The Mental Affordance Hypothesis

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ABSTRACT

Our successful engagement with the world is plausibly underwritten by our sensitivity to affordances in our immediate environment. The considerable literature on affordances focuses almost exclusively on affordances for bodily actions such as gripping, walking or eating. I propose that we are also sensitive to affordances for mental actions such as attending, imagining and counting. My case for this 'Mental Affordance Hypothesis' is motivated by a series of examples in which our sensitivity to mental affordances mirrors our sensitivity to bodily affordances. Specifically, subjects perceive opportunities to perform a mental action and their doing so leads, under the right conditions, to the automatic preparation of that action. I conclude by sketching a mental affordance research program that would reinforce my case for the Mental Affordance Hypothesis and establish its ramifications for a number of debates across philosophy and psychology.

Affordances are opportunities for action. A teapot, for example, has the property of *being grippable*. When a subject grips the teapot, she exploits this affordance. The concept of affordances, introduced by the ecological psychologist J.J. Gibson (1966), has been applied extensively across a range of disciplines. There are compelling reasons to think that our sensitivity to affordances plays a crucial role in action. Throughout the considerable literature on affordances the afforded actions that theorists discuss are, with only a few exceptions, *bodily* actions such as gripping, walking or eating. This paper presents the hypothesis that we are also sensitive to affordances for *mental* actions such as attending, imagining and counting. Although this Mental Affordance Hypothesis (MAH) is ultimately answerable to the empirical evidence, a variety of phenomenological and theoretical considerations strongly suggest that we are appropriately sensitive to opportunities for mental action. Although there are a few proposals in the literature that resemble this claim (see §3), as of yet nobody has made a general case for thinking that we are sensitive to affordances for mental action in much the same way as we are sensitive to affordances for bodily action. The current paper is intended to remedy this.

The first section describes how to characterise affordances in general and mental affordances in particular. The second section describes our sensitivity to affordances for bodily action. Specifically, we *perceive* affordances for bodily action and our doing so will, under the right conditions, *potentiate* (i.e. automatically prepare) the performance of that action. The third section pins down MAH as the thesis that there are affordances for a subject S to perform a mental action φ such that: i) the affordance to φ is perceptible by S and ii) when S perceives that affordance under the right conditions the act of φ-ing is automatically readied. The fourth section introduces a series of cases that plausibly

confirm that hypothesis: affordances to attend; affordances to imagine; and affordances to count. I conclude by sketching a mental affordance research program that would reinforce my preliminary case for MAH and establish its ramifications for a number of debates across philosophy and psychology.

1. What Are Affordances?

Gibson introduced the term 'affordance' in his 1966 work *The Senses Considered as Perceptual Systems*. His understanding of the concept evolved throughout his career, and his most fully developed account of affordances can be found in his final work *The Ecological Approach to Visual Perception* (1979). In this book, he introduces the concept as follows:

> The *affordances* of the environment are what it *offers* the animal, what it *provides* or *furnishes*, either for good or ill. The 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. (1979, p. 127)

Although the notion of affordances remains a key concept in the ecological school of psychology (e.g. Michaels 2003) it has also been taken up across a wide range of other disciplines including: cognitive psychology (e.g. Tucker & Ellis 1998); neuroscience (e.g. Cisek & Kalaska 2010); music (e.g. Krueger 2011); anthropology (e.g. Ingold 2011); design theory (e.g. Norman 1999) and artificial intelligence (e.g. Horton *et al*. 2012), not to mention phenomenology (e.g. Dreyfus 2002) and philosophy of perception (e.g. Siegel 2014). Although the ubiquity of the concept of affordances gives us a vast and diverse body of research from which to draw, it comes at a cost: the term 'affordance' has become weighed down by the theoretical baggage of its different applications (see Hartson 2003; Michaels 2003; Scarantino 2003).

If we strip away the accrued theoretical baggage, affordances are at their core *opportunities for action*. An opportunity to perform an action is a situation in which it is possible for a subject to deploy some ability they possess. Consider a tree's property of *being climbable* by me. Affordances are relativized to particular subjects, thus what is climbable *for me* will differ from what is climbable *for you*, which will in turn differ from what is climbable *for a squirrel*. For a tree to be climbable for me is for it to stand in a certain relation to my ability to climb: it must be something toward which I can successfully deploy that ability (see Nanay 2010, pp. 430-432). Some trees will stand in this relation to my climbing ability (e.g. sturdy trees with plenty of branches) and other trees will not (e.g. weak trees with too few branches). The tree's climbability and my ability to climb it are *complementary dispositions*: they are

a mutually dependent pair of dispositional properties, much like a sugar cube's disposition to dissolve in my tea and my tea's disposition to dissolve the sugar cube (Turvey 1992).[1]

What constitutes an opportunity for action will depend on how one conceives action. Although no shared conception of action can be explicitly found in the affordance literature, I will work from the plausible view that actions are those things a subject does that are under her intentional control. To have control over something you are doing is to be able to continue or terminate it at will. This motivates the following definition of action offered by Levy:

> [ACTION] Necessarily, *A* is an action by agent *S* at time *t* if and only if *S* has the specific ability at *t* to intentionally and directly stop and continue the event identical with, or partly constitutive of, *S*'s *A*-ing. (2016, p. 79)

If you move your leg because you intend to then this movement is one over which you have exercised control and is thus an *intentional action*. If you move your leg because a doctor taps your knee with a hammer then this movement is outside your control and thus not an action. Instead, it is a *mere movement*. There is a third category of events that are controllable but not actually controlled. These are *nonintentional actions*. When you absent-mindedly jiggle your leg, for instance, you are not exercising control over that movement. That said, you *could* stop the movement if you wished (Levy 2016, p. 77). Actions are complex events with many layers and an action can still qualify as being under intentional control even if there are parts of that action that are not controllable by the agent (Wu 2013). Gripping a teapot, for example, is an action under my control even if the exact aperture of my grip is the result of an automatic process outside my control.

Unlike some competing views, this account avoids an excessively narrow view of what qualifies as an action. Furthermore, it can be fruitfully applied across philosophy and psychology. Psychologists often appeal to control in their investigation of action and empirical work on the mechanisms of control can help flesh out the proposed view.[2] And, as we will see, it integrates well with claims about the role of affordances in action.

We can now define affordances as follows:

> **AFFORDANCE:** *x* affords *φ-ing* for *S* iff *x* offers an opportunity for *S* to *φ*.

[1] Some adopt a more liberal conception of affordances on which the things afforded need not be actions. Gibson (1979 p. 39) talks about a fire affording warmth, for example, even though warmth is not an action. However, Michaels (2003) argues convincingly against such a liberal conception. This is one of several debates about the metaphysics of affordances that I will put aside for the purposes of this paper.

[2] Controlled processes have been distinguished from automatic processes by their being conscious, attentive, flexible, context-sensitive, goal-driven, and more besides (see Wu 2013 for an overview). Many of these features should doubtless figure in an account of control. However, the marker of control that promises to distinguish actions from mere events is the availability for continuation and termination highlighted by Levy.

The entity *x* that offers an opportunity for action needn't be an object. A particular configuration of traffic might present an opportunity for me to cross the road, but here it is the overall *situation* that presents the opportunity to *φ* rather than some particular object (Siegel 2014). Relatedly, *x* can present an opportunity to *φ* without *x* being the target of my *φ-ing*. When a teapot affords gripping it is the teapot that gets gripped, but when a traffic configuration affords crossing it is not the traffic configuration that gets crossed.

Equipped with the definition of affordances above, we can define mental affordances as those affordances such that the afforded action *φ* is a mental action. Mental events can be distinguished from bodily events by their being *covert*: they involve internal changes to our mental states and do not essentially involve any physical movement (Metzinger 2017). The things we do mentally include - though are by no means limited to - attending, imagining, remembering, evaluating, deciding, inferring, calculating and judging. In line with the definition of action above, mental actions are those mental events that are under our control. Deliberately recalling the name of my first teacher is an intentional mental action because I initiate and continue the process of recollection. In contrast, when a spontaneous memory of a childhood trauma springs into my mind, this mental occurrence is outside of my control so is a mere mental event. And absent mindedly reminiscing about long-lost pets is a nonintentional mental action because I *could* stop it even though I in fact don't, meaning that the mental process is under my control (Levy 2016).

There is considerable debate over the extent to which we have agency over our mental processes (see Soteriou & O'Brien 2009). Some have argued that our mental agency is extremely narrow in scope (e.g. Strawson 2003). However, such conservativism plausibly reflects an excessively demanding conception of action (Wu 2013). We actively control some of our mental processes, and many others are *controllable* if not actually controlled. Indeed, the unwarranted assumption that all mental actions must be actively controlled could underwrite the mistaken claim that mental action is rare (Levy 2016).

So long as one acknowledges that there are mental actions, it will be hard to deny that there are mental affordances. If we actually perform mental actions then there must be situations in which it is possible for us to perform those mental actions. An opportunity for mental action is nothing more than a situation in which it is possible to perform a mental action, and a mental affordance is nothing more than an opportunity for mental action. Mental affordances are thus ubiquitous: a stimulating documentary affords reflection; an old photo album affords reminiscing; a place of worship affords contemplation; a fantasy novel affords imagining; and a philosophy paper affords evaluation.

In some of these cases, the object or situation *x* that affords *φ*-ing is the target of the mental act. The documentary does not present an opportunity to reflect as such but rather an opportunity to reflect

on that very documentary. In other cases *x* affords *φ*-ing without being the target of the afforded act. A space might afford contemplation without affording contemplation of that very space.[3]

Positing mental affordances is easy to justify because the conception of affordances I have offered is not very demanding. One might worry that a concept this undemanding is unlikely to be of much theoretical value and, consequently, that MAH will be hollow. However, the real theoretical work is not done by affordances as such but by our *sensitivity* to them. The substance of MAH is that we are sensitive to mental affordances in much the same way as we are to bodily affordances. It is to this sensitivity that I now turn.

2. How Are We Sensitive to Affordances for Bodily Action?

The literature suggests that our sensitivity to affordances for bodily actions has two layers: first, we are able to perceive affordances for bodily action; second, perceiving those affordances (under the right conditions) potentiates the afforded action i.e. automatically prepares the subject to perform that action. I explore these in turn.

2.1 From Affordances to Affordance Perception

A key claim made by many affordance theorists, including Gibson, is that we are *perceptually* sensitive to affordances (see Gibson 1979; Michaels 2003; Dotov *et al*. 2012). On this view, recognising the climbability of a tree is not a matter of seeing a set of qualities then inferring that an object with those qualities is climbable by you. Instead, you can simply *see* its climbability.

This claim can be made without any commitments regarding the nature of our perceptual relation to affordances. Gibson's understanding of affordances is bound up with a number of theses regarding affordance perception including: that affordances are perceived directly rather than via a mental representation; that affordances are perceived through 'optic flow' information without any need for internal processing; and that in ordinary perception we are aware exclusively of affordances. However, we should understand affordance perception in a way that is consistent with: a representational view of affordance perception (Siegel 2014); affordance perception requiring internal processes that disambiguate ambiguous sensory inputs (Christensen & Bicknell forthcoming); and ordinary perceptual awareness being characterised not just by affordances but by objects and qualities (Nanay 2010).

[3] I explore this more closely elsewhere (McClelland 2015).

To say that we are perceptually sensitive to affordances is not to say that we are perceptually sensitive to *all* affordances. You might be perceptually attuned to climbing affordances but not to juggling affordances. And you might fail to perceive particular climbing affordances if background conditions are not met (e.g. if you are not in the requisite state of mind or if the affordance is somehow masked). Furthermore, you might *misperceive* a tree as climbable when it is not, with potentially embarrassing consequences (Gibson 1979, p. 139). Exactly how and when we perceive (or misperceive) affordances is an open question that continues to attract investigation.

Why think we perceive affordances? A key motivation comes from reflection on our phenomenology. Some report that they perceptually experience the teapot not just as white and as smooth but as *grippable*. This is similar to our perceptual experience of other so-called 'high-level' properties. Seeing something as a monkey, as an orange or as Donald Trump contributes something extra to your perceptual experience of the object: something irreducible to changes among the 'low-level' colours, shapes and textures we experience (McClelland 2016). Furthermore, whether you perceive these properties will depend on what perceptual capacities you have acquired and what mind-set you're in (e.g. whether you're looking for a certain kind of object). Unlike these properties though, affordances are properties an object has *relative* to a subject at a time. The teapot is grippable by you from one stance but not another, so should be perceived as such, whereas Trump is Trump from any position.

The most vivid cases of affordance perception are those in which we experience an action not just as *available* but as positively *solicited*. Consider the way in which we experience a ringing phone as demanding to be answered (Koffka, 1935), an itch as demanding to be scratched (Hall 2008) or a cake as demanding to be eaten (Siegel 2014). In the teapot case we might experience the object as available for gripping without experiencing any particular urge to grip. But in these other cases we're drawn to perform the afforded act. It is unclear how exactly to cash out the metaphor of being solicited or demanded to act on an affordance. These objects are not, after all, perceived as issuing commands. That said, this does designate a vivid and commonplace feature of our perceptual experience (one that I will try to shed light on shortly).

Although Gibson himself did not argue for affordance perception on phenomenological grounds, he did note that his concept of affordances was inspired by similar notions introduced with a more phenomenological remit in Gestalt psychology (1979, p. xiii). And regardless of Gibson's official stance on phenomenological evidence of affordance perception, the fact that it fits so intuitively with our phenomenology could well be responsible for why the idea has been taken up so widely (Heft 2001, p. 114).

Although phenomenological considerations will be important in this paper, we should not lose sight of the considerable explanatory applications of affordance perception. The most important of these concerns action selection. Prescott, Bryson & Seth explain that '[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) By perceiving affordances in our environment we perceive a menu of possible actions available to us. Although we're free to go 'off-menu' and adopt a course of action outside the perceived range of options, most of our actions will exploit a perceived affordance. This saves us from the burdensome task of having to infer explicitly what kinds of action are available to us, freeing up our cognitive resources for the task of deciding which of the available courses of action is best (Cisek & Kalaska 2010; McClelland forthcoming). Without affordance perception, our capacity-limited cognitive resources would have a lot more work to do, making our selection of action slower and more vulnerable to over-load. With affordance perception, we can exploit a fruitful division of labour between rapid, automatic perceptual processes that present us with a menu of possible actions and slow, deliberative post-perceptual processes through which we can select which action to perform.

Although I take the facilitation of action selection to be the most fundamental explanatory application of affordance perception, it also has a range of other theoretical applications. Affordance perception is thought to underwrite our acquisition of skills (Gibson 1966; Dreyfus 2002), our comprehension of tool-use (Gibson 1979; Lockman 2000) and our understanding of the actions of others (Gibson 1979; Stoffregen *et al* 1999). The first-person observation that we perceive affordances is thus corroborated by a range of third-person explanatory projects.

2.2 From Affordance Perception to Potentiation

Moving beyond Gibson, recent work in cognitive neuroscience suggests that our sensitivity to affordances has another dimension. A range of studies indicate that when we perceive an affordance, the motor patterns responsible for performing the afforded action (or parts of that action) are automatically readied. This automatic preparation of an action is called 'potentiation'. In a 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'. If the presented item is a teapot with the handle to the subject's right then their response time is slower when the trial requires a left-handed button-push but faster when the trial requires a right-handed button-push (and vice versa for a teapot facing the other way). Tucker and Ellis explain this interference in terms of subjects perceiving the teapot as affording a right-handed

grasp.[4] The readying of this right-handed movement makes a left-handed button push slower because the subject has prepared an action with the other hand. But it makes a right-handed button push faster for the same reason. Since gripping the teapot is not something the subject *intends* to do in this situation, the gripping response must be potentiated *automatically*.[5]

Any given perceptual environment will present a subject with a range of affordances. Does this mean that all of the afforded actions are potentiated? Not quite. First, *φ*-ing would only be potentiated if the subject perceives an affordance to *φ*. This is contingent on her being able to perceive *φ*-ing affordances and on her being suitably sensitive to such affordances in that situation. Second, even if she does perceive a *φ*-ing affordance, *φ*-ing will only be potentiated if other background conditions are met. Although Tucker and Ellis propose that seeing a grippable teapot always potentiates a gripping response, Bub *et al* (forthcoming) have data suggesting that potentiation may be contingent on what kind of task we are performing. The gripping response, for example, might only be readied when we are engaged in a task in which gripping is a likely response.

Even though potentiation is contingent on the background conditions described, it remains the case that any given situation is likely to potentiate a range of actions. But wouldn't the readying of a whole range of incompatible actions cause difficulties for the acting subject? Cisek & Kalaska (2010) offer a promising account of how the brain deals with these contradictory signals. According to the 'affordance competition hypothesis', the motor patterns triggered by our affordance perception compete with each other for further processing. Various factors, such as how optimal the opportunity for action is, contribute to the success of one motor pattern over another. This automatic parallel process filters out some potential actions in favour of others. The losing signals make little or no difference to the subject's performance while the winning signals are more fully prepared, setting the subject up to perform the relevant action.

We gain an interesting clue into how potentiation works from the phenomenon of *utilization behaviour* (Brazzelli & Spinnler, 1998). This is a condition, caused by brain damage to the frontal lobe (Besnard *et al*. 2011), in which subjects are compelled to 'utilize' items that they see. When presented with an apple subjects eat it regardless of whether they are hungry. When presented with a toothbrush they brush their teeth even in inappropriate contexts such as a doctor's office. When

[4] Confusingly, the term 'affordance' is often used in the cognitive neuroscience literature to refer to the potentiated motor pattern rather than to the perceived property of the object. Confusion might also be caused by the literature talking loosely of motor patterns being triggered by perception of an object rather than specifically by perception of the object's affordance. Only the more specific claim captures the findings of these studies.

[5] Although some have attempted to offer deflationary explanations of this interference effect in terms of attention (e.g. Kostov & Yanyan 2015), a range of further studies have cast doubt on such alternative accounts (e.g. Yamanashi *et al* 2015).

presented with pens they draw with them even if there is no paper on which to draw. This condition has been interpreted in terms of subjects being unable to suppress potentiated actions (e.g. Rietveld 2012; Cisek & Kalaska 2010). If certain background conditions are met then perception of an apple will potentiate the motor process responsible for eating. In a typical subject, if eating the apple is an unsuitable response then that motor process is suppressed (often unconsciously). But for subjects with relevant frontal lobe damage such suppression is not possible and they are compelled to eat.

As with affordance perception, the potentiation of action functions to help us meet the challenge of action selection. Tucker & Ellis explain, '…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) One of the key factors in successful action selection is speed. If the actions from which we are selecting are prepared *prior* to our selection, we can perform the selected action much more quickly than if we were starting from scratch (Cisek & Kalaska 2010; McClelland forthcoming).

Potentiation also has wider theoretical applications including roles in the explanation of skill acquisition, tool-use and action understanding. I would like to focus on the phenomenological manifestations of potentiation. Compare the experience of catching a ball that is hurtling towards you with the experience of deliberately throwing the ball back to its owner. The agential phenomenology of the throw is one of spontaneous action – of causing oneself to throw the ball to its owner. In contrast, the agential phenomenology of the first action is one of having an action drawn out of one by a stimulus. This kind of experience is better characterised as one of *allowing* an action to occur rather than of initiating it spontaneously.

Potentiation helps explain what is distinctive about the catching experience. Perceiving the on-coming ball leads to a strong potentiation of the act of catching. The relevant motor signal has not been knocked out by competition with other signals, nor by any automatic suppression of inappropriate actions. The subject is thus in a state such that she will reach to catch the ball unless she actively suppresses the relevant motor process. This means that to catch the ball the subject can simply allow this process to unfold without having to initiate the act of catching from scratch. This explains why the subject's agential phenomenology is one of *allowing* rather than *initiating*. The fact that the process responsible for the subject catching was prepared prior to her intention to act does not preclude it from qualifying as an action. Her catching still falls under her control in that she is free *not* to perform the potentiated action. Perhaps there are cases where the potentiation of an action is so strong that it is impossible to resist (ducking a ball coming at your face?) but this is not the kind of case I am considering here.

Potentiation also helps explain a feature of our perceptual phenomenology that was left unaccounted for earlier. *Soliciting* affordances are those affordances that are experienced as in some way calling out to be acted upon. Perhaps the metaphor of solicitation can be cashed out in terms of the afforded action being strongly potentiated. The experience of feeling drawn to catching the ball is just the experience of your catching response being fired up: a response that needs to be actively suppressed if you don't wish to do it.[6]

This contrasts with the perceptual experience of the teapot's non-soliciting gripping affordance. There you perceive the teapot as grippable but the potentiation of gripping is too weak to show up phenomenally, perhaps because it has been knocked out of the affordance competition by better opportunities for action. In this kind of case, there would be no need to consciously suppress an impulse to grip. Furthermore, if you did grip the teapot this would likely be experienced as something you actively do rather than as something you simply allow to unfold. Put another way, not all motor signals are created equal and so do not all make their presence felt to us equally.

3. Framing The Mental Affordance Hypothesis

An object or scenario *x* affords the mental act of *φ-ing* to a subject *S* iff *x* presents an opportunity for *S* to perform the mental act of *φ-ing*. MAH is the hypothesis that we are sensitive to mental affordances in the same way as we are sensitive to bodily affordances. We have seen that our sensitivity to bodily affordances is characterised by *perception* of the affordance and, under the right condition, *potentiation* of the afforded action. MAH is thus true iff there are affordances to perform a mental act *φ* such that:

> **PERCEPTUAL REQUIREMENT:** *S* perceives *x* as affording *φ*-ing, and;
>
> **POTENTIATION REQUIREMENT:** *S* perceiving *x* as affording *φ*-ing potentiates *S φ*-ing.[7]

I take these requirements to be invidually necessary and jointly sufficient for MAH being true. Although satisfaction of the second requirement entails satisfaction of the first it will be useful to consider them separately. Some might object that these requirements are too demanding. After all, many theorists discuss affordance perception without any mention of potentiation, so perhaps MAH

[6] This is an alternative to accounts on which solicitations are a kind of imperatival perceptual content (e.g. Hall 2008; Watzl 2017). On my proposal, it is not how we represent the ball that accounts for the experience of solicitation.

[7] Our sensitivity to affordances is such that the perceiving an affordance only potentiates the afforded action if certain background conditions are met. For the sake of MAH though, I am targetting cases in which those conditions *are* in fact met. This is why the 'under the right conditions' clause is not included in the Potentiation Requirement.

should be framed with only the first requirement. Against this I would argue that the we cannot capture the role affordances play in action if we disregard potentiation. Although there is a division in the literature between discussion of perception and of potentiation, this division is unnatural and unhelpful.

If MAH is true, then this would tell us a great deal about the workings of many of our mental actions. The challenge of action selection concerns not just bodily action but mental action too (Wu 2013). In any given scenario, there are a wide range of mental actions available to us and our challenge is to select the best course of mental action, to do so in a way that is rapid and to avoid over-loading our capacity-limited cognitive resources. MAH proposes that just as our selection of which bodily action to perform is facilitated by our sensitivity to our environment's affordances for bodily action, our selection of which mental action to perform is facilitated by our sensitivity to our environment's affordances for mental action. We experience a menu of possible courses of mental action, some of which are automatically readied prior to selection, and many of our mental actions follow the offerings of these menus. The breadth of this menu will vary: when we are particularly focussed there might be just one course of mental action that presents itself to us. There will also be cases where we go 'off-menu' and perform a mental action without perceiving any affordance to perform that act. Since mental actions are less constrained by our environment than bodily actions, this might be more commonplace with mental action selection. Nevertheless, the experienced menu of mental actions will often have a role to play.

Is this conception of mental affordances mirrored by anything already in the literature?[8] In design theory, Hartson (2003) introduces the notion of cognitive affordances, but these are understood as features that aid an agent's understanding of the use of an artefact rather than as opportunities for mental action. Also in design theory, Zhang & Patel (2006) define cognitive affordances as those affordances that depend on background knowledge, such as a post-box that affords posting only to an agent with an understanding of the postal system. Again, mental action is not their concern. In artificial intelligence, Raubal & Moratz (2008) present an artificial agent sensitive to affordances to deliberate about which bodily affordance to act upon. Sloman similarly posits 'deliberative affordances' for human subjects (2008). In neither case though is there exploration of a broader class of mental affordances.

In the philosophical literature, Scarantino seems to share my conception of mental affordances, but only mentions their possibility in passing (2003, pp. 960-961). None of the more developed positions

[8] Although I do give a preliminary treatment of mental affordances in (McClelland 2015) the current proposal diverges from it in a number of respects.

seem to be targeting the same kind of thesis. Proust (2016) posits 'cognitive affordance-sensings' but her concern is specifically with meta-cognitive feelings, and her characterisation of these affordances as non-conceptual appraisals of one's situation diverges from the conception I offer. Rietveld and Kiverstein explore affordances for 'high-level' actions (2014). Some of these actions might be characterised as mental, though the authors themselves seem to resist the division of actions into bodily and mental. They also diverge from my proposal by adopting a distinctive normative conception of affordances on which '…affordances have an existence that is dependent on the abilities and practices found within a form of life' (2014, p. 339).

Matthen argues that the concept of affordances should be extended beyond bodily actions to encompass what he calls 'epistemic affordances' (2005, p. 233). These are affordances to perform epistemic mental actions such as co-classifying things, making inductive generalisations and re-identifying an object. Matthen's insightful claims about how we perform epistemic operations on the basis of our sensory experience certainly offer potential applications of MAH. However, his proposal is much more narrow in scope than my own. His account does not allow affordances for non-epistemic mental actions such as imagining or attending. Nor does it allow affordances for mental actions that are learned rather than innate, such as the act of counting. These exclusions are bound up with the distinctive teleosemantic theory of sensory content that Matthen develops, so could not be lifted without undermining his wider philosophical project. It is also worth noting that although Matthen does hold that affordances for epistemic action figure in the contents of perception, the potentiation of mental actions has no place in his account.

Metzinger's 'cognitive affordance hypothesis' proposes a 'constant flow of possible mental actions' (2017, p. 11). Unlike the other views discussed, Metzinger's proposal shares with mine the suggestion that a variety of mental actions are automatically prepared and compete with one another to be performed (2017, p. 11). However, Metzinger does not conceive of cognitive affordances as things we perceive in our environment. Instead, they are *internal* opportunities for action presented by one's inner environment of non-sensory mental events. On this view, an idea can afford reflection but a book cannot. It is hard to extract Metzinger's claims about affordances for mental action from his wider theoretical project of assimilating mental action into a predictive processing framework. Metzinger also limits the scope of afforded mental actions to those that achieve certain epistemic results, so his proposal is again more narrow in scope than my own (2017, p. 3). As with Matthen, Metzinger's theoretical commitments mean that his account cannot be straightforwardly extended to encompass the wider range of mental affordances that I propose.

Since there is only a modest and somewhat disparate literature in support of mental affordances, it is perhaps unsurprising that very little has been said *against* the view that we are sensitive to such affordances. The nearest is perhaps Nanay who holds that we perceive opportunities for bodily action but denies that this can be extended to mental action (2013, p. 18). Although Nanay shows that his own arguments for the perception of bodily action properties do not extend to mental action, he does not give reasons to doubt that other arguments for the perception of mental action properties might be developed. He does suggest that opportunities for mental action are too sophisticated to be represented perceptually (2010, p. 432), but without a precise and independently motivated account of how sophisticated perceptible properties are able to be, this worry has little force.

4. Three Candidate Mental Affordances

Case I: Affording Attention

Consider the following scenario adapted from Watzl (2017). You are working at your desk when a fire alarm goes off. It is a false alarm and the noise is turned off, but a fault means that a large red warning light continues to flash in your office. You find the warning light extremely distracting. Despite the distraction, you manage to keep your focal attention directed on your work. Sometimes it is impossible not to attend to a salient stimulus, like a loud bang. In such cases, your attending is outside your control and therefore not an action. In the case at hand though, you succeed in exercising control over your attention and keep it focused on your work. This is not to say that you don't attend to the warning light *at all* (indeed, a case could be made for thinking that wholly unattended stimuli are unexperienced, which would be at odds with the phenomenology of the scenario). Rather, you attend to the warning light only peripherally and resist the urge to bring it into focal attention. I suggest that this scenario is best described in terms of our sensitivity to affordances of focal attention. The warning light is a possible target for the mental act of focally attending. As such, the light presents an affordance for mental action. The question is whether we're sensitive to this affordance in the same way as we're sensitive to affordances for bodily action.

Regarding the Perception Requirement, I propose that your perceptual experience represents the warning light *as focally attendable*. Although there are no uncontroversial criteria for distinguishing perceptual from non-perceptual states, a key feature of perceptual states is their (relative) cognitive impenetrability. A key feature of this scenario is that the opportunity to attend continues to impress itself on you irrespective of your belief that it is a false alarm. Although you believe there's no need to attend to the alarm, and that your attention is better directed toward your work, you still experience

a pull on your attention. This indicates that the process responsible for your experience is resistant to correction by beliefs, which tallies with it being perceptual.

Regarding the Potentiation Requirement, the felt urge to attend indicates that attending is strongly potentiated. This felt urge is not explained by a desire to attend – in the scenario described you have no desire to attend to the light. Instead, automatic processes that are insensitive to your desires are pulling your attention toward the light. Your agential phenomenology points the same way. Consider the experience you would have if you stopped resisting the urge to attend to the warning light. Your experience would be one of effortlessly allowing your attention to be taken to the light, not one of effortfully directing your attention toward it. This suggests that the act of attending to the warning light is already strongly potentiated prior to your attending.

In the case described it might be hard to isolate the experience of the light *as attendable* from the felt urge to attend to the light. A critic might object that the felt urge is real but is not driven by perception of an affordance to focally attend. To address this objection we should consider cases in which items are perceived as attendable but without any felt urge to attend. A promising case is one in which you attend to a salient person in a football crowd and the surrounding crowd is perceived *as attendable*. Even in the absence of anything pulling your attention toward the surrounding crowd I would suggest, following Noë (2005), that the crowd are experienced *as available* – that is, as peripheral items that can be brought to the fore through an act of attention. Now, if we perceive items as attendable in these non-soliciting cases it is plausible that items that do solicit our attention are similarly perceived as attendable.

It is encouraging that long-standing empirical findings regarding our response to a salient stimulus mirror more recent findings regarding our response to the grippable teapot. Just as perceiving a grippable teapot prepares a gripping response, perceiving any salient item prepares an attentional response. And just as gripping responses compete with other motor responses to determine action, the attentional signals from different stimuli compete to direct attention. The gripping response might be unconsciously suppressed or, when particularly strong, requires conscious suppression. Similarly, attentional signals are suppressed by unconscious mechanisms but, when particularly strong as in the fire alarm case, must be actively resisted. Most strikingly, if we are performing a task that requires us to attend to a certain item but an irrelevant 'distractor' is present, this interferes with us attending to the target item in much the same way as the irrelevant gripping affordance of the teapot interferes with response time in the Tucker and Ellis study (Posner *et al.* 1980). Although the concepts of affordances and potentiation are not found in the empirical literature on attention, the foregoing indicates how naturally they can be applied.

There are good reasons to think that our sensitivity to attentional affordances satisfies the Perception and Potentiation Requirements. But is attending a mental act? Overt attention is the *bodily* activity of directing one's sense organs toward a particular stimulus, property or region. Covert attention is the *mental* act of concentrating on a particular perceived stimulus, property or region. It might be objected that when a stimulus affords attention it only affords *overt* attention, thus the warning light affords the bodily act of directing one's eyes toward it. I would respond that although stimuli can indeed afford overt attention, they *also* afford covert attention so still qualify as mental affordances. After all, what makes the warning light distracting is that it pulls one's *concentration* away from one's work not just one's eyes.

Far from generating a problem for MAH, the overt/covert distinction actually opens up an interesting line of argument. Someone on board with bodily affordances can have no principled objection to affordances for overt attention since it is a bodily act. But someone on board with affordances for overt attention will be hard-pushed to object to affordances for covert attention since the two have similar psychological profiles and share intimate functional connections. The case of attention thus shows how accepting bodily affordances whilst rejecting mental affordances is an uncomfortable position to sustain.

The foregoing suggests that we are sensitive to at least one kind of mental affordance viz. affordances to attend. Attention is a pervasive and important feature of our mental lives, so the result that attention is guided by our sensitivity to affordances is significant. What it does not do, however, is give us good reason to posit affordances for some wider set of mental acts relevantly similar to attending. The mental act of attending is quite different to other kinds of mental act, so a critic might reasonably maintain that attentional affordances are the only mental affordances to which we are sensitive. To extend the scope of MAH we should thus turn to a case that could leverage some wider generalisations.

Case II: Affording the Imagining of a Bodily Action

Consider the following scenario. You are traversing a series of stepping stones across a river. The first few stones are fairly easy to deal with, and you perform the appropriate hops and steps without having to reflect on your actions. Things then get a lot trickier with a more difficult distribution of stones. You pause, mentally rehearse a viable route over the remaining stones, then execute the rehearsed path. I suggest that each of the actions involved in this scenario is best described in terms of affordance perception. The situations you find yourself in for the easy stones each afford certain bodily acts. In contrast, the situation you find yourself in when you reach the tricky stretch affords the *mental* act of

rehearsing your leap in imagination. This tricky situation presents you with an opportunity to exercise a certain mental capacity, and phenomenological considerations suggest we are sensitive to this opportunity in a way that satisfies the Perceptual and Potentiation Requirements.

Regarding perception, as you traverse the easy stones, there is no need to *infer* what kind of step can be performed on the next stone. Instead you *perceive* the situation as affording a specific stepping action. I suggest that exactly the same applies to your experience in the tricky case – that you perceive the situation as affording a certain mental act viz. the act of mentally rehearsing a viable route. And this appearance is plausibly cognitively impenetrable. If you're convinced by a friend that the best strategy is *to not think and to just keep going*, then pausing and rehearsing your leap will be at odds with your beliefs. But the process responsible for your experience of the imagining-affordance is relatively insensitive to your background beliefs.

Regarding potentiation, as you traverse the easy stones your experience is not one of initiating the appropriate stepping action but is rather one of allowing the potentiated steps to unfold. Again, I suggest the same applies to your experience when you perform the imaginative act – you do not deliberately initiate the act of mentally rehearsing your jump but rather allow a potentiated mental action to unfold. In order to follow your friend's advice, you would have to actively suppress the urge to pause and think, which indicates that the preparation of this mental action is driven by what you perceive rather than by your intention.

Moving beyond phenomenological considerations, there is also indirect empirical evidence that imaginings of bodily acts can be potentiated. A wealth of data suggest that the neural underpinnings of imagined bodily acts overlap extensively with the neural underpinnings of the actual performance of those acts (e.g. Jeannerod 1995). This drives a convincing account of imagined bodily acts as 'off-line' performances of bodily acts. If we can perceive opportunities for bodily action, and our doing so potentiates the afforded bodily act, then it is plausible that the same holds for *imagined* bodily acts. The overlapping mechanisms of actual and imagined action make it uncomfortable for one to hold that perceived situations can ready the performance of relevant bodily actions but cannot ready the performance of relevant imaginings of bodily action.

Unlike the case of attention, this example opens up a large class of mental actions for which there are plausibly affordances. If we are sensitive to affordances for mentally rehearsing a certain kind of leap, we are presumably sensitive to affordances for mentally rehearsing a host of other bodily actions. The space of perceptible affordances for bodily actions might even be duplicated in a space of perceptible affordances for the imaginative performance of those same bodily actions.

By considering mental acts with an intimate connection to bodily action, we put ourselves in a good position to argue that those who countenance affordances for bodily action ought also to countenance affordances for these mental actions. A limitation of this strategy, however, is that one might object that *only* those mental acts with a close connection to bodily action can be afforded. It might be argued that opportunities to perform abstract mental acts detached from the bodily are too complex to be perceived, or that the non-motoric nature of such acts precludes them from being potentiated. This leads us to our third and final candidate.

Case III: Affording Counting

Our environment can present us with counting affordances. Consider a jar full of marbles, a pile of pennies, or the leaves on a clover. Here I am targeting the mental act of counting rather than the bodily act of pointing to items and numbering them out loud.[9] The question is whether we perceive the marble jar as affording counting, and whether perceiving the marbles potentiates the act of counting. I trust that readers will be able to imagine the kind of phenomenological case I would make for this conclusion, so I will instead jump straight to some data that indicates we are relevantly sensitive to counting affordances.

Earlier I introduced the phenomenon of utilization behaviour. The symptomatic behaviours I highlighted were all bodily acts: eating an apple, brushing with a toothbrush and writing with a pen. Interestingly though, the patient discussed by Brazzelli and Spinnler also displayed a 'compulsion to count' (1998, p. 350).[10] This indicates that the act of counting is potentiated by our perception of counting affordances. In neurotypical subjects this signal to act would get suppressed (often unconsciously) but because of the patient's deficit this suppression does not happen, hence her atypical behaviour. It is worth noting that the patient's symptoms are not naturally explained in terms of atypical behavioural urges: the characteristic feature of the disorder is that the patient's behaviour is *environment led*, meaning that she acts on perceived affordances regardless of whether she has a desire to perform those actions. Consequently, the fact that she performs the act of counting on

[9] Sometimes we count in a way that involves doing those bodily acts off-line i.e. by pointing and numbering in our heads. It is implausible, however, that the act of counting is exhausted by such overt or covert bodily action. We can count things without performing either of these acts, and we have a brain area – the intraparietal sulcus – that is directly associated with arithmetic without being directly implicated in those bodily acts (Dehaene *et al.* 2004).

[10] A complication here is that the cases of counting observed by Brazzelli and Spinnler are, of course, cases of overt counting. One might claim that it is this bodily act that is afforded rather than the mental act of counting. However, the burden of proof would be on the objector to say why this is so. Ordinary subjects perform these bodily acts to *assist* a mental act of determining how many of something there are, and there is no obvious reason to doubt that the patient is doing the same. Put another way, the patient is most likely compelled to make bodily gestures that aid counting precisely because she is compelled to perform the mental act of counting.

certain stimuli indicates that she *perceives* those stimuli as offering an opportunity to count. This case again puts pressure on those who accept affordances for bodily action to countenance affordances for certain mental actions. If the compulsive bodily actions of Brazzelli and Spinnler's patient are to be understood in terms of affordance perception and the ensuant potentiation of the afforded action then, other things being equal, the same interpretation ought to be given of her compulsive mental actions. Of course, utilization behaviour is just one node in the nexus of affordance theory, and a full case for counting-affordances would have to explore many other nodes. Nevertheless, this finding is promising enough to encourage such an exploration.

We are thus led to the defeasible conclusion that we are sensitive to counting affordances. Where does this leave us? Counting is part of a wider class of arithmetical actions, so to the extent that one finds it plausible that we are sensitive to counting affordances one should also take seriously the idea that we are sensitive to affordances for other arithmetical actions. A pile of sweets, for example, might present affordances of division and stimuli in the language of mathematics might present affordances for far more sophisticated arithmetical actions. And now that we have moved beyond affordances for off-line bodily activity to mental acts more detached from bodily action, it is plausible we are sensitive to affordances for a range of other abstract mental actions.

5. Conclusion: The Mental Affordance Research Program

In this paper I hope to have addressed some conceptual questions surrounding the claim that we are sensitive to affordances for mental action. I also hope to have made a strong preliminary case for thinking we are sensitive to at least some mental affordances: affordances to attend, to imagine and to count. This suggests that our selection of mental actions is at least partly underwritten by our sensitivity to mental affordances. Indeed, once one appreciates the role of affordances in the selection of bodily action, and recognises that the challenge of action selection extends to the mental, it is unsurprising that our selection of mental action should be facilitated in the same way.

However, my aim in this paper has not just been to make a preliminary case in favour of MAH but to motivate a wider mental affordance research program. The preliminary case I offer should be enough to motivate the direct empirical investigation of our sensitivity to mental affordances. In some cases the relevant data may already exist but stand in need of reconceptualisation. I have suggested that findings regarding attention, for instance, can be reframed in terms of our sensitivity to affordances to attend. But in most cases new experiments would need to be devised to determine whether we are relevantly sensitive to mental affordances. Such experiments would help establish the scope of our sensitivity. Do we respond to affordances to deliberate, to recollect, to infer, to evaluate? What factors

influence whether we perceive such affordances, and whether our perception potentiates the afforded mental act? If there are mental affordances to which we are not sensitive, why not?

I also hope to have motivated a wider exploration of the potential theoretical applications of mental affordances. Bodily affordances have been put to theoretical use in contexts including skill acquisition, tool-use and action understanding. There is thus an impetus to explore: whether and how the acquisition of new mental skills makes us sensitive to new affordances for mental action; how our understanding of tools that aid mental action – such as an abacus or a smartphone – interacts with our sensitivity to mental affordances; and whether our understanding of the mental actions of others is underwritten by a sensitivity to the mental affordances available to them.

Bodily affordances have also proven important for our understanding of psychiatric conditions which invites the question of whether there are mental disorders caused by a disruption to our ordinary sensitivity to mental affordances. We have already seen how utilization behaviour plausibly involves the disinhibition of potentiated bodily and mental action. Another potential target is ADHD which might be understood as a deficit in subjects' ability to suppress potentiated acts of attention.

Another possible theoretical application of affordances is to our execution of an action rather than its selection. It is one thing to explain how we select catching the ball over other possible courses of action, but quite another to explain how we actually catch it. The proposal is that affordance perception also underwrites our ability to successfully implement our selected actions. Whether this proposal is correct is an open question, with many advocates of affordances objecting that affordance perception is ill-suited to this action-guiding role (Clark 2001; Matthen 2005). This is not to say that action execution is not perceptually guided: our catching of the ball is clearly guided by what we perceive. The worry is that it is not perception of the ball's affordances that performs this guiding role. After all, seeing the ball *as catchable* does not seem to tell us anything about how fast to run, when to reach out our arm, what grasp to use etc. (Fajen 2005). If it does transpire, however, that perception of bodily affordances performs this action-guiding role, we should expect perception of mental affordances to do the same. Some of the examples I have introduced might be understood in such terms. In the stepping-stone case, once I have decided to imagine my route the details of what I imagine are determined by what I see: perhaps the first stone affords the imagining of a particular first step, the second stone affords the imagining of a particular second step etc. The counting case could be cashed out in similar terms. If such an account could be made to work, it would provide an interesting picture of how we implement mental actions.

Mental affordances also have ramifications for a variety of more philosophical questions. Our sensitivity to mental affordances is relevant to debates surrounding the nature and scope of mental

agency. Conservative views of mental agency seem to be motivated by the observation that putative mental actions rarely begin with an explicit intention to act. The concept of mental affordances might help us to replace the model of mental actions as intentionally initiated with a model on which we intentionally control mental processes that are initially triggered automatically. Drawing on Matthen, we might also put affordances to work in epistemology, especially with respect to how we use sensory cues to make inferences about perceived items. And drawing on Metzinger, we might use affordances to shed light on mental actions that are directed toward our inner environment rather than the external world.[11]

There are also interesting questions to be asked about how exactly our sensitivity to mental affordances works. How, for example, is the perception of mental affordances and the potentiation of mental action neurally implemented? In what ways does this differ from the neural processes responsible for our sensitivity to bodily affordances? One difference between bodily and mental affordances is that the latter typically come cheaper: an object must have very specific physical properties to be grippable but *any* object in the perceptual field is a possible target of imaginative action. This suggests that our sensitivity to mental affordances needs to be more selective, making us aware of a few potentially useful opportunities for imagination but not every such opportunity. And how, if at all, do the neural processes that underwrite our sensitivity to mental affordances interact with their counterparts for bodily action? Is there one system for bodily action and another for mental action or are they more integrated? One consideration that points to a degree of integration is that action selection sometimes involves picking *between* a bodily and a mental action: we can check whether we have loaded all our luggage into the car either by performing the bodily act of going back into the house to look for leftover bags or the mental act of recalling loading each item into the car (Pezzulo 2018).

Mental action is an important, and too-often neglected, target of philosophical and psychological enquiry. MAH proposes that mental affordances have an important role to play in mental action and the mental affordance research program promises to uncover exactly how that role is performed.[12]

[11] The possibility of internal mental affordances raises the question of whether we can be sensitive to such affordances in a manner that's relevantly similar to our sensitivity to bodily affordances. Although we cannot perceive our own inner states, perhaps there is a quasi-perceptual awareness of internal mental affordances that is relevantly similar. This will be worth exploring in the future.

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