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Representing Our Options: The Perception of Affordances for Bodily and Mental Action

1. Introduction

Affordances are possibilities for action. As you wander through a park, a football might afford kicking, a bench might afford sitting and a tree might afford climbing. The term 'affordance' was introduced by ecological psychologist J.J. Gibson. He explains '[t]he affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill.' (1979, p. 127). Gibson put forward a rich set of claims about affordances and their theoretical significance. I will be building on two of those claims in particular. The first claim is that affordances have a constitutive connection to the acting agent. Gibson explains '[t]he verb to afford is found in the dictionary, but the noun affordance is not. I have made it up. I mean by it something that refers to both the environment and the animal in a way that no existing term does. It implies the complementarity of the animal and the environment.' (1979 p. 127). The football, for example, affords kicking *by me* - its being kickable is a property it has relative to my capacities for action. The second claim is that affordances are *perceptible* properties. Gibson states that this is '...a radical hypothesis, for it implies that the "values" and "meanings" of things in the environment can be directly perceived.' (1979, p. 127). On this view the football's property of being kickable, for example, is not something you explicitly infer on the basis of what you perceive but rather something you see directly.

Although I will be emphasising the importance of the insights above, I will not be committing to Gibson's wider claims about the methods of psychology and the nature of the mind. In fact, I'll be drawing heavily on more recent work on affordances that is often quite anti-Gibsonian in its commitments. Cognitive neuroscientists have given 'new life' to the concept of affordances, understanding them as '...action patterns activated while observing objects' whilst jettisoning many of Gibson's driving ideas (Pezzulo et al 2010, p. 68) A range of neurological and behavioural evidence suggests that, under the right circumstances, seeing a football can activate the motor process responsible for kicking independently of any intention to kick it. Although Gibson himself was somewhat sceptical about the theoretical significance of internal processes, it is now widely agreed that this motoric responsiveness to possibilities for action is integral to our engagement with the world: that perception of the possibility of engaging in a certain kind of act triggers actual activation of the motor process required to perform that act.

Gibson also held that our perceptual engagement with affordances is non-representational – a claim that again reflects his doubts about the theoretical significance of internal processes. I am open to the possibility that on seeing the football, for example, its kickability is something I perceptually *represent*, rather than something I perceptually 'pick up' on in some non-representational way. Siegel (2014) recasts affordances in representational terms, as does Clark with his concept of 'action-oriented perception' (2016). I will frame the paper in representational terms, though my core conclusions can be recast in non-representational terms. I also resist the Gibsonian claim that our perceptual experience consists predominantly of affordances. The best of Gibson's ideas can be sustained whilst acknowledging that a great deal of our perceptual field is not constituted by affordances but by objects and their qualities (Nanay 2010).

This is a paper of two halves. In the first half of the paper I propose that our representation of affordances is a distinctive and important variety of self-representation. By perceiving the ball as

kickable, we implicitly represent our own potential to kick. Experiencing the world relative to our capacities for action underwrites our sense of ourselves as active agents. This sensitivity to affordances provides a sophisticated architectural solution to the problem of action selection. Affordances have been fruitfully explored in ecological psychology, cognitive neuroscience and phenomenology but these three strands of research do not interact as much as they should. I aim to offer a proposal that ties all three strands together. The second half of the paper is more exploratory. There I argue that we are not just sensitive to possibilities for bodily actions like kicking, sitting and climbing. We also represent the availability of certain mental acts like attending, imagining and deliberating. This underwrites our selection of mental action in much the same way as perceiving affordances for bodily action underwrites our selection of bodily action.

2. The Representation of Our Options for Action

2.1. Affordance Perception

Affordances are ubiquitous in our perceptual phenomenology. Besides experiencing a teapot as smooth and as curved, you experience it *as grabbable*. Besides experiencing a cake as brown and as sticky, you perceive it *as edible*. Besides experiencing the path as rough and as winding, you experience it *as walk-on-able*. The most vivid affordances are those that do more than present us with a possible course of action. Instead, they *solicit* us to act upon them. As Ridderinkhof et al put it ‘...intrinsic to the experience of an affordance is that stimuli incite or summon certain actions.’ (2011, p. 180). Sometimes the cake does not just seem edible – it positively *calls out* to be eaten. We will try to unpack exactly what this amounts to later on, but for many the metaphor of being ‘solicited’ to act by perceptual objects rings true.

A key feature of our sensitivity to affordances is that we experience them *perceptually*. We do not see a collection of action-neutral properties of the teapot then explicitly *infer* that the teapot is something we can grab. Instead, we *see* its grabbability (Clark 2016, p. 171). This kind of perception underwrites our fluid engagement with our environment. When we are making tea we can reach out and grab the teapot with little or no thought. There’s no need to work out that the teapot can be grabbed, nor any need to work out that grabbing is the right action to take in order to pour the tea. Instead, we can simply *follow the affordances* – perception can successfully guide our action with little help from explicit conscious cognition.

Although some people deny that affordances figure in their perceptual experience (e.g. Prinz 2012), for now I’m going to assume that the foregoing provides an accurate preliminary description of our perceptual phenomenology. The next task is it to look a little more closely at the contents of affordance perception. I want to claim that our perceptual representation of affordances is a kind of self-representation. At first glance, there’s something uncomfortable about this claim. When you perceive the teapot as grabbable, you are perceptually attributing a property *to the teapot*. After all, when you act on this affordance it is the teapot that you grab and not yourself! Affordance perception is thus quite unlike paradigmatic cases of self-representation. When I experience my own body, my own feelings or my own actions the object of my representations is *myself* – it is *me* to whom I am attributing certain properties. If the object we represent in affordance perception is not the self, in what sense could affordance perception be a form of self-representation?

To answer this question we must return to Gibson’s thought that the concept of affordances ‘...implies the complementarity of the animal and the environment.’ (1979, p. 127) Affordances are not

properties that can be understood in isolation from a subject's abilities. Things only have affordances relative to a subject's capacities for action. Your property of being able to do certain kinds of thing, and an object's property of being able to have certain kinds of thing done to it by you, are two sides of the same conceptual coin.

Consider the teapot's property of being grabbable by me. This is constituted by, on one side, the teapot's dispositional property of being able to receive a certain kind of grip, and my dispositional property of being able to grip certain kinds of things. These dispositional properties may be grounded in relevant categorical properties, such as the shape of the handle and the size of my hand respectively. But we shouldn't equate the dispositional property of being grabbable by me with these categorical grounds, for these categorical properties can obtain without it being possible for me to grab the teapot. The teapot's possession of the affordance is constituted by it having this dispositional property, paired with my dispositional property, and to represent an affordance is to represent that such a pairing obtains.¹

A representation of an affordance is thus, in one breath, about both the world *and* the self. When I see the teapot as grabbable, the intentional object of my representation is the teapot but the representation informs me as much about myself as it does about the object. Specifically, I learn that a certain action is available *to me* - that *I* am now in a situation where it is possible for me to exercise my ability to grab. By representing the teapot as grabbable-*by-me* I am representing something about myself and my capacities without having myself as the object of representation. Where something is represented by a mental state without being the intentional object of that mental representation, we can say that it is represented *implicitly*. It is in this sense that affordance perception can constitute a form of self-representation.

One way of isolating the implicit place of the self in affordance perception is to consider cases in which our perception of affordances goes wrong. Gadsby (2017) studied the affordance perception of subjects with body dysmorphic disorder. When offered a chair of ample size for the subject to sit, subject's misperceived the chairs as *un-sit-on-able*. This perceptual error was not due to any deficit in their perception of the chair's spatial properties. Rather, the error was on the subject-side of the equation. Because subjects had a body schema that misrepresented their own body size as much greater than it actually was, they misrepresented what kinds of object they were able to sit on. So although the intentional object of the subject's perceptual state is *the chair*, it is not the intrinsic properties of the chair that they misrepresent but how the chair stands relative to their own capacities. The dysmorphic image of the self is thus implicit in the subject's perception of the chair's affordances.

To help make sense of this form of implicit self-representation, we can compare affordance perception to other kinds of egocentric representation. Consider our perception of spatial properties. Rather than perceiving the location of a teapot in absolute terms, we perceive its location relative to our own. We can see it as near-to-us or as distant-from-us, and can represent these properties without representing its location in absolute space. Crucially, by representing the relative location of the teapot we also implicitly represent our *own* location. When we represent the teapot as near, the *object* of our representation is strictly the teapot, but the representation is as much about our spatial location as it

¹ In characterizing affordances this way I remain neutral on a number of technical questions. There are extensive debates surrounding, for instance, whether affordances should be understood as relations. Since all sides of the debate agree that affordances in *some* way involve our abilities, I needn't take a stand on the debate for the purposes of this paper. Where I do take a stand is on whose abilities affordances stand relative to: objects afford action for an *individual* rather than for a group or a species.

is about that of the teapot. Our egocentric representations of the spatial properties of objects thus, in one breath, explicitly locate things in the world *and* implicitly locate the self. Whereas these egocentric representations represent things relative to our *spatial location* affordance perception represents items relative to our *abilities*. And by representing things relative to our abilities, we gain as much information about our own properties as we do about those of the affording object.

All of these egocentric perceptual representations have subtle but important ramifications for our phenomenology. Perceptually representing the teapot as being *here* underwrites your experience of the teapot *as present* to you and also underwrites your experience of your *own* presence in the world as a spatial object. By explicitly experiencing the egocentric location of an object you implicitly experience your own spatial locatendess. Affordance perception further enriches our experience. Perceptually representing the teapot as grabbable underwrites your experience of the teapot as *available* for action and also underwrites your experience of your own agency. Thanks to affordance perception, we experience an environment that is alive with possibilities for action. Crucially, we thereby experience *ourselves* as things alive with the potential to act. This sense of ourselves as agents is not constituted by phenomenal representations of ourselves and our abilities. Instead, we find our power to act reflected in the experienced landscape of affordances before us.

The foregoing is an attempt to summarise how we perceptually experience affordances, and thereby implicitly experience ourselves as agents able to engage with our environment. Our next task is to explore how affordance perception works and what advantages it bestows on the agent. If we wish to understand affordance perception, establishing its functional role is clearly important. There is, however, a secondary motivation for such an investigation. By establishing how affordance perception functions I hope to lend further support to my phenomenological claims. A sceptic can easily reply that those who purport to find affordances among the contents of their perceptual experience are simply fabricating phenomenal properties, or else taking real phenomenal features and mischaracterising them in terms of affordances. Such phenomenological disputes are notoriously difficult to resolve, but an important factor in such disputes is how plausible a phenomenological claim is from a functional perspective. If there is no promising account of how and why we would experience our current possibilities for action, that would be a point in favour of the sceptic's take on my phenomenological claims. If, on the other hand, we can give a plausible account of how affordance perception works and what adaptive value it has, that would be a major point in favour of the view I have sketched.

One might ask whether it is our phenomenology or our functional psychology that is in the driving seat here. As I see it, phenomenological and functional claims about affordance perception can be mutually supporting: phenomenological observations can help justify claims about how the mind functions and insights into the functions of the mind can lend support to our phenomenological observations. Although I happen to have started from the first-person perspective in this paper, I wouldn't wish to give one side of the story any real priority over the other. Interestingly, Gibson himself was not directly concerned with capturing our perceptual phenomenology. He does, however, note that his concept of affordances was inspired by similar notions introduced with a more phenomenological remit in Gestalt psychology (1979, p. xiii). My strategy in this paper is to integrate first-person phenomenological claims about affordance perception with third-person theoretical claims about their explanatory value, thereby bucking the problematic trend of considering one at the expense of the other.

2.2. How Does Affordance Perception Work?

As I alluded to in the introduction, a variety of neurological and behavioural studies reveal that seeing an object that affords a certain action can activate the motor pattern responsible for performing that action. Although I can't do justice to the vast literature on the topic, my aim is to bring together those threads in cognitive neuroscientific research that allow us to tell a coherent and well-supported general story about motor patterns being triggered by our perception of affordances. Seeing a teapot, for example, can trigger the motor process responsible for gripping. Most of the time this activity gets suppressed: we don't find ourselves compulsively grabbing every teapot that we see.² But on those occasions where we do grab the teapot, our act of gripping stems from a motor process that was initiated from the point of perception. As Tucker & Ellis propose, '...intended actions are formed from, and informed by, already existing visuomotor representations. Actual actions are produced by the selection and elaboration of such representations.' (1998, p. 844)

In a revealing study by Tucker & Ellis (1998), subjects were required to identify the orientation of a presented object by pushing a button with their left hand when the object is upside-down or pushing a button with their right hand when it is the correct way up (or vice versa in other trials). This study revealed an 'interference effect' related to the affordances of the perceived object. Where the object was a teapot with the handle facing toward the subject's right-hand, and the required button-push was left-handed, response time was slower than normal. But where the required button-push was right-handed, response time was faster than normal. Tucker & Ellis explain this interference in terms of the perception of the teapot activating the motor pattern for a right-handed grab. The readying of this right-handed movement impedes performance of a left-handed button push, but makes a right-hand button push faster.

Pezzulo et al explain that '[a]n open issue in this field pertains to the extent to which affordances are elicited automatically, upon seeing objects, or are activated when a specific action goal is pursued.' (2010, p. 69). Tucker & Ellis suggest that the activation of the gripping motor response is automatic: that whenever we see a grabbable teapot an appropriate gripping response is prepared regardless of our current goals. Others are more circumspect. Bub & Masson (2010), for example, present a series of experiments indicating that task-irrelevant stimuli only trigger a gripping response when the subject is engaged in a task that requires gripping. Even on this view though, actions that are inappropriate given one's goals are triggered by perceived objects: when engaging in a task that requires gripping, irrelevant grippable objects interfere with performance. There is thus at least something *quasi*-automatic about the perceptual triggering of motor patterns: it remains the case that gripping of an object is prepared without any intention to grip that object, even if that preparation transpires to be contingent on our being engaged in a certain kind of task.

The experiments considered present subjects with artificially simplified situations. In real life, any given perceptual environment will present us with a wide range of affordances. This suggests that, at any given time, a number of different motor responses are being prepared. Of course, these actions can't *all* be performed. Cisek & Kalaska (2010) propose that these different motor patterns compete for further processing, with various factors contributing to the success of one motor pattern over another. Pavese & Buxbaum (2002) found that how optimal an opportunity for action is makes a difference: nearby items will trigger a gripping pattern more strongly than more distant objects, for

² Interestingly, subjects suffering from Utilization Behaviour *do* compulsively act on affordances (Brazzelli & Spinnler 1998). Brain damage renders subjects disinhibited, meaning that the motor patterns triggered by perceived objects unfold into overt actions. This condition can be regarded as positive evidence for perception activating motor patterns (Tucker & Ellis 1998).

instance. The affordance competition is also modulated by one's background emotional state, the focus of one's attention and, crucially, by one's current goals (Cisek & Kalaska 2010). Botvinick et al (2009) found that the extent to which a distractor interferes with your performance of a gripping task depends on the details of what your goal in the task is. Each of these factors bias the competition, helping some motor patterns achieve further processing at the expense of their competitors.

Although the competition between these motor patterns occurs unconsciously, our perceptual experience reflects the results of this competition.³ Consider the experience you have when stepping into your kitchen. The set of affordances you experience can be described as a *menu* of possible actions. Let's say that you experience the cake as edible, the kettle as fill-able and switch-on-able and the fridge door as openable. Like a menu, some possibilities are excluded from the presented options: perhaps perceiving the light switch prepared a pushing response but, due to a poor performance in the affordance competition, this option never made it as far as your experience. And like a menu, which option you take is up to you. You aren't compelled to pick one option for action over another. Instead, you are free to exercise your agency. That said, the menu of options you experience is a menu with *recommendations* of various strengths. We can now unpack the metaphor of solicitation in terms of the strength of motor signals: when a perceived affordance strongly activates a motor response, we experience ourselves being drawn to perform that act – an experience naturally described with the metaphor of solicitation. The cake might strongly solicit eating – that is, might strongly activate the motor pattern of reaching out and eating – and you might elect to heed this solicitation and eat the cake. Alternatively, you might resist this solicitation and instead act on the kettle's non-soliciting filling-up affordance in order to achieve your goal of making a cup of tea. Although you perceptually experience the kettle's affordances, the relevant motor response is not strongly activated so there is no felt solicitation to act. Alternatively, you might choose to go 'off-menu', disregarding the experienced affordances in favour of an opportunity for action you have deliberately identified yourself. You are free, for example, to play a saucepan like a bongo even if you don't perceive it as *drummable* (perhaps because you don't have the training needed to make you perceptually sensitive to such affordances). Even though we sometimes go off-menu in this way, experiencing a menu of options for action is plausibly very useful to us. It is to the value of the phenomenal affordance menu that we now turn.

2.3. What is the Value of Affordance Perception?

Implicit in the foregoing is the suggestion that perceptually experiencing affordances helps us to pick what action to perform. The problem of picking what action to perform is a challenge, faced by all autonomous agents, known as the Selection Problem. I suggest the value of affordance perception is best understood in terms of this problem. Although this might be implicit in much of the affordance literature it is something that deserves to be explored explicitly. Prescott, Bryson & Seth explain '[a]ction selection is the task of resolving conflicts between competing behavioural alternatives, or, more simply put, of deciding what to do next.' (2007, p. 1522) The problem was influentially framed by Allport (1987) and continues to be a central issue across ethology, psychology and robotics. The reason that action selection presents a problem for creatures is neatly captured by Wu:

...in the typical case, an agent confronts (too) many perceptual inputs and (too) many possible behavioral outputs. The agent must be selective in the face of this Problem

³ Cisek & Kalaska (2010) present the 'affordance competition hypothesis' as a neurological model of action selection and are fairly quiet on how affordances show up in our perceptual experience. The claims made here are my own.

on pain of failing to act: she must select a specific input to inform a specific output.
(2011, p. 50-51)

Consider the challenge you face as you step into your kitchen. There are multiple objects on which you can act, and multiple actions that can be performed on each of these objects. The sum of the available object/action pairings constitutes a 'behavioural space' through which the agent must find a path (Wu 2011, p. 53). The more rich one's environment, and the more broad one's repertoire of actions, the larger the behavioural space becomes. Successfully picking an action rather than being immobilised by indecision is already an achievement of sorts but the real challenge is to pick the best possible action, relative to your needs and goals, for the situation at hand.

In order to confront selection problems, we must be equipped with cognitive tools that allow us to pick actions successfully. Prescott describes this architectural challenge as '...the task of designing control systems that implement effective action selection.' (2008, p. 1) It would be a mistake, however, to assume that we have just one self-contained system for action selection. Although there are a number of different models of action control, Ridderinkhof et al note that the common denominator of these models is that they each propose an '...interplay between relatively automatic and relatively deliberative processes.' (2011, p. 176) On the deliberative side, our selection of actions is facilitated by our capacity to use sophisticated conceptual processes of explicit reasoning. This capacity is not, however, without its shortcomings. The two most serious shortcomings are that it is *slow* and that it is *capacity-limited*. Your ability to select actions deliberately is no good if it arrives at the right action too late, nor if it is overwhelmed by a high cognitive load. Our cognitive architecture compensates for these limitations by also exploiting automatic processes in action selection.

The affordance-sensitive architecture under discussion offers a plausible account of how automatic and deliberative processes interact in action selection: the automatic process of affordance competition presents us with a menu of options for action over which we can then deliberate. Furthermore, the goals we set as a result of deliberation modulate the affordance competition, which better tunes this automatic process to yield results that reflect our requirements. This division of labour allows the exploitation of sophisticated deliberative processes whilst ameliorating their shortcomings in speed and capacity.

Regarding capacity limitations, experiencing a weighted menu of options for action ameliorates the cognitive load placed upon our deliberative resources in at least three ways. First, rather than having to select between all the actions we can possibly perform at a given time, we can select from a shortlist of the most promising such options. For example, rather than wasting our cognitive resources on considering whether to switch the kitchen light on in daylight, that option gets knocked out of consideration in the pre-deliberative affordance competition, freeing us up to reflect upon the more serious contenders.

Second, the options from which we can select are specific actions-on-objects. Strictly speaking, action selection has two aspects – selecting which action to perform and selecting which object to perform it on (Allport 1987; Botvinick et al 2009; Wu 2011). Having to perform two different tasks of selection would increase the cognitive load on deliberation. We would have to pick from among the cake, the fridge and the kettle as objects *and* from among eating, opening and switching-on as actions. This makes the space of selection much larger than it needs to be. Affordance perception *pre-determines* appropriate object-action linkages so that we only need to select between cake-eating, fridge-opening and kettle-switching-on. Since eating the kettle is not a serious option, there's no need to risk wasting our cognitive resources explicitly considering it.

Third, rather than having to evaluate the available options from scratch, our perceptual experience of affordances comes pre-loaded with particular weightings. We can evaluate our options for action much more efficiently when a pre-deliberative process has given us a first-draft of their relative merits. The automatic proto-assessment of how good a course of action is won't be sensitive to all the relevant considerations, but let's not forget that the affordance competition is influenced by how easily an action can be performed and what our current goals are, so is far from blind with respect to the merits a course of action might have. In many cases, there might be no need to deliberate at all. When driving a familiar route, for example, we might be able to just follow the soliciting affordances without having to explicitly deliberate at all.

An important point to remember here is that our cognitive architecture confers these advantages of efficiency whilst maintaining a certain degree of *flexibility*. Sometimes the right action to perform is not the action that is most strongly solicited. And sometimes the right action to perform is one that is not on our experienced menu of options. This might be because the relevant motor pattern was initially activated but got knocked-out of the affordance competition. Or the relevant motor pattern might not have been triggered in the first place, perhaps because it would involve an atypical mapping of object and action. Possibilities such as these are why it is important we aren't committed to following the affordance menu. We can deploy our more sophisticated capacities for rational deliberation to select actions that aren't strongly solicited, to identify options for action beyond those experienced and to establish novel linkages between object and action. In the continual trade-off between the automatic and deliberative aspects of action selection, we can lean more heavily on one kind of process or the other in different contexts. We can turn the dial more towards the automatic processes, minimising the load on deliberative processes but increasing our risk of sub-optimal action selection, or we can turn the dial more towards the deliberative processes lowering the risk of sub-optimal action select but increasing the risk of straining our capacity-limited resources to the point where they are no longer effective.

Our affordance-sensitive architecture also yields an advantage of speed. There are at least four such advantages. First, the serial process of rationally evaluating our possibilities for action is more slow the more options there are to consider. The advantages of efficiency described above thus indirectly confer advantages of speed: by giving us less to deliberate about, we are able to select what to do more rapidly.

Second, the process of affordance competition is a self-organising process that computes a range of possible actions in parallel. This allows it to arrive at recommendations for action more rapidly than could the slow serial process of rational evaluation. The more labour of action selection that can be off-loaded to the affordance competition, the more rapidly an action can be deliberately selected.

Third, explicit deliberation is a post-perceptual process. This means that when there's new information about our environment to consider, deliberation doesn't even get out of the starting blocks until it has received the outputs of prior perceptual processes. The affordance competition, on the other hand, is a perceptually driven process that is initiated much more rapidly after stimulus onset. As Tucker & Ellis explain, '[t]he visual system is highly integrated with the motor system to the extent that no clear divide exists between what one could call purely visual processing and purely motor processing.' (1998, p. 830) This again means that off-loading more work to the affordance competition can accelerate the process of action selection.

Fourth, our affordance-sensitive architecture has the advantage of *pre-preparing* a range of possible actions. On a traditional 'cognition sandwich' model (Hurley 1998), agents perceive the world, work out what to do, then initiate the selected action see (Cisek & Kalaska 2010). On the proposed

affordance-sensitive architecture, by contrast, a number of motor patterns are activated prior to action selection. Where the selected action is among those pre-prepared patterns, our performance is given a neural head-start. This comes out in the interference effect studies discussed above: subjects response time is faster when a perceived affordance readies an appropriate motor-response.

Again, our architecture has the flexibility to calibrate this trade-off between rapid automatic processes and slow deliberative processes depending on our needs. When a task requires speed, for example, we can turn the dial towards relying on the automatic processes. This allows us to act quickly but results in more frequent mistakes. Ridderinkhof et al (2011) found that in tasks that require rapid responses, subjects acted on task-irrelevant affordances more often. In situations with less time pressure, however, we can turn the dial the other way and exploit deliberative processes to arrive at the best possible action.⁴

Where does this leave us? We now have a plausible story of *how* affordance perception works. We also have a plausible story of *why* it would work that way. It is also important that a plausible evolutionary story of how these adaptational advantages were achieved is available. Our less sophisticated ancestors relied entirely on an automatic process of affordance competition, suitably biased by current needs and goals, to select what action to perform. When we developed the capacity to deliberate explicitly about what action to perform, this affordance-processing mechanism wasn't left by the wayside. Instead, a process of exaptation transformed it into a mechanism for action *recommendation* rather than action selection, compensating for the limitations of speed and capacity faced by our more developmentally recent powers of rational deliberation.

Although the foregoing account of the role of affordance perception in action selection is driven by neurological and behavioral findings, it finds further support in our phenomenological observations: first-person reflection suggests we are perceptually aware of possibilities for action, experiencing a 'solicitation' to perform some actions over others. Moreover, those unconvinced by the proposed phenomenological observations now face the problem of rebutting a description of experience that tallies with an independently-motivated account of how action selection works.

3. Mental Affordances

3.1. The Extension Question

The first half of the paper offered an account of our experience of affordances, their role in guiding our actions. The next task is to consider the *scope* of this role. Specifically, does affordance perception underwrite our selection of just bodily action, or does it also underwrite our selection of mental action? Put another way, do we just experience options for what to do with our body, or do we also experience options for what to do with our minds? We can call the view that affordance perception is limited to bodily action the exclusive view, and the view that it extends to mental action the inclusive

⁴ An advantage of our affordance-sensitive architecture that I won't discuss is the way it offers a balance between commitment and flexibility. On the one hand, agents need to stick with the actions they select. If they are constantly abandoning actions in favour of other possibilities they will fail to perform any action successfully (Prescott, Bryson & Seth 2007). On the other hand, agents need to be able to switch to a different action when the situation demands, such as abandoning a food source to evade an approaching predator. Affordance perception means that possibilities for action are still automatically processed even when we are engaged in a selected action. This allows particularly salient new action-possibilities to override the action currently being performed, or at least to be presented for consideration by the acting subject.

view. Answering this question will yield a fuller picture of the implicit experience of the self conferred by affordance perception.

The first thing to note here is that despite the extensive literature on affordances for bodily action, there is very little discussion of the possibility of affordances for mental action. This could be a reflection of the widespread tendency among those studying action to focus exclusively upon bodily actions. Wu notes, '[g]iven the armchair nature of their work, it is striking that philosophers have largely neglected mental actions.' (2013, p. 247) In some cases, this neglect of mental actions might be driven by the belief that there is *no such thing* as mental action, or at least that the scope of mental action is extremely limited. Mental 'behaviours' are mental events that fall short of the criteria for action. Whether any mental events satisfy the criteria for action will depend on what exactly your criteria are. This is not a topic I wish to get into, though I would note that Wu's (2013) defence of mental action offers a very plausible account. A widely-shared background thought is that what distinguishes actions from mere behaviours is that they are appropriately guided by our goals (though how to cash out 'appropriately' is disputed). Cases in which our mental activities are driven by our goals are thus *prima facie* good candidates for mental action. Pezzulo captures this thought:

...some internal cognitive operations can be conceptualized as (mental) actions in virtue of their intentional or purposive structure; or, in other words, because they (are selected to) achieve some form of outcome or goal—even if the goal is not specified in terms of outward behavior. (Pezzulo 2018, p. 1)

Maintaining that there are mental actions is compatible with those actions being in some sense 'embodied'. There are good reasons to think that the act of speaking in one's own head, for example, is a covert counter-part of the act of speaking aloud: a counter-part that even results in muscular movements that correspond to the overt expression of the silently spoken words (Sokolov 1972). We should not, however, confuse being *embodied* with being *bodily*. Inner speech remains a mental action even if the process that underwrites inner speech is deeply connected to that responsible for overt speech. As a rough heuristic, we can regard mental acts as those acts that can be performed covertly, and bodily acts as those that require overt movement (Metzinger 2017, p. 26). These covert acts encompass not just covert counterparts to overt action (such as inner speech) but covert acts that might have no direct link to bodily action (such as abstract contemplation or mathematical reasoning).

3.2. *The Phenomenological Case for the Inclusive View*

I advocate the inclusive view according to which we do indeed experience affordances for mental action. That is, we experience objects and situations as being available for the exercise of our mental abilities. Call this 'the mental affordance hypothesis'. On this view, we experience a weighted menu of options for mental action and this menu functions to guide our selection of what mental action to perform. This has important implications for how we experience our environment. Besides experiencing possibilities to grip, walk and kick, we would experience possibilities to attend, imagine and deliberate. Crucially, this also has implications for how we experience *ourselves*. I have argued that we have a sense of ourselves as agents of bodily action is conferred by our experience of objects as being available for physical engagement. I propose that we also have a sense of ourselves as agents of mental action that is similarly conferred by our experience of objects as being available for mental engagement. By seeing a painting as available for our contemplation, for example, we implicitly experience ourselves as potential contemplators, enriching our experience of our own agency.⁵

To make the case for the inclusive view we should consider a few more examples. I suggest that affordances *to attend* are a ubiquitous feature of our phenomenology. Attending is the mental act of

⁵ Fabry (2018, p. 4) also proposes that our sense of mental agency is underwritten by our cognitive interactions with the world. For Fabry, however, the sense of agency depends on actual cognitive interactions where on my account the experienced *availability* of such interactions is enough.

focussing upon a particular object, property or region of the visual field.⁶ Our attention is guided by the *saliency* of things. When we look upon a new visual scene, our attention is drawn to some things over others. The Tate Modern Gallery on the Thames provides sweeping views of the London skyline. As I step out onto the viewing level of the gallery my attention might first be drawn to St Paul's Cathedral, then to the Millennium Bridge and then to a boat on the river. Each of these items is experienced as a potential target for my attention – as an object on the menu of attendable things. Moreover, each of these items solicits my attention to different degrees – St Paul's demands my attention more than the boat. As with bodily affordances, we are free to follow those solicitations or to direct our attention more deliberately. If I have been told, for instance, that there's a beautiful fleeting cloud pattern to be seen, I might resist the solicitation to direct my attention to the most salient items in the visual field, instead deliberately directing it toward the clouds instead.

Objects and situations can also afford imaginative acts. Consider the experience a footballer might have during a penalty shoot-out. Players often rehearse their shot in imagination before taking their shot. Here I suggest they experience the football before them as affording certain acts of imagination, such as imagining kicking the ball firmly into the top left corner. One difficulty players face is that the ball also affords the imagining of a bad kick. Players may have to resist the solicitation to imagine kicking the ball high over the crossbar. Interestingly, these imaginative acts involve the very motor processes responsible for performing the imagined act (Jeannerod 1995). Since we experience affordances to perform physical actions, it is perhaps unsurprising that we would also experience affordances to perform the covert imaginative counterparts to those actions.

Unlike bodily actions, many of our mental actions are not directed towards physical objects. Instead, they are directed towards things in our mind.⁷ Consider the unprompted thought that I should retrain as an astronaut. Perhaps this thought affords imagining what it's like to do a spacewalk, or of calculating the odds of me becoming an astronaut or of deliberating about whether I should give up my current job. The unprompted mental image of a world-leader in a nappy might solicit my attention, or afford the mental act of reflecting upon why exactly this image seems so apt. Of course, the suggestion that mental items can afford mental actions is at odds with the thought that affordances are perceptible properties: mental items are not, I assume, perceived. A case might be made, though, for our awareness of these opportunities for mental action having a quasi-perceptual directness that makes them appropriately similar to normal affordances. Since the 'behaviour space' of mental action encompasses both our outer and inner environments, it is to be expected that affordances for mental action will be found in both domains.

The inclusive view promises to capture a subtle but important aspect of how we experience ourselves. Mental affordances, like bodily affordances, are properties that objects or situations have relative to your capacities for action. So in representing a mental affordance, you implicitly represent yourself. What's interesting about mental affordance perception is the facet of ourselves that we thereby represent: our perceptual experience of our environment reflects our mental capacities, conferring an implicit awareness of ourselves as *mental agents*. It would be a mistake to say you generally have phenomenal self-representations in which you are the object of representation and you attribute various mental abilities to yourself. But it would also be a mistake to say that our mental abilities have no place in our ordinary experience. The mental affordance hypothesis provides a way of navigating between these two poles: we do experience our own mental powers but we experience them implicitly through an awareness of the opportunities for mental action afforded to us rather than

⁶ Attending typically has a bodily component too. When we focus upon an item in the visual field, we turn our eyes and/or our head toward it. Nevertheless, we can maintain a distinction between covert and overt attention. Since Posner's (1980) influential study it has been clear that shifts of attention need not coincide with shifts of eye movement. Although more recent work suggests that there are intimate functional connections between covert and overt attention, it remains possible to sustain the distinction between the act of mentally focussing on an item and the act of turning one's gaze toward it.

⁷ On the distinction between internally and externally directed cognition see Dixon et al (2014).

explicitly through direct self-attributions. We experience a world alive with the possibility of mental engagement, and our doing so confers an ever-present experience of our own mental agency.

Crucially, this is to be distinguished from the sense of mental agency we might have over a mental action we are performing. One might hold that when we deliberately direct our attention, this act comes with a sense of agency: an experience of the act as *being done by me*. The sense of agency I'm targeting is more subtle and more pervasive. The proposal is that even when we aren't performing a specific mental action, a sense of mental agency is conferred by our awareness of *possibilities* for mental action – by my experience of what I *could* do rather than my experience of what I'm *doing*. I suggest that this aspect of experience that ought to have a place in discussions of the phenomenology of mental agency.

3.3. *The Theoretical Case for the Inclusive View*

As with the earlier discussion of affordances for bodily action, phenomenological claims can reinforce, and be reinforced by, claims about functional role. What purpose would experiencing a weighted menu of options for mental action serve for us? The simple answer is that it would serve exactly the same purpose as experiencing options for bodily action. Just as we face a selection problem for bodily action, we face a selection problem for mental action (Wu 2013). At any given time there are a range of mental actions available to us, and we need to be good at picking the best mental action for the situation at hand. We can exploit deliberative processes to identify what mental actions are available to us, and which such action it would be most advantageous to perform. As we have seen though, such deliberative processing faces limitations of capacity and speed. By off-loading some of the work of mental action selection to non-deliberative automatic processes, we can lighten the load on our cognitive resources and accelerate our selection of mental action.

This proposal predicts an affordance competition between possible courses of mental action. Our perception of our environment triggers the preparation of a range of mental actions. These mental actions then compete for further processing, and their competition is modulated by factors such as our current goals, our current direction of attention and our emotional state. The upshot of this competition is a menu of experienced affordances for mental action, weighted with different strengths of solicitation. By selecting one of these acts, we allow one pre-prepared mental action to unfold at the expense of the others.

So far I've been talking as if there are parallel competitions: one between affordances for bodily action and another between affordances for mental action. In reality though, courses of mental and bodily action can compete with one another. Pezzulo has recently offered the following excellent example:

Imagine one is checking out an apartment for rent, and has to leave the keys inside. This situation may involve the competition between various policies: a policy that only includes pragmatic actions, and which consists in closing the door immediately; a policy that includes mental epistemic actions, and which consists in carefully double-checking mentally whether one has collected all the necessary luggage, until one is confident enough and can then close the door; and a policy that includes physical epistemic actions, and which consists in visiting once more all the rooms, before closing the door. Clearly, policy selection would involve [a trade-off] between mental vs. physical epistemic actions (e.g., a "mental check" is usually faster but more error-prone compared to physical search). (Pezzulo 2018, p. 2)

This kind of trade-off points to what we might call an *inclusive affordance competition*: an automatic, parallel competition between affordances for both bodily and mental action. One of the things that the example above reveals is that we cannot be effective selectors of bodily action without being effective selectors of mental action. Whether going back into the flat to check the luggage is the optimal action depends not just on what other bodily actions are available to us, but on what other *mental* actions are available to us. An affordance competition that does not encompass mental affordances would thus be ill-equipped to help us face this selection problem and others like it.

The foregoing emphasises the commonalities between the selection of bodily action and the selection of mental action. We should, however, be mindful of the differences between bodily and mental action. The first thing to note is that the way in which objects are available for mental action is not quite the same as the way in which they are available for bodily action. Our bodily interactions are constrained by the physical properties we have and by those of the item with which we are interacting. A teapot affording gripping by me, for example, depends on underlying categorical properties such as the shape of its handle and the size of my hands. Our mental engagement with the teapot, in contrast, is not constrained in quite the same way. The teapot's availability for attention does depend on it being visible to me, which in turn depends upon the physical size of the teapot, the physical properties of my eye and the physical spatial relation between us. But this is quite different to the kind of physical matching of hand and handle that underwrites the teapot's grippability. This boils down to the fact that when I grip the teapot, I do something physical to it, but when I attend to the teapot I don't. So although my being able to act mentally on the teapot might have physical preconditions it is not subject to the same kinds of physical constraint as my being able to act on the teapot physically.

Although these differences are worthy of attention, they should not be regarded as problems for an inclusive view of affordances. It so happens that mental affordances are much less constrained by physical properties than are bodily affordances, but that does not make it any less plausible that we are sensitive to such affordances. One might worry that the relatively unconstrained character of mental affordances entails that they are too ubiquitous: being available for attention, evaluation or imagination comes very cheap, so any given environment will be replete with such possibilities. If we include our *inner* environment within the space of possible mental action, the range of actions available becomes more vast still (Metzinger 2017, p. 26). To assuage this worry it should be noted that our environment also presents us with a fecundity of possibilities for bodily action. Just think of the vast range of actions you could perform in your kitchen! With bodily affordances, only a fraction of these possible actions are automatically pre-prepared when we perceive the kitchen, and only some of these get through the affordance competition to show up in our perceptual phenomenology. Exactly the same can apply to mental affordances, so I can avoid any commitment to subjects experiencing an implausibly vast menu of options for mental action.

Although other contrasts between bodily affordances and the proposed mental affordances could easily be found, my response is likely to be the same: that so long as these differences do not impugn on my core claim that we experience a menu of options for mental action, generated by an automatic competition between different pre-prepared courses of mental action, then they are differences I should have no difficulty accommodating.

3.4. Mental Affordances in Context

Mental action in general, and affordances for mental action in particular, have not received a great deal of attention. The literature includes some red herrings that sound like affordances for mental action but turn out not to be (e.g. Hartson 2003). Scarantino mentions the possibility of mental affordances in passing (2003, pp. 960-961) and Sloman (2008) discusses affordances for the mental act of deliberation. Pezzulo & Cisek (2016) propose that the competition between affordances extends to more sophisticated kinds of processing. They suggest that besides processing the bodily actions currently available to us, we process what bodily actions *would* be available to us were we to act in a certain way. This extension of the affordance competition certainly resonates with my proposal, but the model is still ultimately concerned with actions that are bodily rather than mental⁸ Metzinger's

⁸ Dennett too has come to find value in the concept of affordances, understanding it within a predictive processing framework. Consider the following passage: '...responses to incoming stimulation of its sensory systems may be external behaviours: a nipple affords suckling, limbs afford moving, a painful collision affords

recent work on what he calls ‘cognitive affordances’ perhaps comes the closest to my proposal. Metzinger asks:

Could there be something like an exclusively internal affordance competition? Let me propose that mind wandering, the almost continuous appearance of task-unrelated thoughts, may be exactly this — the creation of a constant flow of possible mental actions, a dynamic inner environment constituted by non-sensory events which need to be predicted and controlled. Call this the “cognitive affordance hypothesis”. (Metzinger 2017, p. 11)

For Metzinger, mental actions are strictly limited to actions directed at one’s own internal states. This means that the mental actions afforded are exclusively self-directed mental actions, such as actions we perform on our own thoughts and memories. My proposal, in contrast, is that our external environment also presents us with affordances for mental action and that the mental actions so afforded are directed at worldly items. Where Metzinger’s cognitive affordance competition is self-generated, mine is also driven by our perception of our environment. If I am right that we experience our external environment in terms of possibilities for mental action, and that our doing so helps guide our selection of mental action, there would thus be reason to prefer my broader conception of mental affordances to Metzinger’s.⁹

Metzinger also adopts a narrow view of the *purpose* of mental action. He suggests ‘...for the very large majority of mental actions “reward expectation” can be conceptually reduced to “epistemic value”, for example as a relevant fitness-enhancing information gain under counterfactual outcomes.’ (2017, p. 3) Examples of such goals include ‘knowing the result of 2+3’ and ‘arriving at a logically valid conclusion’. I suggest this conception of mental action is too narrow.¹⁰ It seems I can engage in an extended act of imagination driven by the goal of creating an exciting fantastical world without any epistemic ambitions at all. Moreover, I would suggest that situations in our environment can afford such imaginative acts.^{11,12}

retreating. Or they may be entirely covert, internal responses, shaping up the neural armies into more and effective teams for future tasks.’ (2017, p. 166) Here Dennett comes close to saying that the latter covert mental responses are also responses to perceived affordances.

⁹ Fabry’s commentary on Metzinger emphasises the importance of our mental interactions with our environment – what she calls our ‘cognitive niche’. I would argue, however, that Fabry goes too far in the other direction, claiming that mental processes that are less ‘coupled’ with the environment are less agential (2018, p. 4). A better view, I think, is one on which the landscape of mental action encompasses both our outer and inner environments and that our mental agency extends to actions directed at either domain.

¹⁰ Metzinger does acknowledge the possibility of such non-epistemic ‘conatively’ driven mental actions but puts them aside for the purposes of his enquiry (2017, p. 3).

¹¹ Metzinger’s account of mental action is motivated by a desire to accommodate mental action within a predictive processing (PP) framework. His conception of cognitive affordances as belonging to internal states is bound up with his suggestion that mental action involves predicting changes to the precision values of one’s internal states. Perhaps a PP account could be given of mental actions directed toward the environment as opposed to our internal states, but if not then Metzinger’s view might hold an advantage in the eyes of those committed to a PP framework. I’m not motivated by any prior commitment to PP so don’t consider this possibility a threat to my view.

¹² Attention provides a further point of comparison. Metzinger wants to accommodate volitional attention as a mental action, and again does so by appealing to predictions of precision. For Metzinger, this has the result that volitional attention ‘...always operates on aspects of an internal world model.’ (2017, p. 9) This might make it hard to accommodate our experience of external objects as soliciting our attention. Strictly speaking, attending to an object involves a change to our internal processing rather than any change to the external object, but we don’t want to lose sight of the fact that the act of attending is directed toward the object, and that it is the object

Conclusion

One of the ways in which we experience ourselves is by phenomenally representing our possibilities for action. On the phenomenal side of the story, this means experiencing a world alive with possibilities for interaction, conferring an implicit awareness of our own agency and abilities. On the functional side of the story, doing so plays a crucial role in action selection, flexibly balancing the automatic process of affordance competition with the deliberative process of rational evaluation. Here phenomenological observations and behavioural/neurological evidence are mutually supporting.

With this model on the table, we then face the question of whether it can be extended to encompass mental action too. My suggestion is that it can, and that our selection of mental action is similarly facilitated by competition between automatically-prepared courses of mental action that generate an experienced menu of options for action. Considerations surrounding mental action selection lend significant support to my proposal, but a full case in favour of the mental affordance hypothesis would require empirical investigation. Specifically, it would require the investigation of whether opportunities for mental action generate the same kinds of 'interference effect' we find for bodily affordances. It also predicts that just as misrepresentation of our bodily abilities leads to misrepresentation of the bodily actions available to us (Gadsby 2017) so too does misrepresentation of our mental abilities lead to misrepresentation of the mental actions available to us.

Of course, the theoretical applications of the mental affordance hypothesis are only half of the story. The other half is phenomenological, and in this paper I have suggested that the concept of mental affordances helps us to understand an important aspect of our perceptual phenomenology. Not only does this help us capture what our perceptual experience of objects is like, it helps capture our experience of selecting what mental action to perform and of being solicited to perform one mental action over others. Most importantly, it helps capture how we experience ourselves as mental agents: our sense of mental agency is not conferred by us directly representing the self and attributing mental powers to ourselves, but rather by representing our environment as a field of possibilities for mental engagement.

that is experienced as affording that act. Again, freed of the pressure to conform to a PP framework, I have no reason to say that attending is an act performed on internal models rather than external objects. Another advantage of my view is that I can explain the guidance of attention in terms of a competition between environment-driven affordances-to-attend. Indeed, neural findings regarding the 'priority map' (Bisley & Goldberg 2010) can be naturally re-framed in those terms. For Metzinger though, competition between cognitive affordances is internally driven. For him, the mechanisms responsible for guiding volitional attention are an 'open question' (2017, p. 22). By allowing mental actions to be driven by the environment, I'm free to explain salience and attention in terms of affordance competition.

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