Intellectualism and the argument from cognitive science

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1. Introduction

Theoretical knowledge, such as knowing that Paris is the capital of France or that water freezes at zero degrees Celsius, is widely accepted to be a propositional attitude. Is practical knowledge, such as knowing how to play the piano or how to ride a bike, also a propositional attitude? The Intellectualist says yes: when someone knows how to play the piano, or knows how to ride a bike, there is a proposition that they know. Two different kinds of evidence have been invoked in the debate over Intellectualism: semantic evidence and scientific evidence. Those who appeal to semantic evidence are concerned with whether our ascriptions of practical knowledge ('knowing-how') follow the same truth-conditional semantics as our ascriptions of theoretical knowledge ('knowing-that'). Those who appeal to scientific evidence are concerned with whether our best theories in cognitive science posit propositions to play similar explanatory roles in both practical knowledge and theoretical knowledge. In this paper, we are primarily interested in the relationship between Stanley and Williamson's (2001) semantic argument for Intellectualism and the 'argument from cognitive science' against it: the anti-Intellectualist response from philosophers (including Noë 2005, Devitt 2011, Roth and Cummins 2011) who use scientific evidence to suggest that practical knowledge is non-propositional.

In the first half of the paper, we introduce Stanley and Williamson's argument for Intellectualism (Section 1) and the argument from cognitive science against it (Section 2). We defend the claim that there is a genuine disagreement between the two positions, by showing that the same thesis is at stake in both arguments (Section 3). We do so to reject claims that the scientific evidence casts doubt on a distinct thesis from the one supported by the semantic evidence (see Glick 2011, Jung and Newen 2011). We show that the Intellectualists and anti-Intellectualists in question are concerned with the same metaphysical question of whether practical knowledge is a relation to a proposition. We argue, however, that the argument from cognitive science is based on a naturalistic approach to metaphysics: its proponents are assuming that findings from cognitive science can inform our metaphysics of mental states. It is less clear whether their Intellectualist opponents endorse such a methodology: we show that Stanley's (2011a, b) attempt to defend Intellectualism from the argument from cognitive science reveals an inconsistent attitude toward the evidential relationship between science and metaphysics.

In the second half of the paper, we turn our attention to more recent defenses of Intellectualism to see whether this metaphilosophical matter has been resolved. Stanley and Krakauer (2013) and Pavese (2015, 2017) appeal to findings from cognitive science to support their Intellectualist positions, which suggests that they endorse the idea that scientific findings can inform metaphysical conclusions. Stanley and Krakauer use experimental data from subjects with memory disorders to argue that propositional knowledge is an essential part of skill, for example,

and Pavese claims that the cognitive science of the human motor control system can support the Intellectualist idea that practical knowledge involves knowing a proposition under a 'practical mode of presentation'. On closer inspection of their arguments, however, we again find evidence of conflicting attitudes towards the role of scientific findings in metaphysical debates (Section 4). When findings from cognitive science seem to support the Intellectualist conclusions arrived at via semantic evidence, the Intellectualists in question allow these findings to inform the metaphysics of practical knowledge. But when the scientific findings seem to challenge Intellectualism, they are dismissed or reinterpreted to be consistent with Intellectualism and the associated semantic evidence. We argue that this leaves these Intellectualists in a difficult position with respect to their metaphysical methodology: their use of scientific findings to argue for Intellectualism requires accepting some form of naturalized metaphysics, but their rejection of anti-Intellectualism seems to rest on using semantic claims to deny the relevance of similar scientific findings.

We have no stake in the Intellectualism debate, and we do not argue that Intellectualists ought to endorse naturalistic metaphysics. One might reject naturalistic metaphysics, for example, on the grounds that the only metaphysical role played by contingent scientific evidence is to provide counterexamples to purportedly necessary metaphysical truths. But for an Intellectualist holding this position, most scientific findings will be irrelevant: this cannot explain why we find semantically-motivated Intellectualists engaging with the argument from cognitive science or appealing to scientific findings in support of their view. Furthermore, we are not claiming that naturalistic metaphysics is an all-or-nothing affair: we do not argue that endorsing some form of naturalistic metaphysics requires rejecting semantic considerations, for example. We are simply claiming that one's approach to metaphysics should be consistently applied. In situations where scientific evidence and semantic evidence are both playing a role, it is important for those involved to clearly state their methodological presuppositions. The debate over Intellectualism is one example of such a situation: we single it out here as part of a more general plea for metaphilosophical clarity in scientifically-informed debates about the mind.

2. Arguing about Intellectualism

2.1 What is Intellectualism?

When you believe that it is raining, when you hope that the car starts, or when you know that the tide is coming in, you are related to a proposition. In each case, the proposition in question can be expressed by a declarative sentence: 'It is raining'; 'The car starts'; 'The tide is coming in'. While propositions can be linguistically expressed, and while they can be the objects of some mental states, they are neither linguistic entities nor mental entities. Propositions are the abstract bearers of truth and falsity: when I have a true belief, it is true in virtue of the proposition believed being true; when I utter a false sentence, it is false in virtue of my utterance expressing a false proposition. Propositions are also shareable in a way that a particular utterance or instance of believing is not. When two declarative sentences share the same meaning, this is in virtue of expressing the same proposition. When two people share the same belief, this is in virtue of them both standing in the belief relation to the same proposition. In the case of mental states, there are a number of different ways to understand the relation between the subject of the mental state and

the proposition: one might be related to a proposition dispositionally, functionally, or representationally, for example.[1]

Theoretical knowledge is widely accepted to be propositional knowledge: if you know that Paris is the capital of France, or know that water freezes at zero degrees Celsius, there is a proposition that you know, which can be expressed by a declarative sentence (e.g. 'Paris is the capital of France', 'Water freezes at zero degrees Celsius'). The propositional status of practical knowledge is more controversial, however. When we ascribe know-how to ourselves or others, we don't usually articulate a declarative clause that expresses a proposition. But might it still be the case that when you know how to ride a bike, or know how to play the piano, there is a proposition that you know? Ryle (1949) famously argued that there is not: he proposed that practical knowledge is non-propositional and thus a distinct kind of knowledge from theoretical knowledge. The Intellectualist approach rejects Ryle's distinction and argues that practical knowledge, like theoretical knowledge, is a propositional attitude.

There are different ways to understand the nature of propositions themselves. We can think of them as structured from the concrete objects and properties to which our expressions or thoughts refer (Russellian), or as structured from the modes or guises through which they present the referents of our expressions or thoughts (Fregean). Alternatively, we can think of propositions as unstructured functions from possible worlds to truth-values. Intellectualism is compatible with any of these. Some Intellectualist proposals take a Russellian view of propositions (e.g. Stanley and Williamson 2001) while others take a Fregean approach (e.g. Pavese 2015). Stanley (2011a) makes clear that he intends his Intellectualism to be compatible with unstructured views of propositions too.

2.2 The semantic approach to Intellectualism

The basic linguistic form of knowledge attributions, in English at least, might initially seem to support an anti-Intellectualist approach to practical knowledge. When we ascribe theoretical knowledge, we say someone *knows that* something is the case: the 'that-clause' is a declarative sentence which expresses the proposition known. When we ascribe practical knowledge, by contrast, we say someone *knows how to* perform a certain activity: we don't employ a declarative clause to express their knowledge. This might be taken to suggest that Intellectualism is false:

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[1] According to dispositionalist views, for example, to stand in a relation to a proposition is to possess the appropriate dispositions toward the proposition. (Believing that *p* might be a matter of being disposed, in the relevant circumstances, to assent to *p*, to use it as a premise in reasoning, to use it as a ground to doubt propositions that one knows entail ~*p,* and so on). On functionalist proposals, standing in a relation to a proposition is a matter of being in a state that plays the relevant causal role. (Believing that *p* might be the causal state that follows on perceiving that *p)*. Representationalism proposes that standing in a relation to a proposition is a matter of tokening an internal representation with the same content as the proposition. It is also possible to hold these views in concert. For details about these views of propositional attitudes, and their interrelations, see Schwitzgebel (2015).

that when someone has practical knowledge, there is not a proposition to which they stand in the knowledge relation.[2]

Stanley and Williamson (2001), however, argue that a better understanding of the syntax and semantics of knowledge ascriptions actually supports the view that practical knowledge is propositional. They argue that Intellectualism is a straightforward consequence of a leading theory of semantics according to which knowledge-how ascriptions in English, sentences of the form 'S knows how to φ', are true just in case the subject *knows that* a course of action is a way in which she herself could φ under the circumstances. The first step of Stanley and Williamson's account is an appeal to the standard syntax of knowledge-how ascriptions, according to which they contain embedded questions about how to perform the relevant action(s). For example, the sentence "Hannah knows how to ride a bicycle," embeds the infinitival question of what to do to ride a bicycle, which should be interpreted: how can one ride a bicycle. The second step of the account is an appeal to a theory of semantics developed by Lauri Karttunen (1977), according to which such knowledge-how ascriptions are true just in case the subject knows at least one proposition expressed by a sentence of the form 'w is a way in which I can φ', and entertains the proposition(s) under a practical mode of presentation. What makes the difference between thinking of a way under a practical mode of presentation as opposed to under some other guise is that "thinking of a way under a practical mode of presentation undoubtedly entails the possession of certain complex dispositions" (Stanley and Williamson 2001, 429); presumably, those governing the manifestation of actions relevant to the way of φ-ing given the circumstances. (We will return to the idea of 'practical modes of presentation' in Section 4.3 when we consider Pavese's (2015, 2017) work on the subject.) Thus, on Stanley and Williamson's intellectualism, just as knowing that p is a relation to a proposition p, knowing how to φ is knowing that q, where q is a proposition containing a way to φ, entertained under a practical mode of presentation. The fact that we cannot articulate the proposition q, or can do so only with the aid of demonstratives, should not mislead us into thinking that there is no proposition involved.

2.3 The scientific approach to Intellectualism[3]

2.3.1 The argument from cognitive science against Intellectualism

Stanley and Williamson's semantic approach is not the only way to engage in the Intellectualist debate. Philosophers also appeal to cognitive science, arguing that certain data from psychology,

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[2] On the other hand, there is evidence that ascriptions of practical knowledge do function like propositional attitude ascriptions, in the sense that they are non-extensional: substituting co-referential terms in the content can alter the truth-value of the ascription. It might be true to say that a dancer knows how to give a performance of Improvisation No. 15, but false to say that the dancer knows how to give a semaphore recital of Gray's 'Elegy', despite the fact that the dance performed is a movement-perfect semaphore version of the poem (Carr 1979).

[3] By distinguishing between the semantic and scientific approaches to Intellectualism, we are not committed to the claim that semantic theories and scientific theories are mutually exclusive. We are proposing, however, that the semantic theories to which Stanley and Williamson (2001) and Stanley (2011a, b) appeal in support of Intellectualism are not scientific theories. They are theories which attempt to account for people's semantic intuitions in terms of *abstract* entities like propositions, sets of worlds, and meanings, and thus cannot offer a *causal* scientific explanation of how the intuitions arise. Following Fodor and Lepore (2012) we allow that semantic

cognitive neuroscience and computer science are relevant to our understanding of the nature of mental states.[4] Although Fodor (1968) claims that a computational view of the human mind supports a form of Intellectualism about practical knowledge, evidence from cognitive science is more often used to press the anti-Intellectualist case.[5] What we call 'the argument from cognitive science' is an anti-Intellectualist argument which targets Stanley and Williamson's (2001) conclusion that practical knowledge is propositional knowledge and thus the same kind of knowledge as theoretical knowledge. The argument from cognitive science has two components: it aims to show that practical knowledge is non-propositional, and that practical knowledge is distinct from theoretical knowledge. We consider these two components of the argument separately, starting with the latter. We first show how anti-Intellectualists appeal to the scientific distinction between declarative memory and procedural memory to argue that practical knowledge is not a kind of theoretical knowledge (2.3.2), before considering how assumptions about the explanatory role of propositional representations in cognitive science are used to argue that practical knowledge is non-propositional (2.3.3).

2.3.2 Is practical knowledge distinct from theoretical knowledge?

Debates about Intellectualism have been heavily influenced by the scientific discovery of the distinction between declarative and procedural memory. Prior to this discovery, memory was considered a unitary phenomenon. In the late 1950s, a patient (known as 'HM') had a bilateral medial temporal lobectomy, after which he was no longer able to form lasting memories of facts and events. However, his capacity to learn new motor skills was largely unaffected: over 10 trials, HM acquired the motor-skills necessary to trace the outline of a five-pointed star while only being able to see the reflection of the star, his hand, and the pencil in a mirror (Milner 1962).[6] This indicated a dissociation between two cognitive functions: the function of forming memories for facts and events (which HM had lost) and the function of acquiring motor-skills

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theories can be scientific theories when they are psychologized: when the semantic properties of linguistic expressions are mentally represented by competent speakers, and when these concrete mental representations are causally responsible for those speakers' semantic intuitions. As we make clear in this paper, neither Stanley and Williamson (2001) nor Stanley (2011a, b) has a psychologized causal theory of semantic intuitions: they do not think that propositions, for example, must be understood representationally. In this paper, therefore, we contrast their semantic approach with scientific approaches to Intellectualism.

[4] We use the term 'cognitive science' broadly here, to include all scientific approaches to the mind: we include implementation-level theories from neuroscience in addition to abstract computational theories, for example.

[5] Fodor argues that cognitive science supports "intellectualist accounts of mental competences" (Fodor 1968, 627), based on the claim that mental processes are computational processes. When a computer has a certain competence, such as knowing how to multiply, this competence can consist in running a sequence of rule-governed operations. If minds are computational, then our own mental competences might also consist in such a sequence, even if we are unable to articulate the operations in question. Fodor proposes that it is therefore plausible that our practical knowledge or 'know-how' employs "propositions, maxims, or instructions" that constitute a formulation of our tacit knowledge (Fodor 1968, 638).

[6] The procedure that HM underwent in 1953 was intended to relieve the debilitating symptoms of epilepsy. It involved bilateral removal of the hippocampus, parahippocampal gyrus, entorhinal cortex, and most of the amygdalae. After the procedure, HM was unable to form new long-term memories of facts or events, (complete anterograde amnesia,) and he could no longer access memories he acquired in the few years leading up to his surgery, (retrograde amnesia). By 1968, however, Suzanne Corkin reported that "[t]he retrograde amnesia [of HM] is now restricted mainly to the year before his operation," (Corkin 1968, 255).

(which HM retained). Following Cohen and Squire (1980), it became standard to refer to these two dissociable kinds of memory as 'declarative' and 'procedural' respectively.[7] This psychological distinction between declarative memory and procedural memory is often understood as providing a scientific grounding for the distinction between theoretical and practical knowledge:

> "[t]he folk distinction between knowledge-that and knowledge-how is commonly thought to be the same as the psychological one between 'declarative' and 'procedural' knowledge […] psychology shows that procedural knowledge, hence knowledge-how, does not require [declarative knowledge, hence] knowledge-that, precisely what Stanley and Williamson's Intellectualism claims it does require" (Devitt 2011, 3-6).

If the two distinctions map on to each other, and the dissociation evidence tells us that declarative and procedural memory are independent from one another, then practical knowledge cannot be a kind of theoretical knowledge: knowing how is not a kind of knowing that.[8]

How might the Intellectualist respond? One might challenge the idea that procedural memory maps onto practical knowledge, as Stanley does in later work (Stanley and Krakauer 2013). Stanley (2011a), however, allows for the sake of argument that procedural memory and practical knowledge are co-extensive and focuses on showing that procedural memory can nevertheless be propositional. He first emphasizes that cognitive science draws a distinction between semantic and episodic forms of declarative memory in terms of the kind of content remembered: episodic memory involves indexical content where semantic memory involves content that is context-free. This suggests, Stanley claims, that "the brain has specific mechanisms governing indexical propositions and non-indexical propositional attitudes" (Stanley 2011a, 156). He then proposes that a similar claim can be made about the distinction between declarative memory and procedural memory: declarative memory involves propositions about how the world is, while procedural memory involves propositions about ways to perform actions. He concludes, therefore, that procedural memory is propositional.

There are several problems with Stanley's response to the argument from cognitive science. First, as Brown (2013) points out, it is not clear that Stanley has defended the view put forward by Stanley and Williamson (2001) that practical knowledge is a kind of theoretical knowledge. If Stanley accepts that the distinction between theoretical and practical knowledge is equivalent to the dissociation between declarative and procedural memory, then even if practical knowledge is propositional, it is a distinct kind of propositional knowledge from theoretical knowledge. Our

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[7] The source of the declarative/procedural distinction is Cohen and Squire (1980). The more recent distinction between declarative and non-declarative memory stems from Squire and Zola-Morgan (1988). When characterizing it, the authors write: "Declarative memory includes what can be declared or brought to mind as a proposition or an image. […] Non-declarative memory refers to a heterogenous collection of abilities: motor skills, perceptual skills, and cognitive skills (these abilities and perhaps others are examples of procedural memory); as well as simple classical conditioning, adaptation level effects, priming, and other instances where experience alters performance independently of providing a basis for the conscious recollection of past events" (171).

[8] It is a matter of debate what the relationship is between declarative *memory* and declarative *knowledge*. If not all declarative memories are factive (see e.g. Schwartz 2018), and all declarative knowledge is factive, then some declarative memories are not declarative knowledge. Nevertheless, because it has been commonly assumed that all declarative knowledge is declarative memory, and all procedural knowledge is procedural memory, and because declarative memory is dissociated from procedural memory, it follows that declarative knowledge is dissociated from procedural knowledge. This is the dissociation that the present argument from cognitive science rests upon.

own concern is with a second problem: at most, Stanley (2011a) has shown that it is possible for procedural memory to be propositional, in the sense that there is no logical inconsistency in attributing propositional content to procedural memory. But the argument from cognitive science does not claim that it is logically impossible for procedural memory to be propositional: it claims that propositions play no explanatory role in our best scientific account of procedural memory. We return to the issue of consistency shortly; in the meantime we turn to the second part of the argument from cognitive science: the claim that procedural memory or practical knowledge is non-propositional.

2.3.3 Does practical knowledge involve propositional representations?

The anti-Intellectualist argument from cognitive science often combines the claim that procedural memory is distinct from declarative memory with a stronger argument for thinking that practical knowledge is not propositional. This argument starts from the recognition that abstract propositions are not the sort of things that can play a causal role in cognitive systems. Cognitive science proposes that if propositions are to play an explanatory role in our best science of the mind, then they must do so in virtue of being the contents of physically-implemented causal states: *representations*. A representation has both causal and semantic properties. In virtue of its semantic properties, the representation can be considered a stand-in for its propositional content; in virtue of its causal properties, the representation can interact with other internal states to cause behavior. It is not at all clear how semantic properties such as propositional content could play an explanatory role in cognitive science without being attached to the causal posits of the science.[9]

It is important to notice that propositional representations, as they feature in the argument from cognitive science, are not simply causal entities which relate to abstract propositions. Cognitive science combines the representational picture of mental states with a computational story about mental processes: representations are computational states, theoretical posits invoked only when there is some explanatory work that they can do. Classical cognitive science proposes that the computational relations between mental representations are analogous to the formal relations that hold between propositions in first order logic. For this to work, propositional representations need to do more than just bear propositional content; they also need to carry their semantic content in a syntactically-structured way to which the computational processes are sensitive. These symbolic, language-like representations don't merely bear propositional content; they do so by using a compositional syntax that mirrors the compositional semantics of their propositional content, allowing the inferential role of the propositional content to be reflected by the causal role of the representation. As cognitive science textbooks attest, to describe a mental representation as 'propositional' is to commit to claims about the syntactic format in which it stores its content.[10]

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[9] As Fodor writes, "I don't see how an organism can stand in an (interesting epistemic) relation to a proposition except by standing in a (causal/functional) relation to some token of a formula which expresses the proposition. […] I want a *mechanism* for the relation between organism and propositions, and the only one I can think of is *mediation by internal representation*." (Fodor 1978, 520)

[10] The following definitions of 'propositional representation' can be found in cognitive science textbooks: "[P]ropositional representations [are] representations in which relationship are represented by symbols, as when the

When philosophers engaged in the debate over Intellectualism appeal to cognitive science, it is to this "unproblematic characterization of propositional representations":

> "A mental representation is propositional if and only if the representation has an internal structure like natural language. […] There is broad consensus that propositional representations have to be characterized in that way." (Newen and Jung 2011, 96)

Philosophers who take a naturalistic approach to the metaphysics of mind think that cognitive science provides evidence about the nature of our mental states and capacities, and thus that a mental state or capacity should be considered propositional to the extent that our best scientific theories of it posit symbolic representations with syntactic structure.

The argument from cognitive science acknowledges that we have good reasons for positing propositional representations to account for certain mental states. Declarative memory, for example, which "includes what can be declared or brought to mind as a proposition" (Squire and Zola-Morgan 1988, 171), involves information that we can articulate, introspect, and use in inference. The best explanation for the causal role of this content is to suppose that it is encoded in a propositionally-formatted representation. When cognitive science considers whether procedural memory or practical knowledge is propositional, the question is thus whether "a person has practical knowledge by virtue of there being a rule that has a symbolic, language-like ("propositional") representation" (Bartels and May 2015, 20). Cognitive science has largely rejected a propositional interpretation of human practical knowledge, largely because alternative explanations are available which leave no explanatory role for propositional representations. Propositional representations are usually only posited when they are needed to explain how inferential and linguistic phenomena occur, and skilled behavior doesn't generally pose such an explanatory need. As Devitt points out, for example, findings from dynamical systems theory, Gibson-inspired ecological theories, and connectionism support the view that "[w]e have very good reasons to suppose that there are nonpropositional states of knowledge-how, constituted probably by embodied but unrepresented rules" (Devitt 2011, 215). When Noë (2005) challenges Stanley and Williamson's Intellectualism, he appeals to similar work on embodiment in cognitive science highlighting how skilled action often exploits features of the subject's body and environment in a way that removes any explanatory need for propositional representations. Roth and Cummins (2011), in their response to Stanley and Williamson, point out that if representations are ever posited to account for practical knowledge, they are generally not propositionally-encoded representations. These proponents of the argument from cognitive science thus claim that we have no scientific justification for positing propositional representations to account for procedural memory, and conclude that practical knowledge is not propositional.

Recall that Stanley's response to the argument from cognitive science is to claim that even if procedural memory provides a distinct kind of knowledge from declarative memory, it can still be propositional knowledge. Proponents of the argument from cognitive science are clear about what it would take to persuade them that practical knowledge is propositional:

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words of a language are used to represent objects and the relations between them" (Goldstein 2010, 418); "According to the propositional hypothesis, mental representations take the form of abstract sentence-like structures" (Friedenberg and Silverman, 2006, 8).

> "the claim that knowledge-how reduces to propositional knowledge has always, and rightly, been understood as requiring that (1) The knowledge itself be propositional knowledge or at least encoded explicitly as particular linguistic or quasi-linguistic expressions that were (2) causally operant in the manifestation of the knowledge." (Wallis 2008, 141)

To engage with the argument from cognitive science, as Stanley purports to be doing, would therefore require showing that a scientific account of procedural memory does in fact benefit from positing propositionally-formatted and causally-efficacious representations. But when Stanley proposes that procedural memory is propositional, he is not making any such suggestion: Stanley's understanding of propositional mental states involves no commitment to internal representations that encode the propositional content.[11] Stanley is merely claiming, as we have already seen, that it is logically possibly for procedural memory to involve relations to abstract propositional contents. Although Stanley might appear to be engaging with the argument from cognitive science against Intellectualism, his response fails to address its key claim that we have no scientific justification for thinking that propositions play a causal-explanatory role in the mechanisms of practical knowledge.

3. Methodology and metaphysics

3.1 Are there two kinds of Intellectualism?

The semantic approach to Intellectualism, and the scientific argument against it, focus on different features of practical knowledge. Several commentators have argued that these distinct approaches to arguing about Intellectualism actually correspond to different varieties of Intellectualism. If this were the case, then there might not be any genuine disagreement between the semantic argument for Intellectualism and the anti-Intellectualist argument from cognitive science. We will briefly consider this possibility, before rejecting it.

Jung and Newen propose that "at least two different projects can be identified based on two very different understandings of the nature of knowledge-how" (Jung and Newen 2011, 84). They think that focusing on the semantic analysis of practical knowledge ascriptions will lead to epistemological conclusions concerning whether our concept of practical knowledge can be defined in terms of our concept of theoretical knowledge. Focusing on the data from cognitive science, they suggest, will lead to conclusions about the nature of the mind, specifically whether the information processes underlying practical knowledge are reducible to the information processes underlying theoretical knowledge. According to Jung and Newen, the two projects should properly be understood as "orthogonal to each other" (Jung and Newen 2011, 91). They maintain that much of the debate about the argument from cognitive science against Stanley and Williamson's (2001) Intellectualism comes down to "an illegitimate amalgamation of the two projects" which they recommend "should be kept apart" (Jung and Newen 2011, 85).

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[11] Stanley proposes that "[a]n anti-representationist view of the mental is completely consistent with the fact that we have propositional knowledge states" (Stanley 2011a, 159), for example, and makes clear that Stanley and Williamson's (2001) distinction between propositional and non-propositional mental states is intended "to be entirely neutral on how propositional knowledge is realized in the brain" (Stanley 2011b, 45).

Glick raises a similar concern, claiming that "significant confusion has resulted" (Glick 2011, 415) from the common failure to distinguish between two different Intellectualist theses, each resulting from a different approach to Intellectualism:

> "two methodologies for evaluating Intellectualism, one focused on formal linguistic properties of sentences that attribute know-how, and one focused on data from cognitive science […] correspond to distinct views on what the Intellectualist thesis is supposed to be." (Glick 2011, 398)

Glick thinks that the two approaches mean something different by the term 'propositional knowledge'. Focusing on semantic evidence, he proposes, leads to conclusions about whether practical knowledge is a relation to a proposition. Appealing to data from cognitive science, he suggests, leads to stronger conclusions about whether practical knowledge is a certain kind of relation to a proposition: one which is Gettierizable, linguistically accessible, and makes its content available for use in reasoning. The upshot of this, according to Glick, is that "the Intellectualist conclusion of the linguistic [semantic] argument is compatible with the anti-Intellectualist conclusion of the argument from cognitive science" (Glick 2011, 399).

We agree with Jung and Newen (2011) and Glick (2011) that there is considerable confusion regarding the relationship between semantic and scientific approaches to Intellectualism, but we disagree about the source of this confusion. We propose that both the semantic and scientific approaches to Intellectualism are interested in the same thesis: whether practical knowledge is propositional, in the sense of being a relation to a proposition in Glick's weaker sense. As a result, we maintain (*contra* Glick) that the anti-Intellectualist conclusion of the argument from cognitive science is *not* compatible with the Intellectualist conclusions drawn from the semantic evidence. We deny Jung and Newen's claims that conclusions based on semantic evidence only concern knowledge ascriptions while conclusions based on scientific evidence only concern information-processing. We propose instead that the semantic argument for Intellectualism and the anti-Intellectualist argument from cognitive science are both concerned with the same metaphysical conclusion regarding the propositional nature of practical knowledge.

In support of our view, Stanley and Williamson (2001) and Stanley (2011a) make clear that they are not only arguing for semantic claims, but also using those semantic claims to establish metaphysical conclusions. When Stanley and Williamson apply their account of practical knowledge to Jackson's 'Mary' thought experiment, for example, they are clearly supposing that their account of practical knowledge can inform the debate about the metaphysics of conscious experience (Stanley and Williamson 2011, 442-443). And Stanley emphasizes that his semantic arguments for Intellectualism should be understood as "both explanations of the meanings of sentences containing embedded questions as well [as] explanations of the nature of what it is to stand in the knowledge relation to a question" (Stanley 2011a, 144). The underlying assumption is that careful consideration of the semantics of our mental state ascriptions will result in metaphysical conclusions about the nature of mental states, because "[d]iscussions of semantics are often in fact discussions of metaphysics, carried in the formal mode" (Stanley 2011a, 144).

Similarly, the anti-Intellectualist philosophers who appeal to cognitive science are not merely arguing about information-processing, but rather trying to establish metaphysical conclusions about the nature of mental states. They focus on evidence from cognitive science because they

are metaphysical naturalists, who think that our understanding of the nature of the world should be informed by our best scientific data.[12] If we take such an approach to the metaphysics of practical knowledge, then our evidence can include findings from cognitive science:

> "if we are interested in the nature of knowing-how, we need to appeal to science to determine whether 'knowing-how' refers to a natural kind of knowledge, what is the best scientific characterization of its nature and its relation to other kinds of knowledge" (Brown 2013, 223)

According to naturalistic approaches to the metaphysics of practical knowledge, "[i]t is a partly *empirical* question whether 'knowing how' refers to standing in relation to a proposition" (Levy 2017, 513, italics in original). Proponents of such an approach, such as Devitt (2011), think that any attempt to understand the nature of practical knowledge without paying attention to the science of such knowledge is considered "deeply misguided":

> "We should approach epistemology and semantics from a metaphysical perspective rather than vice versa. My argument for this position […] reflects Quinean naturalism: the metaphysics I want to put first is a naturalized one." (Devitt 2011, 9)

We take these passages as clear evidence that at least some of the philosophers who appeal to cognitive science in the debate over Intellectualism are ultimately concerned with the metaphysical question of whether practical knowledge is propositional, which is the same metaphysical question at stake in semantic approaches to Intellectualism. In the following section, we propose that much of the confusion surrounding semantic and scientific approaches to practical knowledge actually results from Intellectualists' inconsistent treatment of metaphysical naturalism in their response to the argument from cognitive science.

3.2 Anti-Intellectualism and naturalistic metaphysics

Stanley and Williamson's (2001) semantic argument for Intellectualism solicited a barrage of objections from philosophers who appeal to cognitive science to push an anti-Intellectualist conclusion. Many of these objections are based on the assumption that scientific data can tell us about the nature of practical knowledge: in other words, that a naturalistic metaphysics of mind is viable. Several proponents of the argument from cognitive science not only commit to drawing metaphysical conclusions from cognitive science, but also openly reject metaphysical approaches that use semantic or linguistic theories to reach metaphysical conclusions. Roth and Cummins (2011), for example, openly criticize Stanley and Williamson's attempt to derive claims about

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[12] Metaphysical naturalism, also known as scientific metaphysics, comes in a variety of forms. For the purposes of this paper, we understand it as committed to the positive claim that scientific findings can be relevant to metaphysics, in the sense that our metaphysical conclusions can be informed by empirical scientific data. (For defenses of naturalized metaphysics, see Maddy 2007, Ladyman and Ross 2007, Chakravartty 2017.) We are not assuming that metaphysical naturalism must completely reject the role of *a priori* intuitions or conceptual analysis, or deny the evidential status of semantics (although several proponents of the argument from cognitive science do make such a denial). Furthermore, we are not assuming that proponents of the semantic approach to Intellectualism must be opposed to metaphysical naturalism; they might be pluralists in this sense. We are merely claiming that the argument from cognitive science assumes that findings from cognitive science can substantially inform our metaphysics of mental states (i.e. not merely by providing counterexamples to purportedly necessary truths).

the metaphysics of mental states from semantic theories based on linguistic intuitions, claiming that "no sane epistemology can allow that the semantics of ordinary talk can substitute for serious neuroscience or psychology" (Roth and Cummins 2011, 27). Noë also complains that Stanley and Williamson's methodology "directs our attention to considerations about language (how people talk) when theorists of mind (in philosophy or cognitive science) are interested in human nature and the nature of mind" (Noë 2005, 288). Devitt is less hostile to semantic theories, but thinks that no semantic theory has the metaphysical power required to reject the evidence from cognitive science that practical knowledge is non-propositional:

> "We have very good reasons to suppose that there are nonpropositional states of knowledge-how, constituted probably by embodied but unrepresented rules, states that are central to explaining many behaviors. Could *any* semantic theory be strong enough to overthrow this? I think that is most unlikely. I love some semantic theories myself but I don't think that any one of them is well-enough established to have this metaphysical clout. S&W's semantic theory must be mistaken." (Devitt 2011, 215)

These anti-Intellectualists do not engage with the details of Stanley and Williamson's semantic argument: they don't propose alternative theories of embedded questions, for example. They either reject the idea that semantic evidence can lead to metaphysical conclusions, or they think that there is good scientific evidence against Intellectualism that overrides any semantic evidence to the contrary.

Intellectualists such as Stanley and Williamson could, of course, take a similarly critical view of naturalistic metaphysics: they could argue that semantic evidence entails modal conclusions that override any contingent evidence from cognitive science, for example. In such a case, this particular debate over Intellectualism would have reached a stalemate. The disagreement would no longer concern arguments for and against Intellectualism as such, but rather the metaphilosophical question of the appropriate methodology for metaphysics. The situation that has arisen, however, is very different. In response to the argument from cognitive science, Stanley (2011a, b) does not merely reject its conclusion but engages with the details of the argument in a way that suggests he is open to scientific evidence as well as semantic evidence when establishing the metaphysics of mental states. He seems to be allowing, for example, that the scientific distinction between declarative and procedural memory could be relevant to establishing facts about the nature of theoretical and practical knowledge. Stanley goes so far as to acknowledge that our ordinary understanding of knowledge might be proved wrong by science, allowing that "it may be that science will discover that our one concept of knowledge […] answers to different kinds" (Stanley 2011a, 37). This suggests that there is a live debate between proponents of the semantic argument for Intellectualism and their opponents who appeal to the argument from cognitive science.

Despite this apparent willingness to engage with the naturalistic presuppositions of the argument from cognitive science, Stanley makes several comments that directly conflict with this approach. In contrast to the his claim that science could inform our concept of knowledge, he proposes that "[i]t could still be correct that knowing how to do something is a kind of knowing-that something is the case" even if "no scientific sense could be made out of ordinary propositional attitudes" and there were thus "no instances of the relation of knowing that something is the case" (Stanley 2011b, 46). He also claims that the issue of whether propositional mental states involve syntactically-structured representations is "orthogonal" to the

question of whether practical knowledge is propositional (Stanley 2011b, 42) because his view is neutral on how propositional knowledge is "realized in the brain" (Stanley 2011b, 45). But if Stanley accepts that cognitive science informs our metaphysics of mind, then these matters are not orthogonal: they are part of the scientific evidence that is relevant to judging whether mental states are propositional.

As we have seen, Stanley's technique for dealing with anti-Intellectualist arguments from cognitive science is to show how the scientific claims are logically consistent with his own Intellectualist picture. This logical consistency, however, neither supports his own view nor defuses the argument from cognitive science. It provides no support for Stanley's own metaphysical view, because almost all metaphysical claims will be logically consistent with any scientific findings, as Chakravartty points out: "[a]ny metaphysical project that is not immediately self-undermining *ab initio* will be consistent with empirical observations" (Chakravartty 2013, 43). And Stanley's claims of logical consistency do nothing to play down the argument from cognitive science, because the argument from cognitive science relies on the naturalistic claim that the causal commitments of our best scientific explanations of the mind should guide our metaphysics of practical knowledge. To counter the argument from cognitive science, Stanley would need to show that propositions can play a causal explanatory role in our best scientific account of practical knowledge. Pointing out that there is no *logical contradiction* in procedural memory involving a metaphysical relation to an abstract entity only tells us that Stanley's position is *compatible* with the claims of cognitive science. The "[m]ere compatibility" of scientific theories and metaphysical positions, however "does not buy one much epistemic warrant" (Chakravartty 2013, 47).

In summary, the Intellectualist response to the argument from cognitive science is a confusing one. In the face of the argument from cognitive science and its reliance on naturalistic metaphysics, the Intellectualist seems to have two options: they can either reject the argument outright on the grounds that it requires metaphilosophical presuppositions which they don't endorse; or they can engage with the argument and argue that its proponents are wrong about the best scientific explanations of practical knowledge. Stanley (2011a, b) provides no alternative explanations of the scientific findings, but neither does he question the methodology of the anti-Intellectualist. Instead, he suggest that the scientific findings be reinterpreted in a way which fits with his semantic conclusions. Is he allowing that scientific findings can inform our metaphysics of mind, but only when they are consistent with our semantic theories? In what sense are the scientific findings informing the metaphysics, if they can be so easily dismissed by semantic considerations? We postpone discussion of this matter until we have looked at some more recent defenses of Intellectualism which seem to combine semantic and scientific approaches to nature of practical knowledge.

4. Recent arguments for Intellectualism

4.1 Combining cognitive science with semantics

The Intellectualist conclusion proposed by Stanley and Williamson (2001) met with resistance from philosophers engaged in naturalistic metaphysics, who argue that the evidence from

cognitive science strongly supports an anti-Intellectualist position. We have argued that the initial Intellectualist response from Stanley (2011a, b) is difficult to interpret: it seems to both endorse and reject the naturalistic metaphysics that grounds the argument from cognitive science. As we argue above, this leaves the defender of Intellectualism with two options. They can either take the naturalistic assumptions seriously and give a scientifically motivated argument that posits an explanatory role for propositions in practical knowledge, or they can reject naturalistic metaphysics and dismiss the argument from cognitive science as concerning mere realization data which is irrelevant to the nature of mental states.

In this part of the paper we focus on recent defenses of Intellectualism. Stanley's collaboration with a neuroscientist (Stanley and Krakauer 2013) draws on the cognitive neuroscience of skilled behavior to argue that skill requires both a procedural component and a propositional component. Pavese (2015, 2017) appeals to computational models and the cognitive science of motor control to make sense of the Intellectualist claim that practical knowledge involves knowing a proposition "under a practical mode of presentation" (Stanley and Williamson 2001, 429). By focusing on empirical research, the proponents of these Intellectualist proposals appear to be taking cognitive science as a legitimate guide to the metaphysics of mind. We will argue, however, that semantic arguments are still doing most of the work, and that the tension between the semantic claims and the scientific claims remains unresolved.

4.2 Stanley and Krakauer on propositional knowledge

We have seen that the scientific dissociation between declarative and procedural memory is often used to argue against Intellectualism. The argument from cognitive science claims that skilled behavior requires procedural memory (practical knowledge) but not declarative memory (theoretical knowledge), and that the cognitive science of memory takes procedural memory to be non-propositional. Whereas Stanley (2011a) defended Intellectualism by arguing that procedural memory *is* propositional, Stanley and Krakauer (2013) take a different approach. They accept that the procedural component of skilled behavior is not propositional: it is motor acuity, which can become more precise through practice. They argue, however, that skilled behavior requires more than this procedural motor competence alone: it also requires propositional knowledge of the task in question. Stanley and Krakauer's defense of Intellectualism draws on both scientific and semantic arguments in order to claim that skilled behavior manifests propositional knowledge in addition to motor acuity.

Stanley and Krakauer's scientific argument reinterprets studies of amnesia, including the classic studies of HM which drove the initial distinction between declarative and procedural memory. Patients like HM can learn to perform new skilled activities, despite being unable to retain new knowledge of facts, events, or experiences long-term. This functional dissociation, Stanley and Krakauer claim, has been widely misinterpreted as showing that motor skill does not require knowledge. Stanley and Krakauer point out that HM received explicit verbal instruction each time he performed the task, "and was able to use that knowledge each time" (Stanley and Krakauer 2013, 8). They appeal to similar experiments with other amnesia subjects which seem to show that "the amnestic patients could not perform any of the tasks *unless instruction was provided on each day*" (Stanley and Krakauer 2013, 8, italics in original). Stanley and Krakauer propose that the correct conclusion to draw from this data is "that *motor skill* involves both a

knowledge component and a component that is not knowledge-based, namely the so-called procedural aspect" (Stanley and Krakauer 2013, 8, italics in original).

In other words, Stanley and Krakauer take the propositional knowledge communicated in the instructions to be a necessary condition for manifesting the skill: they propose that HM and other subjects with amnesia are using knowledge in the form of instructions or descriptions to guide their skilled behavior. Therefore, Stanley and Krakauer conclude, skilled behavior requires propositional knowledge in addition to motor acuity and thus supports an Intellectualist view of skill. Their revisionist conclusion is that: "the central discoveries in neuroscience about motor skill lend no support whatsoever to the view that skilled motor activity is not the manifestation of knowledge" (Stanley and Krakauer 2013, 10).

We propose that there is nothing controversial about the claim that HM and others with amnesia use instructions to guide their behavior. HM had severe impairments on tests of long-term declarative memory, but exhibited intact performance on tests of working memory: he could repeat strings of up to six or seven digits, for example, on memory span tasks (Squire 2009, 3). There is no reason to think that other amnesia subjects lacking long-term declarative memory have deficits in short-term or working memory. But the fact that amnesia subjects use instructions to guide their behavior does not demonstrate that skilled behavior in general requires propositional knowledge. First, it's not clear that the ephemeral nature of the information in short-term memory qualifies it to count as knowledge, where the latter is generally assumed to be a stable and long-lasting state. Second, the most we can conclude from the data in question is that people with amnesia can use working memory to initiate skilled behavior. Stanley and Krakauer, however, think that their conclusion about the relation between skill and knowledge in amnesia subjects generalizes to the population at large. They propose that "[m]anifesting skill […] involves a large amount of propositional knowledge about the relevant activity":

> "Our core claim is that real world motor skills require the employment of the correct average action, presumably selected from a large potential repertoire through external instruction or self-instruction based on ever-accumulating knowledge of the task, followed by increased precision of the selected action through practice (motor acuity)," (Stanley and Williamson 2013, 9)

Notice, however, that there is a clear difference between the sort of knowledge that amnesia subjects receive in the form of external instruction and the ever-accumulating repertoire of knowledge that enables someone to manifest skilled behavior. While the former case is best understood as involving working memory, the latter case cannot be understood this way: working memory does not allow for large amounts of information, nor does it allow for the accumulation of information over any significant length of time. If skilled behavior in general manifests such knowledge, that knowledge must be stored in long-term declarative memory; after all, Stanley and Krakauer have ruled out that procedural memory (motor acuity) as a source of knowledge. But if skilled behavior requires propositional knowledge stored in declarative memory, the amnesia data that Stanley and Krakauer cite actually works against them. The very basis of the distinction between declarative and non-declarative memory comes from observing what HM and others can and cannot do: one of the originators of the distinction points out that "the terms declarative and nondeclarative were introduced with the idea that declarative memory

refers to the kind of memory that is impaired in HM" (Squire 2009: 4).[13] As long as we accept that amnesia subjects with no long-term declarative memory can manifest skilled behavior, then the accumulation of large stores of propositional knowledge cannot be necessary for skill. If Stanley and Krakauer want to argue that scientific findings support their claim that skill requires knowledge, they will need to appeal to (at least) two distinct cognitive mechanisms by which that knowledge is acquired, stored, and used to initiate behavior. The data from people with amnesia cannot support their more general claims.

This is where it becomes clear that Stanley and Krakauer are relying on a second argument for thinking that skills require propositional knowledge: the semantic argument. Stanley and Krakauer offer a "pre-theoretic" characterization of skill, identifying "the functional category that scientific accounts of skill should at the very least approximate" (Stanley and Krakauer 2013, 3). They characterize skilled activity as intentional action which is under rational control, and as requiring knowledge about the activity in question. They support this pre-theoretic characterization of skill by appealing to non-empirical reasoning from philosophers such as Aristotle and Anscombe. The key part of their claim, that the knowledge required for skilled activity is propositional knowledge, is based on same linguistic argument used by Stanley and Williamson (2001) and Stanley (2011a): Stanley and Krakauer claim that the most promising syntactic and semantic account of knowledge ascriptions "treats them uniformly as factual knowledge" due to their status as embedded questions (Stanley and Krakauer 2013, 5). And it is this semantic argument, rather than the scientific argument above, which forms the basis for their Intellectualist account of skilled behavior. Stanley and Krakauer take their pre-theoretical and semantic musings to result in an "uncontroversial claim" about the relation between skill and knowledge which is "*sufficient to refute* basic presuppositions of neuroscience, such as the view that skill is identical to procedural knowledge" (Stanley and Krakauer 2013, 6, our italics). The 'refuted' view, they claim, results from "an incorrect identification between categories in neuroscience and mental kinds" (Stanley and Krakauer 2013, 2).

Stanley and Krakauer are clearly right that we cannot correctly identify *propositional* skill with *non-propositional* procedural memory. And so they are right to point to a tension between their own view (that skill requires propositional knowledge) and the widely endorsed scientific view (that skill does not require propositional knowledge). But their approach to resolving the tension is simply to claim that their conclusion, based largely on semantic evidence, is "sufficient to refute" the conclusion of the argument from cognitive science. They do not, for example, weigh up the different kinds of evidence involved in the two approaches, or suggest that one theory puts pressure on another, or consider revising their pre-theoretic notion of skill. Stanley and Krakauer seem to think that their "pre-theoretic" notion of skill takes priority when we come to consider

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[13] The source of the declarative/procedural distinction is Cohen and Squire (1980). The more recent distinction between declarative and non-declarative memory stems from Squire and Zola-Morgan (1988). When characterizing it, the authors write: "Declarative memory includes what can be declared or brought to mind as a proposition or an image. […] Non-declarative memory refers to a heterogenous collection of abilities: motor skills, perceptual skills, and cognitive skills (these abilities and perhaps others are examples of procedural memory); as well as simple classical conditioning, adaptation level effects, priming, and other instances where experience alters performance independently of providing a basis for the conscious recollection of past events" (171).

the nature of the world: they take their semantic argument for Intellectualism to establish truths about the nature of our mental states which are sufficient to refute scientific claims about the mechanisms of skilled behavior. Stanley and Krakauer thus allow no room for a naturalistic approach to metaphysics. They do not consider that scientific theories might inform our metaphysics of mental states, or that we might reconfigure our pre-theoretical concept of skill in light of what cognitive science tells us.[14]

We are not suggesting that the argument from cognitive science should override any semantic evidence in this case, nor are we denying a role for *a priori* evidence. We are simply indicating that the outright dismissal of scientific arguments concerning the nature of skill and practical knowledge strongly suggests that Stanley and Krakauer reject naturalistic metaphysics. While we have no problem with this metaphilosophical stance, it raises problems for the status of Stanley and Krakauer's own scientific argument for Intellectualism. Stanley and Krakauer appeal to scientific data concerning HM and other amnesia subjects: they argue from an empirical claim (that these subjects had instructions prior to initiating skilled behavior) to a claim about the propositional nature of skill. To use this empirical data to support their Intellectualist view about the nature of skill, Stanley and Krakauer must be allowing that at least some scientific findings can inform our metaphysics. But as we have shown above, when the scientific findings support an anti-Intellectualist view, Stanley and Krakauer dismiss them: and not on scientific grounds concerning their theoretical virtues or methodology, for example. The scientific findings in question are simply taken to be "refuted" because they are in tension with the semantic evidence for Intellectualism.

4.3 Pavese on practical modes of presentation

If practical knowledge is propositional knowledge, as the Intellectualist claims, then why does it typically correspond to certain behavioral competences and skills in a way that other (theoretical) propositional knowledge does not? According to Stanley and Williamson's (2001) characterization, practical knowledge is knowledge of a proposition *under a practical mode of presentation*: to know how to φ is knowing that *w*, where *w* is a contextually relevant way to φ under a practical mode of presentation. It is this 'mode of presentation' which distinguishes practical knowledge of a proposition from theoretical knowledge of a proposition. Rather than argue directly for Intellectualism, Pavese (2015, 2017) focuses on developing an account of 'practical meanings' which she thinks could provide a more rigorous characterization of the

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[14] The idea that our folk concepts are subject to change on consideration of scientific evidence is key to naturalistic approaches to the mind, as Churchland argues:

> "what we take to be obvious or observational within the framework of intuitive psychology is not guaranteed correctness or survivability simply on the strength of that obviousness and observationality. […] even intuitive frameworks, and even observational concepts, can be reconfigured as science proceeds" (Churchland 1986, 293)

practical modes of presentation proposed by Stanley and Williamson (2001) and Stanley (2011a). Her approach combines a semantic approach to Intellectualism with findings from the cognitive science of motor control.

Pavese (2015) takes a Fregean approach to propositions, according to which a proposition is structured, and its components are modes of presentation (or senses) of objects rather than the objects themselves. This allows her to argue that knowing a proposition under a practical mode of presentation is just knowing a proposition that has a practical mode of presentation as a component. Pavese then proposes that practical knowledge concerns "how to execute some task or other" (Pavese 2015, 2), and that the different methods for executing a task are distinct practical modes of presentation of that task: when we grasp a particular method for executing a task, therefore, we have grasped the task under a practical mode of presentation. This allows that we can have theoretical knowledge merely by knowing a proposition concerning a task, but we can't have practical knowledge of a proposition concerning a task unless we also we grasp a particular method for executing this task, i.e. unless we know the proposition under a practical mode of presentation:

> "As Fregean senses, practical modes of presentation are conceptual components of the propositional content that is putatively known when one knows how to do something. On this view, know how is […] knowledge of a *practical proposition*, a proposition that has as a component a *practical* sense" (Pavese 2015, 2, emphasis in original)

Pavese (2017) develops this theory of practical modes of presentation by appealing to the cognitive science of human motor control. Cognitive psychology and cognitive neuroscience explain our voluntary movements in terms of the computational mechanisms that transform our intentions to act (e.g. to wave, to catch a ball, to pour a drink) into the bodily movements that achieve these outcomes (e.g. reaching one's arm at a certain angle and velocity). It is widely accepted that the planning stage of motor control uses information about the agent's intentions, their sensory input, and their motor abilities to issue a *motor representation*. (In keeping with the earlier discussion, representations are physically-implemented computational states that have both semantic and causal properties.) Motor representations carry information about how the motor system can achieve the agent's goal through neural commands, bodily kinematics, and muscle contractions.

Pavese proposes that the motor control system, and motor representations in particular, support her theory of practical modes of presentation. She claims that "a satisfactory psychological explanation of motor behavior based on those computational models is one that assigns a central explanatory role to practical meanings [practical senses] " (Pavese 2017, 93). She argues that our motor representations bear two kinds of content: one concerning the action or task to be performed (e.g. pouring a drink), and the other concerning a particular method for executing the task in terms of our basic motor abilities (e.g. grasping and tipping a bottle in the appropriate

way). The latter of these, she claims (in keeping with the earlier work outlined above), is the mode of presentation or practical sense of the task in question: "methods stand to tasks as Fregean meanings (or senses) stand to their denotations (or referents)" (Pavese 2017, 76). Pavese is not only committed to the claim that motor representations have both a sense and reference, but also to the claim that the sense determines the reference, such that a motor representation "denotes a task and expresses a meaning (or sense) that determines that task — their meaning being a method for performing that task" (Pavese 2017, 85). These practical senses are not propositions, but Pavese intends them to be the kind of semantic entities that could be components of Fregean propositions and thus provide "a more rigorous characterization of Stanley and Williamson (2001) and Stanley's (2011) notion of practical modes of presentation" (Pavese 2017, 42).[15] If this works, then motor representations are what enable one to grasp practical senses, which in turn enables us to grasp a proposition (which includes this practical sense as a component) under a practical mode of presentation. If practical knowledge involves knowing a proposition under a practical mode of presentation, then possessing practical knowledge could be partly explained in terms of grasping the practical sense of a motor representation.

Pavese's approach to Intellectualism, like Stanley and Krakauer's, combines semantic theorizing with findings from cognitive science. But Pavese's semantic interpretation of motor representations sits uneasily with approaches to semantic content in cognitive science more generally. Cognitive science favors a referential view of content which allows for naturalistic accounts of content acquisition: representations come to be associated with their referents in virtue of the latter's causal properties.[16] Fregean senses, as abstract semantic entities with no causal properties, can play no explanatory role in cognitive science. It is difficult to see how one could be a realist about representations while maintaining that they play an explanatory role in virtue of their abstract Fregean senses.

There is, however, a non-Fregean way to interpret the motor system in a way that retains 'mode of presentation' talk to refer to non-semantic features. When individuating representations by their referential content is too coarse-grained to capture their cognitive significance (e.g. when two coreferential representations play different roles within the cognitive system), cognitive science often allows that the same referent can be represented in different ways: by distinct symbols or distinct regions of state space, depending on the cognitive architecture. These distinct 'modes of presentation' are whatever formal, physical, or functional properties of representations

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[15] The question of how practical meanings could appear as components of thoughts is one Pavese leaves "to future work" (Pavese 2017, 94).

[16] Fodor emphasizes that, for cognitive science, having a non-naturalistic theory of mental content is akin to having no theory of content (Fodor 2008, 51). He proposes that "the referential kind of content affords by far the best hope of naturalization" (Fodor 2008, 51); Rupert similarly acknowledges that referential theories of mental content "better satisfy naturalistic scruples" (Rupert 2011, 102).

allow the cognitive mechanisms to treat coreferential representations as distinct.[17] It is thus plausible that two motor representations playing distinct causal roles could refer to the same task, such that they could be considered different (non-semantic) modes of presentation of the task, and perhaps as different methods for executing the task. We include this interpretation because Pavese herself seems to acknowledge that we might think of practical senses as such non-semantic modes of presentation, claiming that "we might think of the method itself as the result of breaking down a task into elementary parts, in which case we want to identify the method with the very same structured task" (Pavese 2017, 81). Such a position, however, would not support the other Fregean claims that Pavese wants to make: on a non-semantic interpretation of practical modes of presentation, we don't have a causal explanation of how they could determine reference or be components of propositions.[18] And even if motor representations (individuated as modes of presentation) could be components of propositionally-structured representations, it is not clear how they could be graspable or conceptual. Recall that on Pavese's Fregean approach, "practical modes of presentation are conceptual components of the propositional content" that are graspable by the subject (Pavese 2015, 2). According to the cognitive science of motor control, motor representations operate at a time-scale which suggests they are automatic and inaccessible to consciousness, and that they carry information about biomechanical constraints and kinematic rules (e.g. the mathematical relationship between the velocity and amplitude of movement) of which we have no conceptual knowledge.[19] Motor representations thus seem ill-equipped to be the graspable, conceptual components of propositional thoughts.

These considerations raise questions about the role of cognitive science in Pavese's Intellectualism. As we see it, there are two ways that Pavese could be employing scientific findings in her argument. On the first of these, she is appealing to the cognitive science of motor control as evidence to support her claims about practical modes of presentation. If this is the case, then scientific findings are being taken to inform our metaphysics of practical knowledge, which implies that Pavese must accept some form of naturalistic metaphysics. But it is difficult to characterize Pavese as endorsing a naturalistic metaphysics when she fails to take into account several important scientific features of the motor control system. By characterizing the motor system in terms of a single motor representations referring to each task, she neglects to mention that cognitive scientists don't generally agree with this view. Many cognitive scientists posit

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[17] For further discussion of representational vehicles as non-semantic modes of presentation, see Aydede (2000), Schneider (2009), Drayson (2018).

[18] In cognitive science, semantic compositionality plays a causal-explanatory role in virtue of representational (e.g. syntactic) compositionality. Pavese's view would thus seem to require additional evidence that we have a cognitive architecture which allows motor representations to be combined with amodal conceptual representations to form propositionally-structured representations.

[19] These constraints and rules include the isochrony principle (the tangential velocity of movements is scaled to their amplitude), Fitt's Law (the time required to move to a target area is a function of the distance to the target and its width), and the two-third power laws between curvature and velocity.In target-pointing experiments, subjects can adjust their pointing trajectories when the target is displaced without awareness of the displacement or their adjustments. See Mylopoulos and Pacherie (2017) for details.

hierarchies of representations with distinct functions, and different kinds of contents: action goals, action outcomes, bodily movements, and sensory feedback are alternative candidates to tasks (see Ferreti 2016 for discussion). Even if Pavese is right to posit a single representation that specifically represents tasks, it is hard to see how the causal-explanatory framework of cognitive science could justify a Fregean interpretation of this representation on which abstract entities are doing the main explanatory work.

There is a second way, however, that Pavese could be employing scientific findings in her argument. On this view, we should not interpret Pavese as endorsing naturalistic metaphysics. We should understand her instead as relying on broadly semantic considerations to guide the metaphysics of practical knowledge, akin to Williamson and Stanley (2001). We can understand her methodology as a form of the functional reduction which has its roots in the 'Canberra Plan' approach of Lewis (1966) and colleagues. On this approach, one would take the concept of a practical modes of presentation and analyze it into its functional roles. Then, one would look to the actual world to figure out if there is an entity that could realize these roles. When philosophers taking this approach appeal to cognitive science, it is not to seek evidence for metaphysical theories but rather to locate a plausible realizer for their functional concept. (This approach is naturalistic in the ontological sense that it aims to identify physical realizers of functional roles, but it allows no scientific evidence about the physical world to informs our concepts.) There is a sense in which this interpretation fits Pavese's approach: she articulates her Fregean view of practical modes of presentation (2015) before she brings in the appeal to the cognitive science of motor representations (2017). Pavese's claims, however, do not seem to fare any better on this understanding of her methodology. Even if she were justified in conceiving of practical modes of presentation as having functional roles that include reference-determination, graspability and propositional composition, motor representations would not be good candidate realizers. As we have argued, to the extent that motor representations could realize practical modes of presentation, they do not play the functional role of Fregean senses: they do not determine reference, they are not graspable concepts, and they are not components of propositions.

We do not know which of these interpretations of Pavese is the more accurate, but neither alternative seems to establish what Pavese is arguing: that motor representations, as posited by cognitive science, can in some sense account for the practical modes of presentation required by Intellectualism about practical knowledge. If the cognitive science is playing an evidential role in establishing metaphysical claims, then it does not provide evidence supporting a Fregean picture of practical modes of presentation. If the cognitive science is playing a realization role,

however, then motor representations do not seem to have the right properties to play the functional role of Fregean practical modes of presentation.[20]

5. Conclusion

In the first half of this paper, we argued that the disagreement between semantically-motivated Intellectualism and the argument from cognitive science rests on metaphilosophical attitudes toward metaphysical naturalism. Philosophical proponents of the argument from cognitive science assume that scientific findings can substantially inform our metaphysics of mental states, such as to call into question the Intellectualist's conflicting metaphysical conclusion. We have shown that Stanley's (2011a, b) defense of Intellectualism against the argument from cognitive science takes an inconsistent attitude toward metaphysical naturalism, both allowing that scientific findings can alter our pre-theoretic concepts and rejecting or reinterpreting any scientific findings that are in tension with semantically-derived conclusions. The resulting confusion over the relationship between semantic and scientific approaches to Intellectualism has sometimes been taken to show that there are two distinct forms of the Intellectualist thesis: one concerning the semantics of practical knowledge ascriptions, and the other concerning the nature of the information processing responsible for skilled behavior. We deny this, proposing instead that proponents of semantic arguments for Intellectualism and proponents of scientific arguments against Intellectualism have the same Intellectualist thesis in mind: the metaphysical claim that practical knowledge is propositional in nature.

By understanding the debate in terms of attitudes toward metaphysical naturalism, we are able to suggest possible Intellectualist responses to the argument from cognitive science. One response

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[20] There is a further reason to doubt that motor representations can account for Pavese's practical modes of presentation. Pavese (2015) claims her approach to Intellectualism is concerned solely with the mental properties which we ascribe to *persons*: knowledge, competence, and intentional action, for example. She explicitly contrasts this approach with the standard methodology of cognitive science, as exemplified by Fodor (1968), of explaining the capacities of persons in terms of the properties and interactions of their 'subpersonal' cognitive subsystems:

> "I am interested in explaining competences that the subject can exercise intentionally. Because of that, the level of explanation at which my arguments work is personal [...] My view leaves it entirely open whether a Fodorian theory is the most adequate sub-personal theory of this sort of competences." (Pavese 2015, 18)

While there are a number of different ways to understand the personal/subpersonal distinction (see Drayson 2012, Rupert 2018), none of them would countenance Pavese's (2017) appeal to the motor control system as personal level or neutral with respect to subpersonal theories. The motor control system is a computational subsystem posited by cognitive scientists in order to give a decompositional explanation of the system-level capacities of the cognitive system: a mechanistic explanation of capacities like knowledge, competence, and intentional action in terms of the subpersonal states and processes that interact to produce these system-level features. Any attempt to explain the intentionally-exercised competences of the person in terms of the cognitive science of the motor system is no less a subpersonal explanation than Fodor's (1968) theory. We charitably suggest that Pavese's position has changed between the 2015 and 2017 papers.

would be to reject the assumptions of metaphysical naturalism, and deny that findings from cognitive science can challenge Intellectualist conclusions arrived at from semantic considerations. Another option would be to take the metaphysical naturalism seriously, and engage with the argument from cognitive science on its own terms by arguing that our best understanding of the scientific findings in fact support Intellectualist conclusions. This need not mean denying a role for semantic evidence: one could take both semantic and scientific findings to provide evidence for metaphysical conclusions, and adopt some principled method for weighing them against each other.[21]

In the second half of the paper, we applied these insights to more recent defenses of Intellectualism which seem to appeal to both semantic and scientific evidence. We argue that Stanley and Krakauer (2013) rely on metaphysical naturalism to employ data from amnesia subjects as evidence that propositional knowledge is required for skilled behavior. Elsewhere in their paper, however, their argument for Intellectualism relies on semantic evidence which they take to refute scientific claims. At the very least, Stanley and Krakauer owe us an explanation of their metaphilosophical approach: what kind of evidence can inform metaphysical claims, and how do we weigh different sources of evidence? We similarly propose that Pavese's (2015, 2017) account of practical modes of presentation relies on metaphysical naturalism when it treats cognitive scientific findings as evidence for a certain view of practical modes of presentation. If this is right, however, Pavese's metaphysical naturalism only goes so far: she ultimately interprets the scientific findings in a non-naturalistic manner which seems to be constrained by her pre-existing commitment to a certain semantic approach. Like Stanley and Krakauer, Pavese thus also seems to owe us an explanation of her metaphilosophical approach. In particular, we need an account of the respective roles played by scientific evidence and semantic evidence in establishing metaphysical claims about propositional knowledge under a practical mode of presentation.

Given that the Intellectualists studied here seem be motivated largely by the semantic approach of Stanley and Williamson (2001), one might wonder why they address findings from cognitive science at all. They clearly think that the semantic argument establishes Intellectualism about practical knowledge, and their engagement with metaphysical naturalism is minimal and inconsistent.[22] We suspect that the inclusion of findings from cognitive science in recent

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[21] This principled method might be merely inference to the best explanation. Williamson (2016) argues that when we construct philosophical theories, our evidence base is the total sum of human knowledge: scientific and semantic, *a posteriori* and *a priori*. Notice that if any of the Intellectualists discussed in this paper are using this strategy, they are not doing so in a principled way. They have not outlined the set of possible explanations nor the respects in which their own explanation is preferable.

[22] Perhaps these philosophers are under the impression that their philosophical reflections, rather than empirical investigation, determine the *explananda* of cognitive science. As Rupert (2018) points out, some philosophers take the view that their non-empirical characterizations of the mind "provide a presumptive constraint on cognitive-scientific modeling and theorizing" (Rupert 2018, 6) in a way quite unlike that of any other science. Stanley (2011a,

defenses of Intellectualism is not motivated by a desire to engage with the anti-Intellectualist argument from cognitive science or its metaphysical naturalism. Intellectualists face increasing pressure to say what makes some propositional knowledge distinctively practical: how does know-how relate to abilities, competences, and skilled behavior?[23] The cognitive science of skilled behavior and motor control is brought it, we suggest, specifically to solve this particular issue. The result is that semantically-motivated Intellectualists now find themselves in unfamiliar territory: their philosophical focus on epistemology and philosophy of language is generally conducted in abstraction from scientific theories of cognition and action. When these Intellectualists turn their attention to skill, they are often trying to combine modal claims about the nature of mental states with scientific accounts of physical behavior in the actual world. Such a project raises complex issues about methodology and metaphysical approaches, and would benefit from a careful consideration of metaphilosophical assumptions. We hope this paper will provide a starting point for future discussions of the relationship between semantic evidence and scientific evidence in the Intellectualism debate and beyond.

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147) gestures toward such a view when he suggests that that folk psychological concepts constrain cognitive science in a way that the concepts of folk physics don't constrain the physical sciences. This is a view denounced by those working in cognitive science, as well as by philosophers of science. See Thagard (2009) and Rupert (2018) for further discussion.

[23] Weatherson observes that the focus on skill instead of know-how is "a trend that we see exemplified in recent work by, inter alia, Pavese (2013), Fridland (2014) and Tsai (2014)" (Weatherson 2017, 371).

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