***Abstract***

Predictive approaches to the mind claim that perception, cognition, and action can be understood in terms of a single framework: a hierarchy of Bayesian models employing the computational strategy of predictive coding. Proponents of this view disagree, however, over the extent to which perception is *direct* on the predictive approach. I argue that we can resolve these disagreements by identifying three distinct notions of perceptual directness: psychological, metaphysical, and epistemological. I propose that perception is plausibly construed as psychologically indirect on the predictive approach, in the sense of being constructivist or inferential. It would be wrong to conclude from this, however, that perception is therefore indirect in a metaphysical or epistemological sense on the predictive approach. In the metaphysical case, claims about the inferential properties of constructivist perceptual mechanisms are consistent with both direct and indirect solutions to the metaphysical problem of perception (e.g. naïve realism, representationalism, sense datum theory). In the epistemological case, claims about the inferential properties of constructivist perceptual mechanisms are consistent with both direct and indirect approaches to the justification of perceptual belief. In this paper, I demonstrate how proponents of the predictive approach have conflated these distinct notions of perceptual directness and indirectness, and I propose alternative strategies for developing the philosophical consequences of the approach.

**1. Introduction**

*1.1 Perception and prediction*

The idea that the mind works by *predicting* is rapidly gaining currency in philosophy of mind.[[1]](#footnote-1) The most well-known version of this predictive approach combines a Bayesian model of perception and cognition with ‘predictive coding’, a data-compression strategy used by neuroscientists to model how the brain allocates resources to novel information. [[2]](#footnote-2) In philosophy, the notion of the predictive mind has been proposed as a way to unify perception, cognition, and action. The philosophical implications of the predictive approach, however, are far from clear. In this paper, I focus on a particular area of disagreement between its proponents, concerning the *directness of perception* on the predictive approach.

The two main proponents of the predictive approach in philosophy, Andy Clark and Jakob Hohwy, discuss the directness of perception at several points in their work without reaching any clear conclusions. In this paper, I will show that the confusion stems from a failure to distinguish between three senses in which perception can be said to be direct or indirect: a psychological sense, a metaphysical sense, and an epistemological sense. I will argue that a persuasive case can be made that perception is psychologically indirect if we take the predictive approach to perception. Proponents of the predictive approach appear to extend this psychological indirectness to metaphysical or epistemological notions of indirectness, drawing conclusions about the objects of perceptual experience, for example, and about the justification of perceptual beliefs. I argue that there is no straightforward entailment from psychological indirectness to either metaphysical or epistemological indirectness. The predictive approach to the psychological mechanisms of perception is consistent with both direct and indirect theories of the metaphysics and epistemology of perception.

In this remainder of this introduction, I’ll give an overview of what I’m calling the ‘predictive approach’ to the mind, and highlight some of the claims that have been made regarding its implications for the various kinds of perceptual directness. Then, in Section 2, I’ll introduce the distinction between direct and indirect perception in psychology, which maps onto the distinction between ecological and constructivist theories of perceptual information. These theories offer rival accounts of the causal mechanisms which enable sensory inputs to become perceptual states, and I suggest that proponents of the predictive approach are largely correct in classifying their theories as constructivist, and therefore indirect. In Section 3, I show how metaphysically direct and indirect theories of perception (e.g. naïve realism, representationalism, sense-datum theories) arise as answers to a distinct problem of perception. I argue that when proponents of the predictive approach draw conclusions about the metaphysical indirectness of perception from its psychological indirectness, they require further argumentation to justify this move. Section 4 concerns the distinction between epistemologically indirect perception and epistemologically direct perception, and its reliance on a distinction between inferential and non-inferential processes. I argue that the perceptual inferences posited by the predictive approach to perception do not necessarily play the epistemic role suggested by the approach’s proponents: perceptual beliefs can be epistemologically direct despite being produced by mechanisms which are psychologically indirect. I conclude in Section 5 that the psychological indirectness of perception does not, without further argument, have any straightforward consequences for its metaphysical or epistemological directness. Proponents of the predictive approach to perception who want to argue that their approach has implications for the metaphysics or epistemology of perception should start by distinguishing these different senses of perceptual directness. I show that drawing these distinctions enables us to see what further argumentation would be required to justify the claim that the predictive approach to perceptual psychology has more widespread philosophical implications.

*1.2 Overview of the predictive approach*

As I use the term ‘the predictive approach’, it refers to a set of theoretical commitments that go by a variety of names, including ‘the hierarchical predictive processing perspective’ (Clark 2013b) and the ‘the prediction error minimization framework’ (Hohwy 2013). There are two key ideas behind the predictive approach. The first of these is that the brain is Bayesian: it generates hypotheses or expectations about the world and updates these in light of new evidence, roughly in accordance with Bayes’ Rule. Bayes’ Rule states that the probability of a hypothesis, given the evidence, is updated by considering the product of the likelihood (the probability of the evidence given the hypothesis) and the prior probability of the hypothesis. In the case of visual perception, for example, the claim is that my visual system expects a certain kind of object in the environment to result in a certain kind of retinal stimulus for me, and it generates a hypothesis to this effect. This hypothesis will be checked against my retinal data and my brain will calculate out how likely the hypothesis is, given the retinal data. This likelihood, multiplied by the prior probability of the hypothesis, yields the posterior probability. The hypothesis with the highest posterior probability will determine what I perceive.

This is an oversimplified example, because in fact the predictive approach posits many hypothesis-testing models, arranged hierarchically. Hypotheses correspond to the parameters of each model, and can be understood as representations of the world in the form of probability functions. Hypotheses higher up in the hierarchy act as Bayesian priors for lower-level processes: each level tries to predict the input to the level below, and the discrepancies between the generated prediction and the actual input can be used to update the hypothesis. Importantly, the predictive approach adopts an empirical Bayes method: the priors are estimated from the data rather than fixed pre-observation, so they are shaped over time from the sensory data. This allows the predictive approach to account for priors without circularity, because the hypotheses determining perceptual experience are not themselves based directly on perceptual experiences but extracted indirectly from higher-level hypotheses.[[3]](#footnote-3)

The predictive approach combines these Bayesian hierarchical processes with the second key element of the approach: the computational framework of predictive coding. Predictive coding is an approach to data-compression developed by computer scientists to maximise the efficiency of an information system. To ensure that a system doesn’t encode any more information than it needs, a system can use its existing information to predict its inputs. Then, instead of having to process all the inputs it receives, the system only needs to process those inputs that it didn’t predict. This means that the system’s resources can be focused on unexpected or novel inputs.

Proponents of the predictive approach to the mind propose that the brain uses a predictive coding strategy so it needn’t process all of the information that our sense organs receive. Instead it predicts (on the basis of the probable environmental causes) what information will reach our senses and then only processes the unexpected information. This adds an important element to otherwise standard Bayesian approaches to perception and cognition: the brain doesn’t first process all the sensory inputs, then form hypotheses about what causes them; instead it hypothesises about the probable causes, and checks its predictions against the sensory input. Only the discrepancies between the predictions and the inputs are encoded and processed by the brain.

While scientific work on the predictive approach to the mind has raised a number of interesting philosophical questions, my focus in this paper concerns the supposed implications of the predictive approach for the directness or indirectness of perception.

*1.3 The predictive approach and perceptual directness*

Proponents of the predictive approach have considered whether the predictive approach has implications for the directness or indirectness of perception, but without defining or clarifying what they mean by referring to perception as ‘direct’ in the first place. The predictive approach to perception is first and foremost a scientific claim about the causal mechanisms that generate perceptual states from the sensory stimuli, so an obvious place to start is the distinction between direct (ecological) and indirect (constructivist) theories in the psychology of perception. Proponents of the predictive approach, including Clark (2013b) and Hohwy (2013), often describe the approach as an extension of Helmholtz’s (1878) constructivist theory of perception. Constructivist theories of perception are contrasted with ecological theories of the perception, like that of Gibson (1950, 1979). Within the psychology of perception, ecological theories are considered direct, whereas constructivist theories are indirect.

This psychological distinction between direct and indirect perceptual theories differs from the metaphysical distinction between direct and indirect perceptual experience. The latter is a claim about the objects of perception: whether we perceive the world immediately (as in naïve realism, for example) or via an intermediary (e.g. a sense-datum). Proponents of the predictive approach tend to deny that perception is metaphysically direct. Hohwy, for example, seems to endorse a sense-data theory, claiming that “perception is indirect […] what we perceive is the brain’s best hypothesis” (Hohwy 2007, 322). Clark rejects this view and considers the naïve realist approach, before coming to the confusing conclusion that “the implied metaphysical perspective may most safely be dubbed ‘not-indirect perception.’” (Clark 2013a, 493).

At least some of the discussions of perceptual directness and the predictive approach, however, are more concerned with epistemological questions than metaphysical or psychological questions. Perceptual knowledge or beliefs can be understood as direct to the extent that they are non-inferentially justified, and indirect to the extent that they are inferentially justified. Both Clark and Hohwy consider the possibility that the predictive approach results in a ‘veil of perception’ that prevents direct epistemic access to the world, such that the perceiver can only have non-inferential justification at best for their perceptual beliefs. Clark (2013a) rejects this view in the end, but Hohwy (2013, 2014) takes seriously the claim the perception is indirect in the sense that external states of affairs might “remain hidden behind the veil of sensory input and can only be inferred” (Hohwy 2013, 50).

Throughout these discussions of perceptual directness and indirectness, the proponents of the predictive approach never consider that there might be different kinds (psychological, metaphysical, epistemological) of directness and indirectness involved. They acknowledge that there is a lack of clarity about the notions of directness and indirectness at play, but don’t explore the matter further. Clark concludes that the directness or indirectness of perception on the predictive approach is a “delicate issue” which he will not attempt to adjudicate (Clark 2013a, 493), while Hohwy claims that “the notions of ‘direct’ and ‘indirect’ are not very clear and unambiguous when applied to the way the mind relates to the world” (Hohwy 2013, 227-228). Hohwy even suggests avoiding the direct/indirect dichotomy entirely:

“It is thus not satisfactory to claim that the perceptual relation is direct, nor to claim it is indirect. The right response to this situation is not to force a choice between them but to try to reconceive the perceptual relation to the world such that we do not have to choose between perception being ‘direct’ or ‘indirect’ in the first place.” (Hohwy 2013, 228)

My aim in this paper is to show, *contra* Hohwy, that we can and should make the decision between direct and indirect perception. But while my approach goes against the letter of Hohwy’s proposal, I think it retains his spirit. I propose that what he calls ‘the perceptual relation to the world’ should be reconceived as three distinct perceptual relations, each of which can be classified as direct or indirect: a causal (psychological) relation between sensory stimuli and perceptual states; a metaphysical relation between the perceptual experience and its objects; and an epistemological relation between our perceptual beliefs and the external world. In what follows, I will explore each of these perceptual relations in turn.

**2. Psychological theories of perception and the predictive approach**

*2.1 Psychological theories of perception*

The psychology of visual perception has been dominated over the past fifty years by two broad approaches to perception: constructivist and ecological theories.[[4]](#footnote-4) The fundamental difference between the two approaches lies in their treatment of the ‘inverse problem’ in optics. It is widely known that the data on our retina are compatible with a number of distinct percepts: one pattern of retinal data could be caused by two objects of different sizes at the same distance from us, for example, or by two objects of the same size at different distances from us. Given that we perceive just one scenario in each case, it seems that the visual system must have some way of solving this underdetermination problem.

Constructivist theories of perception aim to describe the processes that construct the underspecified perceptual state from the retinal data: the visual system takes the retinal data and attempts to figure out which of several possible scenes could be causing it. There must be some sense in which the brain has existing information about what might be producing the retinal data, which it brings to bear on the task. Using this information, the visual system then figures out which of the possible environmental configurations is actually causing the stimulus. Helmholtz (1878) was the first to propose a constructivist theory of visual perception, and he characterised the processes involved as ‘unconscious inference’. Helmholtz claimed that when presented with the sensory input, the brain uses stored information about the world to perform inferences to establish the most probable cause of that sensory input. He maintained that “while in these cases no actual conscious inference is present, yet the essential and original office of an inference has been performed” (1878). While Helmholtz thought that associative processes grounded perceptual inferences, contemporary constructivists propose that the mechanisms of perceptual inference are computational processes.

Constructivist theories of perception can be contrasted with ecological theories of perception. Most notably associated with Gibson (1967, 1979), ecological theorists deny that visual sensory input is restricted to static data on the retina: sensory input includes retinal flow, the way the ambient light array changes with movement. As the perceiver moves around their environment, some aspects of the light array change while others stay constant; these invariances specify the scene for the perceiver, providing the patterns which they can detect or extract by interacting with the environment. Ecological theorists propose that there is enough information in the light array of an active perceiver to provide all the features found in perception: shape and size of objects, depth of field, etc. These are precisely the features that constructivists think must be inferred. Ecological theorists argue that the motivation for positing such inferences is lost once we understand the sensory stimuli correctly: the visual system does not need to infer the cause of the stimuli because the stimuli, considered correctly, contain enough information about their cause.

The key difference between constructivist and ecological approaches to the psychology of perception thus hangs on their attitude towards *perceptual* *inference*: constructivists claim, and ecological theorists deny, that perceptual processes are inferential. If this distinction is to be a useful one, there must be a concept of inference which can be correctly applied to some theories of perceptual mechanisms and not to others. Specifying such a concept has proved difficult: the standard philosophical literature on inference concentrates on person-level, conscious, and voluntary reasoning processes that operate over belief states (Harman 1986, Boghossian 2014). While it is possible to argue that perceptual processes are reasoning-like and that perceptual states are belief-like, the processes leading from sensory input to perception are mostly non-conscious and involuntary: they are often attributed to a person’s perceptual subsystems rather than to the person. So if perceptual psychologists are using this standard philosophical account of inference to describe perceptual mechanisms, it follows that their usage can’t be a literal one.

Some supposedly constructivist approaches to perceptual psychology clearly are using the term ‘inference’ metaphorically or instrumentally (Hatfield 2002, 120).[[5]](#footnote-5) But many constructivist theories intend to offer an account of perceptual processing that is literally inferential. These theories rely on being able to specify a notion of inference which can be accurately applied to unconscious and automated processes. This is often done by appeal to computation: inferences are rule-based computational transitions between informational states (Hatfield 2002), where the rules in question conform to the logic of thought (Mandelbaum 2016). This characterisation of inference arguably allows us to distinguish between perceptual processes which are genuinely inferential (i.e. constructivist) and those which are non-inferential (i.e. ecological).

*2.2 Directness and the psychology of perception*

The practise of distinguishing between direct and indirect psychological theories of perception dates back to Gibson’s (1967) introduction of his ecological theory of perception, when Gibson proposed that constructivist theories of perception were indirect in a sense that his ecological model was not. While there are several respects in which ecological theories differ from constructivist theories, the directness of the ecological theory comes down to the way the stimulus is processed (Egan 1998). Gibson claims that in contrast to constructivist theories, on which stimuli are mediated by inferential processes over internal representations, his own ecological theory provides “direct or immediate awareness of objects and events when the perceptual system resonates so as to pick up information” (1967, 168). Gibson allows, of course, that there are causal processes between the stimuli and the percept; his notion of directness is intended “to exclude an extra process of inference or construction” (Gibson 1979, 149).

The psychological directness or indirectness of a perceptual theory therefore rests on whether the processes involved are genuinely inferential. I will argue, however, that the close relationship between indirectness and inference in perceptual psychology does not carry over to discussions of indirectness and inference elsewhere, particularly in epistemology.

*2.3 The predictive approach and psychological directness*

Given this distinction between psychologically direct and indirect theories of perception, we can ask where the predictive approach fits in. Proponents of the predictive approach tend to assume that theirs is a constructivist approach to perception, which would make it psychologically indirect. They often explicitly liken the predictive approach to Helmholtz’s constructivist approach: Hohwy notes that all contemporary formulations of the predictive approach have Helmholtz’s idea of “the brain as hypothesis-tester” at their core (Hohwy 2013, 5); Clark claims that predictive approaches take the key idea “that sensory systems are in the tricky business of inferring sensory causes from their bodily effects” (Clark 2013b) from Helmholtz. Proponents of the predictive approach accept that the sensory input itself is insufficient to generate perceptual states, and thus that the visual system uses stored information about the world to infer the causes of the retinal data. Their talk of hypothesis-testing and inferring, and their explicit comparisons to Helmholtz’s constructivist view, suggest that the predictive approach to perception is generally understood as indirect in the psychological sense discussed above.[[6]](#footnote-6)

It is possible that proponents of the predictive approach understand their commitment to inference as an instrumental one: a useful way of talking which doesn’t claim that perceptual processes are literally performing genuine inferences. There is precedent for such instrumentalism in other Bayesian approaches to perception: as Colombo and Series (2012) demonstrate, some Bayesian approaches to perceptual processes are not claiming that the mechanisms of perception implement hypothesis-testing machinery, but only that data concerning perceptual processing can be predicted and systematized by using the formal tools of Bayesian analysis. These approaches are compatible with both constructivist and ecological theories of perceptual psychology, in so far as they remain neutral about the underlying mechanisms.[[7]](#footnote-7)

I will assume, however, that proponents of the predictive approach to perceptual psychology are not merely claiming that psychological data can be predicted and simulated by Bayesian mathematics. Following Kiefer (2017), I will take such theories at face value: as committed to the view that perceptual representations are literally the conclusions of Bayesian inferences which take sensory representations and background knowledge as premises.[[8]](#footnote-8) Such an interpretation gives proponents of the predictive approach a stronger case for extending their claims about the psychological indirectness of perception to metaphysical and epistemological domains: if perception is genuinely (rather than merely instrumentally) inferential, then it seems more plausible that these inferences will have implications for theories of representation, rationality, justification, and so on. I will argue that even on the strongest interpretation of the predictive approach, its psychological indirectness does not entail that it is metaphysically or epistemically indirect.

**3. Metaphysical theories of perception and the predictive approach**

*3.1 The metaphysics of perception*

The previous section concerned the psychological mechanisms responsible for perception: constructivist and ecological theories propose different kinds of causal mechanisms in response to the supposed inverse problem of optics. Call this the ‘informational problem of perception’: it concerns how sensory input information becomes perceptual information. Metaphysical theories of perception, however, are traditionally understood as responses to a distinct problem. The ‘metaphysical problem of perception’ starts from the intuition that the world is presented to us immediately from an experiential perspective: when we open our eyes in normal lighting conditions, physical objects in the external world seem to appear to us. In cases of illusion and hallucination, however, there is no appropriate physical object which could be the immediate object of our experience. The metaphysical problem of perception concerns how to think about the objects of perception, and the relation between the objects and the perceiver, in a way that does justice to our veridical experiences while accounting for our non-veridical experiences. As I’ll briefly outline below, the major metaphysical theories of perception – naïve realism, representationalism, and sense-datum theory – can be understood as responses to this challenge.[[9]](#footnote-9)

The naïve realist proposes that the world itself is the object of perception: my veridical experience fundamentally consists in my perceiving physical entities in the world.[[10]](#footnote-10) In veridical perceptual experience, therefore, physical objects and their properties in the world constitute our experience. In non-veridical experiences, however, the physical objects and their properties are not how they are experienced to be, and so cannot constitute our experience. This suggests to the naïve realist that the non-veridical perceptual experience is a different *kind* of perceptual experience from the veridical perceptual experience (even if the perceiver can’t tell the two experiences apart). This ‘metaphysical disjunctivism’ saddles the naïve realist with a counterintuitive claim about the metaphysical individuation of perceptual states, but allows that our veridical experiences are genuinely world-involving.

The representationalist claims that perceptual experience fundamentally consists in my representing the world as being a certain way. Veridical and non-veridical cases of perceptual experience can be classed as the same kind of perceptual state in virtue of representing the world the same way, where the difference is merely in whether the world meets the correctness conditions of the experience: non-veridical cases involve misrepresentation. Importantly, the representationalist is not generally claiming that we perceive a representation of the world, but rather that we perceive the world itself by representing it in experience. In the veridical case, therefore, the representationalist can be a metaphysical realist who allows that we are causally connected to the world of physical objects. But these objects cannot *constitute* the perceptual experience, if experiences are being individuated by their representational content, and so this realism differs from the naïve realism outlined above.

The sense-datum theorist claims that perceptual experience fundamentally consists in my perceiving internal mental entities or ‘sense-data’. Veridical and non-veridical cases of perceptual experience can be classed as the same kind of perceptual state in virtue of having the same sense datum as their object. In the veridical case, the external world corresponds to the sense datum; in the non-veridical case, it doesn’t. But even in the veridical case, the object of perceptual experience is the internal mental object rather than the world itself.

How do these answers to the metaphysical problem of perception relate to the answers given to the informational problem of perception studied by perceptual psychologists? This will depend on more general considerations regarding the relation between metaphysical claims and scientific claims. Traditional approaches to metaphysics often emphasise the independence of metaphysics from scientific concerns, sometimes on the grounds that metaphysics deals in essential natures while science provides only contingent facts, or on the assumption that only metaphysics tells us about constitution while science tells us only about causes. Traditional methodologies in the metaphysics of perception focus on the role played by reflection on the phenomenal properties of first-person experience, for example, or by transcendental arguments concerning the role that perception must play.[[11]](#footnote-11) On such approaches, it is difficult to see how any scientific claims about perceptual psychology could entail substantive metaphysical facts about the nature of perception.

On the other hand, if one holds a naturalistic approach to metaphysics, then scientific facts are deemed relevant to the metaphysical conclusions we draw. Metaphysical naturalists propose that metaphysics can be informed (to a greater or lesser extent) by successful scientific theories.[[12]](#footnote-12) They tend to play down appeals to *a priori* reflection and modal intuitions in favour of empirical data. But notice that metaphysical naturalism alone does not entail that we can ‘read off’ metaphysical facts about (say) representationalism from scientific theories like (say) constructivism in perceptual psychology. Questions remain about how the resulting metaphysical position follows from the scientific claims: are scientific claims about laws of nature being used to derive claims about nomological necessity, or is nomological necessity being taken as basic and prior to scientific laws, for example?[[13]](#footnote-13) Are natural kinds being used as a guide to nomological necessity, or vice versa?[[14]](#footnote-14)

Applied to the metaphysics of perception, this suggests that while naturalist approaches to perceptual metaphysics can draw on psychological theories of perceptual mechanisms, they still owe us a further story about the relation between the two. If constructivism is correct in its claim that perception is the result of inferential processes, for example, this alone does not entail that perceptual experience represents the world. These are the sorts of issues that one would have to address to justify making metaphysical claims on the basis of the scientific data.

*3.2 Directness and the metaphysics of perception*

The metaphysical distinction between direct and indirect perception is a much older distinction than the distinction between direct (ecological) theories and indirect (constructivist) theories in the psychology of perception. Where the latter distinguishes the kinds of causal mechanisms responsible for perception, the former concerns the role of the physical world in perceptual experience. Theories which claim that the world itself is the immediate object of perceptual experience, such as naïve realism, are metaphysically direct theories of perception. Theories which claim that the world itself is only perceived indirectly, because the immediate or direct objects of perception are mental objects (sense-data) are metaphysically indirect theories of perception.

Representationalism is usually considered a metaphysically direct theory of perception on the grounds that when we represent the world veridically in perception, we perceive worldly objects rather than mental objects. But if we focus on the distinction between representational realism and naïve realism, it can be argued that naïve realism is metaphysically direct in a way that representationalism is not (Fish 2004). Recall that the naïve realist can claim that veridical perception is essentially ‘world-involving’ because the worldly objects of veridical perception *constitute* perceptual experience. For the representationalist, the worldly objects of perception can’t constitute the perceptual experience, because the same representational perceptual state can occur without the worldly objects being present. Philosophers such as McDowell take this to indicate that representationalism has more in common with indirect than direct perception, metaphysically considered: the similarities between sense-data theories and representationalist theories are “much more significant than the difference between them” (McDowell 1998, 244).

I’ll argue that however we construe the distinction between metaphysically direct and metaphysically indirect, there is no straightforward move to be made from psychological indirectness to metaphysical indirectness.

*3.3 The predictive approach and metaphysical directness*

Much of the scientific work on predictive perceptual processes is wholly focused on the causal mechanisms responsible for perception. But the more philosophical proponents of the predictive approach explore where the predictive approach fits into the traditional metaphysical debates about theories of perception. Hohwy (2007), for example, suggests at one point that the predictive approach supports a sense-data theory of perception; Clark (2012) considers the idea that the predictive approach supports the world-involving view of the naïve realist. It’s not always clear what grounds these metaphysical speculations, but this is an issue to which I will return. In the meantime, it is interesting to notice the divergence of their metaphysical claims concerning the nature of perception.

Hohwy argues that the predictive approach entails that perception is not just psychologically indirect but also metaphysically indirect. His first attempt to cash this out suggests that he thinks of metaphysical indirectness in terms of sense-data: perception is indirect when its immediate objects are mental objects, with the world being perceived only via these mental objects.

“One important and, probably, unfashionable thing that this theory tells us about the mind is that perception is indirect […] what we perceive is the brain’s best hypothesis, as embodied in a high-level generative model, about the causes in the outer world.” (Hohwy 2007, 322)

In more recent work, Hohwy seems to retract the sense-data claim, acknowledging that “[p]erception is of course not indirect in the sense that there is an inner representation somehow emblazoned on a mental screen observed by some homunculus” (Hohwy 2013, 48). But he remains committed to the idea that the predictive approach yields some metaphysical form of indirectness, in the sense that there are internal models “interspersed” between the perceiver and the world which imply that “perception must be at one remove from the world” (Hohwy 2013, 48).

Clark, however, rejects the sense-data interpretation of the predictive approach from the start.

“There is no sense, even assuming the prediction-driven account is accepted, in which what we perceive is the brain’s best hypothesis. Instead, what we perceive is the world, as (hopefully) revealed by the best hypothesis. Nor is there any sense in which the objects of perception are here being treated as anything like Moorean ‘sense data’, where these are conceived as proxies intervening between the perceiver and the world.” (Clark 2013a, 492)

This suggests that Clark is thinking of perception as metaphysically direct on the predictive approach, in the sense that the objects of perception are the physical world and its properties, rather than mental objects. And at some points, Clark even seems to be suggesting that the predictive approach might be metaphysically direct in the McDowellian sense of being ‘world-involving’:

“the account on offer shares as much (or so it seems to me) with direct as with indirect views of perception, for it delivers a genuine form—perhaps the only genuine form that is naturally possible—of ‘openness to the world.’” (Clark 2013a, 492)

When Clark introduces this idea of ‘openness to the world’, he clearly has in mind the naïve realist’s claim that the world itself can constitute our perceptual experience. He cites McDowell (1986) and Putnam (1999) as proponents of such a view, who offer “an account of inescapably world-involving relations and interactions” (Clark 2012, 765). Clark proposes that the predictive approach to perception is not only consistent with such world-involving views of perception, but that it can in fact support naïve realism by providing the mechanism whereby “beings like us are able to achieve genuine access to the causal structure of our environment” (Clark 2012, 767).

But despite his claims about the world-involving nature of perception, we cannot consistently interpret Clark as pushing the naïve realist view. Shortly after proclaiming perceptual experience to be “directly world-revealing” (Clark 2012, 755) on the predictive approach, Clark rejects metaphysical disjunctivism on the grounds that he is not prepared to pay the “well-known cost” of such approaches, i.e. denying that veridical and non-veridical experiences are the same kind of perceptual state (Clark 2012, 763). Furthermore, Clark is reluctant to commit himself to any claim that perception is metaphysically direct on the predictive approach, instead hedging with the statement that “the implied metaphysical perspective may most safely be dubbed ‘not-indirect perception’” (Clark 2013a, 493).

What should we make of these diverging claims about the implications of the predictive approach for the metaphysical debate over the nature of perceptual experience? One thing to notice is that neither Clark nor Hohwy explains how they arrive at their metaphysical conclusions. Neither mentions whether their methodology involves *a priori* reflection or transcendental arguments, and it is more likely (given that both Clark and Hohwy take a naturalistic approach to philosophy in general) that they are adopting the sort of naturalistic metaphysics introduced above. Neither of them makes any distinction between the scientific conclusions they associate with the predictive approach (e.g. regarding cortical hierarchies and data compression strategies) and their metaphysical conclusions regarding perceiver-world relations. But even where scientific theories are informing metaphysical claims, the latter cannot be simply ‘read off’ the former. If there were such a process, then we would not find Clark and Hohwy agreeing on the constructivist solution to the informational problem of perception while disagreeing on how to answer the metaphysical problem of perception. Even if they are merely using the same process of inference to the best explanation that yielded their predictive approach to perceptual psychology, they are clearly drawing different conclusions from their reasoning.[[15]](#footnote-15) [[16]](#footnote-16)

If predictive theories of perceptual psychology support a particular metaphysical approach to perception, this support must be established by argumentation that has yet to be provided. There is therefore no direct entailment from psychologically indirect theories of perception to metaphysically indirect theories of perception.

**4. Epistemological theories of perception and the predictive approach**

*4.1 The epistemology of perception*

The nature of our perceptual knowledge of the world has traditionally been closely tied to metaphysical theories about the objects of perception. Sense-datum theories, for example, are often claimed to give rise to an epistemic ‘veil of perception’: if the immediate objects of perceptual experience are mental objects, then how can we get beyond this veil of mental objects to have epistemic access to the physical world? The worry is not necessarily that sense-datum theories prevent us from having knowledge of the physical world *tout court*, but rather that our beliefs about the world can’t be justified on the immediate basis of our perceptual experience. They may, however, still be justified by our background beliefs or by inference to the best explanation.

Representationalist and naïve realist views of perception allow that the immediate objects of perception are, in the veridical case, physical objects and their properties in the world. Such views avoid the ‘veil of perception’ worry, because they permit us to form justified perceptual beliefs about the world without having to rely on further inference. One might argue that the naïve realist can claim to have a stronger epistemic case, on the grounds that the perceptual experience justifying perceptual belief is actually constituted by the physical world on their view. Thus the metaphysical disjunctivism of the naïve realist view can be argued to yield an epistemological disjunctivism: in the veridical case, the perceiver has a form of justification that they lack in the non-veridical case, in virtue of being in a different kind of perceptual state.[[17]](#footnote-17) Both the naïve realist and the representationalist allow that veridical and non-veridical experiences can be subjectively indistinguishable to the perceiver: people who adopt epistemological disjunctivism claim that such experiences can play different justificatory roles despite their introspective sameness.

*4.2 Directness and the epistemology of perception*

There is a notion of perceptual directness and indirectness associated with the epistemology of perception that is distinct from both psychological and metaphysical notions of directness and indirectness. The epistemological notion of direct perception concerns our perceptual beliefs about the world, and specifically their justification: the claim is that our perceptual beliefs about the world are direct when they are non-inferentially justified, and indirect when they are inferentially justified. To say that a belief is inferentially justified is just to say that its justification is constituted (at least in part) by having other justified beliefs. Non-inferentially justified beliefs are justified by states which are not themselves subject to justification (‘unjustified justifiers’): candidates include experience and kinds of intuition. To say a perceptual belief is direct, therefore, is to say that it is justified in some way other than by inference from other beliefs.[[18]](#footnote-18)

According to this epistemic distinction between direct and indirect perceptual beliefs, the naïve realist and the representationalist are usually interpreted as claiming that perceptual experience itself non-inferentially justifies our perceptual beliefs, and thus that our perceptual knowledge of the external world is epistemologically direct.[[19]](#footnote-19) Sense-datum theories of perception, on the other hand, are generally understood to be epistemologically indirect, because perceptual beliefs about the physical world must be justified by further inferences.

Despite this long-standing association between metaphysically indirect theories of perceptual experience and epistemologically indirect theories of perceptual beliefs (e.g. the claim that sense-datum theories result only in inferential perceptual knowledge of the world), there is no logical connection between metaphysical and epistemological approaches to directness and indirectness. Epistemological directness is compatible with any metaphysical view, direct or indirect, of the nature of perception. As Lyons points out, even a sense-datum theorist can have direct knowledge of the external world, provided that the inference from sense-data to external objects is one which “does not impose evidential requirements on the conclusion belief” (Lyons 2016). His point is that not all inferences play an epistemic role: if we assume that beliefs are justified by evidence, for example, and that evidence must be accessible to the believer, then only inferences to which the believer has conscious access can play a justificatory role. If perceptual beliefs are the result of unconscious inferential processes, therefore, the resulting beliefs wouldn’t necessarily be epistemically indirect.

This is an important point, given our focus on inferential processing in perceptual psychology. The fact that perception is the result of inferential processes does not require that those inferences provide evidence for the perceptual state. On the assumption that we cannot consciously access these perceptual inferences or the representational states over which they operate, we have no reason to think that they provide evidence to justify the perceptual state.[[20]](#footnote-20) The perceptual state can still count as non-inferentially justified, and thus provide direct perceptual knowledge of the world.[[21]](#footnote-21) And while the representations involved in perceptual inference have to be sufficiently belief-like in order for the process to count as inferential, this does not entail that they come with all the epistemological trappings of belief.[[22]](#footnote-22) As Fodor points out, computational approaches to perceptual psychology offer accounts that are inferential and representational, but where these concepts should not be assumed to have epistemological commitments:

“the sort of RTPs [representational theories of perception] that cognitive scientists endorse have shed a feature that traditional versions of the doctrine, rationalist and empiricist, invariably took for granted: that RTPs must provide not just a psychology of perception but an epistemology, too” (Fodor 2000, 21).

*4.3 The predictive approach and epistemological directness*

I have been allowing that the predictive approach posits genuinely inferential perceptual mechanisms. As I argue above, however, not all inferences are epistemically equal: some inferences play an evidential or justificatory role, while others need not. Clark and Hohwy, however, seem to move directly from claims about the psychological indirectness of the predictive approach to claims about its epistemological indirectness.

Both Clark and Hohwy consider whether the predictive approach results in a ‘veil of perception’ that prevents the perceiver from having epistemic access to the physical world: Clark acknowledges that the predictive approach prompts “fears of losing the world behind a “veil of perception”” (Clark 2013a, 488), while Hohwy suggests that external states of affairs “remain hidden behind the veil of sensory input and can only be inferred” on the predictive approach (Hohwy 2013, 50).

Clark eventually rejects the epistemological worries associated with inference and veils of perception, but Hohwy takes them more seriously. Hohwy thinks that the predictive approach posits an “evidentiary boundary” between the mind and the world, because “it forces a clear distinction between internal states, where the prediction error minimization occurs, and hidden causes on the other side of the boundary, which must be inferred” (Hohwy 2014). But inferential processes can only give rise to an evidentiary boundary if those inferential processes impose evidential requirements in the first place. And as we have already seen, this does not fall immediately out of an inferential account of perceptual processing.[[23]](#footnote-23)

In addition to drawing conclusions about epistemological indirectness from psychological indirectness, Hohwy also draws conclusions about epistemological indirectness from his metaphysical claims. Having rejected naïve realism, he takes his assumption that one can be in the same kind of perceptual state in both veridical and non-veridical conditions to entail scepticism, by “decoupling the brain from the body and the environment in an epistemic sense” (2014):

“The brain doing the inference is secluded at least in the sense that certain kinds of doubt about the occurrence of the evidence are unanswerable without further, independent evidence. […] Bayesian framework thus entails skepticism.” (Hohwy 2014)

But this brand of Cartesian scepticism, whether motivated by Descartes’ evil demon or by the more contemporary ‘brain in a vat’ formulation, seems to provide a *prima facie* challenge to the justification of our perceptual beliefs on *any* theory of perception: it is not particular to the predictive approach.[[24]](#footnote-24) Hohwy seems to suggest that the usual responses to the Cartesian sceptic are not available to proponents of the predictive approach, because the predictive approach is internalist. But the kinds of externalism that are used to respond to the sceptic (broad perceptual content, justification which is not *a priori* accessible, knowing as a factive mental state, for example) are compatible with the predictive approach.[[25]](#footnote-25)

**5. Conclusion**

Faced with questions about the directness or indirectness of perception, proponents of the predictive approach have a confused and unsatisfying response. We find Clark concluding that the predictive approach “shares as much […] with direct as with indirect views of perception” (Clark 2013a, 492), and Hohwy cautioning that it is “not satisfactory to claim that the perceptual relation is direct, nor to claim it is indirect” (Hohwy 2013, 228). I have argued that this position can be improved upon by paying closer attention to the distinct varieties of perceptual directness under discussion: psychological, metaphysical, and epistemological.

The predictive approach to perception is a scientific theory of perceptual mechanisms, which builds on the psychological work of Helmholtz. Its focus on the inferential construction of perceptual states, and clearly invites classification of the predictive approach as an indirect theory of perception in the psychological sense, in contrast to direct ecological theories.

I have argued that this kind of perceptual indirectness does not license the claims about metaphysical and epistemological indirectness that are made by the proponents of the predictive approach. The metaphysical claims, which attempt to locate the predictive approach in relation to metaphysical theories of perceptual experience, require further justification – regardless of whether the underlying metaphysical stance is naturalistic or *a priori*. The epistemological claims appear to erroneously assume that all inferential processes play the same epistemological role with respect to justification and evidence. And neither the psychological nor the metaphysical notion of perceptual indirectness licenses the epistemological claim that the predictive approach faces a particular sceptical problem.

I do not intend to suggest that the predictive approach to the mind has no interesting metaphysical or epistemological implications. Rather I suggest that any such claims would need to be further supported. To make their metaphysical case, proponents of the predictive approach need to show how the scientific data on Bayesian brain and predictive coding support metaphysical claims about natural kinds, laws of nature, and nomological necessity, for example. To make their epistemological case, proponents of the predictive approach need to show why we should interpret Bayesian computational processes as inferential in a relevantly epistemic sense.

It is, of course, open to proponents of the predictive approach to focus solely on the scientific claims of the theory, and to distance themselves from the sorts of issues that might be considered metaphysical or epistemological. But if proponents of the predictive approach want to engage with debates about the objects of perception, for example, and the evidential role of perceptual processes, then they need to show their working.

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1. For a representative sample, see Clark (2012, 2013a, 2013b, 2016), Hohwy (2007, 2013, 2014), Shand (2014), Macpherson (2015), Gladziejewski (2016), Burr and Jones (2016). [↑](#footnote-ref-1)
2. For neuroscientific uses of predictive coding, see e.g. Friston (2002) and Friston and Kiebel (2010). [↑](#footnote-ref-2)
3. For more on empirical Bayes and the predictive approach, see Hohwy (2013, 33) and Clark (2013b, 185). [↑](#footnote-ref-3)
4. Throughout this paper I will be following proponents of the predictive approach in focusing solely on visual perception. [↑](#footnote-ref-4)
5. It is common to find computational models of visual perception such as Marr’s (1982) account described as inferential, despite the fact that the perceptual states being processed are not explicit representations, but rather embodied or hard-wired within the visual system. Pylyshyn denies that such approaches are genuinely inferential, are suggests that these processes are “best viewed as the wired-in regularities such as any mechanism must possess” (Pylyshyn 2006, 38-39, n.8). [↑](#footnote-ref-5)
6. Orlandi (2014) argues that predictive approaches to perception are not genuinely constructivist theories because the bulk of the information processing is top-down rather than bottom-up. I take it, however, that construction processes in general are not essentially ‘bottom-up’: suspensions bridges are a case in point. I maintain that predictive approaches to perception are constructivist because they are inferential, and indirect as a result. [↑](#footnote-ref-6)
7. Orlandi (2014, 89) argues that the tools of Bayesian analysis can describe and predict the behaviour of non-inferential mechanisms, and shows how an instrumentalist understanding of Bayesian inference can support the predictive approach as an ecological theory of perception. [↑](#footnote-ref-7)
8. Kiefer (2017) outlines and defends a model of inference according to which neural networks perform statistical inference according to Bayes Rule. See also Gładziejewski (2016), who argues that the predictive approach posits genuinely representational structures. [↑](#footnote-ref-8)
9. I don’t consider adverbialism in what follows, on the grounds that proponents of the predictive approach have made no claims about the relation between their theory and adverbialism. [↑](#footnote-ref-9)
10. To say that an experience fundamentally consists in something is to say that it is that in virtue of which it has all the other psychological properties it does. See Logue (2011) for elaboration. [↑](#footnote-ref-10)
11. I am grateful to Anil Gomes for discussion of the role played by transcendental arguments in philosophy of perception. [↑](#footnote-ref-11)
12. For a spectrum of relevant views on naturalistic metaphysics, see Ross, Ladyman and Kincaid (2013). [↑](#footnote-ref-12)
13. See Schrenk (2005) for a discussion of the different ways that natural necessity and laws of nature can relate. [↑](#footnote-ref-13)
14. For an exploration of the relation between natural kinds and nomological necessity, see Collier (1996). [↑](#footnote-ref-14)
15. There’s a further concern for naturalistic metaphysics regarding the theoretical virtues of the predictive approach. Naturalistic conclusions about metaphysical possibilities should be guided by the appropriate sort of theories: theories which show the hallmarks of success such as “empirical adequacy, simplicity, novel predictions, novel explanations, unification, consilience and more” (Callender 2011, 45). It is far from clear that the predictive approach offers such a theory. It has been criticized for being ad-hoc and scarcely supported by empirical studies (Egner and Summerfield 2013, 210-211), and Clark himself acknowledges that “[d]irect neuroscientific testing of the hierarchical predictive coding model […] remains in its infancy” (Clark 2013b, 191) and that the predictive approach “leaves much unspecified” (Clark 2013b, 200). [↑](#footnote-ref-15)
16. I am grateful to Mary Leng for discussion of the role played by inference to the best explanation in scientific metaphysics. [↑](#footnote-ref-16)
17. Notice that epistemological disjunctivism does not require metaphysical disjunctivism. The representationalist could hold that they have justification in the veridical case that they lack in the non-veridical case, despite the two perceptual experiences being of the same metaphysical kind. See Logue (2011) for discussion. [↑](#footnote-ref-17)
18. See Fumerton (2006, 680-681). [↑](#footnote-ref-18)
19. Naïve realists claim that their theory allows for superior epistemic contact with the world on the grounds that perceptual experience is constituted by its worldly objects, but this distinction between naïve realism and representationalism is not generally framed in terms of inferences. [↑](#footnote-ref-19)
20. There is no reason to think the situation would be different on an externalist approach to justification or evidence. On a reliabilist approach, for example, inferential perceptual processes would provide justification in so far as they are reliably truth-conducive: it’s hard to see what further relevant epistemic role would be played by their inferential nature. I am grateful to Alistair Isaac for discussion of this point. [↑](#footnote-ref-20)
21. See Siegel (2017), however, for discussion of the idea that perceptual inferences can play a justificatory role. [↑](#footnote-ref-21)
22. Stich (1978) distinguishes between beliefs and subdoxastic states, where the latter are belief-like states that are consciously inaccessible to the believer. I discuss Stich’s distinction in Drayson (2012), Drayson (2014), and Drayson (2017). [↑](#footnote-ref-22)
23. I discuss Hohwy’s notion of an evidentiary boundary as it relates to the cognitive architecture of predictive processing in Drayson (2017). [↑](#footnote-ref-23)
24. Notice that Cartesian skepticism affects metaphysically direct as well as indirect approaches, because even metaphysical disjunctivism allows that our veridical experiences are subjectively indistinguishable from the relevant non-veridical experience. [↑](#footnote-ref-24)
25. Hohwy proposes that the predictive approach is (vehicle) internalist by way of contrast to (vehicle) externalist approaches such as enactive and extended views. The standard responses to Cartesian skepticism are externalist with respect to content, justification, or knowledge, none of which require a commitment to externalism about vehicles. [↑](#footnote-ref-25)