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# Sensorimotor Theory, Cognitive Access and the 'Absolute' Explanatory Gap

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## Abstract

Sensorimotor Theory (SMT) is the claim that it is our practical know-how of the relations between our environments and us that gives our environmental interactions their experiential qualities. Yet why should such interactions involve or be accompanied by experience? This is the 'absolute' gap question. Some proponents of SMT answer this question by arguing that our interactions with an environment involve experience when we cognitively access those interactions. In this paper, I aim to persuade proponents of SMT to accept the following three claims. First, that appeals to cognitive access fail to answer the absolute gap question. Second, that SMT can be read in a way that rejects the gap question. Third, that if proponents of SMT are prepared to read SMT in a way that rejects the absolute gap question, then they can also reject the claim that cognitive access is needed to explain experience.

## 1. Introduction

The smell of freshly ground coffee, the taste of dark chocolate, the hearing of church bells on a crisp Sunday morning. How should we explain such familiar experiences? According to some (e.g. Levine, 1983), any explanation we offer needs to close (in some way) an alleged gap between, on the one hand, these sorts of phenomenal experiences, and on the other, our bodily behaviours, such as smelling, tasting or hearing.

Sensorimotor Theory (henceforth SMT) has garnered attention for, among other things, its apparent ability to address this gap issue. SMT does so by distinguishing between what can be called 'comparative' gap questions, that is, questions about the gaps within and between the sensory modalities (smelling, tasting, hearing, touching, seeing), and the 'absolute' gap question, that is, the question about the gap between phenomenal experience and behaviour.

SMT answers these 'comparative' gap questions in the following way. According to proponents of SMT, looking at an apple differs from looking at the sea, for example, because you or I know how we can examine an apple from different angles yet we also know how we cannot do anything comparable when it comes to looking at the sea. You or I also know, insist proponents of SMT, how touching the apple allows us to manipulate the apple in ways not possible if we are only looking at the apple. That is to say, it is the different know-how of what are called sensorimotor contingencies (SMCs) that gives our encounters with our environments their visual or tactile characteristics.

Those keen on SMT usually take these answers as providing a philosophically interesting and empirically satisfying take on such comparative gap questions. This is often understood to be one of the main selling points of this theory.

However, this still leaves unanswered the question, why should anything we do involve or be accompanied by phenomenal experience? This is the absolute gap question. This question arguably takes precedence over the previous comparative gap

questions. For as both those against and for SMT seemingly accept, one can offer examples of agents e.g. robots, that do possess the sort of sensorimotor know-how described before but still have no phenomenal experience. If these sorts of examples are to be excluded, then the absolute gap question needs to be answered.

SMT can be understood as answering the absolute gap question via an appeal to what is called 'cognitive access', which can be broadly understood as the claim that an agent's interactions with an environment involve or are accompanied by phenomenal experience when an agent casts their attention on and accesses i.e. cognitively accesses, those environmental interactions.

In this paper, I will aim to persuade proponents of SMT to accept the following three claims. First, that appeals to cognitive access fail to answer the absolute gap question. Second, that SMT can be read in a way that rejects the gap question. Third, that if proponents of SMT are prepared to read SMT in a way that rejects the absolute gap question, then they can also reject the claim that cognitive access is needed to explain experience.

For example, I will argue that SMT's answer to the absolute gap question fails because there are distinct readings of the term "cognitive access" available within the literature yet of these available readings, none in fact answers this gap question. On the other hand, rather than attempting to answer the absolute gap question, proponents of SMT could instead offer a reading of SMT that demonstrates that there is no absolute gap question in need of answering. This would be to reject the absolute gap question.

I will argue that if proponents want to adopt this approach, that is, they seek to reject the gap question, then they should endorse what I will call an identity view of SMT (Myin and Loughlin, 2017), according to which phenomenal experience can be identified with what we do. According to this identity view, *phenomenal experience is a doing*. If experiencing is a doing, then we don't need to access anything in order have experience. We simply need to do.

Note that this is not to defend SMT. Rather my aim is simply to clarify what sort of view of SMT proponents of this theory should adopt *if* they want to reject the absolute gap question. And *if* proponents of SMT are prepared to adopt such an identity view, then, so I claim, they should also be prepared to reject the notion of cognitive access.

The layout of the paper then is as follows. In section 2, I outline the basic tenets of SMT. In section 3, I identify two readings of cognitive access: what I call a higher order reading and a functional capacity reading. In section 4, I argue that neither of these readings can answer the absolute gap question. In section 5, I sketch an alternative identity view of SMT.

**2. Sensorimotor Theory (SMT)**

Suppose you are looking at a red bicycle. As you move while continuing to look at the bicycle, you might notice how the colour of the bicycle remains constant even though the play of light ensures that parts of the bicycle sometimes darken or lighten (what is often called colour constancy). You might also notice how if you simply shut your eyes, then you will cease to see the bicycle altogether. According to Sensorimotor Theory (SMT), it is your attunement or sensitivity to these subtle and not so subtle changes to your visual perception that gives your sensation its particular quality. In other words, the redness you perceive when you look at the bicycle is a property of your sensorimotor interaction with the bicycle.

Against this it might be objected that your visual sensation seems utterly unlike your bodily action. For some e.g. Nagel (1974), this is because there is 'something-it-is-like' to the experience of redness, which marks out this visual sensation from others (it is unlike the visual sensation of yellow, for example). Phenomenal sensation and bodily activity thus appear utterly different, all of which raises the question: why should your experience of redness accompany your activity of looking at the bicycle?

This question is a well-known variant on what others have termed the 'explanatory gap' (Levine, 1983), namely the gap between, on the one hand, phenomenal experiences or sensations, and on the other, bodily behaviours. If we want to explain experience, then we need to find a way to close this gap. Or so it is claimed.

Following Hurley and Noë (2003), this explanatory gap can be broken down into further 'comparative' gaps and an 'absolute' gap. The first is the comparative intramodel gap. This is the gap between differences within a modality e.g. vision, and our bodily behaviours. The second is the comparative intermodal gap. This is the gap between differences between modalities e.g. between vision and touch, and bodily behaviours. Third, there is the absolute gap. This is the gap between phenomenal experience and bodily behaviour. For example, why should anything you or I do involve or be accompanied by phenomenal experience? This is the absolute gap question.

Now, it might appear that closing any of these gaps means accepting the following two claims. First, if we are to explain phenomenal experience, then we need to identify some mediator that can 'bridge' the gap between phenomenal experience and behaviour. Second, identifying such a mediator requires looking inside the head.

However, those keen on SMT deny the second claim (in section 4 of this paper, I will show that SMT can be read in a way that also denies the first claim). That is, proponents of SMT deny that for every phenomenal experience there is a correlating brain state or process, whose activation or occurrence is the explanatory basis for that experience. According to O'Regan, this is because "there is logically no way to link properties of such [brain] mechanisms to the different varieties of feel that accompany sensations" (O'Regan, 2009, p588).

For example, suppose we did posit some neural mechanism as the mediating link between the brain and experience. We can then ask: what is it about this mechanism that generates, say, a visual sensation of looming, and not another visual sensation (the intramodal gap)? Moreover, why should this mechanism generate a visual sensation and not a tactile sensation (the intermodal gap)? Finally, why should this mechanism generate any sensation at all (the absolute gap)? For some proponents of SMT, the difficulty here is logical, not empirical. That is to say, they claim that no appeal to mediating mechanisms, no matter how finely described, can make headway on closing these gaps between what happens in the brain and what we experience.

Proponents of SMT consequently take a very different approach. They insist on broadening the explanatory basis of experience to include the agent's spatially and temporally extended sensorimotor interactions with an object and/or wider environment. It is claimed that there is a 'natural relation' (O'Regan, 2009) between the qualities of our phenomenal experience and how we interact with objects and our surrounding environments. As O'Regan puts it, "to every aspect of phenomenology..there corresponds an objective physical characteristic of the interaction" (2009, p588).

Central to this proposal is the role played by an agent's practical knowledge of how a sensation will change whenever an agent moves in the environment i.e the agent's attunement to or sensitivity to what are called 'sensorimotor contingencies' (henceforth SMCs). Returning to the example of the red bicycle, the claim is that it is your attunement or sensitivity to how your sensation changes as you move in relation to the bicycle i.e., your attunement or sensitivity to the SMCs involved, that gives your interaction with the bicycle its phenomenal quality of redness.

For SMT, what holds true for visual experience also holds true for other forms of phenomenal experience as well. Rather than looking at a red bicycle, suppose you are instead squeezing a sponge. You close your fingers around the sponge, which causes the sponge to become smaller. In getting smaller, you squeeze further, until the sponge is a fraction of its original size. The sponge now fits snugly into your hand. Whilst doing all this, you experience the sensation of softness. According to SMT, just as redness is being attuned to or sensitive to how your visual sensation will change as you move in relation to the bicycle, then so too softness is being attuned to or sensitive to how your tactile sensation will change whenever you interact with the sponge (O'Regan, 2011, p108). And what is true of touch is also true of taste (see Noë, 2004) and of smell (see Cooke and Myin, 2011).

Supporting evidence for these claims comes from the use of what are called 'sensory substitution devices', such as Bach-y-Rita's Tactile Vision Substitution System or TVSS. TVSS is a device which consists of a head or eyeglass mounted camera, whose visual output is transduced to trigger an array of vibrators which are placed somewhere on the body of a blind (or blindfolded) subject. After training with the

device, during which time the subject moves with the device and learns how movement alters the sensory tactile input, subjects begin to report experiencing objects arrayed in three-dimensional space around them. They are also able to make judgments about the number, relative size and position of objects in their environment (Noë, 2004, p26). By insisting that visual experience depends upon an agent's attunement or sensitivity to SMCs, SMT predicts that a TVSS user's tactile experience will become visual to the extent that the TVSS device enables the user to replicate the sensorimotor know-how characteristic of vision. This prediction is (to some extent) borne out by the empirical literature (see O'Regan, 2011, p140).

By broadening the explanatory basis for experience, and by appealing to practical know-how of SMCs, proponents of SMT aim to close both the intra- and inter- modal gaps. Looking at one object differs from looking at another object, for example, because of the different attunements or sensitivities involved. This closes the comparative intramodal gap. Moreover, looking at an object differs from touching an object because, again, of the different attunements or sensitivities involved. This closes the comparative intermodal gap.

These answers to the intra- and inter- modal gap questions are standard fare in the literature on SMT. However, they still leave unanswered the absolute gap question. For as opponents and proponents of SMT agree (see section 3 of this paper), it seems plausible to imagine an agent e.g. a robot, that can engage in the sorts of sensorimotor know-how described above and yet not possess any phenomenal experience. In which case, proponents of SMT still need to answer the question, why should anything you or I do involve or be accompanied by phenomenal experience?

**3. Cognitive Access**

The absolute gap question can be answered, according to some proponents of SMT, by appealing to 'cognitive access', which can be broadly understood as the claim that an agent's interactions with an environment involve or are accompanied by phenomenal experience when an agent casts their attention on and accesses i.e. cognitively accesses, those sensorimotor interaction with an environment.

O'Regan (2014) illustrates the term 'cognitive access' in the following way. Suppose two people are washing the dishes. The first person is experiencing the softness of the sponge. However, the second person, perhaps because they are chatting with a friend, does not experience the softness of the sponge. We can explain the difference between these two people, insists O'Regan, by appealing to what is called "cognitive access". For it is because the first person, "cast[s] their attention on and cognitively access[es] the quality of their interaction with the sponge [that we would say they are] consciously experiencing the softness" (O'Regan, 2014, p25).

However, determining exactly what is meant by the term 'cognitive access' is complicated by the fact that there are arguably distinct readings of this term available in the literature.

According to earlier O'Regan (2011), for example, phenomenal experience involves a hierarchy of levels of cognitive access (ibid, p92). It also involves some form of self in order to access these higher levels (ibid). The claim is that at the first lower level, the agent (the self) is poised to make use of their interaction with the environment. At a second higher level, the agent knows that they are so poised to make use of their interaction. It is these two levels of cognitive access, that is, "cognitive access to the fact that it [the agent or self] has cognitive access to something" (ibid, p91), that explains phenomenal experience.

This has obvious parallels with higher-order thought (HOT) theories of consciousness (a parallel noted by O'Regan - see 2011, p93). However, O'Regan clarifies that what the agent has higher order access too are dispositions (ibid, p93, footnote 5). In other words, it is only when the agent is both disposed to make use of their interaction with the environment and knows that they are so disposed that the agent has phenomenal experience.

In order to illustrate this proposal further, suppose I am driving my car and I notice that the upcoming traffic light is quickly turning from green to yellow to red. Seeing the red light will (and should) dispose me to press on the brake and slow down my car. I will likely do this in an automatic manner and so will not have any phenomenal experience. This is the first level of cognitive access.

However, suppose I had been driving at considerable speed when I noticed the traffic light change. Now the situation is very different. For now I am not only disposed to slow down in response to the light. I also know that I may not be able to slow down. This 'access-to-access' will likely snap me out of any mental stupor I may be in. My heart may start to beat faster, for example. I may start to sweat. I may loudly curse the light. If I do stop my car in time, I will likely feel very relieved. This is the second level of cognitive access. Plausibly, I now do have phenomenal experience of seeing the traffic light change. Thus, it is only when I both access my environment (I am disposed to act in response to seeing the traffic light change) and I access my access to the environment (I know that I am so disposed and so press down very hard on the break to slow the car) that I have phenomenal experience of seeing the traffic light change. For ease of exposition, I will call this a higher order reading of cognitive access.

Yet within the literature on SMT, this appeal to cognitive access has been significantly modified over the years.

Cognitive access, according to later formulations, is now just viewed as a "functional capacity to make use of this access" (Degenaar and O'Regan, 2015). In particular, it is only when an agent's sensorimotor interactions with the environment are "integrated into the appropriate cognitive capacities" that such interactions become "objects of consciousness" (ibid). This sensorimotor integration is then to be understood in terms of how the agent's interactions with the environment are used "in (rational) planning, thought, and in the case of typical human adults, verbal report" (Degenaar and O'Regan, 2017, p4).

Hence, what is now distinctive about cognitive access are the capacity or capacities involved i.e., capacities to plan, think or report on what is occuring. It is these capacities that distinguish engagement with the environment that has phenomenality from engagement with the environment that does not. More importantly, it is the capacity to 'integrate' certain engagements into subsequent behaviours that makes those engagements phenomenal. For example, if I stop my car on time, I may make a mental note to always drive slower in the future. It is this capacity for sensorimotor

integration that, according to Degenaar and O'Regan, is the hallmark of phenomenal experience. I will call this the functional capacity reading of cognitive access.

Now there is an important parallel between these two readings. For neither reading involves appealing to "'higher-order' thoughts or to mental states accessing mental states" (Degenaar and O'Regan, 2015). That is, according to both the higher order and functional capacity readings, it is our use of our engagement with the environment that explains what we experience. For example, according to the higher order reading, when I am driving too fast and I notice the traffic light change, accessing my access to the environment is simply to press down very hard on the brakes to slow my car.

Nonetheless, there are grounds to keep the two readings distinct. For example, on the higher order reading, there is a hierarchical structure to one's access to the environment. Yet on the functional capacity reading, no such hierarchy is invoked. All that matters are having the capacity or capacities to integrate current behaviours into future behaviours. Of course, such integration might still involve some notion of a self. [1] And as we have seen, talk of a rudimentary self plays a key role within the higher order reading. Yet it is striking that talk of a self is entirely absent from the functional capacity reading. These differences, I claim, provide grounds to regard the higher order and functional capacity readings of the term "cognitive access" as noticeably distinct.

Recall that the absolute gap question asked, why should anything you or I do involve or be accompanied by phenomenal experience? We can now see that some proponents of SMT answer this question by claiming that our interactions with an environment involve or are accompanied by phenomenal experience when we access, either in a higher order or functional capacity way, our sensorimotor interaction with the environment.

In the next section, I will critically examine this answer. Specifically, I will ask: does this in fact answer the absolute gap question?

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[1] For example, Noë (2016) endorses a sensorimotor integration approach and takes this to presuppose that there is an agent, "one who cares about and has knowledge of and access to a meaningful world" (p76). In other words, Noë, unlike Degenaar and O'Regan, does link sensorimotor integration to a notion of self.

**4. Problems with access**

According to both opponents and proponents of SMT, it seems plausible to imagine an agent e.g. a robot, as enacting the sort of sensorimotor know-how identified in section 2 and yet still not having any phenomenal experience.

For example, Clark and Toribio have stated:

> "A good Ping Pong playing robot, which uses visual input, learns about its own sensorimotor contingencies, and puts this knowledge into use in the service of simple goals (e.g. to win, but not by too many points) would meet all the constraints laid out [in O'Regan and Noës' 2001a formulation of SMT]. Yet it seems implausible to depict such a robot (and they do exist – see e.g. Anderson 1988) as enjoying even some kind of modest visual experience. Surely someone could accept all that [O'Regan and Noë] offer, but treat it simply as an account of how certain visual experiences get their contents, rather than as a dissolution of the so-called hard problem of visual qualia." (O'Regan and Noë, 2001a, p980)

In other words, Clark and Toribio objected that even if appealing to sensorimotor know-how can explain what and/or how the robot perceives, it still leaves unanswered the question: why should the robot's interaction with the environment involve or be accompanied by any visual experience? That is, Clark and Toribio objected that SMT still has not answered the absolute gap question.

In response, O'Regan and Noë accepted that Clark and Toribio's ping-pong playing robot would not have any experience. However, O'Regan and Noë also insisted that if such a robot were to be modified such that it "not only masters sensorimotor contingences, but makes use of that mastery to engage with the world in a thoughtful and adaptable way, then it..has (at least primitive) visual experience" (2001a, p1013). That is, a suitably modified ping-pong playing robot could have visual experience (albeit of a basic kind).

This suggests one way in which the absolute gap question could be answered within the debate over SMT. We can reconstruct the dialectic here as follows. On the one hand, Clark and Toribio grant that if the robot has experience, then sensorimotor know-how can explain what and/or how the robot has such experience. The latter can be understood to be a necessary condition for the former. However, on the other hand, Clark and Toribio object (and O'Regan and Noë accept) that this still doesn't amount to an explanation for experience. For even if the robot has sensorimotor know-how, it doesn't follow that it then has phenomenal experience. It is this sufficient condition for experience that, it is claimed, is still missing from the SMT account. As such, answering the absolute gap question requires providing, not only a necessary condition for experience, but also a sufficient condition as well. [2]

Now fast forward to the present situation. As pointed out earlier (see section 3), the claim is that if someone engages in cognitive access (either via higher order levels or functional capacities), then they have phenomenal experience. Set within the sort of dialectic sketched above, cognitive access is thus both a necessary and sufficient condition for phenomenal experience. For if cognitive access were only necessary for phenomenal experience, then this would leave open the possibility of agents that do engage in cognitive access but have no experience (the sufficient condition). Alternatively, if cognitive access were only sufficient for phenomenal experience, then this would leave open the possibility of agents that do have experience but not because of cognitive access (the necessary condition).

However, I shall now argue that there are grounds to doubt that cognitive access can act as both a necessary and sufficient condition. Specifically, I will claim that even if access is necessary for phenomenal experience, it is not also sufficient.

Think back to the example of driving my car (see section 3). Following the higher

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[2] Crane describes the distinction between necessary and sufficient conditions in the following terms: "To say that a particular claim, A, is a necessary condition for some other claim, B, is to say this: B is true only if A is true too. Intuitively, B will not be true without A being true, so the truth of A is necessary (i.e. needed, required) for the truth of B. To say that A is a sufficient condition for B is to say this: if A is true, then B is true too. Intuitively, the truth of A ensures the truth of B – or, in other words, the truth of A suffices for the truth of B. To say that A is a necessary and sufficient condition for the truth of B is to say this: if A is true, B is true, and if B is true, A is true" (2003, p14). It is Crane's reading of this distinction that I am employing in this paper.

order reading, at the first level I see the traffic light change, which disposes me to stop my car. At the second level, I know that I am so disposed. The claim is that once I engage this second level of access, then I have the phenomenal experience of the seeing the traffic light change.

Consider then the following variant to this example. Some cars now have autopilot features. It is not a stretch to suppose that in the near future your car could become an autonomous vehicle i.e., capable of autonomously navigating traffic and stopping at traffic lights. At the heart of this autonomous vehicle will likely be some computational system. Computers, as we all know, can be hacked. Suppose then that your autonomous vehicle is hacked. [3] Now, unbeknownst to you, the computer controlling your car always increases the speed of the car until it breaks the speed limit. Using its various sensors, the computer may be aware of the traffic light changing from green to yellow to red but because of its speed need to utilize those sensors to press down hard on the breaks to slow the car.

Let us grant everything the proponent of the higher order reading thinks is needed for phenomenal experience to occur. That is, we could grant that at the moment of sensing the traffic light change, the computer accesses its own access to the environment and is disposed to react accordingly i.e. to press down hard on the breaks. We could also grant that having such 'access-to-access' requires that the computer possess some rudimentary form of self. The problem here, I claim, is that even if such 'access-to-access' is necessary for experience, it doesn't appear to be sufficient.

Note that for a system as sophisticated as one that can control a car in ongoing traffic, removing or adding features to that system will likely have many knock-on effects within and for that system. We might speculate that if we removed the potential for

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[3] This is a plausible scenario. John Arlidge has described his own real life experience of being in an autonomous vehicle. He writes: "I am going to take Frank Sinatra Drive to Interstate 15, but I won't be driving. No one will. The car will do it itself. I get into the "driver's" seat, press the blue button on the steering column that "engages personal co-pilot" and take my hands off the wheel and my feet off the pedals. The car, a prototype, stays perfectly central in its lane and about 40 yards behind the truck in front, at a steady 55mph. It is – remarkably – not at all scary, so I set a course north for Seattle.." However, Arlidge also notes, more ominously, "Smart machines have plenty of other downsides, too. Automated cars have been hacked, and the hackers have taken control of the brakes and the steering" (Arlidge, The Week, issue 1142, Sept 2017, p52-53).

access-to-access from the computer and this resulted in the computer not having any experience, then this would demonstrate that access-to-access was indeed necessary for experience. However, as noted before, access-to-access and a self are linked, since access-to-access implies that there are a variety of behaviours that the agent can choose from (see O'Regan, 2011, p92). Hence removing the computer's access-to-access also requires removing the computer's ability to choose from these variety of behaviours i.e., the computer's self. In other words, even if we grant that access-to-access *alone* is necessary for phenomenal experience, it is still not sufficient, since a self is also needed for experience to occur.

However, if removing one feature of the system requires removing others, then so too adding one feature to the system also requires adding others. The problem is that O'Regan gives no indication as to why adding these various features would, in and of itself, thereby make that system conscious. For example, does the system become conscious when it has access-to-access plus a self? Or does consciousness require access-to-access plus a self plus a further set of conditions (like the car being in alignment with nearby traffic)? In short, pick whatever conditions or set of conditions you like, the question remains: why should that be the condition or set of conditions sufficient for consciousness to occur? O'Regan does not answer this question. [4] [5]

I would argue then that this example suggests that *if* the computer has phenomenal experience, then the computer engages in cognitive access. Cognitive access may be necessary for experience to occur. But if the computer engages in cognitive access, it doesn't follow that the computer has any experience. Cognitive access is not also sufficient for experience to occur. For it is not clear how we identify what condition is sufficient for phenomenal experience. If so, then the higher order reading of cognitive

[4] Note that this worry also applies if we think of sufficiency, not as something that either occurs or does not occur, but rather as some sort of gradient. The claim would then be that once the agent moves along this sufficiency gradient, then at some point phenomenal experience starts to emerge. However, we then face the same question. For how do we determine *where* on this supposed gradient experience starts to emerge? That is, where do we draw the sufficiency line?

[5] This is not intended to dismiss the proposals of others, such as Kriegel (2004), who think that understanding phenomenal experience does require appealing to some notion of "for-me-ness" or a self. Indeed, the identity view I subsequently outline in section 5 could be viewed as compatible with some notion of self or agent. Experiential doings could be understood to be the doings of someone, for example.

access does not answer the absolute gap question. For it has failed to identify the condition both necessary and sufficient for phenomenal experience.

What then of the functional capacity reading of cognitive access? Does it fare any better with this example?

As with the higher order reading, let us grant everything the proponent of this reading claims is needed for experience to occur. Suppose we now add various functional capacities to the computer controlling the car. For example, perhaps the computer can now run sophisticated diagnostics on the source of the hack. It could also have the capacity to implement complex procedures that would protect it against further hacks of its software. We could also suppose that the computer has highly developed speech recognition and speech production software such that, for example, I can ask it what is happening and a voice directed by the computer can reply to me in spoken English.

Nonetheless, I would claim that the same problem that confronts the higher order reading also confronts the functional capacity reading. Removing the capacity for sensorimotor integration and thereby removing the computer's potential to have experience might demonstrate that this capacity was necessary for the computer to have experience. However, since integration is about the bringing together of a set of disparate features (planning, thinking, providing a verbal report etc), then removing this capacity for integration will likely also require removing other features of the computer. For example, removing the computer's capacity to plan will have knock on effects on the computer's capacity to think. Thus, even if we grant that integration *alone* is necessary for experience, it is not sufficient, since many other features (planning, thinking) are also needed for experience to occur.

However, if removing one feature from the system requires removing others, then so too adding one feature to the system requires adding others. Adding the capacity for planning or thinking to the computer, for example, will likely also require adding many other capacities to the computer, like the abilities to recall what has happened and to anticipate what to do in future events. But as before, the problem remains that Degenaar and O'Regan give no indication as to why we should think that adding these functional capacities to a system would, in and of itself, thereby make that

system conscious. For pick whatever capacity or set of capacities you like. We can still ask: why should that be the capacity or set of capacities sufficient for conscious experience to occur? Degenaar and O'Regan do not answer this question.

Again, this example suggests that *if* the computer has phenomenal experience, then the computer engages in cognitive access. Cognitive access may be necessary for experience to occur. But if the computer engages in cognitive access, it doesn't follow that the computer has experience. Cognitive access is not also sufficient for experience to occur. For it is not clear what condition is sufficient for phenomenal experience. If so, then the functional capacity reading of cognitive access does not answer the absolute gap question. For it has failed to identify the condition both necessary and sufficient for phenomenal experience.

One response to all this might be to object that I have only considered one example. Are not more examples needed if appeals to cognitive access are to be shown to fail as answers to the absolute gap question?

However, the key claim here is that an agent's interaction with an environment involves or is accompanied by phenomenal experience when an agent accesses, either in a higher order way or functional capacity way, their sensorimotor interaction with that environment. This is a universal claim, that is, it is meant to cover all instances of phenomenal experience. Yet if this is a universal claim, then one counter example can challenge it. Our autonomous car example does just this. For here we have an example of an agent that does engage in cognitive access but does not have any phenomenal experience, since the condition sufficient for phenomenal experience to occur has not been identified.

I offer this challenge not as a reason to reject SMT but rather as a warning to SMT. For if proponents of SMT understand the absolute gap question as requiring them to provide both a necessary and sufficient condition for experience, and if they propose cognitive access as that which can answer this question, then appeals to cognitive access (understood either in terms of higher order levels or in terms of functional

capacities) will, in my opinion, fail. [6] This is because such answers leave open the possibility of agents that do engage in cognitive access but have no experience. As such, Clark and Toribios' objection remains: SMT has still not provided an answer to the absolute gap question. I claim this should encourage proponents of SMT to consider adopting an alternative approach to the absolute gap question.

**5. Rejecting the absolute gap question**

Recall that the absolute gap question asks, why should anything you or I do involve or be accompanied by phenomenal experience? As noted in the introduction, there is some textual evidence to support viewing SMT as that which rejects this question. For example, O'Regan and Noë have remarked, "..there is no explanatory gap because there is nothing corresponding to the theorist's notion of qualia. That is, we reject the conception of experience that is presupposed by the problem of the explanatory [i.e. absolute] gap" (2001a, p962). More recently, O'Regan (2014) has written: "The trick used in the sensorimotor approach is to try to "dissolve" the hard problem of qualia rather than "solving" it" (p25).

I will now argue that if proponents of SMT do in fact seek to reject this gap question, then they should adopt what I will call an identity view of SMT (Myin and Loughlin, 2017). According to this view, experience can be *identified* with what we do. If this view is accepted, then there is no gap between doing and experiencing, hence no absolute gap question in need of answering. Moreover, proponents of an identity view of SMT can also reject talk of cognitive access. For if *experiencing is doing*, then we don't need to access anything in order to have experience. We just need to do. In what follows, I will expand upon these various claims.

Before doing so however, it is worth pointing that if an identity view is to look attractive to proponents of SMT, then this view needs to meet certain requirements. For example, an identity view needs to recognize the difference between those agents that have phenomenal experience and those agents that do not. This is a well-

[6] My challenge is restricted to SMT's proposed answer to the absolute gap question. Nothing said in the text challenges alternative non-SMT answers to the absolute gap question, which should be judged on their own merits.

established theme in the literature on SMT (see Degenaar and O'Regan, 2017). We encountered it earlier with the ping-pong playing robot (see section 4). As both opponents and proponents of SMT agree, this robot (at least as described by Clark and Toribio) does not have any experience. On the other hand, not all doings involve experience. Think back to O'Regan's example of the two people washing dishes (see section 2). Both agents are washing the dishes yet only one of them is experiencing the softness of the sponge. As I will now show however, an identity view can meet these two requirements and so should be attractive to proponents of SMT.

Consider the following examples. I hit my foot on the edge of the bed and I cry out. Or I am hammering a piece of wood and the hammer catches my thumb. Or (as any parent might have experienced) I step on a piece of Lego when barefoot. In these examples, I certainly have a phenomenal experience, one that has what I will call 'forced immediacy'. That is, when I hit my foot, bang my thumb, or step on the Lego, the pain I feel is immediate, (momentarily at least) dominates my experience and occurs against my will.

I think SMT can explain the 'forced immediacy' of these examples if it were to *identify* what I experience with what I do. For why do these particular doings occur? They usually occur because I am careless where I place my feet or how I handle the hammer. Hence, when my foot hits the bed, the hammer hits my thumb, or I step on the Lego, I am entirely unprepared for what is about to occur, which is why my experience is so immediate, overwhelming and occurs against my will. If so, then my experience and my doing do not relate to different things. Rather my experience has the characteristics it does because of the nature of my doing. That is to say, we can explain my experience in terms of my doing.

Of course, I could prepare myself and still have the pain experiences in question. For example, I could intentionally hit my foot against the edge of the bed or I could intentionally step on the Lego. Nonetheless, this preparation changes my doing and with it my experience. For if I intentionally hit my foot or I intentionally step on the Lego, then the resulting experience will not be occurring against my will. Hence, even in these cases, my experience has the characteristics it does because of my doing.

This explanation, I claim, is entirely in keeping with the spirit of SMT. For in these examples, my attunement or sensitivity to SMCs remains critical. Consider that before I hit my foot, before I bang my thumb or before I step on the Lego, my carelessness is characterized by a lack of attunement or sensitivity to the SMCs involved. It is this lack of attunement or sensitivity that leads me to be careless where I place my feet or my thumb. Yet the moment my foot makes contact with the edge of the bed, the moment the hammer makes contact with my thumb or the moment I step on the Lego, I then do become suitably attuned. And once I am so attuned, I then have phenomenal experience. Indeed, it is arguably my sudden acquisition of this new sensorimotor know-how that explains why my doing and so my experience has its particular characteristic of forced immediacy. If so, then my attunement or sensitivity to SMCs can be understood to be identical with what I do. I will call this an identity view of SMT (Myin and Loughlin, 2017). According to this identity view, *experience is to be identified with doing.*

Notice that these examples (hitting my foot, banging my thumb, stepping on the Lego) reveal the complexity of doings. Doings are a product of my evolutionary history e.g. I am an animal with soft body parts, which when hit against hard surfaces causes pain. They are also a product of my own person history e.g. I am individual prone to being careless when walking or hammering. Moreover, doings can be both non-experiential and experiential. As we have seen, the moment I injure myself and thereby acquire new sensorimotor know-how, I suddenly and against my will have phenomenal experience. This is an experiential doing. However, prior to this i.e., when I am careless where I place my body or parts of my body, I am not having any phenomenal experience. Indeed it is this absence of experience that characterizes my carelessness. Carelessness is thus a non-experiential doing. In recognizing the complexity of doings, an identity view of SMT can thus meet the second of the two requirements previously discussed i.e. this view can acknowledge that not all doings are experiential.

It is also this complexity of my doing that distinguishes my doings from those of, say, a ping-pong playing robot (see section 4). As Clark and Toribio allow, this robot has sensorimotor know-how of its environment. However, this is know-how that the robot has been pre-programmed to enact or perform. Suppose, for example, the same robot

is placed in an environment that it has not been pre-programmed to operate in (to pick up cups rather than hit ping-pong balls, for instance). Here the robot will not be able to attune to or become sensitive to the relevant SMCs. Rather it will simply fail to enact its pre-programmed routines. It follows then that the robot cannot acquire new sensorimotor know-how.

Yet when I step on the Lego, it is my acquisition of new know-how that gives my doing and so my experience its forced immediacy. Hence I, unlike the robot, can acquire new sensorimotor know-how. There is thus an attunement or sensitivity to my engagement with the environment that is entirely missing when it comes to the robot. Arguably, it is this attunement or sensitivity to the environment that distinguishes organisms, such as myself, that can have phenomenal experience from those systems, like ping-pong playing robots, that cannot. Hence, an identity view of SMT can meet the first of the two requirements previously discussed i.e. this view can distinguish between those agents that have phenomenal experience and those agents that do not. [7]

Against this identity view however, someone may object that the pain I feel when I step on the Lego could in fact occur without me doing anything. For instance, it might be speculated that my skull could be opened and a surgeon could directly manipulate parts of my brain so as to bring about a feeling of pain. In which case, there is no identity between experience and doing. [8]

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[7] Compare these pain examples with our earlier examples of seeing the red bicycle or squeezing a sponge (see section 1). In the bicycle example, it was your attunement or sensitivity to how your sensation changed as you moved in relation to the bicycle that gave your interaction with the bicycle its phenomenal property of redness. Following an identity view of SMT, the phenomenal property of redness is to be identified with your interaction with particular objects, like painted bicycles. Similarly, in the sponge example, it was your attunement or sensitivity to how the sponge responds when you squeeze it that gave your interaction with the sponge its phenomenal property of softness. Thus, the phenomenal property of softness, like the phenomenal property of redness, is to be identified with your interaction with a particular object, like a sponge. However, what distinguishes these examples from the pain examples is that in the pain examples there is forced immediacy, that is, my know-how of SMCs is suddenly and immediately acquired. Looking at a bicycle, squeezing a sponge and stepping on the Lego are thus very different doings. Nonetheless, this is a confirmation of the complexity of doings, something an identity view readily acknowledges.

[8] However, even if, say, the surgeon's manipulation of my brain could play a role in bringing about a feeling of pain, the pain I feel would likely not have any forced immediacy. After all, my skull is being opened and my brain is being probed. Hence, even if I am unaware that the surgeon is going to make me feel pain, I am still prepared for *something*. But if so, then direct brain stimulation is not comparable to the previous examples. For in the previous examples (hitting my foot, banging my

Yet this objection requires equating doings with bodily movement. And while the above examples do indeed all involve me moving my body, one can nonetheless engage in doings without any movement (Myin, 2016). For example, I may be physically immobile during the surgical operation. But I am still doing something i.e. staying still. Moreover, doings can be "learned reactions, arising from and grounded in a person's history" (Myin and Loughlin, 2017, p18) (see also footnote 9 of this paper). Doings can also be provoked rather than initiated (ibid, p18). As such, even in the case where, so we may suppose, a surgeon's manipulation of my brain does play a role in my pain experience, my lack of current bodily movement does not exclude my experience from being a doing, since it may still be my history of doings that, along with the surgical operation, explains why I am now having a pain experience. Importantly, there then need be no suggestion that my pain experience just is a brain state. There thus remains an identity between my experience and my doing. [9]

An identity view of SMT also supports the standard SMT explanation of why consciously imagining or thinking about seeing an object is so unlike consciously perceiving an object. [10]

For example, I am looking at an object but I close my eyes such that I no longer see the object. Alternatively, while looking at the object, sudden changes occur to parts of

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thumb, stepping on the Lego), it was precisely my carelessness and so my lack of preparation that made my subsequent pain what it was.

[9] A worry with the identity view of SMT might be the following. If practical knowledge of SMCs is identified with the doings of agents, yet SMCs are understood to be relations between features of an agent's sensory apparatuses and how those apparatuses react to the environment during *movement* by the agent, then how can there be practical knowledge of SMCs when agents are standing still, that is, not moving in an environment? In response, consider that Shapiro (2011) identifies two possible readings of sensorimotor know-how. On the strong reading, I must interact with an environment now in order to have experience: no action, no experience. On the weak reading, "it is important only that one has, sometime in the past acted in the world in ways that created knowledge of sensorimotor contingencies; perceptual experience *now* consists in the knowledge one has acquired from these previous actions" (ibid, p168, italics in original). In other words, an agent's current perceptual experience depends on what one does now only in the sense that it enacts sensorimotor know-how, knowledge which can have been acquired at some previous date. Shapiro (ibid, p169) points out that neither reading is without its problems. Nonetheless, if an identity view of SMT were to endorse a weak reading, then, as Myin (2016) illustrates, proponents of SMT could claim that it is the agent's history of engagements with environments i.e. the agent's history of doings, that realize the agent's current perceptual experience. This history would still be operative in cases where the agent is not currently engaged in bodily movement.

[10] The following is based on Myin and Loughlin (2017).

the object such that my attention is automatically directed to those changes. Contrast this with imagination or thought. When I imagine seeing an object or simply think about seeing an object, the object I am imagining or thinking about could cease to exist (or might never have existed) and yet I can still imagine seeing the object or think about seeing the object. What I do thus impacts much less in imagination or thought than in perception.

Proponents of SMT explain why looking at an object is so unlike imagining or thinking about an object by appealing to so-called 'bodiliness' and 'grabbiness' (O'Regan and Noe, 2001b; O'Regan, Myin and Noë, 2005). Ceasing to see an object when you close your eyes displays the 'bodiliness' of perception. A sudden change to an object that automatically grabs your attention displays the 'grabbiness' of perception. Yet neither imagining seeing an object nor thinking about seeing an object exhibits similar 'bodiliness' or 'grabbiness'. Appeals to 'bodiliness' and 'grabbiness' are of apiece with an identity view of SMT, since such a view identifies perceiving with doing (Myin, 2016).

Crucially, an identity view of SMT is both dissimilar and similar to the sort of identity claims put forward by classical theorists of mind-brain identity, such as Place and Smart (Myin and Loughlin, 2017). Unlike such theorists, this identity view of SMT does not identify experience with any states or processes in the brain (recall the direct brain stimulation example) but rather with what agents do. Nonetheless, like such theorists, this view of SMT does insist that identities don't need further explanation.

For example, if A is non-identical with B, then it makes sense to ask: if A occurs, why does B occur? Contrarily however, if A is identical with B, then it no longer makes sense to ask: if A occurs, why does B occur? For once we identify A and B, then there can be no gap between A and B. Our question then cashes out as the question: if A occurs, why does A occur? Such a question is quite clearly senseless. [11] Which is just to say that identities don't need further explanation.

[11] This is compatible with allowing that one could be mistaken about the identity in question i.e. one may not know that A is identical with B, and yet the identity may still hold.

Recall one final time the absolute gap question: why should anything you or I do involve or be accompanied by phenomenal experience? This question, we can now see, is premised on the claim that there is a gap between what we do and what we experience. If so, then it makes sense to ask: if A occurs (our doings), then why does B (our experiences) also occur?

However, if proponents of SMT adopt an identity view, then A (doing) is identical to B (experience). In which case, it is now senseless to ask: if A occurs (our doings), then why does B (our experiences) occur? Put another way, just as SMT rejects the claim that what mediates the relationship between experience and behaviour can be found inside the head (see section 1), then so too an identity view of SMT goes one step further and rejects the claim that there are *any* such mediators (either inside or outside the body) between experience and behaviour. And if there is no gap between doing and experiencing, then there can be no absolute gap question in need of answering. In other words, the absolute gap question can be rejected.

Where does all this leave cognitive access? Perhaps those keen on an identity view of SMT could still hold on to some notion of access. [12] But equally such proponents may now wonder why they should do so. For once it is accepted that experiencing is doing, then it follows that we don't have to access anything in order to have phenomenal experience. We just need to do. An identity view of SMT thus offers the possibility of rejecting the claim that cognitive access is needed in order to explain phenomenal experience.

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[12] If proponents of an identity view of SMT were to retain some notion of cognitive access, then this would require reformulating what access means. For if experiencing is a doing and experiencing involves accessing, then access is a doing. But access now means something very different to that proposed by either O'Regan or Degenaar and O'Regan. According to these earlier and later formulations, access was understood to be what an agent uses *in order to have* phenomenal experience (see section 2). Alternatively, if doings can be non-experiential and experiential and access is re-formulated as a doing, then access can be non-experiential and experiential. Before I step on the Lego, for example, access could be identical with my carelessness. Carelessness, as I have argued, is a non-experiential doing. But access could also be identical with my immediate response when my barefoot makes contact with the Lego, such as when I shout out "Ow!", or otherwise grab my injured foot. This is an experiential doing. Yet if access can thus be non-experiential and experiential, then we can ask: what role does access play in experiential doings and how is this role different from the role it plays in non-experiential doings? It is unclear (to me at least) how to answer this question. Yet this tricky question can simply be avoided if proponents of an identity view were to reject the notion of cognitive access.

**Conclusion**

One of the main selling points of sensorimotor theory (SMT) has been its alleged ability to offer a means of dealing with the so-called explanatory gap. This gap can be broken down into a series of comparative gap questions and an absolute gap question. The comparative gap questions concern gaps within and between sensory modalities. The absolute gap question asks: why should anything you or I do involve or be accompanied by phenomenal experience? Proponents of SMT have attempted to answer this absolute gap question via appeal to cognitive access.

My aim in this paper has been to persuade proponents of SMT to accept the following three claims. First, that none of the available readings of cognitive access (either the higher order reading or the functional capacity reading) answer the absolute gap question. Second, that proponents of SMT can reject this gap question *if* they were to endorse an identity view of SMT, according to which phenomenal experience can identified with doing. Third, if proponents of SMT are prepared to endorse this identity view, then they should also be prepared to reject the notion of cognitive access.

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