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Agency and bodily ownership: the Bodyguard hypothesis

Frédérique de Vignemont

When I report, “I am raising my arm”, there are two occurrences of the first person pronoun: at the level of the agentic experience (*I* am raising my arm) and at the level of the body part that is moving (*my arm* is raising). The first expresses the sense of agency. The second expresses a sense of bodily ownership. The question that I want to raise here is how one should understand the relationship between these two types of self-awareness. The point is not to reduce the latter to the former: one can be aware of one’s body as one’s own while one remains still or during passive movements for which one experiences no sense of agency. Still there may be a sense in which bodily control, which is at the core of the sense of agency, contributes to the sense of bodily ownership too. The challenge is to assess in what manner.

According to an agentic conception of the sense of ownership, the body that we experience as our own is the body that we represent as being under our control. In 2007, I defended a version of this conception (Vignemont, 2007). More specifically, I argued that the body schema, defined as a specific type of body representation that is action-orientated, grounds the sense of bodily ownership, and that its disruption causes disownership syndromes. However, such an agentic conception faces a number of difficulties that cannot be solved without further refinements. After highlighting the complexity of the relationship between bodily control and the sense of bodily ownership, I will argue in favour of a specific type of body schema, whose function is to protect the body. I will then defend what I call the Bodyguard hypothesis by showing how the protective body schema can account for the first-

personal character of the sense of bodily ownership. I will finally offer some speculation about the functional role of the sense of bodily ownership.

1. An agentic mark of the sense of bodily ownership?

We posit that the potentiality for action of our bodily self is a necessary condition to accomplish the sense of body ownership we normally entertain. (Gallese and Sinigaglia, 2010, p. 751)

The body is a unity of actions, and if a part of the body is split off from action, it becomes 'alien' and not felt as part of the body. (Sacks, 1984, p. 166)

As illustrated by these quotations, many theories appeal to the notion of action in relation to the sense of ownership, and even more of disownership (Davies et al., 2001; Dieguez and Annoni, 2013; Gallese and Sinigaglia, 2010; Vignemont, 2007; Baier and Karnath, 2008; Aymerich-Franch and Ganesh, 2016). But is our ability to control our body a necessary condition for the sense of bodily ownership: does one experience a body part as one's own only if one can control it? And is it a sufficient condition: does our ability to control a body part entail that one experiences it as one's own?

The fact is that disownership syndromes often involve some more or less extreme motor impairment. This is especially salient in the case of the neurological condition of somatoparaphrenia. Patients suffering from somatoparaphrenia deny ownership of their left arm and can even attribute the so-called 'alien' hand to another person. Their sense of disownership cannot be explained by their numbness: some patients can still feel tactile and painful sensations to be located in their 'alien' hand. Instead it may be explained by their lack of control: most of them are paralysed, and those who are not suffer from the Anarchic hand sign (i.e. the limb seems to have a will of its own). Patients actually frequently complain

about the uselessness of their 'alien' limb: "This arm, it does not move, it does not obey. It doesn't want to do anything, it doesn't help me. It betrays me." (Cogliano et al., 2012, p. 766). One may then be tempted to account for their sense of disownership as follows:

The patient with somatoparaphrenia is no longer able to move her paralysed limb, which is at odds with her prior experience of her limb. This generates the thought that the limb cannot be hers: it is an alien limb. This initial thought is then accepted uncritically as true. (Rahmanovic et al., 2012, p. 43)

The case of deafferented patients, who have lost proprioceptive and tactile signals from most of their body, is also interesting. At the beginning of their disease, when they had not learnt yet to control their body by exploiting visual information, they could report feeling alienated from their body. But as soon as they regained control over their body, they regained a sense of bodily ownership (Gallagher and Cole, 1995). Likewise, amputees who have been transplanted another person's hands experience the new hands as their own only when they can control them (after 18 months), and not earlier when they gain sensations in them (after 6 months) (Farnè et al., 2002):

Journalist: When did you really appropriate these hands? DC: When the first phalanxes started to move, when I was able to eat again with a fork. Then, I said: "Here are my hands." Now I'm completely normal. (Interview of DC, 2008)¹

Finally, the importance of control is confirmed by illusions of ownership in virtual reality environment: controlling a virtual avatar can make one experience the avatar's body as one's own (e.g., Slater et al., 2008).

At this point, one might simply object that bodily control cannot be essential to the sense of bodily ownership given the number of individuals who are paralysed and who still

¹ «L'important: jouer avec mes enfants», *Le Matin*, 26 August 2008, my translation.

experience their body as their own. Indeed disownership syndromes are very rare, whereas paralysis is not, and most patients that are paralysed do not experience disownership.² Hence, the loss of control cannot be sufficient for the loss of the sense of bodily ownership. This first objection invites us to propose two alternative agentive proposals.

The first proposal appeals to *agentive feelings* to account for the sense of bodily ownership. On this view, the body that I experience as my own is the body that I *feel* that I can control. However, this proposal is both too conservative and too liberal. It is too conservative because it cannot account for cases of individuals who feel they cannot control their limbs and still experience them as their own. I have mentioned patients who are paralysed, but one could also point to schizophrenic patients with delusion of control and to patients with 'pure' anarchic hand: they feel that their limbs does not obey them but they still experience them as their own. On the other hand, this proposal is too liberal because the fact that one feels that one can move a limb does not ensure that one experiences it as one's own. This is clearly demonstrated by patients with somatoparaphrenia, who can be unaware of their paralysis (i.e. anosognosia for hemiplegia): they erroneously feel that they can control their paralysed 'alien' hand and yet they do not experience it as their own.

There is, however, a different version of the agentive conception that does not appeal to agentive feelings, but only to *sensorimotor* body representations: it is both necessary and sufficient for a body part to be incorporated in the body schema for one to experience it as one's own (Vignemont, 2007). The body schema is a specific kind of representation of the

² Burin and coll. (2015) found that paralysed patients had a stronger RHI when their affected hand was stroked than healthy participants. They concluded that the patients had a diminished sense of ownership for their paralyzed hand. These results, however, are difficult to interpret because the same patients had no RHI whatsoever when their non-affected hand was stroked. This can hardly be explained by a diminished sense of ownership of the paralysed hand. Hence, there might be a more general disruption, which was responsible both for the stronger RHI on the affected side, and the lack of RHI on the non-affected side.

body that is dedicated to action: it carries information about the bodily parameters that are required to plan and to guide bodily movements, such as posture, strength, limb size, and so forth (Vignemont, 2010). It represents the various parts of the body that are under control, and thus it can misrepresent them. It can thus be dissociated from actual motor capacity. Consequently, the body schema can still include legs that are actually paralyzed. It can also be dissociated from the conscious experience that one has of one's motor abilities. In anosognosia for hemiplegia, for example, the sensorimotor representation of the paralysed side of the body is disrupted, and yet patients still feel that they can move it. This sensorimotor proposal can thus avoid what appeared as fatal objections to other agentic proposals. As such, it is more promising, but does it really work? I will now focus on two arguments that could be made against it, one based on the Rubber Hand Illusion, and the other based on tool use. They will show that we need to refine our agentic conception and our definition of the body schema even more.

2. From the Rubber Hand Illusion to tool use

If the body schema grounds the sense of bodily ownership, then action planning, which is based on it, should be modified by its incorporation of extraneous body parts and by its exclusion of one's body parts. If the agentic conception is true, one should thus expect specific motor correlates to the sense of ownership and of disownership.

Let us first consider the sense of disownership. According to the agentic conception, it should be accompanied by the inability to correctly control the limb that has been excluded from the body schema. Such a prediction is confirmed by a study using hypnosis (Rahmanovic et al., 2012). In this study, one group received a suggestion about their loss of bodily control: "Whenever I tap my pen like this [tap pen three times on table], this arm [touch targeted arm] will feel paralysed". Although some members of this group felt

paralysed and behaved as if they were paralysed, they did not report disownership experiences. This confirms what we already know from paralyzed patients, who continue to experience their body as their own. What is more interesting is the second type of suggestion that another group of participants received, which was explicitly about disownership: “Whenever I tap my pen like this [tap pen three times on table], this arm [touch targeted arm] will feel that it belongs to someone else”. This suggestion successfully induced disownership. Interestingly, it also induced as much paralysis as the paralysis suggestion. Hence, paralysis not only can cause an experience of disownership (as in somatoparaphrenia), but it also can be its collateral damage.

Let us now consider the motor correlates of the sense of bodily ownership, and in particular in the context of the Rubber Hand Illusion (hereafter RHI). In its classic set-up, one sits with one’s arm hidden behind a screen, while fixating on a rubber hand presented in one’s bodily alignment; when the rubber hand is stroked in synchrony with one’s hand, one reports feeling touch to be located on the rubber hand and feeling the rubber hand as if it was one’s hand (Botvinick and Cohen, 1998). The RHI is a purely sensory illusion, at least in its original setting: participants exert no control over the rubber hand, nor do they report feeling control over it (Longo et al., 2008). It then comes of no surprise that action planning can be impervious to the embodiment of the rubber hand. In one study, participants were asked to grasp the hand that was touched with their opposite hand but although they judged the stimulated hand to be at a location close to the location of the rubber hand, their movement itself was not influenced by the illusion (Kammers et al., 2009): the motor system did not take the location of the rubber hand as a starting parameter when planning reaching and grasping movements.³ A critic of the agentic conception may then argue that this result suffices to

³ Still it is worth noting that in other situations the way that one moves one’s hand is affected by the posture of the rubber hand when one experiences it as one’s own (e.g. Kammers et al., 2010).

show that the body schema does not ground the sense of bodily ownership. The objection runs as follows: (i) motor immunity to the illusion shows that the rubber hand is left out of the body schema that guides the movements; (ii) yet participants report ownership over it; (iii) thus, it is false that one experiences as one's own any body parts that are represented in the body schema.

Another objection against the agentic conception, which works as a mirror objection to the objection from the RHI, derives from tool use: whereas one feels the rubber hand as part of one's body although it does not seem to be incorporated in the body schema, one does not feel tools as parts of one's body although they seem to be incorporated in the body schema. Tools can indeed be motorically embodied to such an extent that after tool use, one programs one's movements as if one were still holding the tool, even for actions that have never been performed with it. Let me for instance mention the following study by Cardinali and coll. (2009). Participants first repetitively used a long mechanical grabber to grasp objects. They were then asked to reach and grasp objects with their hand alone, but the kinematics of their movements was significantly modified, as if their arm were longer than before using the grabber. Moreover, this effect of extension was generalized to other movements, such as pointing on top of objects, although they were never performed with the grabber. Finally, after using the grabber, participants localized touches delivered on the elbow and middle fingertip of their arm as if they were farther apart: they perceived their arm as being longer. These results indicate that the body schema was updated during tool use integrating the grabber. The critical question is why one generally experiences no ownership for tools. As Botvinick (2004, p. 783) notes,

From this finding, we would predict that tools are represented as belonging to the bodily self. However, the feeling of ownership that we have for our bodies clearly does not extend to, for example, the fork we use at dinner.

The objection runs as follows: (i) tools are included in the body schema that guides reaching and pointing movements; (ii) yet participants report no ownership over them; (iii) thus, it is false that one experiences as one's own any body parts that are represented in the body schema. One might be tempted to reply that the body schema can make us feel an object as part of our body only if the object looks like a body part (de Preester and Tsakiris, 2009). In other words, if tools are not experienced as parts of our body, it is because they do not look bodily. Some studies have indeed shown that one cannot induce the RHI for a wooden object that does not look like a hand, such as a rectangular block (Tsakiris et al., 2010). However, one may question at which point an object starts counting as being bodily shaped. Shape can be easily altered: hands can barely look like hands, as it is the case after severe degenerative arthritis (which pulls the bones out of alignment), whereas tools can be completely hand shaped, as it is the case for prostheses. Yet in none of these cases does bodily resemblance affect the sense of ownership one way or the other.

Should one simply give up the agentic conception? I do not think so. We simply need a more refined account of the notion of body schema. More specifically, I will argue that there is an equivocation of the term, which can refer to two distinct types of sensorimotor body representations.

3. The duality of body schema

Let us consider again the RHI. It is true that one can experience a rubber hand as part of one's body while failing to plan one's movements on the basis of its location. However, the movements that are tested with the RHI are only goal-directed instrumental movements such as pointing and grasping, and there is a different range of movements that is worth exploring, namely *defensive movements*. Physiological response to threat has indeed become the main implicit measure of the RHI: it has been repeatedly shown that participants react when the

rubber hand is threatened, but only when they report it as their own after synchronous stroking, and the strength of their reaction (i.e. physiological arousal measured by their skin conductance response, or SCR) is correlated with their ownership rating in questionnaires (e.g. Ehrsson et al., 2007). This protective response, which one normally has for one's own body, can be revealed also at the motor level. In one study, participants were in an immersive virtual reality system, which induced them to feel ownership over a virtual hand. The virtual hand was then attacked with a knife. Although participants were instructed not to move, their event-related brain potentials revealed that the more they experienced the virtual hand as their own, the more the perception of threat induced a response in the motor cortex (Gonzalez-Franco et al., 2013). Roughly speaking, when one observes the rubber hand that one experiences as one's own being threatened, one automatically withdraws one's hand. This finding suggests that the RHI has a specific type of agentive mark in the context of self-defence.

Let us now reconsider the objection from tool use. More than a century ago in his utopia *Erewhon* Butler (1872, p. 267) denies any significant difference between tools and hands: "We do not use our own limbs other than as machines; and a leg is only a much better wooden leg than any one can manufacture". Why, then, does one experience no sense of ownership towards tools most of the time, even when they look like a body part? It may be because contrary to what Butler assumed we do use our own limbs other than as machines. More specifically, we do protect them other than as machines: "the target of the actions may be located well within reach, but a tool is chosen as a substitute for the upper limb in order to avoid harm" (Povinelli et al., 2010, p 243). This hypothesis has been tested by Povinelli and colleagues (2010) on chimpanzees. Chimpanzees had the choice between using their hand or a tool to open a box. It has been found that they removed the cover of the box with their hand when they perceived that it contained food and with the tool when they perceived the object in

the box as potentially dangerous.

More generally, we use tools in harmful situations in which we would not use our limbs and we easily put them at risk as long as there is no risk for our body. If we protected tools as we protect our limbs we would not be able to use them as extensively as we do and the range of our actions would be far more limited: we could no longer stoke the hot embers of a fire or stir a pot of boiling soup. This claim does not contradict the fact that we protect tools and react if they are threatened or damaged. We actually need to keep them in good shape in order to be able to use them. Nonetheless, their significance is not of the same kind as the significance of our own body and it is likely that their protection is subserved by different mechanisms than bodily protection.

We thus have a double dissociation: the rubber hand is incorporated for planning protective movements but not instrumental ones, whereas tools are incorporated for planning instrumental movements but not protective ones. I propose that there are two kinds of body schema that underlie these distinct types of actions. The *working body schema* consists in a sensorimotor representation of the body used for acting on the world, for grasping, for exploring, for manipulating, and so forth. Most literature in neuropsychology and in cognitive neuroscience has focused its interest exclusively on this notion, but there is another type of sensorimotor representation of the body that one should not neglect, which is involved in avoiding predators and obstacles, namely, the *protective body schema*. One does not defend one's biological body; one defends the body that one takes oneself to have and the protective body schema, like any representation, can misrepresent one's biological body and include a rubber hand for instance. Although rarely mentioned in the literature on body representations, this notion of body schema can be found in the literature on pain (Klein, 2015a):

There's a body schema representation which is primarily concerned with protective action: that is, one which maps out parts of our bodies that we should

pay special attention to, avoid using, keep from contacting things, and so on. Call this a defensive representation of the body: it shows which parts of the body are in need of which sorts of defense. (Klein, 2015a, p. 94)

The notion of a distinctive space to defend can also be found in the literature on *peripersonal space* (i.e. space immediately surrounding the body). It was first described by the Swiss biologist Heini Hediger (1955), the director of the Zurich zoo, who noted that animals do not process space uniformly: they flee at a specific distance from a predator (i.e. flight distance) and they do not tolerate the proximity even of their conspecifics (i.e. personal distance). Electrophysiological studies on monkeys have confirmed that stimuli close to the body can elicit avoidance responses (Graziano and Gross, 1993). In humans, it was also found that peripersonal space is represented in a specific way compared to far space (Brozzoli et al., 2012). For example, human participants lean away from a visible object, and, when walking through a doorway they tilt their shoulders to protect their body from hitting the doorframe. Other defensive behaviours require no action at all, like freezing or playing dead. For example, an intense sound near the hand can cause a defensive-like freeze response (Avenanti et al. 2012), resembling that observed during the presentation of noxious stimuli or potential threats (Cantello et al., 2000). Peripersonal space can then be conceived as a spatial margin of safety, which requires appropriate actions if it is invaded. What the protective function of peripersonal space highlights is the fact that the body matters for survival. It has a special significance for the organism's evolutionary needs. Because of this significance, there is a specific representation of the body to fix what is to be protected, namely, the protective body schema, which is the anchor of the peripersonal margin of safety. The function of the protective body schema is thus both to draw the boundary of the territory to defend and to guide how to best defend it, and what better defence than the fact to directly connect what is to be protected and how to protect it with no intermediary, no additional processing? One can

then directly translate what happens to one's body to appropriate actions. Hence, the protective body schema represents both the body to guard and the bodyguard. Let us now see how the sense of bodily ownership arises from such a body schema.

4. The Bodyguard hypothesis

The spatial content of bodily experiences is structured by representations of the enduring properties of the body, such as its configuration and its metrics. These representations play the role of spatial frames of reference for bodily sensations. What I propose is that one of the reference frames of bodily experiences is given by the protective body schema. For example, if a spider crawls on my hand, I feel its contact as being located at the basis of my thumb within the frame of the body to protect. This in turn can trigger my hand to withdraw.

In virtue of their protective frame of reference, one may then claim that the function of bodily experiences qualify as being *narcissistic*. I am not claiming that they involve a kind of self-love that eventually ends badly. Instead, I use the notion of narcissism partly in the same way as Akins (1996) does in her analysis of the function of sensory systems. On her view, narcissistic perception is not about what is perceived, but about the impact of what is perceived for the subject. It aims at securing what is best for the organism. For instance, she notes that thermal sensations do not covary with external temperature, but rather indicate what is dangerous or safe for the body given its thermal needs. The felt temperature degree is one thing, but its localization is another, and this is there that the protective body schema intervenes. It informs the brain about the potential relevance of the location of the sensation for the organism's needs. Thanks to their protective reference frame, bodily experiences are thus not simply about the body; they are about the body that has an evolutionary significance for the organism. They involve the awareness of the body as having a special import for the self.

The narcissistic quality of bodily experiences is something over and above the sensory phenomenology of bodily experience. It cannot be reduced to the sensory recognition of bodily properties, but involves autonomic responses. It should thus be conceived of in affective terms. To explore this specific affective phenomenology, I will take as a starting point a more 'familiar' affective feeling, namely, the feeling of familiarity. When I see my students entering the classroom, my visual experience is about their faces that have a special significance for me. The phenomenology of my experience includes both the visual phenomenology of the shape of their face and an affective phenomenology of the personal significance of their face. Likewise, I suggest that the phenomenology of my bodily experiences is dual: it includes both the tactile phenomenology of the pressure on my hand and an affective phenomenology of the evolutionary significance of this body part. Hence, it is not only that bodily boundaries can have a specific type of evolutionary significance and that the boundaries that have such significance are represented in the protective body schema. It is also that it *feels* something specific when one is aware of this significance in the same way as it feels something specific when one sees a person that one knows. This affective phenomenology, which arises from the protective frame of reference of bodily experiences, constitutes the sense of bodily ownership.⁴

We can now formulate the following hypothesis:

The Bodyguard hypothesis: One experiences as one's own any body parts that are incorporated in the protective body schema.

Given the suite of cognitive capacities that human beings normally have, the protective body map grounds the sense of bodily ownership. The Bodyguard hypothesis falls in line with the

⁴ More on the phenomenology of bodily ownership in Vignemont (forthcoming).

general agentive conception because it posits a sensorimotor representation at the core of the sense of bodily ownership, but it includes a new dimension, namely, an affective one.

Now the question is whether the Bodyguard hypothesis can account for the first-personal character of the sense of bodily ownership in a satisfactory way, that is, for the fact that the phenomenology of bodily ownership normally grounds self-ascriptive judgments (e.g., this is my own body). It might indeed seem that the Bodyguard hypothesis faces a version of the classic Euthyphro dilemma. Plato noted that an action is just because it pleases the gods, but the action pleases the gods because it is just. Similarly, it might seem that I experience my body as my own because of its special value for me but this specific body is valuable for me in virtue of being experienced as my own. Put it another way, if the protective body schema represents one's body *qua* one's own, then it can account for the first-personal character of the sense of bodily ownership, but it does so "by taking for granted the notion of ownership by a subject, rather than by offering some kind of reductive explanation of the notion" (Peacocke, 2015, p. 174).

Let us first make clear that the Bodyguard hypothesis assumes only that the function of the protective body schema is to represent the boundaries of the body that matters for survival; it does not assume that it represents the boundaries of the body that matters for survival *qua* one's own, even in a nonconceptual way. This distinction is important if one wants to block the risk of circularity denounced by Peacocke. But then one may wonder what is at the origin of the first-personal dimension of the sense of bodily ownership: how am I aware that this hand is *mine*? In order to answer this question, I will go back to Akins's notion of narcissism. Indeed, what better reference than Narcissism to eke out self-referentiality? According to Akins, perception is always shaped by the following narcissistic question: "But how does this all relate to ME?" (Akins, 1996, p. 345). On her view, this question does not only affect the content of my experiences, filtering only what is relevant to me. It also marks the structure, or

the format, of my experiences, like a signature: “by asking the narcissistic question, the *form* of the answer is compromised: it always has a self-centered glow” (idem). This self-centeredness calls to mind perspectival experiences. For instance, when I see the pen on the left, my egocentric experience is centred on me. Egocentric phenomenology can refer to the self more or less implicitly (on the left or on my left), but in any case it can ground self-locating beliefs of the type ‘the pen is on my left’ (see Alsmith, this volume). Likewise, I propose that under normal circumstances bodily experiences present the body in its narcissistic relation to the self: I am aware of the evolutionary significance of this body part *for me*.⁵ Most of the time, the reference to the self is only implicit (i.e. the body that matters). This explains why the phenomenology of bodily ownership is generally dim and elusive. Still in some contexts, when there is uncertainty for example, the phenomenology of bodily ownership explicitly refers to the self (i.e. the body that matters *to me*). In any case, it can ground self-ascriptive bodily judgments of the type ‘this body part is mine’.

One prediction based on this view is that disruption of self-awareness should lead to disruption of the sense of bodily ownership because patients would lose the ability to be aware the significance of the body *for them*. This prediction seems to be confirmed by depersonalisation disorder (see Billon, this volume). Patients with depersonalisation feel detached from their bodily sensations and feel as if their body did not belong to them, “I can sit looking at my foot or my hand and not feel like they are mine” (Sierra, 2009, p. 27). For instance, they can feel pain and they have protective behaviours like withdrawing, but they experience pain as if they were not concerned (Janet, 1928). A patient with depersonalisation reports: “it is as if I don't care, as if it was somebody else's pain” (Sierra, 2009, p. 49). As Klein (2015b, p. 510) notes, the patient is like the man to whom a policeman shouts, “Stop or

⁵ There is a difference between egocentric experiences and narcissistic feelings: in egocentric experiences the notion of selfhood is minimal and involves only a mere point in time and space, while it seems that narcissistic significance involves an enduring self (survival matters only if one lasts over time).

I will shoot!”, without recognizing that the command is addressed to him. I thus suggest that patients with depersonalisation have at least a partially preserved protective body schema, but they are no longer aware of the significance of their body for themselves because they have a more general deficit of self-awareness. Consequently, they feel as if their body was not their own.

5. The function of the sense of bodily ownership

The notion of narcissistic quality provides us insight about the first-personal dimension of the sense of bodily ownership. It also sheds light on its functional role. According to Akins, narcissistic perception is in direct relation to action: “No matter what else the senses do, in the end, they must inform movement or action” (Akins, 1986, p. 352). For example, to perceive the temperature of the bath as being burning hot is to inform us that we should remove our hand. If the sense of bodily ownership consists in the narcissistic quality of bodily experiences, as I assume, then its functional role must also be to inform movement and action, and more specifically protective movements and actions.

However, it is important to avoid oversimplification. Here is what the Bodyguard hypothesis does *not* claim: the body that one protects is the body that one experiences as one’s own. Since one protects many things besides one’s body and since one does not always protect one’s body, this view is indeed clearly untenable. Like any other behaviour, protective behaviours can result from complex decision-making processes, involving a variety of beliefs, desires, emotions, moral considerations, and so forth. As Helm (2010, p. 57) notes about caring:

This is not to deny that someone who genuinely cares may in some cases be distracted by other things that are more important (...) What is required, however,

is a consistent pattern of attending to the relevant object: in short, a kind of vigilance for what happens or might well happen to it.

There are thus many situations in which we do not protect our body and yet still feel it as our own. It can simply be because we are paralysed. Or it can be for selfish reasons, like pleasure in extreme sports. It can also be for altruistic reasons, like the desire to save the nation at war. However, even if the soldier is ready to sacrifice himself, it is highly likely that he pays extreme attention to its immediate environment and that he is ready to react in case of threat. Otherwise, he would be a bad soldier, of little use for the nation.

But how should one interpret the case of individuals who consistently fail to protect their body? If their protective body schema is impaired, the Bodyguard hypothesis must predict that such individuals should experience no sense of bodily ownership. And indeed this seems to be the case, at least in somatoparaphrenia. Many patients with somatoparaphrenia often try to get rid of their 'alien' limb and they display misoplegia (i.e. dislike of one's body) and self-inflicted injuries. One patient, for example, claimed: "Yes, please take it away. I don't care about its destiny as it is not mine." (Gandola et al., 2012, p. 1176). Another patient said: "I got to get rid of them (...) Put them in a garbage." (Feinberg, 2009, p. 15). Finally, when their 'alien' hand is threatened, they do not react, as shown by the following study. Somatoparaphrenic patients saw either a Q-tip or a syringe approaching either their right hand, which they felt as their own, or their left hand, which they felt as alien (Romano et al., 2014). The experimenter then analysed their physiological level of arousal measured by their skin conductance response (SCR). We know that seeing our body threatened normally induces an increase of our SCR and indeed when the syringe approached the right hand, the SCR increased, as expected. But when the syringe approached the left 'alien' hand, there was no modification of the SCR.

These findings are in line with the Bodyguard hypothesis: the lack of bodily ownership correlates with the lack of bodily protection. However, this correlation does not always seem to hold. For instance, patients with amygdala lesion do not experience fear: SM, the most studied of these patients, was threatened several times in her life, including by a man who wanted to stab her, but she did not react (Tranel and Damasio, 1989). Similar lack of protective behaviour can be found in patients with pain asymbolia: asymbolic patients seem to be in pain insofar as they are able to judge the location and the intensity of painful stimuli, but they do not try to avoid them and do not realize when something is threatening them (Grahek, 2001). What is interesting with these two types of patients is that they seem to show no bodily protection, and yet, as far as I know, they report no sense of disownership. Do they invalidate the Bodyguard hypothesis? As said earlier, there are many reasons one may have for not protecting one's body beside impaired protective body schema, and one of them is faulty evaluation of danger. What is interesting is that the patients' affective attitude towards danger is not simply neutral. Actually, it has been found that SM shows increased arousal under threat (Tranel and Damasio, 1989). This might indicate that at some basic level, she still cares about her body or more simply, that she is interested by what is happening. But in both interpretations, she is not indifferent. And she does not merely fail to run away from danger, she is actually eager to face it: once when she saw a snake, she did not only fail to run away, she actually grasped it. Likewise, patients with pain asymbolia expose themselves to danger almost with a smile: "On occasion, the patient willingly offered his hands for pain testing and laughed during stimulation" (Berthier et al., 1988, pp. 42). The fact that they seem to enjoy painful stimulations to some extent or look for danger indicates that they are *misevaluating* what is going on.

All together, these findings are consistent with the Bodyguard hypothesis. They further highlight the motivational role of the protective body schema. But the crucial question is

whether the sense of bodily ownership itself plays a motivational role. Arguably, an organism that has a protective body schema but that is not aware of the evolutionary significance of its body will well survive. If so, the sense of bodily ownership is merely epiphenomenal and only its ground, namely the protective body schema, contributes to bodily protection.

However, I want to propose here that there might be a specific role that the sense of bodily ownership can play in humans. This is the role of practical authority. In order to defend this view, I base my discussion on Klein's (2015a) imperativist theory of pain. Klein aims to explain how pains motivate us to act and how they justify our actions. On his view, pains are intentional states whose content is imperative: they consist in bodily commands. However, as he notes, we, humans, do not accept and obey all commands. We do so only when we accept the source of the command as having the right authority: acknowledging the practical authority of the source suffices to motivate and to give us reason to act. Klein then argues that in the case of pain the body constitutes our practical authority. By recognizing the authority of the body, we are bound to at least consider the actions that will keep us alive:

We accept our bodies, I suggest, as minimal practical authorities. Our body commands us to protect a certain part. Because we accept our body as a practical authority, that command gives us reason to act—regardless of what else we'd want to do and regardless of what else we know. (Klein, 2015a, p. 80)

What is interesting for the prospect of our discussion of the sense of bodily ownership is the reason for which we accept our bodies as authorities. According to Klein, this is not simply a brute biological fact; we accept it because we have a long-standing attitude of caring about our bodies:

Of course, we accept our bodies as authorities for good reason. Our body is important to us. We care about it. We are in bad shape if it doesn't work. We cease to exist when it does. If we regarded the body as something less than a

minimal practical authority, then we would still have reasons to act in ways that promoted bodily integrity. But we would also be free to accept or ignore those reasons as we please. If we did that, then we'd probably screw it up. (Klein, 2015a, p. 81)

The notion of bodily care, however, raises a number of difficulties (Vignemont, 2015). I suggest replacing it by the notion of narcissistic significance: we accept this specific body as a practical authority because we are aware of its special significance for us. Roughly speaking, it is because I experience the body that commands me as my own that I obey it. The function of the sense of bodily ownership is thus to provide me reason to accept this specific body as a practical authority.

Conclusion

The Bodyguard hypothesis solves the difficulties that a more general agentic conception faces, while doing justice to the intuition that the sense of bodily ownership is intimately related to action. We can now reply to the following questions:

- *What grounds the sense of bodily ownership?* The sense of bodily ownership is grounded in the spatial frame of reference of bodily experience that is provided by a specific type of body schema, namely, the protective body schema.
- *What does it mean to feel one's body as one's own?* Feeling one's body as one's own is to experience a specific type of affective phenomenology that can be described in narcissistic terms. It expresses the awareness of the significance of the body for the subject.

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- *What is the function of the sense of bodily ownership?* The sense of bodily ownership plays a motivational role for self-protection. More specifically, it provides us a reason to accept our body as a minimal practical authority to which we should obey.

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