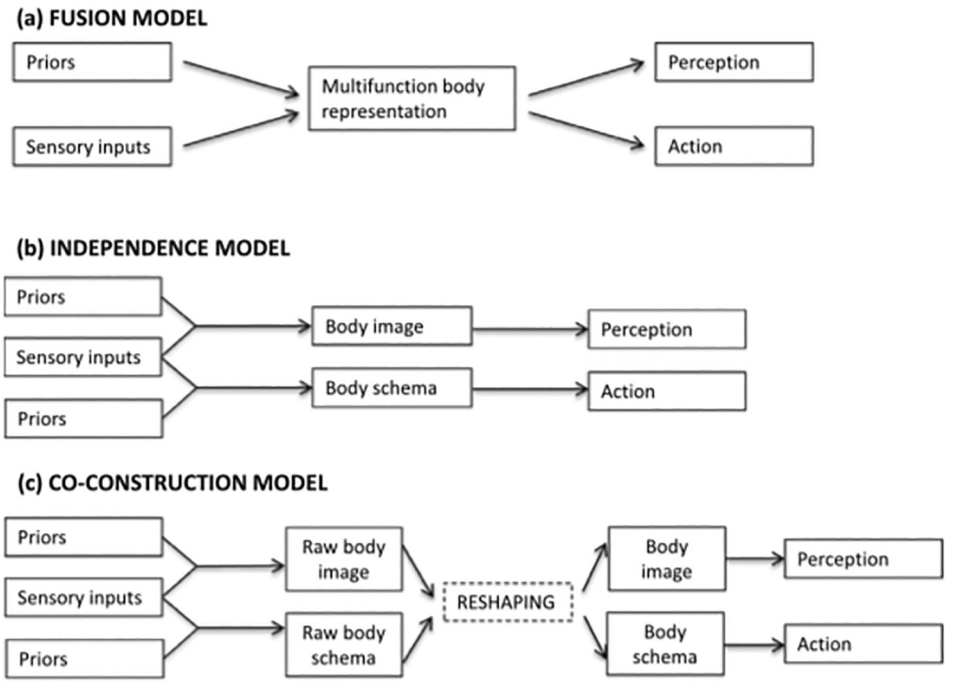

Fig. 1. Three potential body representation models (taken from: Pitron & de Vignemont, 2017, p. 116).

needn't *necessarily* be so: short-term information related to joint position *could* maintain over a long-period of time, if no new sensory input were to replace it (such as when we are completely still for long periods). Similarly, long-term information could shift quite rapidly if we were to perceive a sudden change taking place (such as an arm being cut off). Given this, better terms to employ might be "online" and "offline" (Carruthers, 2008), though these have been used in more specific ways elsewhere (Carruthers, 2013).[2] Despite this terminological ambiguity, I will follow in Pitron & de Vignemont's use of the terms "short-term" and "long-term".

Pitron & de Vignemont propose the following three potential models of how long-term content is tracked and stored (see also: Fig. 1):

a. The Fusion model: There is a unique representation of the enduring properties of the body that both spatially frames bodily experiences and guide bodily movements (Alsmith, 2009; Bermudez, 2005; Brewer, 1995; O'Shaughnessy, 1980);
b. The Independence model: There are two distinct functionally defined representations of the enduring properties of the body, a long-term body schema for action and a long-term body image for perception, and they work independently of each other;
c. The Co-construction model: There are two distinct functionally defined representations of the enduring properties of the body, a long-term body schema for action and a long-term body image for perception, and they can interact and reshape each other (p. 116).

3. Alice in Wonderland syndrome

In an attempt to distinguish between the proposed models, Pitron & de Vignemont offer a fascinating and much needed analysis of a number of AIW case studies. Consider the first two:

> Case report n°1: "Often preceding and during the migraine attack I have a very peculiar feeling of being very close to the ground as I walk along. It is as though I were short and wide, as the reflection in one of those broadening mirrors one sees in carnivals, etc. Of course I know it isn't true." (Lippman, 1952, p. 349)
> Case report n°2: "A patient, for instance, reported: "A feeling that I was very tall. When walking down the street I would think I would be able to look down on the tops of others' heads, and it was very frightening and annoying not to see as I was feeling. The sensation was so real that when I would see myself in a window or full-length mirror, it was quite a shock to realize that I was still my normal height of under five feet." (*ibid.*)

Pitron & de Vignemont claim these as evidence of a dissociation between body image and schema: each patient appears to have a

[2] There are also a number of unanswered questions regarding how these forms of content interact. For example, whether they must be stored separately or are sometimes integrated into coherent representational vehicles.

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