Shaun Gallagher[1]
and Benjamin Aguda[2]

Anchoring Know-How

Action, Affordance, and Anticipation

Abstract: *Action is always situated, always tied to specific contexts, and this is the case with respect to both the non-conscious — and largely subpersonal — processes or mechanisms that make action possible, and the person-level — and sometimes conscious — aspects of action that make action more than mere behaviour. According to one theory about the kind of know-how that we require to do what we do, the 'automatic mechanisms' that support action are 'perfectly general' (Stanley, 2011, p. 84), in contrast to the detailed propositional knowledge that informs action. We will argue, against this view, that the motoric aspects of action are not perfectly general but are extremely specific, and indeed, more so than any propositional knowledge that we may have in regard to our actions. We will also argue that one reason for this specificity involves the anticipatory processes involved in action which tie action to the particularities of the agent's affordance space. One implication of this, at the very least, is that not all aspects of know-how are reducible to or can be subsumed by propositional knowledge. We draw from both phenomenological and predictive processing accounts to make this case.*

Correspondence:
Email: s.gallagher@memphis.edu

1 Philosophy, University of Memphis, USA; Faculty of Law, Humanities and the Arts, University of Wollongong, Australia.

2 Department of History and Philosophy, University of New Orleans, USA.

1. Knowing How to Act

Jason Stanley and Timothy Williamson (2001; 2017; Stanley, 2011) defend an intellectualist model of know-how. Knowing-how, they argue, is really a species of knowing-that. They specify knowing-that as a form of 'knowing-wh' (i.e. knowing-where, -when, -with whom, and so forth). To know where to do something, and when, etc. is to have propositional knowledge. This propositional knowledge is said to be very specific. If I want to turn on the television, I need to know not only where the remote is, but also that I have to pick it up, and that to turn it on I need to stand close to the TV, and aim the remote at the TV, and then press the on-off button. These are a lot of facts that I need to know, and, according to Stanley and Williamson (S&W), knowing them just is what we mean by know-how.[3]

Stanley lays out the detailed argument in his book, *Know How* (2011). He argues against the classic distinction found in Gilbert Ryle (1949) between knowing-that and knowing-how.[4] Our intent in this paper is not to take issue with Stanley's argument as a whole. Indeed, we are interested in other, albeit related, issues, and specifically issues about how to understand anticipatory aspects of action and how they relate to the notion of affordance. We do focus on three claims made in the S&W argument: that mechanisms involved in performance are automatic and 'perfectly general',[5] that when an agent holds to a false

[3] We note that the argument undergoes some subtle changes from their 2001 paper through their recent 2017 paper on skill. In 2001 a necessary condition of know-how is that the person stand in a knowledge-that relation to a singular proposition specifying a way of engaging in action, and that the person entertains this proposition under a practical mode of presentation. This requires the possession of a set of complex dispositions. The key point is that this just amounts to very specific propositional knowledge (knowledge-wh) with respect to doing something. In his 2011 book, Stanley holds that know-how requires more than just this proposition; it requires a set of propositions that successfully guide performance. And in the 2017 paper, S&W define skill as a disposition to reliably form true guiding beliefs during performance. In this paper we focus primarily on Stanley's 2011 book but we will consider a potential response to our concerns based on their more recent paper.

[4] The distinction had already been explicated by John Dewey (1922, pp. 177–8): 'We may, indeed, be said to know how by means of our habits. And a sensible intimation of the practical function of knowledge has led men to identify all acquired practical skill, or even the instinct of animals, with knowledge… Other things also called knowledge, knowledge of and about things, knowledge that things are thus and so, knowledge that involves reflection and conscious appreciation, remains of a different sort…'

[5] In this respect our argument is consistent with Ellen Fridland's (2013) analysis. Fridland, however, follows Stanley's focus on the trigger mechanisms ('knowing what to do to initiate an action' — Stanley and Krakauer, 2013) required to link propositional

proposition about her performance this is not problematic for her performance, and that the use of demonstratives in expressing the relevant propositional knowledge supports the intellectualist model. We think that on these issues the intellectualist view of know-how will unravel.

Stanley distinguishes between the kind of propositional knowledge (knowledge-wh) that one needs in order to know how to do something, and the ability that one may have to carry out the action. The ability is not equivalent to know-how. On his view, know-how just is having the right kind of propositional (factual) knowledge about how to go about doing what you want to do. He characterizes ability in terms of automatic mechanisms that allow an agent to apply her propositional knowledge in specific situations. We take some of these automatic mechanisms to be motoric. Here is Stanley's description:

> The automatic mechanisms that bring the organization of behavior into conformity with propositional attitudes are *perfectly general*. There is not one set of automatic mechanisms for catching a fly ball, and another for throwing a baseball from the outfield to the infield — it would be preposterous to multiply automatic mechanisms in this fashion. Perhaps there is just one automatic mechanism responsible for applying one's standing epistemic states, or perhaps there are several distinct classes of such automatic mechanisms — one's governing propositional states concerning actions like jumping, catching, and leaping, and others governing propositional states concerning (say) language use. But the difference between an expert's knowledge of how to catch a fly ball and an expert's knowledge of how to throw out a runner from the outfield lies solely in the propositional states that guide the action, and not the automatic mechanisms… (Stanley, 2011, p. 184)

We think Stanley is correct to say, as he does, that in the case of expert performance one does not need an explicit or deliberative act of consulting propositional knowledge, but it is not as clear that propositional knowledge relates to these automatic mechanisms in the way he, following Fodor, contends, i.e. that the automatic mechanisms 'bring the organization of behavior into conformity with the propositional structures that are cognized' (Fodor, 1983, p. 9; cited by Stanley, 2011, p. 184), or that expert know-how is solely in the propositional states.

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knowledge and performance as a way to eliminate the infinite regress problem signalled by Ryle. She argues that such mechanisms cannot be general or unintelligent, and that in the most reasonable analysis intelligent (rather than automatic or general) mechanisms are doing most of the work in skilled performance.

We need to back up a bit to consider the nature of automatic mechanisms. Although Stanley suggests that behaviour based solely on these mechanisms is reflex (2011, p. 174), the kind of skilled behaviour that results from know-how cannot be the result of reflex (general, unintelligent, purely automatic) mechanisms. Taking his examples, we know that baseball players do not simply engage reflexes to carry out the dictates of propositional attitudes, even if those attitudes are in the form of a tacit set of rules. Indeed, as John Sutton (2007) shows in his analysis of the cricket batsperson's action, there is a sensitivity and flexibility involved in one's motor processes such that one can be perceptually attuned to the details of a particular situation — the bowler's movements, the speed and trajectory of the ball, one's particular bodily stance, the location of the fielder — such that one can strategically place the ball. If, as Stanley thinks, this involves knowing-where to hit the ball, the execution of the batsperson's swing (given the specifics of ball speed, trajectory, etc.) will have to be differentially precise to place the ball just there rather than elsewhere. Similar things hold for fielding the ball. Following Ryle (1949, p. 130) we'll argue that the activation of appropriate perceptual and motoric mechanisms involves a 'heedful' attentiveness or attunement to specifics of the situation.[6] This is the opposite of a reflex activity that is unable to adapt to changing circumstances.

One doesn't engage in perfectly general movement, or in a pure reflex, to be in a good position and appropriate bodily posture — including a precise shaping of one's grasping fingers — to catch the ball, or to catch the ball and throw it to first base, or to catch the ball and throw it to third base. We know from empirical studies that kinematic properties of movements are different depending on one's situation and one's intentions. For example, kinematic aspects of movement are different when one grasps an apple in order to eat it, *versus* in order to offer it to someone else, *versus* in order to throw it (Ansuini *et al.*, 2008; Becchio *et al.*, 2012; Marteniuk *et al.*, 1987; Sartori, Becchio and Castiello, 2011). Skilled catching, like skilled grasping, is not a matter of reflex, or of perfectly general mechanisms. Rather, the mechanisms are differentially detailed and specified depending on the specifics of the situation and the agent's intentions.

[6] We can specify this involvement as a dynamical integration (a reciprocal causal relation) such that body-schematic processes (mechanisms) both enable and are enabled by heedful perception of the situation.

No matter what your intention, if the motor processes underpinning your action are purely automatic or reflex, or remain perfectly general, you'll never get (or get the ball) to first base.

One way to think of the non-reflex/non-automatic (even if close to automatic) 'mechanism' is in terms of body-schematic processes. Sir Henry Head (1920), who was one of the originators of the concept of body schema, thought of it in the plural. He not only defined two kinds of body schema — a postural schema for postural and motor control, and a sensory schema for locating sensations on or in the body — but also suggested that there may be numerous postural schemas (or motor programs) corresponding to particular combinations of movement. For example, a schema for walking, a schema for jumping, a schema for catching, a schema for reaching, a schema for punching, etc. In other words, Head did not think it preposterous that there are differences in the mechanistic processes for each of these kinds of actions. This contrasts with Stanley's idea of a perfectly general automatic mechanism that might serve all of these actions.

It would not derail Stanley's argument, however, if he allowed for a flexible (not so automatic) mechanism, or even a set of mechanisms, as long as propositional attitudes provided the governing factor. For him, knowing-how is top-down. One question that arises — a question not only for Stanley, but for everyone who wants to explain such action — concerns the source of the specificity. Where does it come from? For Stanley, it seemingly comes from the propositional side — knowing *that* to do X, I need to do a, then b and c — knowing where to position my body, and knowing when to move my limbs, and so forth. The general mechanisms simply deliver the means to fulfil these requirements in a close to automatic way. The expert 'implements' the knowledgeable details in her body schematic processes that constitute her ability. Body schematic processes (i.e. the mechanisms) simply have to be sufficiently flexible or diverse to deliver the performance.

We think that, at the very best, this is only half the story. Moreover, once we have the other half of the story we may have to revise the first half. To make this case, we focus in the next section on the temporal dynamics that would seemingly underpin a particular form of knowledge-wh — namely, knowledge when. In skilled action timing is important. Understanding the temporal dynamics involved in action will, we anticipate, throw the intellectualist account into doubt.

2. Specificity, Action, and Attuned Anticipation

In this section we explicate how action mechanisms or body-schematic processes are not 'perfectly general' but perfectly specific, and that the specificity involved in know-how comes, not from a set of propositions that might be entertained by the agent, but from the detailed, dynamical, flexible, and diverse bodily and environment-related processes that are ordered according to an intrinsic temporality for any particular action.

It is well-known that body schematic processes are dynamical. There are a lot of moving parts that require controlled integration, across varying timescales, in order to come into alignment with a particular action intention or goal. Consider the problem of the multiple degrees of freedom in the bodily system. Nikolai Bernstein explains the problem as follows: 'The first clear biomechanical distinction between the motor apparatus in man and the higher animals and any artificial self-controlling devices… lies in the enormous number (which often reaches three figures) of degrees of freedom which it can attain… Because of this there is no direct relationship between the degrees of activity of the muscles, their tensions, their lengths, or the speed of change in length' (1984, pp. 354–5). Alain Berthoz explains that the body solves the problem of degrees of freedom through a number of different arrangements — skeletal geometry, kinematic phase constraints, muscular geometry, and the dynamics that characterize the relationship between kinematics and geometry. In regard to this last point, Berthoz provides the example of the mechanical system 'formed by the hand, the forearm, and the arm. This system has a geometry, a shape. In general, the geometric characteristics of a mechanical system cannot impose a law of movement a priori along a given trajectory. The trajectory depends mainly on the temporal organization of the motor commands' (2000, p. 145).

Head's original characterization of body-schematic processes indicates that such processes are temporally retentional in that they organize sensorimotor feedback in such a way that the resulting posture is 'charged with a relation to something that has happened before' (Head, 1920, p. 606). He used the metaphor of a taximeter, which registers movement as it goes (Head and Holmes, 1911–1912). Merleau-Ponty borrowed this metaphor to express the temporal dynamics of movements, which are organized according to the 'time of the body, taximeter time of the corporeal schema' (1968, p. 173).

> At each moment in a movement, the preceding instant is not forgotten, but rather is somehow fit into the present, and, in short, the present perception consists in taking up the series of previous positions that envelop each other by relying upon the current position. (Merleau-Ponty, 2012, p. 141)

Perhaps even more importantly, body-schematic processes are anticipatory, as emphasized by Berthoz (2000). There is good evidence for anticipatory processes in coordinated movement. For example, the mouth of the newborn opens in anticipation of the hand (Butterworth and Hopkins, 1988; Lew and Butterworth, 1995); the grasp of a reaching hand tacitly anticipates the shape of the object to be grasped, according to the specific intentional action involved (Jeannerod, 1997; MacKay, 1966; Wolpert, Ghahramani and Jordan, 1995); visual tracking involves moment-to-moment anticipations concerning the trajectory of the target, and tends to be just a little ahead in the projected trajectory (Freyd and Finke, 1984; Hubbard, 1995; Wilson and Knoblich, 2005); reaching for an object involves feed-forward components that allow extremely quick intramotoric adjustments if the object is moved, even if that movement is not consciously perceived by the agent (Georgieff and Jeannerod, 1998). This last point goes back at least to Helmholtz (1962) who conceives of motor control in terms of what is now called a forward model (or comparator), where predictions about future sensory feedback are made based on the current motor command. Such anticipatory processes were also noted by William James (1890), Edmund Husserl (1991), and Pierre Janet (1935). Indeed, Janet himself anticipates what is today explained in terms of affordances (Gibson, 1977) and enactivist embodied cognition: 'When we perceive an object, an armchair, for example, we do not see ourselves as acting at that instant', since we are merely standing, observing. But, he explains, this is an illusion: 'we already have within us the action we associate with the armchair, which we call a perceptual schema — here, the action of sitting…' (Janet, 1935, p. 54; translated in Berthoz, 2000, pp. 10–11).

These anticipatory processes, of which there are many (Berthoz and Petit, 2008, pp. 63ff.), allow the motor system to correct or reorganize action on-the-go in response to unforeseen events. This depends on a retentional registration of the just-past state, a capacity for predicting a future state of the system, and a capacity to integrate these processes within 'a perception–action cycle that sometimes lasts only a tenth or twentieth of a second' (Berthoz, 2000, p. 15). Thus, Berthoz suggests that Husserl's account of intrinsic temporality

(involving retention and protention) is a model that captures some of these dynamical processes (*ibid.*, p. 16; Husserl, 1991; Gallagher, 1998).

Husserl finds phenomenological evidence for what he calls the 'retention' of the just past, and the 'protention' or anticipation of that which is just about to occur; and he considers these to be structural features of consciousness. That is, in any experience one finds both an anticipatory sense of what is just about to happen, however indeterminate, and a continuing sense of the experience that one has just lived through. The structure of this intrinsic temporality is also found in movement and non-conscious subpersonal motor processes, and can be modelled using a dynamical systems approach (Gallagher, 2011; Thompson, 2007; van Gelder, 1999; Varela, 1999). According to this approach, action and our consciousness of action arise through the concurrent participation of distributed regions of the brain and their sensorimotor embodiment, integrated across different timescales (Varela, 1999), including an *elementary* timescale measured in milliseconds, characteristic of neurophysiological events, and an *integration* timescale measured in seconds, corresponding motorically to a basic action, e.g. reaching, grasping.

The system dynamically parses its own activity according to this intrinsic temporal structure. The processes that define the integration scale correspond to the experienced present, a temporal window of experience describable in terms of the protentional–retentional structure explicated by Husserl (Varela, 1999; Thompson, 2007). Whatever falls within this window counts as happening 'now' for the system, and this 'now', much like James's (1890) notion of the specious present, integrates the elemental processes that are ongoing or have just happened. Varela recognized in Husserl's account a 'dynamical bent' that he took as opening towards a neural dynamics that applies to the intrinsic temporality of action as well as consciousness, and which connects with enactivist views by means of this emphasis on action and a dynamical coupling between brain, body, and environment. In this dynamical system, boundary conditions are defined by embodied constraints and the experiential context of the action. They shape the action at the global level and include the contextual setting of the task performed, as well as the independent modulations (i.e. new stimuli or endogenous changes in motivation) arising from the contextual setting where the action occurs (Gallagher and Varela, 2003, p. 123; see also Varela, 1999, p. 283).

Modulations across timescales are dynamically non-linear. This shows up in examples of intentional binding (Haggard, Clark and Kalegeras, 2002; Moore and Obhi, 2012). In the case of voluntary action in contrast to involuntary movement, perceived times of the action and its effect are temporally compressed, i.e. shifted towards each other (Figure 1).

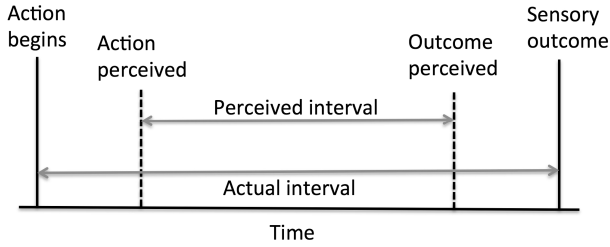

Figure 1. The intentional binding paradigm. Subjects underestimate the actual time interval between action onset and sensory outcome (based on Moore and Obhi, 2012).

This intentional binding effect, where we experience two events as temporally closer than they actually are, correlates to, and has been proposed as a measure of, the pre-reflective sense of agency that is tied to efferent motor-control processes.

Farrer, Valentin and Hupe (2013) have shown that the sense of agency for a particular action depends on its effect falling within a specific time window and that this varies by degree. Thus subjects have a full sense of agency where delays between action and effect are less than 334 msecs; but once the delay approaches a window that overlaps with the integration scale, subjects experience lesser degrees of the sense of agency (for delays between 334 msecs and 707 msecs) or a loss of the sense of agency (for delays beyond 707 msecs). This establishes a rough measure of the most elemental protentional or anticipatory aspect intrinsic to action. Important for our considerations here, in their experiments Farrer *et al.* varied either internal (pre-motor) cues or external environmental cues and concluded that 'the sense of agency… depends [in part] on a time window within which internal and external agency cues are integrated, and that only external agency cues that are time-locked to action onset are integrated with internal agency cues' (*ibid.*, p. 1439). In effect, both embodied and environmental factors influence the intrinsic temporality and the workings of the body-schematic mechanism.

Following a line of thought that goes back to Helmholtz, it is possible to work out the complexities of motoric action and embodied coping in terms of predictive processing. Indeed, Hohwy, Paton and Palmer (2016) employed a prediction error minimization (PEM) framework to explain why predictive processes are always working ahead of themselves, so to speak, correcting current prediction errors and reshaping a hierarchical set of predictions that best fit an anticipated change in the present situation. They refer to this as 'distrusting the present', which they suggest is 'consistent with formal developments in dynamical systems theory. The state dependent dynamics of self-organising and autopoietic systems, systems like the brain, determine the transitions between states. These transitions [are] driven by dynamical instabilities…' (*ibid.*, p. 17, n. 2). Under expectations of volatility (anticipated change), to the extent that the current prediction error, which results in part from the just previous prediction, is explained by that prediction, the system begins to form a new prediction. What changes or causes the instability in the system is its situatedness in a changing environment. As Hohwy *et al.* explain, it 'is not an imposed feature of the system but is a direct consequence of consideration of a hierarchical Bayesian prediction error minimization framework which is itself immersed in a causally deep and complex environment' (*ibid.*).

According to Hohwy *et al.*, this same framework plays a central role in action initiation. According to the free energy principle (Friston, 2010), organisms act to maintain themselves in states of low entropy (surprise, uncertainty), which means to minimize the long-term average of prediction error. On this view, action is a way to sample the environment in order to minimize prediction error. That is, I act in order to change my experience of the environment so as to confirm my prediction (if possible). If, for example, I want to grab a beer, the system can prioritize a desired hand position (my hand on the handle of the mug), and then generate a prediction of what the sensory input should be if my hand is in that position.

> This generates prediction error, since the hand is not yet actually in that position. This prediction error can then be minimized by entraining the body until the desired state is obtained. In this way, action becomes a self-fulfilling prophecy of predicting and then obtaining a certain sensory input. (Hohwy, Paton and Palmer, 2016, pp. 22–3)

Distrusting the present, in this case, involves the attenuation of the current sensory input (*ibid.*, p. 23). The action is governed by the system's attention to the future desired state. 'On this account,

movement initiation relies on temporal processing, where one hypothesis [prediction] begins to succeed another in advance of the movement itself… [Agents] experience a flow of events in advance of any actual change in the environment' (*ibid.*).

Hohwy *et al.* also reference Husserl's retentional–protentional analysis of intrinsic temporality, citing Merleau-Ponty's gloss on this model, where protentional and retentional processes shape 'the intentionalities which anchor me to my surroundings', so that they do not originate in the agent so much as in the agent's 'perceptual field itself, which drags along behind itself its horizon of retentions and eats into the future through its protentions' (Merleau-Ponty, 2012, p. 439). More specifically, Hohwy *et al.* appeal to Rick Grush's (2006) explanation of these same processes, which turns out to be framed in a vocabulary closer to the PEM model.

Our intent is not to adjudicate between these models, or to follow Hohwy *et al.* who, in this context, are primarily interested in explaining the flow of experience (for an account much closer to our own, see Robertson and Kirchhoff, this issue); rather, our intent is to highlight how the predictive processing framework is consistent with the idea that both embodied and environmental factors influence the intrinsic temporality and the workings of the body-schematic mechanism. To put it in Merleau-Ponty's terms, the intrinsic temporal intentionality of action anchors me — keeps me attuned — to an environment, to the perceptual field itself.

Anticipatory attunement to objects and targets in the environment, and to the goals of one's action (which in most cases involve effecting some change in the environment — getting something done in the world) is absolutely central for doing what one wants to do. Body-schematic processes of motor control, specified in complex kinematic detail, are, to put it most succinctly, relational. That is, the details of bodily action are attuned to the environment in an affordance relation. On Gibson's notion of affordance, a chair affords sitting, but only for a body that is capable of bending in the right way; it does not afford sitting for elephants or ants. Affordances are relational in that they depend not just on the object or environmental feature, but also on the agent's body (anatomy, strength, energy level, etc.) and skill level. This lines up well with Husserl's conception of embodied experience as an 'I can', as an *enactive* phenomenon that depends on the intrinsic temporality of action. In this respect:

> Nothing is an affordance for my enactive engagement if it is presented to me passively in a knife-edge present; that is, nothing would be

> afforded if there were only primal impressions, one after the other, without protentional anticipation, since I cannot enactively engage with the world if the world is not experienced as a set of possibilities, which, by definition, involves the not-yet. (Gallagher and Zahavi, 2014, p. 96)

If I form a prior intention, that intention (and the goal of my action) will shape or constrain the action itself. From my first-person perspective, the intention is specifically about *what* I will do, but remains relatively general with respect to *how* I might carry out the action. In the action situation, however, the specific affordance solicits a precise motor intention and shapes my intention-in-action (Searle, 1983). In some cases my action may be spontaneous and without any prior deliberation, planning, or guidance. Such action may still be intentional. I may act with only an intention-in-action, or what Pacherie (2008) calls a P(roximal)-intention. I may be walking past the fridge and decide then and there to reach in and get a beer, and to do so my current posture and the locations of fridge and beer, etc. elicit my movement in a precise body-schematic/kinematic organization, which Pacherie calls the M(otor)-intention. P- and M-intentions are specified not merely in the body; they are embedded and shaped by the specifics of the (physical as well as social/cultural/normative[7]) environment (Gallagher, 2012; 2013; also see Rietveld, 2008; Seemann, 2019, pp. 114ff.).

According to the intellectualist view, the formation of a prior intention (I'm going to get a beer), together with detailed propositional knowledge, and some limited set of perfectly general automatic mechanisms is all the know-how I need to engage in an action that will quench my thirst. Allowing for as much propositional knowledge-wh as one would like — knowing that a beer will quench my thirst, knowing where the beer is, knowing that I can get to the fridge by walking in a particular direction, knowing that the fridge door opens not by twisting a knob but by pulling a handle, and so forth — however, does not give me the full story of my knowing how to get the beer. Knowing how to walk to the fridge will depend not only on knowing that there may be barriers in my way, but on knowing how to move in an anticipatory way to avoid those barriers. Knowing how to walk to the fridge may also depend on me heeding the pain in my right foot. I need to sense the pain and anticipate the possible degree of pain that results if I walk too fast or twist in the

7 If it's your fridge rather than mine I may hesitate.

wrong way. At the fridge, knowing how to reach and shape my grasp is not propositional knowledge — it's the result of a particular pre-predicative, affordance-based perception of the fridge handle, and then of the beer, which activates detailed (not perfectly general) body-schematic (motor control) processes that, with respect to possible degrees of freedom, align skeletal and muscular geometries, kinematic phase constraints, and the dynamics that characterize the relationship between kinematics and geometry with the intended goal. One can form the perfectly specific grasp for the beer only because the beer is there at one end of an affordance relation. It has a location *vis-à-vis* my body and a certain shape which determine the motoric details of how I will reach and form my grasp, respectively.

What should be clear is that these complex and dynamical aspects of the processes and mechanisms that contribute to action are not 'perfectly general' but perfectly specific, and more than mere reflex. The specificity of know-how in any particular skilled action comes, not from a set of propositions that might be entertained by the agent, but from these detailed, dynamical, flexible, and diverse bodily and environment-related processes. Anticipatory aspects in this perfectly specific set of motoric processes are part of what makes intelligent action a dynamical process.

What is not clear, however, is how anything like propositional content could mirror or guide such detailed processes, or even keep up with the constant adjustments that we find in the system. Stanley contends that 'what makes an action an exercise of skill, rather than a mere reflex, is the fact that it is guided by the intellectual apprehension of truths' (2011, p. 174). Although Josefa Toribio (2008) characterizes performance (in the game of golf) as a set of automatic adjustments to 'all kinds of variations', Stanley has no problem in thinking that this means the golfer simply has 'many propositions of the form "w is a way to get a ball to the green"' (Stanley, 2011, p. 184). Charles Wallis (2008, p. 139), however, argues that 'many cases of knowledge-how [involve] complexes of dispositions so elaborate and diverse in their temporal and environmental contexts as to make the notion that individuals have single indexical beliefs regarding the efficacy of these "ways" [of engaging in action, even if framed in singular and very detailed propositions] implausible'. Indeed, as he suggests, any attempt to capture such dispositions or action-related processes in propositional form would lead to an explosion of the number of propositions the agent would have to process (also e.g. Fridland, 2013).

3. Know-How and Ability

For an intellectualist like Stanley, propositional knowledge drives the motoric mechanisms, in the same way that for Descartes and defenders of mental causality mental states drive bodily movement. On this view, body-schematic processes that deliver one's skilful know-how are slaves to propositional knowledge in the form of knowing-where (to look, to reach, to place one's fingers, etc.), knowing-when, knowing-wh-etc. Perhaps, one might think, the know-how of the expert fielder consists of knowing *that* she has to move in a certain arc-like pattern to keep the ball's trajectory through the visual field at a constant speed, i.e. visually stationary on the retina (McBeath, Shaffer and Kaiser, 1995; Fink, Foo and Warren, 2009). To be sure, this does not have to be explicit knowledge or something she could explain. In the same way that expert batters or batting coaches might mistakenly prescribe, 'Keep your eye on the ball' (that's not what batters or batspersons do — Bahill and LaRitz, 1984), it's not clear that expert fielders are able to say precisely how they do what they do. Indeed, their propositions about what they do may contradict what they actually do.

The inability of the expert to put their purported propositional knowledge into the correct explicit propositional formula may seem to count against the intellectualist view. Although Stanley (following Fodor, 1968; see Stanley and Krakauer, 2013) shows rightly that this is not the case, this worry may explain why some theorists discount any phenomenological reports and turn to tacit theoretical knowledge and unconscious inferential processes for explanation. Still, one might think that the *inconsistency* between (a) actual expert practice governed by the correct tacit propositions, and (b) incorrect explicit propositions ('keep your eye on the ball') which, if they were to govern, would tend to undermine expert performance, would be a problem. This would require Stanley to argue that some tacit propositional states must take precedence (overruling the incorrect explicit propositions) to support the smooth functioning of the system.

If the relevant propositions and guidance processes are tacit, for Stanley that cannot mean they are subpersonal, since everything he says about knowledge-wh, and all of his examples, pertain to the personal level of the agent rather than the subpersonal level. For example, he describes knowledge-wh as something had by John or Mary, rather than by a cognitive system. These are states ascribed to agents, rather than to systems (Stanley, 2011, p. 36). Stanley explicitly

maintains: 'Knowing how to do something is first-person knowledge… a kind of knowledge-wh… a first-person mental state' (*ibid.*, pp. 98, 111). What characterizes 'know-wh' constructions is that 'one is in such a state in virtue of knowing the answer to a question' (Stanley and Williamson, 2017, p. 715). It's not a requirement that the performer answer the question with well-formed explanatory statements; he can use demonstratives and say '*This* is how I do it' (Stanley, 2011, pp. 161–2). This reinforces the idea that knowing-how is first-person knowledge, even if it is not necessarily explicit or conscious. Demonstratives, as Stanley notes, in Russell's terminology, are 'egocentric particulars'. Still, if what follows the demonstrative *this* is an active demonstration, that demonstration of knowing-how must necessarily depend on some of the detailed subpersonal motoric processes outlined in the previous sections.

In that case it seems more critical that Stanley explain how it is possible that if my first-person explicit knowledge about how I do something is wrong, I nonetheless know how to do it because I have implicit propositional knowledge (an 'intellectual apprehension of truths' — *ibid.*, p. 174) that amounts to know-how. He responds to Wallis on this issue. 'It is simply not clear why Wallis thinks [a false belief such as "I keep my eye on the ball"] shows that the person in question lacks the propositional knowledge that is knowing how to [hit the ball]… I might very well have false descriptive beliefs about a certain way of ϕ-ing, while retaining my knowledge about that way of ϕ-ing, thought of demonstratively or practically, that it is a way to ϕ' (*ibid.*, pp. 166–7). The contradiction between 'I keep my eye on the ball' and 'I do it *this* way' (accompanied by a veridical demonstration) isn't a problem according to Stanley.

We note, however, that the demonstration itself, and the detail within it, rather than simply the use of a demonstrative expression, is the important part of this. I could be misguided in thinking that I perform an action in some specific way, which I express in descriptive propositions. But I indicate my true doing with the demonstrative 'this'. 'This' points to my demonstration, and I actually perform my demonstration in a different way than I describe it. For example, I might think that I track the ball's trajectory in order to hit it, but in fact I spot the angle of the pitcher's arm at a certain point during the pitch, and it is this that allows me to hit the ball. This is what I demonstrate (perhaps wearing eye-tracking gear). If body schematic processes are slaves to propositional knowledge, however, this particular proposition, 'I do it *this* way', the one true proposition that is in evidence,

employs a demonstrative that simply points to the action itself. It offers no detailed guidance; indeed, it offers no instruction whatsoever.[8] It tells us nothing about how to conduct the demonstration. Moreover, the other proposition that as an agent I can access in this case ('I track the ball's trajectory') contradicts and is untrue. At the very least, it is not clear why that proposition, which does offer guidance, doesn't interfere with my performance, if in fact performance is informed or governed by propositional knowledge.

For S&W there must be a set of tacit or hidden true propositions that guide performance. But what is the evidence for this? It's one thing to discount the phenomenological report, but justification for doing so usually comes from scientific studies. Wallis (2008, p. 140) argues that evidence from behavioural and neuroscientific studies undermines 'the existence of the sorts of beliefs [or propositions] hypothesized by Stanley and Williamson'. His focus is on their 2001 article, but it applies to any claim about such hidden propositional knowledge guiding action. Stanley (2011) responds to Wallis on some of these points, but not to all of them. It's not clear, for example, what his response is to neurological studies that show that brain areas activated during performance 'are strongly dissociable from areas of the brain responsible for propositional knowledge' (Wallis, 2008, p. 139). Or to evidence from the knowledge elicitation literature that shows a double dissociation between acquiring knowledge-how and acquiring propositional knowledge. Thus, for example, Berry and Broadbent (1984) show that practice significantly improves skilled performance on controlling complex computer systems but has no effect on the ability to answer related questions, and further 'that verbal instruction significantly improved ability to answer questions but had no effect on control performance' (p. 209; see Wallis, 2008, p. 131).

Consider also that, in any particular action, the specifics of my performance are constituted in the relations between body and environment. If, as a result of scientific investigation, the specificity

[8] There is much to say about the way demonstratives operate and there are well-known debates about such things that we won't try to rehearse here (see e.g. Campbell, 2002; Kaplan, 1989). There is something odd, however, in the case of using demonstratives and demonstrations to describe or explain how one does something. If I say '*This* is how I do it', and then demonstrate it, I'm really not answering the question. It's rather like saying 'I don't know (in the sense of propositional knowledge), but I'll do it (or this bit of it) again'. Stanley says, the demonstrative statement may be a perfectly adequate description, but not informative (2011, p. 162). We agree that it is not informative but we might also ask in what sense it is adequate.

of these relations — the detailed dynamical relations among all of the moving parts — can be expressed by a set of scientific explanatory propositions, this seemingly goes beyond an *agent's* first-person propositional knowledge. Typically, as an agent I am aware that I am doing something, and *what* that something is (I'm getting a beer — and I can express this in propositional format), but I am not aware of *how* I am doing it — that is, I am not aware of the motoric details, for example that I'm shaping my grasp thus and so (Frith and Gallagher, 2002; Jeannerod and Pacherie, 2004). If, as an agent, I can express this *how* only in a proposition that requires a demonstrative ('*This* is how I do it') and a demonstration, then the 'this' is an egocentric particular that stands in for everything pre-predicative (non-representational, non-conceptual, non-propositional) in my know-how. I may become aware of some motoric details, in a vague sort of way, if something is not quite right — I may be off balance or in the wrong position to easily reach the beer. I can make adjustments without being able to answer questions about, or express, in propositional format, precisely how I do it. Indeed, I may find myself doing something in the context of performance that I would not be able to demonstrate in any precise way outside of the performance.[9]

Indeed, in some pathological cases, one may lack specific propositional knowledge-wh about the objects and targets of an action and still have enough know-how to accomplish a relatively complex action. DF, who suffers from visual form agnosia, is unable to recognize whether a mail slot is at 45º, or 90º, or 180º. Yet she is able to place a disc in the slot based on visual information (via the dorsal visual pathway which provides direct input to the motor system) (Milner and Goodale, 2006). The system goes into specific physical states that allow DF to perform the right action, but it is not clear that there is any *propositional* knowledge-wh about slot angles in the system. One might argue, however, something along the following lines: even if DF does not have knowledge-wh, we could claim that the cognitive system has this knowledge. DF may not be aware of how the slot is oriented, but surely the system knows. On the one hand, one might speculate that for Stanley this answer does not seem relevant since for him knowledge-wh pertains to the personal level of the agent rather than the subpersonal level of the motor system. 'Knowing how

9 We might call this the 'poverty of representation' problem, in contrast to the 'poverty of stimulus' problem.

to do something is first-person knowledge… a kind of knowledge-wh… a first-person mental state' (Stanley, 2011, pp. 98, 111). On this reading Stanley would have to say that DF has no propositional knowledge-wh; therefore, she doesn't have the know-how even if she somehow knows how to put the disc in the slot.

On the other hand, we don't have to speculate since Stanley (*ibid.*, pp. 170ff.) does address this specific case, which he takes as a challenge to his position derived from Sean Kelly (2000), and explicitly raised as an objection by Josefa Toribio (2008). Stanley's response is that specific knowledge about slot-orientation is not required for knowing how to fit the disc into a slot: '*at most* what DF shows is that one can know how to post a card into a slot, without knowing what the orientation of the slot is' (Stanley, 2011, p. 172). Accordingly, he contends, this raises no problem for his account of know-how; DF must have some other 'propositional knowledge concerning a way of putting a card into a slot, without knowing the orientation of that slot' (*ibid.*). This seems to mean one of two things: either (a) DF has incomplete propositional knowledge-wh (specifically about slot-orientation), but must have a sufficient amount of other propositional knowledge-wh (perhaps about general location of the slot) to allow her to put a card into a slot, or (b) DF actually does have propositional knowledge-wh about slot orientation, and this knowledge is based on a non-conscious and 'non-conceptual understanding of orientation, yielded by her intact dorsal stream' (*ibid.*). We find (a) unconvincing simply because the amazing thing about DF's performance is that she gets the orientation right, she is above chance in this regard, when she puts a card in the slot, and it's not clear what other non-slot-orientation knowledge could allow for that. We think (b) is a more interesting interpretation in the sense that it is clearly the case that non-conscious information coming through the dorsal stream does register slot-orientation (and this explains DF's performance), but it is not clearly the case that this information adds up to propositional knowledge. Furthermore, given the rest of Stanley's analysis of the relevant propositional knowledge as a 'first-person mental state' (*ibid.*, p. 111) and clearly distinct from (and even excluded from — *ibid.*, pp. 184–5) the workings of 'automatic mechanisms' (supposedly including dorsal stream mechanisms, which for him are perfectly general and 'do not concern any particular activity'), his solution can't be one that takes propositional knowledge to be subpersonal information at 'automatic mechanism' level, since that would be not just *ad hoc*, but contradictory.

In addition, Stanley rejects the idea that know-how is a form of non-conceptual knowledge. He argues that attributions of know-how create opaque contexts, that is, situations in which an agent knows how to X, but does not know how to Y, even though X is the same as Y under a different description (see Carr, 1979, for a good example; and Wallis, 2008, for discussion). The agent's know-how is conceptually bound to X and conceptually blocked from Y. If know-how were non-conceptual, then the agent would not be blocked in knowing how to do Y. Yet it seems just as reasonable to say that the agent does *know how* to do Y but just doesn't *know that* Y is X. His lack of conceptual knowledge-that does not affect his knowing-how. He knows how to Y; he just doesn't know that he knows how to Y.

More generally, the alternative view is that know-how, in any and every case, goes beyond (is not reducible to) propositional knowledge-that. Stanley will say that on the alternative view proposed here we are describing ability rather than know-how. That is, for him, all of the details about body-schematic processes and flexible mechanisms fall under the category of ability, and this falls short of both skill and know-how. I can know how to do something, Stanley would argue, without having the ability in the present or present situation to do it. He cites a nice example provided by Carl Ginet (1975, p. 8): 'it would not be right to report the fact that I am able to lift a hundred pounds off the floor but my eight-year-old son is not by saying that I know how to do this but he does not know how. Insofar as there is any knowing how involved he knows how as well as I; he just doesn't have the strength to do it' (cited in Stanley, 2011, p. 127). For Stanley, ability includes things like strength, speed, and stamina (see Stanley and Williamson, 2017). The boy has the know-how, but not the ability.[10] In contrast to the case of DF, who has the ability to put the disc in the slot without having the knowledge-wh of how that slot is oriented, Ginet's son purportedly has the knowledge-wh — the know-how — but does not have the ability to lift a weight of 100 lbs.

In Ginet's example, however, does it come down to strength, or strength and skill? Assume that his eight-year-old son never lifted a set of weights. Assuming that there is some skill involved — a right

[10] 'Consider the difference between someone who can bench-press a maximum of 100 pounds and someone who can bench-press 150 pounds. We may suppose that both employ the same technique; only brute strength makes the difference between them. Both are equally skilled, but clearly have different abilities' (Stanley and Williamson, 2017, p. 721).

way to do it so that one doesn't hurt oneself — it may be that he is lacking not only strength but also skill.[11] Skill, in this case, may include a heedful anticipation of how 100 lbs will feel as it is lifted — a being heedful of heft that one gains only by experience or practice, and by gaining a certain bodily attunement to the weight. Depending on my own state of fitness, lifting 100 lbs, because of the way it feels, may entail a different stance or posture on my part, a different positioning of my hands on the bar, than if I am going to lift 150 lbs, and part of knowing how to lift the weight entails this skill of anticipating a proper stance.

4. Skill and Acuity

Both Stanley and Ryle agree that knowing-how includes skill, and that skill is a disposition (Ryle, 1949, p. 27). We agree. But we disagree with Stanley that 'the acquisition of a skill is due to the learning of a fact' or a set of rules (2011, pp. 130, 183). An action is a skilled action, rather than a reflex, according to Stanley, because 'it is guided by knowledge, [e.g.] by knowledge of how to catch a fly ball'. Stanley and Williamson define skill as a kind of 'disposition to know':

> More specifically, to be skilled at the action type of ϕ-ing is to be disposed to form knowledge appropriate for guiding tokens of ϕ-ing… In most activities, skill involves knowledge-wh states similar in all relevant respects to states typically thought of as knowing how. (2017, p. 715)

For S&W, skill is a disposition to be able to collect and use (or be guided by) situation-specific knowledge-wh. It includes both perceptual and motor aspects, although one can make a distinction between mere perceptual ability (or capacity or acuity) and perceptual skill (*ibid.*, p. 724, n. 11), and supposedly the same distinction with regard to the motoric. S&W voice a worry that it might appear they are putting skill before knowledge (*ibid.*, p. 721). One might think this because they suggest that in playing tennis I gain knowledge-wh as the result of a skilful perceptual process. Specifically, I may know where the ball is going to hit on the court because I've observed the swing and stance of the server. So the knowledge-wh concerning

[11] There are in fact different ways to bench press, different muscle sets to contract, and different places at which to place one's grip — all of which can make a difference in how much weight one can press.

where the ball will hit is based on my perceptual acuity. Perhaps some would say that it's the result of an inference from what I have perceived, but one could also say that it's the result of a continuous perception that began when I saw the server swing. In turn, however, my motor skill involves using (being guided by) that knowledge of where the ball will hit in order to move and return the serve. In the first part of this piece of the game it seems that perceptual acuity delivers knowledge-wh; in the second part it seems that the same knowledge-wh guides skilful motor performance. S&W try to avoid giving the acuity aspect of skill priority over the knowledge aspect simply by emphasizing that skill is really knowledge. But clearly, more is involved in my moving to return the serve than just knowing where the ball will hit. The skilful performance involved in returning the ball will have to involve putting my motor ability (all of the detailed motor processing described in the previous section) into action including perceptually informed, heedful anticipations about where I will place the ball *vis-à-vis* the other player.

In this dynamical back and forth of perception and action there is no putting one process before the other. What S&W call my knowledge-wh of where the ball is going to hit just is the result of my skilful, heedful perception of the other player's action, and at the same time it's what elicits my motor response, which obviously begins not when the ball hits, but with my perception of the server's swing and stance. None of this is automatic, although that's the way this intelletualist approach characterizes acuity. As Fridland (2017, p. 1543) characterizes this view, 'motor acuity is a more or less bottom-up, brute-causal process that does not require epistemic, cognitive, semantic, personal-level, or agentive explanations'. She argues in contrast that skill is intelligent all the way down. We could certainly say that some of it is habitual (in Dewey's sense of an intelligent habit rather than in Ryle's sense of an automatic repetition) and a matter of disposition, it's also a matter of what Ryle calls 'heedful' action, where heed is more than just passive perceptual or motor acuity (Ryle, 1949, p. 130).

Consider a second example from Ginet. Someone who has the know-how, and, we can add, the skill, may suddenly become disabled. 'An expert skier who in the course of a downhill run gets a bad case of stomach cramps and is able to complete the run only very clumsily still knows how to ski very well, even while temporarily unable to do so' (Ginet, 1975, p. 8; see Stanley, 2011, p. 127). The stomach cramp takes away the skier's ability or motor acuity temporarily. Consider another example. If know-how includes skill (everyone seems to agree

that it does), and if to become a skilled skier or musician takes practice and a tuning up of one's motor acuity, we would say that a former expert skier or musician who has not skied or played for 30 years is out of practice. She may still have the general ability (a general strength, flexibility, good vision, and motor control, etc.), and may still have the knowledge-wh. Shouldn't this be enough for the intellectualist? '[T]he musician or athlete is using knowledge of the musical score or the game to dictate to those automatic non-knowledge based components; it is the combination that leads to the skilled performance' (Stanley and Krakauer, 2013). But being out of practice means that, although she maintains general motor abilities, she no longer has the appropriate motor acuity and thus no longer has the skill, she no longer has the practical know-how, and she would not be able to perform in a skilful manner until she became sufficiently practised again and regained all the fine-tuned motor control and the detailed timing required for skilled performance (see Fridland, 2015, for related examples and discussion).

Perhaps this point about skill amounts to a terminological or conceptual quibble about how to use the term 'know-how', or how practical we want to make that concept. Hintikka (1975, p. 11) suggests that 'what is confusing about the locution "knowing how" is its being ambiguous between (i) a skill [or ability] sense and (ii) a "knowing the way" sense'. On the skill sense an agent has knowledge-how to A if she can perform A; on the 'knowing the way' sense an agent has knowledge-how to A if she can answer the question of how to go about doing A. Stephen Hetherington maintains that we have to adopt one of these definitions (2006, p. 91). He adopts the first, i.e. he equates knowing-how with ability; S&W adopt the second. There is one important point where these two definitions meet, however. Specifically, when S&W allow the agent to answer the question with a demonstrative. This may be the best and most reliable answer. But as previously noted, the demonstrative in effect points to the demonstration, since one does not simply say '*This* is how I do it'. The proper demonstration is to do it, in which case the 'knowing the way' sense just is the ability sense. The truth of *this* is not in the proposition but in the doing.

So we can set aside the terminological issue in order to characterize the important aspects of the phenomenon. In this respect our primary concern has been to highlight in what way knowing-how is anchored in the specificity and the dynamical character of embodied, situated performance, and to avoid what Alfred North Whitehead once called

the 'fallacy of misplaced concreteness' (1925, p. 52). We want to avoid taking the abstractness of propositional knowledge for the concreteness of know-how in embodied performance.

5. Conclusion

We've highlighted some issues and raised some questions about the intellectualist conception of know-how, as defended by S&W. First, the mechanisms involved in intentional actions and expert performance are not automatic and 'perfectly general', but involve a high degree of specificity tied to particular contexts and what Ryle calls a 'heedful' attentiveness or attunement to specifics of the situation. Second, the scientific evidence gives us reason to think that in cases of intentional and skilled actions the operation of body-schematic mechanisms involve processes that take their bearing from and are dynamically coupled to the environment; and there is no evidence that gives us reason to think that they are guided or instructed by non-conscious, detailed propositional knowledge about *how* to do what one is doing. This does not rule out the idea that they are, to some degree, guided or constrained by more general intentions that may specify *what* I am doing. Third, the meaning of demonstratives in reports about know-how cash out in actual demonstrations and do not point to any further propositions, hidden or otherwise. These considerations push against an intellectualist interpretation and towards a more dispositional conception of know-how and skilled behaviour, of the sort that Ryle defended.

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