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A Naturalistic Perspective on Knowledge How: Grasping Truths in a Practical Way

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Abstract: For quite some time, cognitive science has offered philosophy an opportunity to address central problems with an arsenal of relevant theories and empirical data. However, even among those naturalistically inclined, it has been hard to find a universally accepted way to do so. In this article, we offer a case study of how cognitive-science input can elucidate an epistemological issue that has caused extensive debate. We explore Jason Stanley's idea of the *practical grasp* of a propositional truth and present naturalistic arguments against his reductive approach to knowledge. We argue that a plausible interpretation of cognitive-science input concerning knowledge—even if one accepts that *knowledge how* is partly propositional—must involve an element of knowing how to act correctly upon the proposition; and this element of knowing how to act correctly cannot itself be propositional.

Keywords: naturalistic epistemology; knowledge how; knowledge that; anti-intellectualism; intellectualism; practical grasp; cognitive science

1. Introduction

Our aim in this paper is to use a naturalistic approach to explore Jason Stanley's [1–4] notion of the *practical grasp* of a propositional truth, in light of his intellectualist approach in general. We show that there is more to his notion of "practical grasp" than merely a special kind of relation to a propositional truth, and that this added dimension raises questions about how reducible *knowledge how* is to *knowledge that*. In his investigation of knowledge, Stanley strives to position his theory as being compatible with cognitive science. We will show that his interpretations and conclusions are problematic.

There has arguably been an increased acceptance of naturalism among philosophers, in the sense of a wider acknowledgement of an "all-encompassing" natural world. There is consensus, too, on the importance of taking scientific evidence into account when dealing with philosophical problems, although there is much debate about what exactly such an acceptance ought to involve [5]. An *ontological* naturalism that excludes supernatural entities is nowadays largely uncontroversial. Physicalists [6] claim that physical entities and their arrangements underlie all causal interactions, but it is a much-debated question whether, for example, the mental can be reduced to the physical or not [7]. Influential positions in *methodological* naturalism include, for example, replacement naturalism [8], which claims that epistemology should be replaced with cognitive psychology; substantial naturalism [9], which holds that philosophical problems and issues need to be reformulated in a more strict scientific terminology in order to remain relevant; and cooperative naturalism [10], which claims that philosophy needs to take scientific findings into account where such findings exist. Furthermore, *evolutionary* naturalism [11,12] emphasizes that cognitive agents such as humans are shaped to fit their environment by natural selection. An evolution-based understanding of our cognitive structures and mechanisms can then be seen to replace, succeed, or complement traditional epistemological understandings [13].

We will take a physicalist-inspired approach within cooperative and complementary evolutionary naturalism that views all philosophical questions as being legitimate. The answers need to be compatible with the natural world and the evolved cognitive agents in it, as well as with scientific results. If there is relevant scientific input concerning a particular question or problem at hand, it must be taken into account, and intuitions must give way. We consider this approach both inclusive and potentially fruitful, and so will use it to elucidate the aforementioned influential discussion concerning *knowledge*.

Section 2 briefly discusses Stanley's [1] explanation of how *knowledge how* differs from *knowledge that*. Sections 3–5 evaluate Stanley's basic argument in favour of intellectualism. Section 6 shows how his concept of *knowledge how* counts against elements of his intellectualist argument. Section 7 explores a possible objection to the alternative that we sketch, concluding that—even within Stanley's framework—There must be more to *knowledge how* than the grasp of a proposition. Section 8 presents insights from cognitive science to support our interpretation and discusses how Stanley's position is problematic.

2. The Argument from Knowledge Transfer

A central element in Stanley's [1] theory of knowledge is that practical *knowledge how* can be reduced to propositional *knowledge that*. A general difficulty for any theory that attempts to reduce *knowledge how* to *knowledge that* is that of knowledge transfer. If *knowledge how* is essentially propositional, then it would seem that it ought to be easy to transfer propositionally; yet it is not. Comprehending all the propositional truths about how to swim will not enable one to swim. One cannot learn it from a book. Success takes practice and time. One does not learn it, intellectually; one must learn to do it practically, in a way that seems to point towards some non-propositional proficiency.[1]

To accommodate this practical aspect of *knowledge how* whilst preserving his intellectualist account, Stanley defines *knowledge how* as the practical grasp of a propositional truth: to have mastered a skill is to have grasped a propositional truth in a "practical" way. For an agent to act skillfully, according to Stanley, she must entertain "a practical way of thinking" [1] (pp. 124–130) concerning the true proposition(s) she knows (i.e., her knowledge how). She must grasp the way an action can be performed and be able to perform the action under relevant parameters of normality. She must apply the information she has acquired "in a first-person way" [1] (p. 124): that is, she must relate it to her practical capacities. In this way, *knowledge how* can be seen as propositional, despite possible appearances otherwise.

Given what it is meant to do, the practical grasp of a propositional truth must include the ability to apply that propositional truth practically. If learning to swim means gaining a practical grasp of the propositional truths about swimming, then that practical grasp includes being able to execute the necessary motions described by those propositions: i.e., acting on those propositions in *the right kind of way*. Stanley writes that the inspiration behind his idea can be found in Davidson's philosophy [15]. Davidson added the criterion "in the right way" to avoid the problem of deviant causal chains. Given his causal model, he needed a mechanism that prevents actions coming about in random ways. That said, exactly what constitutes the "right way" was unclear even to Davidson, who wrote [15] (p. 79): "I despair of spelling out . . . the way in which attitudes must cause actions if they are to rationalize action." Many researchers have drawn attention to this: e.g., Stout [16] (p. 4) mentions "what Davidson famously despaired of spelling out." We think it just as difficult to account for "the right way" in Stanley's account. Stanley's notion of practical grasp has gone through many modifications over the years; we will not treat them all but will focus mostly on his formulation in [1]. Stanley and Williamson [3] write that the agent must entertain a way of Φ-ing under a practical mode of presentation and that [3] (p. 429): "thinking of a way under a practical mode of presentation

[1] For a thorough treatment of this problem, see Glick [14]. He calls it the *sufficiency problem*.

undoubtedly entails the possession of certain complex dispositions." Stanley [2], [1] builds on this idea when he develops his view on "ways of thinking" [1] (ch. 4), which involves a "more sophisticated notion of [a] proposition" [1] (p. viii).

There are no uncontroversial views in the literature on the exact meaning of "proposition",[2] and Stanley's is especially hard to pin down. What is clear is that, on his view, propositions are facts and "a proposition is the sort of thing that is capable of being believed or asserted" [1] (p. vii). Thus, there is a duality to his conception: propositions are factual and, therefore, ontological; at the same time, they are something that one can stand in an epistemic relationship to. They appear among a subject's ways of thinking or in different *modes of presentation*.

This conception enables Stanley to argue that skilled action is propositional in character. It is propositional because the skilled agent, in acting, acts on a proposition that she grasps epistemically and can act on because she relates this knowledge to herself in a "first-person kind of way" (see [1] (pp. 85–86, 124–130)). The challenge for the intellectualist is that *S* can know a proposition *p* without knowing how to transfer *p* into action. One could know that *w* is a way to ride a bike without being able to ride a bike oneself: i.e., there is seemingly a difference between *knowledge that* and *knowledge how*. In his defense of intellectualism, Stanley suggests that *knowledge how* must comprise a special kind of grasp: the practical grasp of a proposition enabling the agent to apply the truth she has acquired to her own agency ("a first person way of thinking" [1] (pp. 85–86)). *Knowledge how* does not consist of a propositional truth *per se* but rather the practical grasp of that propositional truth. The answer to a question about *knowledge how* does not consist of a proposition *per se* but of the "practical grasp" of that proposition, which is what constitutes the skill. When an agent transforms her skill into practice, she does so under a "practical mode of presentation" [2]. The problem with this is that Stanley also argues [1] (pp. 126–128) that knowing how to do something need not mean being capable of doing it: i.e., *knowledge how* need not be the ability to execute a skilled action. Part of our critique is to ask: what *is* the practical presentation in question?

3. Stanley's Intellectualism

The backbone of Stanley's argument for intellectualism is his analysis of embedded questions: i.e., questions that appear in declarative statements or as part of another question. The details of his analysis are complex. To simplify somewhat, he argues that the semantic nature of "how" questions is similar to that of "wh" questions—i.e., who/where/why/when questions—because all conform to the same basic pattern. "Knowing-wh stands and falls together—either they are all species of propositional knowledge, or none of them are" [1] (p. 134). A unified semantic theory requires that *all* answers be propositional. Stanley writes that [1] (p. 141):

> the kinds of philosophical and scientific considerations that would lead us to conclude that knowing how to Φ is not a species of propositional knowledge would also lead us to conclude that knowing where to Φ is not a species of propositional knowledge.

If "how" questions could be answered in a non-propositional way, as anti-intellectualists claim, that would necessarily *also* be true for "wh" questions, which Stanley finds unacceptable: according to him, the answers to these questions often clearly *are* propositional.

Contra Stanley, Devitt [17] argues that one should go ahead and accept that, in many cases, knowing-wh is *not* propositional ([17], as quoted in [1] (p. 134)):

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[2] It is not our purpose here to give our own view of exactly what a proposition is. Suffice to say, pace Stanley, on our view, *S*'s acting on propositional knowledge requires a kind of knowledge that is not propositional. Propositional knowledge is clearly relevant to action, but we reject the intellectualist claim that *knowledge how* is reducible to *knowledge that*. It is no problem for our view if an agent is unable to verbalize the knowledge she acts on when she acts with skill, but the intellectualist, who takes such knowledge to be propositional (i.e., *knowledge how* is defined as a relation to a proposition), must deliver a convincing account how S can fail to be able to express such knowledge or re-define the term "intellectualist" in an other-than-usual way. We return to this in Section 4 and we explain our own view in more detail in Section 8.

> The foraging desert ant wanders all over the place until it finds food and then always heads straight back to its nest. . . . On the strength of this competence, we feel no qualms about saying that it "knows where its nest is." But to attribute any propositional attitudes to the ant simply on the strength of that competence seems like soft-minded anthropomorphism.

Stanley replies [1] (p. 134):

> It should be widely acknowledged that the philosophical and scientific motivations that motivate the view that knowing how is not a kind of propositional knowledge also would lead one to conclude that many ascriptions of knowing-wh, even ascriptions of knowing whether one of several options obtains, do not ascribe propositional knowledge.

"Knowing whether one of several options obtains" is a clear-cut case of propositional knowledge built on propositional descriptions of the world: either Bogota is the capital of Colombia or it is not. Stanley takes it as an unwelcome result if a semantic theory of questions says that knowledge-wh can be non-propositional in character because [1] (p. 134) "languages are remarkably uniform in their ascriptions of knowing where, knowing when, and knowing whether." He goes on to argue that *knowledge how* is likewise expressed in this uniform way cross-linguistically.

At this point, let us set aside further discussion of the details and refer the reader to Stanley. The bottom line is that he argues that embedded questions demand a unified semantic theory and that this points in the direction of a *propositional* theory, as many of the questions must be answered in the form of a proposition.

A possible objection, given Stanley's linguistic focus, is that communication of *knowledge how* does not work the way he seems to presuppose. In everyday life, "how" questions are not treated in the same manner as "wh" questions. Imagine what such communication would be like if they were. If one asks, "how do I swim?" the reply would need to be something like: "place yourself laterally in the water with your arms extended straight in front of you and your legs behind you. . . . First, kick your legs behind you. Then you just glide for a bit and pull yourself forward with your arms." [18]. If one asks, "how do I ride a bike?" the reply would need to be something like: "start with one foot on the ground. Your other foot should be flat on a pedal pointed upwards. Push off, put that foot on the other pedal, and go! Keep going as long as you can maintain balance." [19].

These questions are common enough; what is rare is the propositionally structured reply: one does not normally answer these questions linguistically. Such replies seem odd and unhelpful. An exchange of this sort seldom happens; even when it does, it is of little use in transferring *knowledge how*.

Contrast this with "wh" questions and their replies. If one asks: "where is the nearest gas station?" the reply might well be something like, "just carry on down this road; there'll be a Texaco on your right-hand side after half a mile." "When did Susan leave the party?" "She left around ten." "Who is Barack Obama?" "He served as 44th president of the United States."

Questions and answers of this form are ubiquitous; answers of the "how" form are rare. In the age of Google and Wikipedia, one can always search the Internet for answers to such "how" questions; but they do not occur as often in everyday life as "wh" questions do. When—as may rarely happen—they are answered propositionally, the reply does not *really* answer the question; it cannot because it does not give the enquirer the *practical competence* she is seeking. Few people ever ask for the best description of the act of swimming; if one asks, "how do I swim?" that's not what one wants, anyway. The "how" question is posed with actual performance in mind. Experts typically impart *knowledge how* by demonstrating it, while the novice imitates what she is shown.[3] Stanley's analysis strikes us as

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[3] We are simplifying, of course. In practice, there are multiple ways to learn and improve *knowledge how* without recourse to *knowledge that*. In addition to imitation, Johansson and Lynøe [20] (pp. 159–161) suggest practicing on one's own, practicing with a tutor, and learning via "creative proficiency": a practical variation of creative thinking

contrived and not really addressing everyday life. To genuinely know how to do something—to gain that *knowledge how*—one must go ahead and *try* it.

Whereas questions and answers are generally sufficient to gather knowledge in the *wh* domain, they are of little help when it comes to knowledge how to perform a particular task—unless the task is truly simple, like "how do I start the coffee machine?" (to which the reply might be "push the red button"). Such simple questions are quite different from questions concerning how to ride a bike or swim, a point we will return to below. Indeed, we suppose that one could call them camouflaged *knowledge that* questions even though they seem to ask for *knowledge how*.[4] In any case, Stanley's interest is not in these simple cases but in complex activities like swimming or riding a bike.

Though Stanley puts a great deal of weight on answering questions about such activities, he does not claim that people ask and answer "how" questions in the way we have discussed. Instead, he has a special sense of answering questions in mind.

4. Answering Questions

Building on his earlier work with Williamson, Stanley holds that *knowledge how* always amounts to knowing the answer to a question; but this does not mean that all such knowledge consists in the ability to verbalize one's answers, because [2] (p. 214) "knowing how to ride a bicycle involves knowledge of a distinct proposition than does knowing how to explain how to ride a bicycle."[5] One's ability to answer a question can be latent, in which case one simply acts, based on implicit facts; as Stanley puts it [2] (p. 214): "only grasping a way to ride a bicycle is required to know how to ride a bicycle." The cycle-riding agent has, in a practical way, grasped the requisite propositions for riding a bike: i.e., she knows of some means, w, such that w is a way to ride a bicycle. Her *knowledge how* consists in an ability to answer certain questions in principle, not necessarily in practice.

It is important for Stanley that, even though knowledge how to Φ is the same as knowing a fact about Φ, the intellectualist does not demand from the agent that she can explain how to Φ. The only requirement is that she grasps a way in which Φ can be performed, though Stanley understands that one might think otherwise [2] (p. 214): "perhaps the very fact that the intellectualist defines knowing how in terms of propositional knowledge suggests that someone who knows how to do something must be able at least to *express* her propositional knowledge." The point is that the agent need only be able to express that knowledge *somehow*, perhaps with demonstratives, not necessarily explain it verbally: a weaker claim than the one might otherwise think Stanley is making.

Stanley explicates his point by offering the young Mozart who, having been asked, "how do you do it?" points to one of his masterpieces while writing it, saying [2] (p. 214): "this is how I can do it." Of course, one could object that this does not answer the question of how to compose a masterpiece. An answer should be informative, and Mozart's "answer" is not illuminating at all—not so much because he cannot verbalize himself as because he is seemingly unable to give any satisfactory answer. It seems counterintuitive to say that he possesses an ability to answer the "how" question presented to him. Nevertheless, Stanley claims that Mozart's pointing at his masterpiece, while composing it, is an expression of *knowledge how*. He justifies this by asking one to consider what words should count as expressing *knowledge how*. If *all* words should count—and Stanley believes they should—then, Stanley says, demonstrative expressions like "this" count, and Mozart has successfully expressed his *knowledge how*.

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[4] Arguably, many everyday *knowledge how* questions, and basically all those one expects to be answered verbally, are concealed *knowledge that* questions: e.g., "how do I get to the bus stop?" and "how do you play chess?" are both asked in a "how" manner but are really requests for *knowledge that*.

[5] Stanley quotes Fodor: "There is a real and important distinction between knowing how to do a thing and knowing how to explain to do that thing. But that distinction is one that the intellectualist is perfectly able to honor . . . The ability to give explanation is itself a skill—a special kind of knowing how which presupposes general verbal facility at the very least. But what has this to do with the relation between knowing how and knowing *that*? And what is there here to distress an intellectualist?" (quoted in Stanley [2] (p. 213).

Stanley does not seem much concerned with how the recipient interprets Mozart's gesture. What matters is that Mozart has a way to express his knowledge that Stanley's intellectualism can capture. Stanley goes further: the intellectualist need not hold that an agent is able to express the proposition that represents her *knowledge how* in words at all, not even using demonstratives. Her *knowledge how* need be nothing more than a state implicated directly in action. Stanley writes [2] (p. 215):

> The southpaw is winning on points. But then the expert boxer adjusts and starts boxing in a particular way that is the best way to fight against a southpaw. The announcer, pointing at the way in which the expert boxer is fighting, utters: "He knows that that's the best way to beat a southpaw." *The announcer's knowledge-ascription is quite explicitly a true ascription of knowledge-that*. Furthermore, it is true *whether* or not the boxer is able to verbalize his knowledge of the way in question of boxing against a southpaw in non-indexical terms, non-demonstrative terms.

The point Stanley wants to make here is that it is not a requirement on his intellectualist account that *S* can verbalize his *knowledge how*. The expert boxer knows how to beat a southpaw without being able to verbalize this knowledge. This, he says, is analogous to the fact that one can know multiple different shades of a colour without being able to express this knowledge [2] (p. 215).

We have two responses to this. First, that an observer—the announcer in this case—can have propositional knowledge about another person's *knowledge how* does not imply that the latter knowledge is not of a different, more *practical* sort. Second, is it genuinely possible to know the answer to a question, in the sense required by Stanley's account, if one is unable to verbalize one's *knowledge how*? As we argue throughout, an intellectualist account which accepts a "mute" grasp of propositions is highly problematic. It runs the risk of ending up in precisely the type of conception of *knowledge how* that it seeks to avoid. What seems to constitute a practical mode of presentation for Stanley involves some kind of expertise irreducible to the proposition in itself. Moreover, Stanley's conception of *knowledge how* seems very distant from how research suggests that cognitive processes work.

Stanley's expert boxer has grasped certain boxing truths, expressed through his change of tactics. We have a problem with this. If, as Stanley claims, knowledge always involves grasping a proposition, and this is meant to capture how actions are informed by intelligence, it seems to us a proper demand that the agent should be able to give a more informative expression to the proposition she is meant to grasp. If she cannot do so, it is hard to see in what sense she grasps a proposition. Stanley's "mute" grasp of a proposition strikes us as mysterious, yet Stanley offers nothing to dispel the mystery. Instead, he focuses on shared characteristics of "how" and "wh" questions.

5. Wh-Questions

Remember that, for Stanley, two things are key: *knowledge how* consists in knowing the answer to a question, while *knowledge how* should fit within a more general account of knowing answers to questions. Toward that end, he seeks to set out for his readers the similarities between knowledge how and knowledge-*wh* and so between "how" and "wh" questions. He believes that knowledge ascription is always done in a similar way, comprising the ability to answer a "how" or a "wh" question. Just as one says things like "Hannah knows *where* her bike is", "Hannah knows *why* her bike has a flat tire", and "Hannah knows *when* she parked her bike in the garage", so one says things like "Hannah knows *how* to ride a bike." Of course, one *could* give each of these ascriptions its own account: one for *knowledge where*, one for *knowledge why*, one for *knowledge when*, and so on. What is striking, though, is that all these ascriptions have a similar semantic structure [1] (p. 36): "it is a stable cross-linguistic fact that most of the sentences ... are translated with the same verb used in translations of sentences of the form 'X knows that p'", and "the same word 'know' occurs in all of these constructions." For Stanley, that means they represent a single, unified phenomenon. He writes that [1] (p. 37): "the fact that we do not employ different words for these notions suggests they are at the very least intimately related concepts."

Rumfitt [21] criticizes this line of reasoning. He notes that French everyday language contains several distinct terms for knowledge how: e.g., *savoir faire*. Such terms do not seem to fit the pattern Stanley prescribes.

Stanley replies that the apparent problem is nothing more than a matter of Gricean conversational implicature: while many languages spell out embedded questions in full in accordance with his model, others do not. Their omission of the question word is guided by Grice's maxims [1] (p. 141, *emphasis added*):

> It is clear that in a language in which it is possible to drop the overt question word in expressions of knowing how, Grice's maxim of manner predicts that one ought to drop the question word. But there is no language known to me where the propositional verb together with the bare infinitive means *knowing where*. *So the fact that in many languages ascriptions of knowing how do not superficially appear to take the form of an embedded question should not lead us to analyze them as relations to activities. So doing would lead to an unwarranted asymmetry between states of knowing how to do something and states of knowing when to do something and where to find something, asymmetries that all parties to the debate about the nature of practical knowledge should reject.*

Not only does Stanley seem to think he can explain linguistic developments in the French language by appeal to Grice, he also claims that interpreting *knowledge how* as "relations to activities" would lead to an "unwarranted asymmetry" between states of knowing how and other states of knowing-wh. When Stanley says that *knowledge how* is propositional, he really does mean that it is propositional on a par with knowing where the nearest gas station is; but this raises a difficulty.

6. Ability to Execute a Skilled Action

For a unified theory of embedded questions to be possible in the way Stanley wants, the answer to a "how" question, as an expression of *knowledge how,* must consist of a proposition. As we argued in Section 2, *knowledge how* is the ability to execute a skilled action—noting that, for Stanley, it is not a requirement of *knowledge how* that the agent actually is able to execute the skill; an abstract ability suffices. (We will say more on that below.)

The problem is that, by virtue of the argument from knowledge transfer, it cannot be the mere grasp of a proposition that constitutes *knowledge how*, because *knowledge how* cannot be transferred propositionally. *Knowledge how* must comprise a certain practical kind of grasp. *Knowledge how* does not consist of a propositional truth *per se* but rather the practical grasp of that propositional truth. It follows that the answer to a question about *knowledge how* does not consist of a proposition *per se* but of the practical grasp of that proposition, which is what constitutes the skill. If that is so, it is not the case, *pace* Stanley, that the answers to embedded questions have uniform structure?[6]

If we are right, this weakens Stanley's case for intellectualism. Despite what he claims, his theory seems unable to provide a unified semantic theory, at least when it comes to embedded questions. More tellingly, we believe we have identified an implicit component of genuinely non-propositional knowledge lurking within his theory: what he calls the practical grasp of the proposition. That grasp constitutes the ability to act upon the proposition by performing a skilled action; but does not this ability then constitute a competence in itself, independent from the proposition? If so, is it not this competence that really constitutes *knowledge how*?

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[6] We are aware it may seem odd to say that *knowledge how* should consist in a propositional truth, but this is a consequence of Stanley's theory. Remember he holds that *knowledge how* must consist of an answer to a question. Given that he wants a unified semantic theory of questions, the answer to a question—including the "how" question—must consist of propositions.

7. The Ability Objection

There is a potential problem with our position. At one point, Stanley argues [1] (pp. 126–128) that knowing how to do something need not mean actually being capable of doing it: contrary to what we have claimed, *knowledge how* need not consist of the ability to execute a skilled action. If it does not, then the difficulty we have outlined in Stanley's account threatens to dissolve.

Stanley's claim rests on three examples, two of which are taken from Ginet [22]. Ginet's eight-year-old son is not strong enough to lift a certain box; nonetheless, Ginet, and Stanley, say that he must be said to know how to lift it, because he knows how to lift boxes in general. Stanley writes [1] (p. 128): "Ginet's son knows how one *could* lift one hundred pounds off the floor . . . " The second example, also from Ginet, concerns an expert skier who is unable to ski down a hill because of stomach cramps. Certainly, he knows *how* to ski down the hill, even though he cannot execute the ability at the moment. The third example, taken from Stanley and Williamson [3] (p. 416), concerns a concert pianist who loses both arms. Obviously, she can no longer play the piano, but, given her many years of practice, she still knows how to do so. Stanley believes that, together, these examples support the view that *knowledge how* need not entail the ability to execute a skill but rather takes the form of more abstract knowledge—thereby bolstering the case for his intellectualism.

We have two considerations in reply. First, how do the examples relate to what we have otherwise established? In the argument from knowledge transfer (Section 2), we conclude that *knowledge how* cannot consist in grasping a proposition in exactly the same sense as grasping a proposition theoretically since merely knowing how to do something theoretically does not enable one to do it. If *knowledge how* involves grasping a proposition at all, it must be a special kind of grasping.

It seems odd, then, that this special kind of grasping need not enable one to execute the relevant skill, and not just because of immediate circumstances such as being too young, having stomach cramps or losing one's arms: in other words, it seems odd that one can grasp a proposition "practically" without being able to act on it. The very reason why Ryle [23] separated *knowledge how* from *knowledge that* in the first place was to make room for the reality that is the practical execution of actions. What Stanley's intellectualism risks leaving one with is a notion of *knowledge how* that is practical only in name.

This leads to our second consideration. All three of Stanley's examples have the same basic structure: an agent faces a task that she cannot perform, but which she could perform under *other* circumstances. The eight-year-old can lift boxes, just not this box—until he is older. The skier can still ski, just not until the stomach cramps pass. The pianist knows how to play and *could* play if she, for example, got robotic prostheses. All the examples allow a hypothetical scenario wherein the agent is able to execute the skill.

Stanley writes that these agents possess the relevant *knowledge how* but are unable to execute it at a particular time. The eight-year-old certainly *knows* how to lift the heavy box; he just cannot do it because he is not strong enough. Stanley is stressing his brand of a more abstract form of *knowledge how*. He concludes further that *knowledge how* need not be tied to execution but takes a more abstract form. However, could not the reason one has to ascribe *knowledge how* to these agents instead be the existence of the hypothetical scenarios? If Stanley had not stressed that Ginet's son knows how to lift boxes and simply described an eight-year-old who cannot lift a certain heavy box, would one still say that the child knows how to lift it? At the least, intuitions may differ.

If one leaves oneself open for the kind of *knowledge how* ascriptions that Stanley wants, then one must also allow that someone can know how to play the piano, even though they have never tried. That person could know how, because she knows that, to play the piano, one "just" needs to hit the keys in the correct combinations and sequence using the correct pressure and timing—just as the eight-year-old knows that, to lift a heavy box, one "just" needs to grab hold of the edges and stand straight. We take this to be a biologically implausible consequence. If one is to be said to know how to play the piano, it seems reasonable to demand that one knows how to use it to produce actual, and not hypothetical, music.

8. The Cognitive Science of Knowledge

While Stanley's main focus is to build a theory of knowledge based on linguistic arguments and reflections, he invokes cognitive-science results to strengthen his case [1,4]. Let us take a closer look at some of the relevant findings of cognitive science in light of the considerations we have raised against Stanley. We believe that the naturalistic input which Stanley invites speaks strongly against his position.

The cognitive-psychological dual process theory offers a canonical rendering of cognitive processes that divides the mind into a bottom-up reflexive form (System 1, Type 1 processes) and a top-down reflective form (System 2, Type 2 processes). We wish to use this influential theory as a heuristic framework to inform our account of knowledge.

According to dual process theory, the reflexive form is non-conscious and governs automatic processes, whereas the reflective form is conscious and governs reflective processes [24–28]. Though interpretations of the available evidence vary, there is nonetheless strong evidence that this framework picks out interesting features of human cognition [27,29]. The framework is further supported by how well it coheres with leading memory-systems theories on a lower cognitive-psychological level of analysis. Both Tulving's seminal work on long-term memory [30,31] and Baddeley's on working memory [32] fit generally well with the dual process theory. Procedural memory governs perception, motor functions, and procedural knowledge. Semantic memory governs pattern recognition, categorization, and conceptual knowledge. Episodic memory governs self-awareness and our remembrance of events. Finally, working memory governs several functions correlated with reflection, attention, and executive control. Procedural (non-declarative) long-term memory roughly coheres with System 1, while episodic (declarative) memory together with working memory cohere with System 2.[7]

Both forms of processes are crucial for cognition and fill important, yet distinct, roles. Bottom-up reflexive processes are context-specific whereas top-down reflective processes offer generalizability by sometimes inhibiting reflexive processes. Even though Type 1 processes can appear reflexive and instinctive, they are shaped by repeated experience. Reflective Type 2 processes are more flexible, having the capacity to quickly adjust quickly to new circumstances [33] (pp. 132–133).[8]

Briefly, thoughts and intentions (*knowledge that*) involve working memory and episodic memory based in frontal cortical regions, consisting of homotypical neural cells. Motoric competence (*knowledge how*), on the other hand, involves procedural memory based in the primary motor cortex and the cerebellum, consisting of large agranular neural cells [27,30–32,36–38]. It is plausible to interpret these findings as supporting a distinction between *knowledge how* and *knowledge that*: the two knowledge forms involve different functions, brain regions, and cell types. Stanley [2,4] argues against such an interpretation but does not, in our view, provide any convincing evidence or arguments for doing so.

It is indeed possible to improve one's skills—one's *knowledge how*—by gaining relevant propositional *knowledge that*; but it is only after repeated actual performances of actions that relevant neural connections are established and *knowledge how* developed. Stanley [2] (pp. 155–159) discusses these matters but does not properly acknowledge how primarily non-conscious and reflexive motoric processes govern an agent's ability to act—not propositional aspects [39].

No matter how people may *ascribe* knowledge, the facts of the matter remain: *knowledge how* involves very different processes than *knowledge that*. Empirical evidence suggests strongly that procedural memory and *knowledge how* are non-propositional [40,41].

Returning to the earlier examples, lifting boxes is such an elementary action that one will entrain the necessary neural connections almost by default. Both downhill skiing and piano playing, however, involve motoric competencies that demand specific practice in order to be developed. If such

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[7] It is less clear how semantic long-term memory ought to be positioned in this multi-level picture, and so we will presently leave it as an open question.

[8] For critical views see, e.g., [34,35].

practice is absent—if only propositional *knowledge that* is present—*knowledge how* will not come about. The important thing is not what propositions an agent knows, but what actions she has repeatedly performed, which have the potential to lead her to develop *knowledge how*.

9. Conclusions

We have attempted to argue that *knowledge how* must comprise more than the mere grasp of a proposition even if one otherwise accepts Stanley's intellectualism. We have done this by describing an implicit conflict between what we have called the argument from knowledge transfer and Stanley's argument from embedded questions: one that is revealing of certain characteristics of Stanley's "practical grasp" of a proposition that he downplays. At heart, our objection to Stanley is simple: even if *knowledge how* is propositional, it must involve an element of knowing how to act correctly upon the proposition; and this element of knowing how to act correctly cannot itself be propositional. Thus, *knowledge how* involves an irreducible non-propositional element and cannot be reduced to *knowledge that*. As Ryle [23] (p. 28) put it: "to be intelligent is not merely to satisfy criteria, but to apply them." In accordance with our naturalistic stance, we have looked for input from cognitive science and found it offering convincing support for our non-reductive approach.

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