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Embodying thought in skilful action

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Introduction

The baseball great Yogi Berra notoriously asked, ‘Think? How can you hit and think at the same time?’¹ Because practitioners in many skilled movement domains know that self-conscious thought can disrupt well-practised actions, they like to entrust grooved action sequences to the body, to the habitual routines of kinaesthetic memory. But because they also know that open-ended, flexible performance is context-sensitive and, in the ideal, exquisitely responsive to subtle changes in a situation, they also want to bring all of their experience to bear in the moment, to bring memory and movement together, with thought and action cooperating instead of competing. An elite cricketer, for example, with less than half a second to execute an ambitious cover drive to a hard ball homing directly in at 140 kmh, draws not only on smoothly practised strokeplay but somehow also on experience of playing *this* fast bowler in *these* conditions, and on dynamically updated awareness of the current state of the match and of the opposition’s deployments, to thread an elegant shot with extraordinary precision through a slim gap in the field.² It’s fast enough to be a reflex, yet it is *perfectly* context-sensitive.

This kind of context-sensitivity, we suggest, requires some forms of mindedness. We are interested in the interpenetration of thought and action

exemplified in such open skills, where salient features of the environment are tracked and accommodated in an ongoing manner. Dynamic skilful action is constantly embodying thinking, in unique worlds and contexts. In the improvisatory intelligence of experts in sport or music or dance, for example, the old mind-body problem comes to practical life, or is relocated in rich cognitive ecologies. The complex settings of such mindful thinking in the world incorporate technological, material, cultural, affective and collaborative resources, in shifting balances. An expert skier may monitor the freezing of the powder snow as the sun goes off the slope in a late evening run, accommodating the manner of turning to those subtle changes in conditions. Likewise, the apparently effortless way in which musicians together adapt their performance every night of a long tour reflects not just the direct or immediate drawing-forth of specific styles and forms of musical comportment by a unique constellation of audience and venue but also a much broader and temporally embedded set of contextual factors mediated by collaborative cognition. In different ways, our everyday habitual actions too retain comparable, genuine context-sensitivity when, for example, we are driving in changing conditions or cooking for a particular occasion. Even in more frequently repeated everyday behavioural sequences, like brushing our teeth or gathering together our keys and belongings before leaving home in the morning, we can remain more or less open and responsive to any peculiarities of today's unique constellation of moods and events.

Philosophers could take more account of the nature of intelligence in action by attending to the practices and conceptions of the specialist participants, teachers, critics and enthusiasts who devote vast portions of their lives to sport, dance, yoga, jazz, circus or other forms of embodied performance in what are often dynamic and affectively saturated environments, and who collectively develop their own peculiar ways of communicating, thinking and talking about their activities, often 'beyond the easy flow of everyday speech'.³ These are often highly collaborative activities, more like stealing horses together than driving to work alone or playing chess against a single determined opponent. Understanding them requires us to draw critically on joint action research in the cognitive sciences.⁴ Working phenomenologically but also in conjunction with students of sports psychology, choreographic cognition, ethnomusicology and the like, a richer applied philosophy of mind might tap key dimensions of variation on which distinctive skilled practices differ.⁵ Likewise, with regard to more widely shared habits, phenomenologists, for example, could help forge new hybrid, experience-near approaches to everyday coping alongside theorists of material culture and cognitive ethnographers of habit.⁶ In this chapter, we stick to the general theoretical landscape in examining broad views on how we influence ourselves.

I Habits and skills in phenomenology and embodied cognition

Philosophers of many different persuasions query Ryle's sharp distinction between habits and intelligent capacities, by which habits are single-track dispositions more akin to bare reflexes than to complex tendencies like skills.⁷ As conceptions of agency expand further beyond the momentary, occurrent reasoner, we loosen the association between habit and rigid automaticity, and suggest that habits can be flexible and adaptive as well as idiosyncratic.⁸ Habits are thus fruitfully seen, in certain contexts, as more like immersed embodied skills: in both cases, as explicit and conscious deliberation is set within a broader picture of the non-conscious and relational constitution and maintenance of agency, we can treat both mundane and unique, both expert and ordinary socially situated activities as among the central ways that we express, create and transform our selves.

In seeking to develop such a richer picture of both habits and skills, phenomenologists from Merleau-Ponty onwards have often sought a middle ground between rationalist or ultra-cognitivist intellectualism, on the one hand, and mechanistic forms of pure empiricism on the other. Although there are dramatic variations, too often neglected by philosophers, in individual style and across distinctive activities, embodied activities are neither in general the outcome of detailed prior internal planning and calculation, nor stereotyped and fossilized, mechanically invariant in every exercise. While there are genuine targets at each of these two extremes in contemporary philosophy and science, the alternatives are sometimes caricatured. We prefer to see the two poles as distinctive, if sparsely populated regions of a multidimensional space of possibilities: we query the standard historical narrative by which they are the twin legacies of Descartes' dualism (Section II), and more importantly argue that the spaces between have not been adequately described and explored in recent phenomenology. Roughly, our concern is that some attempted syntheses or resolutions of the putative Cartesian impasse about embodied action still overreact to the intellectualist prong of the alleged theoretical dilemma by taking habit and embodied skill out of the psychological realm entirely. We deny that any invocation of intelligence must be intrinsically intellectualist or rationalist, and argue that there is a rich, under-explored space between deliberative calculation and 'mindless' intuition.

Further, we worry that the forms of evidence brought to bear in discussions of habit and embodied skill by phenomenologists, analytic philosophers and cognitive scientists alike are often unnecessarily thin and abstract. It is not easy to understand the meaning and role of terms like 'minded' or 'mindful', let alone 'conceptual', in the debate between Hubert Dreyfus and

John McDowell.⁹ Phenomenological and cognitive philosophers alike invoke embodied skills primarily as intuitively compelling examples. In explaining the nature of continuous reciprocal causation within coupled dynamical systems, Andy Clark writes:

The players in a jazz trio, when improvising, are immersed in a web of causal complexity. Each member's playing is continually responsive to the others' and at the same time exerts its own modulatory force. Dancing, playing interactive sports, and even having a group conversation all sometimes exhibit this kind of mutually modulatory dynamics.¹⁰

Susan Hurley introduced her account of embodied human beings as dynamic singularities in the causal flow, 'characterized through time by a tangle of multiple feedback loops of varying orbits', by way of the following example:

Consider the circus performer who puts the handle of a dagger in her mouth, tips her head back, balances a sword by its point on the point of the dagger, and with the whole kit balanced above her head magisterially climbs a ladder, swings her legs over the top rung, and climbs back down the other side of the ladder. Each move she makes is both the source of and exquisitely dependent on multiple, internal and external, channels of sensory and motor-signal feedback, the complex calibrations of which have been honed by years of practice.¹¹

Clark and Hurley were in a sense recapitulating the Cambridge psychologist F.C. Bartlett's attempt in 1932, attending to social, cultural, bodily, affective and neural factors at once, to model all cognitive activity on skilled movement:

Suppose I am making a stroke in a quick game, such as tennis or cricket ... when I make the stroke I do not, as a matter of fact, produce something absolutely new, and I never merely repeat something old. The stroke is literally manufactured out of the living visual and postural 'schemata' of the movement and their interrelations. I may say, I may think that I reproduce exactly a set of textbook movements, but demonstrably I do not; just as, under other circumstances, I may say and think that I reproduce exactly some isolated event which I want to remember, and again demonstrably I do not.¹²

Here the rich, context-sensitive variability of embodied activity characterizes remembering, thinking and decision-making too, with physiology by no means a source of rigidity.

Reference to such cases was still striking in the late 1990s, a necessary intervention before the '4E cognition' ('embodied, embedded, extended and enactive') movements had taken off, when an early writer in those movements could be ridiculed in a top philosophy journal for offering a definition of cognition on which 'it would seem that climbing the stairs in the dark is a cognitive process'.¹³ But now, with the embodied and active nature of cognition accepted as a live research programme with many weaker and stronger variants in mainstream cognitive science, we can aim to supplement and build on such anecdotal evidence, seeking firmer and mutually informative links between philosophy and relevant applied fields of enquiry. Building on Bartlett, Clark and Hurley, theorists' attention could be directed to a wider array of the ordinary and extraordinary skills on show around us every day. Let us return to the apparent source of the twin bogeymen of dualism and mechanism.

II Reinterpreting the Cartesian Cyborg

When Dreyfus suggests that 'mindedness is the enemy of embodied coping', McDowell charges him with 'a dualism of embodiment and mindedness that is reminiscent of Descartes': even though Dreyfus is not taking the body to be merely mechanical, by evacuating mindedness from 'egoless' absorbed activity, he too is engineering an 'awkward separation of me from my body'.¹⁴ We suggest that mainstream Cartesian scholarship goes wrong precisely in ascribing to Descartes a fundamental dichotomy between true action and brute reflex automatism. In addition to the historical interest of this richer Cartesian account of how we influence ourselves as unified embodied beings, it also highlights the telling theoretical need for a more differentiated picture of the dimensions and varying characteristics of embodied responses. Some critics who defend a more exuberant and visceral form of contemporary materialism than was visible in mainstream cognitive philosophy until recently do so still by contrasting it with a deadening mechanism based on tight analogies between brain and machine.¹⁵ But arguably, that form of mechanism is itself little more than a ghoul, and we need instead, as Catherine Malabou puts it, 'an approach to the machine that thinks of it not as a control centre but as an organ with multiple and adaptable structures – a future-producing organization, susceptible to an always-accruing functional differentiation'.¹⁶ This shift is dramatically supported when we realize that the body depicted even in 'Cartesian mechanism', that dreich imposition of order on barren matter by which Descartes allegedly sought to bypass 'the concrete life of feeling',¹⁷ is in fact itself a richly baroque system precisely structured on

plasticity. In briefly summarizing here the case for such a reinterpretation, which the current first author has developed elsewhere, building on a swathe of revisionary Cartesian scholarship from the 1980s onwards by historians of the passions and of natural philosophy, we focus on the neurophilosophy of *L'homme*, the *Treatise of Man*, in which Descartes delineates in detail a vision of animal spirits roaming through the pores and traces of body and brain, which is entirely consistent with his scattered remarks elsewhere, through to *The Passions of the Soul*, on corporeal memory and the dynamics of embodied cognition.¹⁸

We can take as representative Owen Flanagan's account of the 'Cartesian automaton', restricted to reflex behaviour in its impoverished world, just because it is only body:

The complete system of wired-in reflex arcs exhausts its behavioural potential. What a particular automaton does, how it in fact behaves, is the inevitable result of the interaction between the environment and the wired-in arcs. Such a system is deterministic in the sense that, barring mechanical failure, there is one and only one response for each stimulus.¹⁹

On this standard interpretation, this is why Cartesian natural philosophy could exclude the contingencies of individual experience: the point of Descartes' fables of automata is to demonstrate that only initial wiring and the immediate environmental input drive the (body-) machinery. For Timothy Reiss, these automata are 'endlessly repeatable, and by definition not particular, not the subjects of a specific history'.²⁰ In the case of a human being, who has an incorporeal soul conjoined to the body-machine, flexibility and genuine action arise solely through the mediation of the rational soul.

But this is a mistaken interpretation of the functioning of a Cartesian 'automaton', which Descartes clearly and consistently describes as capable of (corporeal but entirely genuine) learning. There's no reason to accept that hardwiring or biology, on the one hand, and current stimuli, on the other, must be the sole determinants of machine behaviour. The example of memory, discussed at length in *L'homme* and rehearsed again in *The Passions of the Soul*, makes this easy to see. Figures transmitted by or in the incessant motions of animal spirits or nervous fluids are 'imprinted in the internal part of the brain, which is the seat of Memory'.²¹ This is achieved through bending or rearranging brain filaments so as to alter the intervals between pores through which the spirits will flow in future. The spirits 'trace figures in these gaps': with stronger or more frequent patterns of input, more enduring changes are made in the pores, so that the figures can be more easily formed again, in the absence of the specific stimulus.²² The pattern of the pores, which constrains the patterned flow of spirits, is itself altered over time by the differing motions

of the spirits. These patterned motions are not themselves stored, but are merely 'retained in such a way that' previous figures can be recreated. Even if a particular input is only partially re-presented, recognition may still occur if the connected pores have been disposed so as to open together more easily.²³

So as Hall notes, for Descartes, 'memory traces ... consist in residual patterns of openness among the interstices of the filamentous brain substance'.²⁴ Only physical factors need be involved in reconstruction: the soul may play a part, when united to the machine, but it is not necessary for memory operation. It 'usually happens', according to Descartes, that 'several different figures are traced in the same region of the brain'; thus, 'the spirits will acquire a combined impression of them all'.²⁵ So memories are motions, rather than separate atomic items, and representation in memory does not operate by resemblance. Every trace in a brain region affects any episode of processing, so every memory is composite, just as every sensation dangerously carries the perceptual history of the perceiver. This is how 'chimeras and hypogryphs are formed in the imaginations of those who daydream', who neglect the twin direction offered by external objects and by reason.²⁶ The basic mechanisms of memory, therefore, are mechanisms of creation and effacement simultaneously, as the history-dependent processes by which the nervous spirits restructure the pores of the brain constantly involve both the annihilation of certain prior patterns and possibilities, and the upsurge of new ones.²⁷

So in the memory processes of the Cartesian automaton, the effects of experience are transmitted over long temporal gaps, and are causally involved in behaviour mediated by complex internal processes. The determinism involved is not a simple stimulus/response link, for the corporeal causes act holistically. To put it another way, the case of memory shows that an automaton's physiology changes over time. Automata with different histories, different 'experiences' marking their brains and bodies, will (*contra* Flanagan) respond differently, and one automaton will respond differently to the same stimulus at different times after a new experience has modified the pores and folds of its brain. So if 'automatic' just *means* 'responding identically to the same stimulus', then these Cartesian machines (which, after all, operate as they do because of the disposition of their *living* organs) are not automata. Genuine (unconditioned) reflexes like sneezing, blinking and withdrawing the foot from the fire are the exceptions, *not* the model for all action produced without the soul. There are even distinct neural bases suggested in Descartes' fantastical neurophilosophy. Despite persistent misinterpretation of the famous image of a boy's reflex withdrawal from the fire in the first French edition of *L'homme*, the pineal gland is *not* involved in genuine, basic reflexes, whereas it *does* mediate equally corporeal but complex and adaptive responses.²⁸

Because Descartes' physiology is explicitly modelled on fluid dynamics, the internal operations of the permeable, fluid-filled body in his natural philosophy are in ceaseless, circulatory, holistic exchange with the fluid-filled cosmos.²⁹ The passions are linked by 'nature or habit' with particular movements of animal spirits and fluids in the body and the brain. Those connections set by 'institutions of nature', which are initially set by our temperament and nature but are sometimes still alterable, are sometimes seen as the main threat to the good life.³⁰ On this understanding of Cartesian ethics, Descartes 'offers the hope that by careful training, and the resolute exercise of our will, we can become not the slaves but the masters of our biological inheritance'.³¹

This gives the impression that Descartes took the enemy, in moral life, to be the fixity of biology, the rigidity of the machine's programming, which it is the task of the will to overcome. But in fact, the institutions of nature don't reach all that deeply: by themselves they are neither the main problem, nor the major hope. What Descartes sees as the problem is not fixity, but our tendency to uncontrolled plasticity. Not nature, but *habitude* is the moral key. The term covers various kinds of *variable* connections between bodily motions and thoughts or passions. Habits are grounded in dispositions, which in turn are grounded in the complex dynamical arrangements of physical parts.³² *Habitude* reaches further beyond the individual than does the English 'habit'. All the teachings of childhood are sedimented in associations, the route by which culture intrudes into the soul. Descartes thus has a physiological basis for his concern about our pre-reflective views of the world. He does not hold the intellectualist view that everything implicit in our forms of life must be explicitly encoded in the brain. This would require the equally implausible separate rooting out and challenging of each and every belief.³³ Memories do not have to be stored independently or discretely to be causally active: there are no independent storage boxes which can be either full or empty – only the sets of folding pores in the net of the brain. Our bodies thus hold cultural forms of life not as quasi-theoretical axioms but as nested sets of causal tendencies, realized differently in each brain and body. Descartes' psychophysiology makes quite incoherent the kind of total epistemological re-evaluation and wholesale destruction of false beliefs that mainstream interpretations attribute to him. We should reject these interpretations, and acknowledge instead that Descartes accepts the inevitability of working with our pre-reflective cognitive equilibrium, while seeking also to home in on the more damaging of the inconsistencies and anomalies, accretions of the (social and individual) past, which we have internalized.

Understanding the passions then, for Descartes, is not the simple reprogramming of a rigid body-machine by an authoritative but entirely external soul.³⁴ Rather, it requires *industrie* – artifice, or (psychological) work – the laborious and interminable acquisition of knowledge of our own *habitudes*

and their dispositional bases. Moral life is not based on the old dualist diatribe against the body, but consists, in part, in the knowing use of habit and association in body and brain, inhabiting them more fully as we slowly apply intelligence to the reflexes and (fallibly, interminably) re-colonize the body.³⁵ Standard Cartesian scholarship, scarred by the inability to think outside a dichotomy between self-conscious rational thought and mere reflex, wrongly relegates all ordinary corporeal cognition to the agent's exterior, whereas in fact Descartes saw the unique history of each embodied organic creature as grounding a much wider array of flexible responses and activities than just those mediated directly by reason.³⁶

This reinterpretation of Cartesian accounts of memory and the body unsettles, both historically and conceptually, the very idea of reducing complex embodied action to mere reflex, so much so that that reduction need no longer retain its grip as the historical shadow against which phenomenological philosophy defines itself. The plasticity in play at the heart of this paradigmatic version of mechanism confirms the non-repeatable 'eventlike dimension of the mechanical'.³⁷ As we return to consideration of skilful action, we can see that a multiplicity of parameters inevitably influence the respective contributions of sedimented history and present input: the degree of openness of the skill, the rate and familiarity of change of the current environment, the risk/benefit trade-off of improvisation, and whether it is one person interacting with a quiescent environment or also co-acting with others in a changing world, as in stealing horses together. In refusing the separation of embodied activity from psychology, we need to develop a feel for the shapes and complexities of this multi-dimensional space where the parameters are yet to be fully discovered.

III Habit and skill without psychology: Overreacting to intellectualism

We suggest that some phenomenological accounts of embodied activity are built on overreactions to ultra-cognitivist intellectualist or rationalist theories. Intellectualist views in the psychology of expert systems or in classical motor control theory have two broad characteristics or commitments: action involves the application of explicit rules, and the agent builds up and draws directly on a rich and relatively stable domain-specific knowledge base composed of causally active explicit representations. In some versions, this process might be consciously accessible, whereas on other views, access to that expert knowledge has been wholly proceduralized. These views, which have been effectively and persuasively criticized by Dreyfus and others, are not our targets here.³⁸ We note, as has Dreyfus, that fast and rapidly changing dynamic

domains like open-skill sports or improvisatory jazz make intellectualist approaches particularly hard to credit. There is no complete specification of the task domain available to be internalized, and even if there was, it couldn't be searched and applied in time: with little more than half a second to react before the cricket ball reaches you, how could you think first, then act?

Any intellectualist requirement of a deliberate, pre-planned, explicit blueprint which is merely executed in the expression of embodied action would, we agree, impose an overly static psychology on actions which are often sculpted on the fly, to the needs of the moment and on the basis of a dynamic implicit repertoire of tendencies and potential responses. Our concern is not with the phenomenological critique of ultra-cognitivism, but with the constructive alternatives available. In particular, we think it unhelpful to discard psychology entirely in the process of discarding an overly static psychology. It is too simple just to decentre conscious, effortful, controlled responses in favour of intuitive, attuned, flowing responses, because this merely reverses the values of an unnecessarily dichotomous scheme. We address first habit, then skill and absorbed coping.

Bill Pollard argues that habits are central to agency: identifying someone's action as habitual can, in certain circumstances, be an effective explanation of that action, locating it 'in one pattern in the agent's career'. Compared to compulsions and addictions, habitual actions are more open to simultaneous, online influence: even though they do not require 'any preceding deliberation', they are still unlike mere reflexes in that the agent retains some direct power to intervene and control.³⁹ But Pollard thinks that this link between habit and agency requires a severing of the link between habit and psychology, where he treats 'psychology' as the realm of beliefs, desires, intentions and reasons, and as requiring 'that the agent has some privileged perspective on her own psychological condition'. Given these assumptions about psychology, he recommends placing it at the margins of the philosophy of action, and he invokes much the same line of thought as Yogi Berra or Dreyfus:

For whilst thought is very helpful when we are in novel or important circumstances, the rest of the time it rather gets in the way. In a slogan we might say: we only think when our habits give out.⁴⁰

So Pollard is assuming that when habits are in play, there is no thinking. We query this background assumption that thought is or requires 'preceding deliberation', and the corresponding sharp line between psychology and embodied action. In contrast, we agree with Brett and Sheets-Johnstone that even in the most habitual activities – brushing teeth, washing hands and weaving through a crowd – we often retain significant levels of care, attention and kinetic awareness. Even if the initiation of the habitual action is now outside our sphere of attention, the exercise of many habits intrinsically involves

certain kinds of monitoring. No matter how effectively we have grooved and routinized our expertise as drivers or ball-players, as Brett points out, 'the habit of paying attention to the road is one of the necessary ingredients in being a good driver, just as the habit of keeping one's eye on the ball is essential to being a good ball-player': there is, therefore, in habitual action no inevitable lack of care or attention.⁴¹ Likewise, Sheets-Johnstone cautions that

When Luria speaks of the *automatization* of movement, it is important to point out that he is describing the way in which a single impulse is sufficient to activate a kinetic melody, and not asserting that one is unaware of writing one's name, that one is unconscious of doing so, or that one can nod off while the process continues by itself.⁴²

So it's an unnecessary constriction on the dynamics of thought to assume that what's done from force of habit must be done without thinking: as Brett argues, a 'continuum of cases' will range from more channelled and stereotyped responses to nearly identical situations, 'to those in which attentiveness and variation are an essential part'.⁴³ As well as offering a more complex picture of habitual actions, this perspective also points to a common framework for habits and skills, in which different cases may vary on a range of distinctive dimensions.

Turning then to skill, we can pick out features of the work of Dreyfus, Elizabeth Ennen and Michael Wheeler as exhibiting related overreactions to intellectualism.⁴⁴ Our concern, again, is that these theorists tend to evacuate psychology entirely from action, running the risk of thus neglecting the complex interplay between embodied dynamical factors and cognitive factors. In finding 'no place' for mindfulness in 'the phenomenology of fully absorbed coping', Dreyfus retains and underlines a fundamental dichotomy between what he elsewhere calls 'two distinct kinds of intentional behaviour: deliberative, planned action, and spontaneous, transparent coping'.⁴⁵ This spontaneous, attuned responsiveness or intuitive coping is entirely dominant at high levels of expertise, whether in sport, chess, nursing or driving. At the highest stage in the 'Dreyfus model' of skill acquisition, action management and decision-making do not even appear as problems for the expert practitioner. As a result of a long history of engagement with a complex domain, 'an immense library of distinguishable situations is built up on the basis of experience', allowing fresh 'experience-based holistic recognition of similarity' in the present.⁴⁶ When emotionally engaged and immersively achieving a maximal grip on a complex situation, context-sensitivity is simply built in as part of to ongoing activity:

With enough experience in a variety of situations, all seen from the same perspective but requiring different tactical decisions, the brain of the

expert gradually decomposes this class of situations into subclasses, each of which requires a specific response. This allows the immediate intuitive situational response that is characteristic of expertise.⁴⁷

Practical experience is thus immeasurably more valuable than mere factual knowledge of a domain. Aligning themselves with the scorn for critics exhibited by practitioners in some domains of embodied expertise, Dreyfus and colleagues forcefully and negatively compare professional political commentators to 'articulate chess kibitzers, who have an opinion on every move, and an array of principles to invoke, but who have not committed themselves to the stress and risks of tournament chess and so have no expertise'.⁴⁸ Only when one is involved, and gets a lot of practice, will the body take over and do the rest.⁴⁹ There is then neither thinking nor awareness, neither attention nor choice: at this level of fluid performance, 'an expert's skill has become so much a part of him that he need be no more aware of it than he is of his own body'.⁵⁰ On this account then there is no interplay of automatic and controlled factors when all is going well in an expert's attuned embodied activity, no dynamic interaction of cognition and reaction or of strategy and skill.

In an impressive extension of Dreyfus's phenomenology, Elizabeth Ennen maps this picture of absorbed skilful coping on to a neuroscientific account of skill memory, under which label she addresses habit memory and sequence memory. The non-conscious fluidity of expert activity, Ennen argues, is grounded in the 'non-representational mechanisms of the striatal system', involving in particular highly context-dependent and non-transferable dispositions to respond readily in complex but specific ways.⁵¹ Such 'smooth and unobtrusive responsiveness to circumstances' does not require any conscious or online knitting together of distinct stored items, because that work has already been done in the course of experience: perceptual-motor chunks 'lose their individual identities and become, in a sense, inaccessible', and thus 'not de-coupleable from their sources'.⁵² For these reasons, responses based on skill memory are fast and fluid, quite unlike slow, conscious decision-making processes which draw explicitly on declarative knowledge. Once a sequence has been successfully proceduralized, its activation is non-conscious, involving no awareness, attention, anticipation, accessibility or articulability. For Ennen, this account vindicates Dreyfus's phenomenology of 'mindless' everyday coping skills.⁵³

Although phenomenological views like these have many subtleties and complications, on these central points, the picture is clear and in firm agreement with a range of views elsewhere in the philosophy of mind. Despite their other differences, for example, Dreyfus and Searle agree broadly that as skill develops, the verbalizable rules on which novices rely are not wired-in,

internalized or memorized; instead, 'repeated practice enables the body to take over'.⁵⁴ Likewise, Fred Dretske argues that 'in the case of all skilled actions, whether it be tying your shoelaces, playing a musical instrument or dribbling a basketball – the mind goes elsewhere while the body performs'.⁵⁵

Despite their many differing views on other matters, we suggest that all these philosophers successfully avoid ultra-cognitivist intellectualism in the theory of skilful embodied action only at the cost of entrenching the core intellectualist (and pseudo-Cartesian) dichotomy, even if reversing the values attached to its twin poles. If the intellectualist privileges slow, controlled, effortful planning, and sees cognitively permeable, verbalizable conscious thought as the root of skilful action, the anti-intellectualist overreaction is to privilege fast, effortless, intuitive and entirely non-cognitive responses which are merely the flip side of the same dichotomy.⁵⁶ Such privileging of intuition is both culturally and intuitively appealing, as attested by the popularity of Gladwell's theory of 'thin-slicing', by which we unconsciously find the right patterns in situations faster and more effectively than we would by conscious and deliberate thinking.⁵⁷ The pressure to see mindfulness or mindedness as the enemy of embodied coping is also powerful in practitioners' lore in sport, music and dance. Top sportspeople say that 'when you're playing well you don't think about *anything*', and one leading sports psychologist recommends that 'you absorb yourself in the moment', while musicians typically downplay knowledge and conceptual memory, wanting to entrust performance to the hands or to motor processes.⁵⁸ Introspection and reflection are sometimes viewed with suspicion, as potentially disruptive influences, and it is not a compliment to say that someone talks a good game.

In addition to the dynamical neuroscience on which Dreyfus occasionally draws, there is also empirical research in these applied domains that could be put to service in the attack on mindedness, of which we mention just one example here in lieu of fuller discussions on other occasions.⁵⁹ Visual neuroscientists have discovered that elite players in a high-speed ball sport like cricket actually look *away* from the ball (to the predicted bounce point on the pitch) significantly earlier than novices.⁶⁰ It might appear then that the entrenched verbal maxim 'watch the ball' is, as Dreyfus might put it, a mere training wheel, an awkward linguistic residue of early practice, a beginner's tag which is now severed from the expert's intuitive responses, or a semantic intrusion which the engaged body no longer needs.⁶¹

Before sketching an alternative interpretation of some of these lines of thought and evidence, we note finally the impressive synthesis of phenomenology and cognitive science developed in the recent work of Michael Wheeler. Fusing Heidegger and embodied, embedded cognitive science in the quest for 'a land beyond Cartesianism', Wheeler offers the most sophisticated account yet of absorbed coping without mindedness, in which

personal and sub-personal levels of description are mutually constraining.⁶² We are 'thrown machines', always already embedded in a context, and we don't have reflectively to match a representation of our current situation against a library of stored, context-free representations. Instead, smooth practical activity, whether in habitual behaviour or embodied skill, is our basic mode of interaction. When equipment 'becomes a *transparent* feature of the human agent's phenomenal world', the agent 'has no self-referential awareness of herself as a subject over and against a world of objects': there is no need to *recognize* the doorknob as a doorknob as it turns. But Wheeler's treatment of hitch-free coping stresses two points which are not always highlighted by Dreyfus. First, there is still 'a form of awareness' in play, which Wheeler explains on the basis of Heidegger's 'circumspection' as an action-oriented form of embodied knowledge of how to use equipment in accordance with normatively constrained public practices.⁶³ The neural mechanisms underpinning this kind of smooth coping, Wheeler argues, are likely to exhibit 'extreme nontrivial causal spread', rather than any localizable or repeatable programme driving the motor processes. In sport, for example, Wheeler therefore suggests that 'the neural contribution may be more a matter of nudges and triggers than specification and control, with the real intelligence residing in bodily (e.g. muscular) adaptations and dynamics'.⁶⁴ Second, Wheeler acknowledges the diversity and online complexity of practical activity, following Heidegger in noting a number of ways in which smooth coping can be disturbed as equipment breaks, malfunctions or gets in the way, and when the agent must take a step away from absorbed circumspection, for example, 'by calling a temporary halt to her activity, and by engaging, instead, in practical thinking'.⁶⁵

So Wheeler does see fluid, adaptive embodied cognition as a form of online intelligence, and also rightly encourages us to examine a spectrum of subtly different intermediate cases between absorbed coping and entirely detached theoretical reflection, in which the '*pure* circumspective know-how' characteristic of entirely hitch-free coping might actually be 'somewhat rare'.⁶⁶ Yet he still paints 'thinking' as something that happens only in breakdown, and not when the expert is simply adjusting to minor variations in dynamic task constraints. This point lies at the heart of the diverse views we have canvassed in this section, which for all their differences in method and emphasis converge on a rejection of all forms of 'mindedness' within both habitual and skilful embodied coping. Although they start from a plausible rejection of the idea that action is driven by explicit rules or inner blueprints accessed by way of conscious reflective deliberation, both philosophers and scientists go too far in the other direction by treating expertise as *entirely* intuitive, the sole product (as Dreyfus put it) of 'attractive and repulsive forces drawing appropriate activity out of an active body'. Thus in taking embodied activity right out of the psychological realm, these theories paradoxically

reinforce dichotomies between doing and knowing, or acting and thinking, which we might have hoped to overcome.

IV Habit and skill in expanded psychologies: Applying intelligence to the reflexes

If we want to bring embodied skills within the realm of an enriched and expanded psychology, and to suggest that the body which takes over in engaged practice might itself be minded, we need to respond to applied, empirical and phenomenological concerns alike. We start with the case of verbal maxims or cue words like 'watch the ball', or tags for improvisational jazz pianists such as 'sing while you're playing' or 'jazz hands'.⁶⁷ In both cases, it does seem that such linguistic tags and nudges are not used only by beginners, as Dreyfus might expect. The most experienced elite cricketer in our pilot series of interviews told us 'I personally say "watch the ball, play straight," before every single ball that's bowled': this isn't simply a preparatory tactic in the quiescent peacetime between periods of online activity, because 'I usually say that just as the bowler's heading up into his delivery stride. So that's at the point of delivery'.⁶⁸ It's true that 'watch the ball' is not an instruction sent from a detached mind to an obedient body, the top-down (re-)programming of the body-machine. The function of the verbal maxim is not exhausted (perhaps even no longer significantly affected) by its semantic content; rather, it operates in real time as a *material* symbol, an iterated and interactive self-stimulatory loop.⁶⁹ The role of 'instructional nudges' like 'watch the ball' or 'jazz hands', as Wheeler suggested, need not be precise control of the microstructure of action; yet the expert performer is using these verbal components of multimodal embodied routines to distribute intelligence, coordinating or often resetting and re-chunking patterns of movement or affect or mood, as one among many forms of scaffolding that support the embodied rebuilding of action sequences from the inside. The mind does not only intrude during offline strategic rehearsal or at moments of breakdown. Rather, thought, talk or memory can interact with practised embodied skill at a range of timescales, both in real time at the height of performance and in temporally complex feedback loops.

This line of thought, we submit, should not be surprising. Where Dreyfus pictures the context-sensitivity of expert performance as having all been set up in advance, the simple drawing forth of the appropriate option from the experienced and attuned body, we argue that genuine expertise often requires the rapid switching of modes and styles *within* the performance context. Grooved embodied action must thus be open, under certain circumstances, to

the influence of explicit knowledge, specific memories, or particular decisions. Admittedly, these influences cannot operate simply as top-down triggers of fully structured motor programmes; rather, expertise is in part the training up of the right indirect links *between* thought and action, not the evacuation of thought from action.⁷⁰ We don't need to *oppose* mindfulness to 'attractive and repulsive forces', for mindfulness is itself a complex and dynamic field of embodied forces.

In a series of papers which combine internal critique within phenomenology with the development of a new constructive approach to embodiment, Elizabeth Behnke offers a very different picture of the complexity of kinaesthetic awareness. Phenomenologists, she argues, have too often exclusively and damagingly concentrated only on the alienating and disruptive roles of attention and thought. Where Dreyfus, in seeking to overcome the twin evils of intellectualism and mechanism, sees the expert as equally unaware of his skill and of his body, Behnke complains that 'in attempting to save the Body from being regarded as a mere thing or object that is other than "me"; existential phenomenology tends to emphasize the completely tacit, anonymous, pre-reflective Body, and even to privilege a state in which we do not feel or notice our own Body "in the act" at all'. Although, as Behnke notes, there are also more positive and detailed accounts available of 'the experientially absent Body in its intertwining with its environment', her characterization here does fit the views of Dreyfus and others which we discussed in the previous section. We concur with her diagnosis that thus 'not sensing one's Body', as the Dreyfusian expert does not, 'is cause for concern', a potentially damaging form of 'sensory-motor amnesia'. Behnke acknowledges that becoming aware of my own *body* may sometimes bring 'alienation and rupture', as those hostile to mindedness point out: but this is not inevitable, for 'there are also ways to feel myself Bodily from within, in lucid awareness, without necessarily making my own Body into a separate object over and against "me"'.⁷¹

In both habitual action and skilled movement, on this alternative perspective, neither attention nor awareness is the enemy of embodied coping. Kinaesthetic awareness is indeed fully experiential, and many skilled practitioners in embodied disciplines actively cultivate 'the very event of undergoing sensuous affection in a thoroughly bodily way, directly sensing this undergoing itself as a streaming moment of subjective bodily life'.⁷² Here, somatic education and re-education is entirely within the realm of an expanded psychology, as by way of somatic *perception* we can inhabit movements from within, exploring nuances of bodily possibilities that are otherwise often simply taken for granted.⁷³ The kind of awareness and subjectivity at stake here is clearly not solipsistic or intellectualist, for it is always actually or potentially dispersed and shared across an uneven world of equipment and other bodies

rather than hidden in some unified private realm; sometimes, when in the company of others, for example,

In experiencing shared movement kinaesthetically ... I am neither walled off from the other nor kept at a spectator's distance; rather, I participate from within, whether I am caught up in an ongoing movement, or resist it, or initiate a new move in which another mover is caught up, and so on. Thus kinaesthetic awareness permits an encounter with alterity in which kinaesthetic autonomy and interkinaesthetic connectivity coexist.⁷⁴

In her extraordinary essay 'Ghost Gestures: Phenomenological Investigations of Bodily Micromovements and their Intercorporeal Implications', Behnke catalogues a diversity of the 'ongoing kinaesthetic patterns and processes' of everyday life 'not as observed from the outside, but as experienced from within'.⁷⁵ At different timescales, 'ghost gestures' are tendencies towards movement, schematic or barely perceptible ghostly micromovements that can persist in the body even when the implied or virtual larger-scale gesture or bodily pattern is not actually performed. I still feel the movements of digging in the garden today, or on a longer scale my movement styles hold traces of specific historical patterns of comportment due to long-vanished material constraints, cultural expectations or moral norms. For our current purposes, the significance of such 'ghost gestures as one example of bodily "sedimentation" as the effective presence of the past' lies in Behnke's account of the ways in which we can reactivate this sediment and retrieve the tacit choreography of everyday life. Although ghost gestures are usually an 'inadvertent isometrics', in that they are both unplanned and not sensed, by coming to notice them or bringing them to awareness, I can come, more or less successfully, to inhabit them, rather than letting that sediment simply play out anonymously within me. Awareness plays a key role here in the attempt to open up or counter sensory-motor amnesia, as in certain yoga traditions with approaches to embodiment quite different from sport or Western dance. Not only specific movement patterns, but also silent zones and signature patterns of tension may be for the first time accessed or matched, less as passive parts of a static body that is 'mine' than as ongoing kinaesthetic acts.

In such sedimented bodily patterns, as well as in the recalcitrance of things, the competitiveness of opponents, and the general opacity of the world, we see further limits to smooth embodied coping. But perhaps awareness and attention play useful roles only in such situations when the habitual or expert performer meets with resistances or disruption, or finds unexpected constraints on previously hitch-free practices. The enemy of mindfulness might retreat to such a position, agreeing that thought can play a variety of important roles not in performance but in practice, when the practitioner has time to

employ it, either under the pressure of trouble or the luxury of peacetime. But such a theorist might then hold firm to their central claim that active, smooth online coping in real time does not and should not itself involve any psychological processes. At the right time, the idea would run, apprenticeship must end, and the body must take over, leaving thought entirely out of the picture.

Again, we disagree with this understanding of the nature and role of mindedness and thought in embodied action. Skill is not a matter of bypassing explicit thought, to let habitual or grooved actions run entirely on their own, but of building and accessing flexible links between knowing and doing. The forms of thinking and remembering which can, in some circumstances, reach in to animate the subtle kinaesthetic mechanisms of skilled performance must themselves be re-described as active and dynamic. Thought, again, is not an inner realm *behind* practical skill, but an intrinsic and worldly aspect of our real-time engagement in complex physical and cultural activities.

In many distinctive domains, elite practitioners specifically resist the kind of automation which Dreyfus ascribes to the highest levels of expertise, worrying that trusting the body alone to take over will lead to arrested development. Just as they challenge themselves constantly and deliberately in practice, they know that in performance they will be constantly opened up to new limits. As Rietveld argues, 'every situation contains perturbing influences', with new affective influences always potentially altering our evaluations of significance.⁷⁶ So expert performers precisely 'counteract automaticity' because it limits their ability to make specific adjustments on the fly.⁷⁷ We agree with Jack Reynolds that because experts must avoid 'ignoring and downplaying all that is surprising and traumatic', they remain open to the ongoing trauma of learning so as always to be able to mobilize their capacities afresh in a previously unanticipated 'world of radically differentiated possibilities'.⁷⁸ Again, the knowledge which is thus accessed in action need not be – indeed, cannot be – a stable stock of discrete items because it emerges in real time, and often collaboratively, in the interaction between brain, body and (both social and physical) world. But, again, just because skilful action is usually pre-reflective, it does not have to be mindless. Once we cut the instinctive links many philosophers make between thought and conscious rational deliberation, we remember that a sinuous and sensuous intelligence can indeed animate the skilful body.

By the notion of 'applying intelligence to the reflexes', then, we mean that certain patterns of behaviour which might appear stably chunked, automated and thus inflexible are in skilled performance already and continually open to current contingency and mood, past meanings and changing goals. Experts have opened their 'reflexes' up into acquired adaptive patterns, and constructed over time not a set array of clever moves, but dynamic

repertoires of potential action sequences, which can be accessed, redeployed and transformed appropriately. This process can be enacted at different timescales, and it can be undertaken either deliberately, with the opening up of habits as an end in itself as in yoga, or when innovative choreographers seek to put 'the implicit properties of the motor system ... under conscious control',⁷⁹ or, as in competitive sports, it can flow into action from skilled coaching or arduous effort in the service of other ends. There are many different ways in which embodied coping is minded or mindful in ways like these, varying dramatically across individuals, task domains and cultures. We recommend the search for forms of mid-level, experience-near theorizing, which highlight such differences by focussing on what actually happens to practitioners as they direct attention to kinaesthetic cues in increasingly skilful ways.

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Notes

- 1 Sian L. Beilock, Sarah A. Wierenga and Thomas H. Carr, 'Expertise, Attention, and Memory in Sensorimotor Skill Execution', *Quarterly Journal of Experimental Psychology* 55 (2002), 1211–40, p. 1236.
- 2 Sean Müller and Bruce Abernethy, 'Skill Learning from an Expertise Perspective: Issues and Implications for Practice and Coaching in Cricket', in *The Sport Psychologist's Handbook*, ed. J. Dosil (Chichester: John Wiley, 2006), pp. 245–61; John Sutton, 'Batting, Habit, and Memory: The Embodied Mind and the Nature of Skill', *Sport in Society* 10 (2007), pp. 763–86.
- 3 Maxine Sheets-Johnstone, 'What Are We Naming?', in *The Corporeal Turn: An Interdisciplinary Reader* (Exeter: Imprint Academic, 2009),

pp. 328–49, p. 336 [first published 2005]. For effective critique of the thin and overly metaphorical conceptions of ‘embodiment’ in recent ‘enactivist’ philosophy of cognitive science, see also Sheets-Johnstone, ‘Animation: The Fundamental, Essential, and Properly Descriptive Concept’, *Continental Philosophy Review* 42 (2009), pp. 375–400. While cultural stereotypes often depict the sportsperson or rock musician as inarticulate, both verbal and multimodal communication between expert practitioners can of course be much richer than either journalists or researchers can easily access. See also Sheets-Johnstone, ‘On the Challenge of Language Experience’, in *The Corporeal Turn*, pp. 362–81.

- 4 Natalie Sebanz, Harold Bekkering, and Günther Knoblich, ‘Joint Action: Bodies and Minds Moving Together’, *Trends in Cognitive Sciences* 10 (2006), pp. 70–6; Bruno Galantucci and Natalie Sebanz, ‘Joint Action: Current Perspectives’, *Topics in Cognitive Science* 1 (2009), pp. 255–9; R. Keith Sawyer, *Group Creativity: Music, Theatre, Collaboration* (Philadelphia, PA: Psychology Press, 2003).
- 5 On dance, Catherine Stevens et al., ‘Choreographic Cognition: The Time-Course and Phenomenology of Creating a Dance’, *Pragmatics and Cognition* 11 (2003), pp. 299–329, and David Kirsh, ‘Thinking with the Body’, *Proceedings of the 32nd Annual Meeting of the Cognitive Science Society* (2010), <http://adrenaline.ucsd.edu/kirsh/articles/interaction/thinkingwithbody.pdf> (accessed 6 November 2010); on music, Paul F. Berliner, *Thinking in Jazz: The Infinite Art of Improvisation* (Chicago: University of Chicago Press, 1994); Ingrid Monson, *Saying Something: Jazz Improvisation As Interaction* (Chicago: University of Chicago Press, 1996); Andrew Geeves, Doris J. F. McIlwain, John Sutton, and Wayne Christensen, ‘To Think or Not to Think: The Apparent Paradox of Expert Skill in Music Performance’, *Educational Philosophy and Theory* 46 (2014), pp. 674–91; on embodied disciplines, Loïc Wacquant, *Body and Soul: Notebooks of an Apprentice Boxer* (Oxford: Oxford University Press, 2003); Greg Downey, *Learning Capoeira* (Oxford: Oxford University Press, 2005); Jaida Kim Samudra, ‘Memory in Our Body: Thick Participation and the Translation of Kinesthetic Experience’, *American Ethnologist* 35 (2008), pp. 665–81; Doris J. F. McIlwain and John Sutton, ‘Yoga from the Mat Up: How Words Alight on Bodies’, *Educational Philosophy and Theory* 46 (2014), pp. 655–73.
- 6 Charles Goodwin, ‘Professional Vision’, *American Anthropologist* 96 (1994), pp. 606–33; Jean-Pierre Warnier, ‘A Praxeological Approach to Subjectivation in a Material World’, *Journal of Material Culture* 6 (2001), pp. 5–24; Christina Grasseni, ‘Skilled Vision: An Apprenticeship in Breeding Aesthetics’, *Social Anthropology* 12 (2004), pp. 41–55; David Kirsh, ‘Distributed Cognition: A Methodological Note’, *Pragmatics & Cognition* 14 (2006), pp. 249–62; David de Leon, ‘The Cognitive Biographies of Things’, in *Doing Things with Things*, eds A. Costall and O. Dreier (Farnham: Ashgate, 2006), pp. 113–30; Lambros Malafouris and Colin Renfrew (eds), *The Cognitive Life of Things: Recasting the Boundaries of the Mind* (Cambridge: McDonald Institute for Archaeological Research, 2010); Ed Hutchins and Saeko Nomura, ‘Collaborative Construction of Multimodal Utterances’, in *Embodied Interaction: Language and Body in the Material World*, eds J. Streek, C.

- Goodwin, and C. LeBaron (Cambridge: Cambridge University Press, 2011), pp. 29-43.
- 7 Gilbert Ryle, *The Concept of Mind* (Harmondsworth: Penguin, 1963 [first published 1949]), pp. 41–50, 126–30. But for a sophisticated recent taxonomy in which habits are again deliberately yoked to innate propensities, see Tamar Szabo Gendler, 'Alief in Action (and Reaction)', *Mind & Language* 23 (2008), pp. 552–85.
 - 8 Nathan Brett, 'Human Habits', *Canadian Journal of Philosophy* 11 (1981), pp. 357–76; Edward Casey, 'The Ghost of Embodiment: On Bodily Habitudes and Schemata', in *Body and Flesh*, ed. D. Welton (Oxford: Blackwell, 2000), pp. 207–25; Bill Pollard, 'Explaining Actions with Habits', *American Philosophical Quarterly* 43 (2006), pp. 57–68; Nancy Snow, 'Habitual Virtuous Actions and Automaticity', *Ethical Theory and Moral Practice* 9 (2006), pp. 545–61; Ezio di Nucci, *Mind Out of Action* (Saarbrücken: VDM Verlag, 2008); Clare Carlisle, 'Between Freedom and Necessity: Félix Ravaisson on Habit and the Moral Life', *Inquiry* 53 (2010), pp. 123–45. For Carlisle, 'a person's habit – her posture, her walk, her gestures, the incline of her head; in short, the way she holds herself – may be what most approximates to her essence': 'Creatures of Habit: The Problem and the Practice of Liberation', *Continental Philosophy Review* 38 (2006), 19–39, p. 22.
 - 9 Indeed, the terms of this debate reinforce the unfortunate implication that 'mindedness' or 'mindfulness' is some relatively unified domain. In contrast, we suggest that there are independent anthropological, historical, and conceptual grounds to deny that 'mind' or 'mindedness' is a useful category in such contexts. See for example Anna Wierzbicka, *Semantics, Culture, and Cognition: Universal Human Concepts in Culture-Specific Configurations* (Oxford: Oxford University Press, 1992); Paul S. Macdonald, *History of the Concept of Mind: Speculations About Soul, Mind and Spirit from Homer to Hume* (Aldershot: Ashgate, 2003); Amelie Rorty, *Mind in Action* (Boston: Beacon, 1988), especially p. 5; Ian Hunter, 'Mind Games and Body Techniques', *Southern Review: Literary and Interdisciplinary Essays* 26 (1993), pp. 172–85.
 - 10 Andy Clark, *Being There: Putting Brain, Body, and World Together Again* (Cambridge, MA: MIT Press, 1997), p. 165.
 - 11 Susan Hurley, *Consciousness in Action* (Cambridge, MA: Harvard University Press, 1998), p. 2.
 - 12 F. C. Bartlett, *Remembering: A Study in Experimental and Social Psychology* (Cambridge, MA: Cambridge University Press, 1932), pp. 201–2. Compare Maxine Sheets-Johnstone, 'Kinesthetic Memory', *Theoria et Historia Scientiarum* 7 (2003), 69–92, p. 71: 'a kinetic dynamics unfolds that is at once both familiar and yet quintessentially tailored kinetically to the particular situation at hand' (the essay is reprinted in Sheets-Johnstone, *The Corporeal Turn*, pp. 253–77).
 - 13 Lynne Rudder Baker, review of *The Body in Mind* by Mark Rowlands, *Mind* 109 (2000), pp. 644–7, 646. This is what gave Clark's summary characterization, in *Being There*, of cognitive systems like us as being 'good at Frisbee, bad at logic' (p. 60), its rhetorical force as cognitive scientists began to catch up with the phenomenology of embodiment.

- 14 John McDowell, 'Response to Dreyfus', *Inquiry* 50 (2007), pp. 366–70, 369; compare Dreyfus, 'Response to McDowell', *Inquiry* 50 (2007), pp. 371–7, 376.
- 15 Carlisle, 'Between Freedom and Necessity', p. 131; Charles T. Wolfe, 'De-ontologizing the Brain: From the Fictional Self to the Social Brain', *C-Theory* 30 (2007), <http://www.ctheory.net/articles.aspx?id=572> (accessed 10 November 2010).
- 16 Catherine Malabou, *What Should We Do with Our Brain?*, trans. S. Rand (New York: Fordham University Press, 2008), p. 38.
- 17 Marjorie Grene, *Descartes* (Brighton: Harvester Press, 1985), p. 52. Likewise, laments Jonathan Rée, Descartes made the body just another object in a world 'not of meaning and love and laughter and tears ... but of material particles going about their lonely business' – it was inevitable that the person would subsequently disappear from medical theory, since this 'materialization' of flesh 'takes the juice out of animate bodies, leaving only bare bones and pulp': Rée, 'Subjectivity in the Twentieth Century', *New Literary History* 26 (1995), pp. 205–17.
- 18 René Descartes, *L'homme*, in *Oeuvres de Descartes*, eds C. Adam and P. Tannery (Paris: Vrin, 1996), vol. xi; T. S. Hall (trans.), *René Descartes: Treatise of Man* (Cambridge, MA: Harvard University Press, 1972). For more detail on this interpretation, and contrast with standard readings, see John Sutton, *Philosophy and Memory Traces: Descartes to Connectionism* (Cambridge, MA: Cambridge University Press, 1998), pp. 50–106; Sutton, 'The Body and the Brain', in *Descartes' Natural Philosophy*, eds S. Gaukroger, J. Schuster, and J. Sutton (London: Routledge, 2000), pp. 697–722. For other revisionary work in the same vein, see Desmond Clarke, *Descartes' Philosophy of Science* (Manchester: Manchester University Press, 1982); Richard B. Carter, *Descartes' Medical Philosophy: The Organic Solution to the Mind-body Problem* (Baltimore: Johns Hopkins University Press, 1983); T. M. Brown, 'Descartes, Dualism, and Psychosomatic Medicine', in *The Anatomy of Madness*, eds W. F. Bynum, R. Porter, and M. Shepherd (London, 1985), vol. 1, pp. 40–62; Peter Schouls, *Descartes and the Enlightenment* (Kingston and Montreal: McGill-Queens University Press, 1989), pp. 144–72; Amelie Rorty, 'Descartes on Thinking with the Body', in *The Cambridge Companion to Descartes*, ed. J. Cottingham (Cambridge: Cambridge University Press), pp. 371–92; Susan James, *Passion and Action: The Emotions in Seventeenth-Century Philosophy* (Oxford: Oxford University Press, 1997). A few other scholars see the depth and ramifications of Descartes' reliance on self-organizing dynamical and non-linear feedback mechanisms in his biological, physiological, and medical psychology, but instead of jettisoning the assumption that he was aiming at a linear biophysics of barren matter, convict him of inconsistency: see especially Emily Grosholz, *Cartesian Method and the Problem of Reduction* (Oxford: Clarendon Press, 1991); Steven Shapin, 'Descartes the Doctor: Rationalism and its Therapies', *British Journal for the History of Science* 33 (2000), pp. 131–54; Dennis Des Chene, *Spirits and Clocks: Machine and Organism in Descartes* (Ithaca: Cornell University Press, 2001).

- 19 Owen Flanagan, *The Science of the Mind*, 2nd edition (Cambridge, MA: MIT Press, 1991), p. 3.
- 20 Timothy J. Reiss, 'Denying the Body? Memory and the Dilemmas of History in Descartes', *Journal of the History of Ideas* 57 (1996), pp. 587–607, 604; compare Peter Dear, 'A Mechanical Microcosm: Bodily Passions, Good Manners, and Cartesian Mechanism', in *Science Incarnate*, eds C. Lawrence and S. Shapin (Chicago: University of Chicago Press, 1998), pp. 51–82, 76–7.
- 21 Descartes, *L'homme*, vol. xi., p. 177.
- 22 Ibid., p. 178.
- 23 Ibid., pp. 178–9.
- 24 Hall, René Descartes: Treatise of Man, 96, n. p. 145.
- 25 Descartes, *L'homme*, vol. xi., p. 185.
- 26 Ibid., p. 185.
- 27 Compare Malabou, *What Should We Do with Our Brain?*, pp. 70–2.
- 28 Sutton, *Philosophy and Memory Traces*, pp. 74–81.
- 29 Stephen Gaukroger, *Descartes: An Intellectual Biography* (Oxford: Oxford University Press, 1995), especially pp. 241–56 and pp. 375–7; Sutton, *Philosophy and Memory Traces*, pp. 83–97. On the holistic background in humoral materialism, see Gail Kern Paster, 'Nervous Tension: Networks of Blood and Spirit in the Early Modern Body', in *The Body in Parts*, eds D. Hillman and C. Mazzio (London: Routledge, 1997), pp. 107–25; Paster, *Humoring the Body* (Chicago: Chicago University Press, 2004); Sutton, 'Spongy Brains and Material Memories', in *Environment and Embodiment in Early Modern England*, eds M. Floyd-Wilson and G. Sullivan (London: Palgrave Macmillan, 2007), pp. 14–34.
- 30 René Descartes, 'The Passions of the Soul', in *Oeuvres des Descartes* xi, pp. 394–5.
- 31 John Cottingham, 'The Self and the Body: Alienation and Integration in Cartesian Ethics', *Seventeenth-Century French Studies* 17 (1995), pp. 1–13, 11.
- 32 See the entries for 'disposition' and 'habitude' in Stephen Voss' outstanding lexicon, in his edition of *The Passions of the Soul* (Indianapolis: Hackett, 1989), p. 138 and 140; Sutton, 'The Body and the Brain', pp. 712–14.
- 33 See Reiss, 'Denying the Body?'
- 34 Compare Adam Phillips, 'Minds', in *Terrors and Experts* (Cambridge, MA: Harvard University Press, 1995), pp. 93–104, on the Cartesian soul as 'a kind of enraged bureaucrat, a master of circumstances' (p. 99).
- 35 Sutton, 'The Body and the Brain'. For something of the subsequent uptake and history of related ideas in British philosophy, see Sutton, 'Carelessness and Inattention: mind-wandering and the physiology of fantasy from Locke to Hume', in *The Body as Object and Instrument of Knowledge: Embodied Empiricism in Early Modern Science*, eds C. T. Wolfe and O. Gal (Springer, 2010), pp. 243–63.
- 36 In arguing recently that we are now fulfilling a 'Cartesian vision' by which our bodies are 'just machines in space' and 'something other than ourselves',

Ian Hacking discusses many intriguing cases of the apparent transferability and alienability of body parts, but not a single example of skilful embodied activity: see Hacking, 'The Cartesian Vision Fulfilled: Analogue Bodies and Digital Minds', *Interdisciplinary Science Reviews* 30 (2005), pp. 153–66, and 'Our Neo-Cartesian Bodies in Parts', *Critical Inquiry* 34 (2007), pp. 78–105. Hacking's neo-Cartesian future, a reader of Malabou might note, is one in which mere flexibility has won out over the richer forms of plasticity which have resistance inbuilt.

- 37** Compare Malabou, *What Should We Do with Our Brain?* p. 38.
- 38** But here is one dramatic statement of intellectualism in practice: 'Sir Isaac Newton laid the foundation for modern skiing with several basic laws of motion. Violations of these laws are the cause of problems. Anyone attempting to thoroughly understand skiing should know these laws and the terms used in their proper, intended meaning' – John Howe, *Skiing Mechanics* (Boulder, CO: Poudre Press, 1982), p. 9, as quoted in Sigmund Loland, 'The Mechanics and Meaning of Alpine Skiing: methodological and epistemological notes on the study of sport technique', *Journal of the Philosophy of Sport* 19 (1992), pp. 55–77, 58. A particularly effective critique of such views is Hubert L. Dreyfus and Stuart E. Dreyfus, 'Making a Mind versus Modelling the Brain', in *The Artificial Intelligence Debate*, ed. S. R. Graubard (Cambridge, MA: MIT Press, 1988), pp. 15–41. An influential defence of the priority of 'knowing-that' over 'knowing-how' in recent analytic philosophy is Jason Stanley and Timothy Williamson, 'Knowing How', *Journal of Philosophy* 98 (2001), pp. 411–44: for responses see Alva Noë, 'Against Intellectualism', *Analysis* 65 (2005), pp. 278–90, and Josefa Toribio, 'How do we know how?' *Philosophical Explorations* 11 (2008), pp. 39–52. It is harder to assess whether more moderate, empirically anchored theoretical views in contemporary cognitive psychology remain recognizably intellectualist in these respects. We have previously put such charges to Roger Chaffin's impressive account of memory in music performance: see Geeves, Christensen, Sutton, and McIlwain, 'Critical Review of *Practicing Perfection*', *Empirical Musicology Review* 3 (2008), pp. 163–72. Likewise, dynamically oriented sports psychologists charge Anders Ericsson's impressive 'deliberate practice' framework with residual intellectualism: see for example Bruce Abernethy, Damian Farrow, and Jason Berry, 'Constraints and Issues in the Development of a General Theory of Expert Perceptual-Motor Performance', in *Expert Performance in Sports*, eds J. L. Starkes and K. A. Ericsson (Champaign, IL: Human Kinetics, 2003).
- 39** Pollard, 'Explaining Actions with Habits', pp. 58, 67. See also Pollard, 'The Rationality of Habitual Action', *Proceedings of the Durham-Bergen Philosophy Conference* 1 (2005), pp. 39–50.
- 40** *Ibid.*, p. 67.
- 41** Brett, 'Human Habits', pp. 365–6.
- 42** Sheets-Johnstone, 'Kinesthetic Memory', 75; 'Animation', pp. 390–4.
- 43** Brett, 'Human Habits', p. 369.
- 44** Again, because we're not here doing detailed exegesis, our discussion here neglects important subtleties in and differences between these theories: in

simplifying and highlighting certain key shared assumptions, however, we seek to capture recognizable views across these theorists.

- 45 Dreyfus, 'Refocusing the Question: Can There Be Skillful Coping Without Propositional Representations or Brain Representations?', *Phenomenology and the Cognitive Sciences 1* (2002), pp. 413–25, 417.
- 46 Dreyfus and Dreyfus, *Mind Over Machine: The Power of Human Intuition and Expertise in the Era of the Computer* (New York: Free Press, 1986), p. 32.
- 47 Dreyfus, 'Overcoming the Myth of the Mental', *Topoi 25* (2006), pp. 43–9, 47. Compare Dreyfus, 'A Phenomenological Account of the Development of Ethical Expertise and Mastery', in *Moving Bodies*, vol. 4, ed. E. Jespersen (Oslo: The Norwegian School of Sport Sciences, 2006), pp. 15–30, especially p. 20: the genuine expert has gradually learned 'to decompose ... situations into subclasses, each of which share the same decision, single action or tactic. This allows an immediate response to each situation'. In this and other more recent versions of his model of the stages of skill acquisition, Dreyfus does allow for further development beyond expertise, towards 'mastery' and 'practical wisdom', but the key points under discussion here are not affected.
- 48 Charles Spinosa, Fernando Flores, and Hubert L. Dreyfus, *Disclosing New Worlds: Entrepreneurship, Democratic Action, and the Cultivation of Solidarity* (Cambridge, MA: MIT Press, 1997), p. 87. I owe this quotation to the excellent critical discussion of the Dreyfus model by Evan M. Selinger and Robert P. Crease, 'Dreyfus on Expertise: The Limits of Phenomenological Analysis', *Continental Philosophy Review 35* (2002), pp. 245–79.
- 49 Dreyfus, 'Intelligence without Representation: Merleau-Ponty's Critique of Mental Representation', *Phenomenology and the Cognitive Sciences 1* (2002), pp. 367–83, 379.
- 50 Dreyfus and Dreyfus, *Mind Over Machine*, p. 30.
- 51 Elizabeth Ennen, 'Phenomenological Coping Skills and the Striatal Memory System', *Phenomenology and the Cognitive Sciences 2* (2003), pp. 299–325.
- 52 *Ibid.*, p. 314, relying especially on Ann Graybiel, 'The Basal Ganglia and Chunking of Action Repertoires', *Neurobiology of Learning and Memory 70* (1998), pp. 119–36. There are difficult questions about the unity of the category of 'memory', given the unique properties of the procedural memory systems: see Danièle Moyal-Sharrock, 'Wittgenstein and the Memory Debate', *New Ideas in Psychology 27* (2009), pp. 213–27; Kirk Michaelian, 'Is Memory a Natural Kind?', *Memory Studies 4* (2011), pp. 170–89. As we read it, however, recent neuroscientific research increasingly underlines the dynamic interactivity of procedural and declarative memory processes, to such an extent that the distinction might come under some pressure. See Graybiel, 'The Basal Ganglia: learning new tricks and loving it', *Current Opinion in Neurobiology 15* (2005), pp. 638–44; Henry H. Yin and Barbara J. Knowlton, 'The Role of the Basal Ganglia in Habit Formation', *Nature Reviews Neuroscience 7* (2006), pp. 464–76.
- 53 Ennen, 'Phenomenological Coping Skills', p. 321, quoting Dreyfus, *Being-in-the-World: A Commentary on Heidegger's Being and Time, Division I* (Cambridge, MA: MIT Press, 1991), p. 3.

- 54** John Searle, *Intentionality* (Cambridge: Cambridge University Press, 1983), p. 150. Searle goes on to say that the rules 'recede into the Background', which is a much harder doctrine to interpret: see especially the discussion of Searle's views on this point by Dreyfus in 'Responses', in *Heidegger, Coping, and Cognitive Science*, eds M. Wrathall and J. Malpas (Cambridge, MA: MIT Press, 2000), pp. 324–6. But Dreyfus there accepts that he and Searle agree on the fact that the body takes over.
- 55** Fred Dretske, 'Where is the Mind when the Body Performs?', *Stanford Humanities Review* 6 (1998), <http://www.stanford.edu/group/SHR/6-2/html/dretske.html> (accessed 6 November 2010). Dretske does, however, argue that even though consciousness is withdrawn, 'intelligence' is delegated or dispersed, and that the skilful routines thus delegated to the body 'bear the marks of genuine intelligence'. We think that this last point is spot on, a version of our idea of applying intelligence to the reflexes. Dretske also does allow a range of roles for psychology in attending to higher-order objectives, although from our perspective he retains an unnecessarily hierarchical or managerial picture of the control of skilled action.
- 56** In these respects, our critique of the phenomenologists' response to intellectualism could be connected with a discussion of currently influential 'dual process' theories in psychology and moral philosophy, which also entrench such an extreme dichotomy between two entirely opposed modes of response. For the link to theories of memory see Eliot R. Smith and Jamie DeCoster, 'Dual-Process Models in Social and Cognitive Psychology: Conceptual Integration and Links to Underlying Memory Systems', *Personality and Social Psychology Review* 4 (2000), pp. 108–31, and for an entry into current controversies about dual process theories and social intuitionism in moral psychology see Joshua D. Greene, 'Dual-Process Morality and the Personal/ Impersonal Distinction: A Reply to McGuire, Langdon, Coltheart, and Mackenzie', *Journal of Experimental Social Psychology* 45 (2009), pp. 581–4. We don't have space here to make the connections with theories of skilful coping more explicit. There are clear statements and critical evaluations of dual process theories in J. Evans and K. Frankish (eds), *In Two Minds: Dual Processes and Beyond* (Oxford: Oxford University Press, 2009).
- 57** Malcolm Gladwell, *Blink: The Power of Thinking Without Thinking* (London: Penguin, 2005), pp. 18–47.
- 58** The sporting quotations are from Ken Barrington and Sandy Gordon: for references and discussion see Sutton, 'Batting, Habit, and Memory', p. 767. Contemporary sports scientists are heavily influenced by J. J. Gibson's ecological psychology and by dynamical systems theories in cognitive science, in each case reinforcing the tendency to distrust mindedness: see for example Ian Renshaw, Keith Davids, Rick Shuttleworth and Jia Yi Chow, 'Insights from Ecological Psychology and Dynamical Systems Theory can Underpin a Philosophy of Coaching', *International Journal of Sport Psychology* 40 (2009), pp. 580–602; Renshaw, Davids, and Geert J. P. Savelsbergh (eds), *Motor Learning in Practice: A Constraints-led Approach* (London: Routledge, 2010). For musicians' assumptions and pedagogical traditions, see Roger Chaffin, Gabriela Imreh and Mary Crawford, *Practicing*

Perfection: Memory and Piano Performance (Mahwah, NJ: Erlbaum, 2002), especially, pp. xii–xiii and 26–65.

- 59** Erik Rietveld and colleagues argue for an analogous pluralism in understanding embodied cognition and skilful action, with cognitive and abnormal psychology joining theories of affect and dynamical neuroscience to supplement phenomenological and philosophical investigations. While we draw on Rietveld's constructive theoretical proposals below, he does not canvas the kind of work with known groups in the cognitive neuroscience and psychology of dance and sport which we are recommending. On pluralism see Pim Klaassen, Erik Rietveld, and Julien Topal, 'Inviting Complementary Perspectives on Situated Normativity in Everyday Life', *Phenomenology and the Cognitive Sciences* 9 (2010), pp. 53–73. Dreyfus, however, draws constructively neither on psychological research, stressing instead occasionally the anti-cognitivist neuroscience of Walter Freeman, nor on the sport sciences, which remain an enormous, often conceptually sophisticated, almost entirely untapped resource for philosophical exploration.
- 60** Michael F. Land and Peter McLeod, 'From Eye Movements to Actions: How Batsmen Hit the Ball', *Nature Neuroscience* 3 (2000), pp. 1340–5; Land and Benjamin W. Tatler, *Looking and Acting: Vision and Eye Movements in Natural Behaviour* (Oxford: Oxford University Press, 2009), pp. 153–60; see Sutton, 'Batting, Habit, and Memory', pp. 770–4.
- 61** We can briefly mention two further intriguing examples of the kind of research in dance and sport with which studies of absorbed coping and embodied skill could be dealing. Beatriz Calvo-Merino and colleagues argue that our response to dance sequences, for example in ballet or capoeira, is driven not by abstract knowledge of an action repertoire, but only on the basis of individual movement experience in a specific movement style: our understanding of action is by motor simulation and is tuned to an individual motor repertoire (B. Calvo-Merino, D. E. Glaser, J. Grezes, R. E. Passingham, and P. Haggard, 'Action Observation and Acquired Motor Skills: An fMRI Study with Expert Dancers', *Cerebral Cortex* 15 (2005), pp. 1243–9. Meanwhile, Sian Beilock and colleagues suggest that expert performance in motor skills requires little attention, operates largely outside of working memory, and is substantially closed to introspection: therefore, they argue, highly skilled practitioners in movement domains exhibit a surprising 'expertise-induced amnesia', by which their recollections of real-time performance are 'impoverished' compared to novices (Sian L. Beilock and Thomas H. Carr, 'On the Fragility of Skilled Performance: What Governs Choking Under Pressure?', *Journal of Experimental Psychology: General* 130 (2001), pp. 701–25; Sian L. Beilock, Sarah A. Wierenga, and Thomas H. Carr, 'Memory and Expertise: What Do Experienced Athletes Remember?', in *Expert Performance in Sports*, eds Starkes and Ericsson, especially pp. 315–16). See also now Wayne Christensen, Kath Bicknell, Doris J. F. McIlwain and John Sutton, 'The Sense of Agency and its Role in Strategic Control for Expert Mountain Bikes', *Psychology of Consciousness: Theory, Research, and Practice* 2 (2015), pp. 340–53; Christensen, Sutton and McIlwain, 'Putting Pressure on Theories of Choking: Towards an Expanded Perspective on Breakdown in Skilled Performance', *Phenomenology and the Cognitive Sciences* 14 (2015), pp. 253–93.

- 62** Michael Wheeler, *Reconstructing the Cognitive World: The Next Step* (Cambridge, MA: MIT Press, 2005), p. 120; Wheeler, 'Cognition in Context: phenomenology, situated robotics, and the frame problem', *International Journal of Philosophical Studies* 16 (2008), pp. 323–49.
- 63** Wheeler, *Reconstructing the Cognitive World*, pp. 131–2; 'Cognition in Context', p. 338.
- 64** *Ibid.*, p. 229.
- 65** *Ibid.*, p. 139.
- 66** *Ibid.*, pp. 142–3. Dreyfus, in contrast, often appears somewhat uninterested in dimensions of variation within expert performance, or across distinctive expert domains: for recent critiques along these lines see for example Barbara Montero, 'Does Bodily Awareness Interfere with Highly Skilled Movement?', *Inquiry* 53 (2010), pp. 105–22; Jørgen W. Eriksen, 'Mindless Coping in Competitive Sport: Some Implications and Consequences', *Sport, Ethics, & Philosophy* 4 (2010), pp. 66–86. Dreyfus, meanwhile, accuses Wheeler of a 'cognitivist misreading of Heidegger': 'Why Heideggerian AI Failed and How Fixing it Would Require Making it More Heideggerian', *Philosophical Psychology* 20 (2007), pp. 247–68, 254.
- 67** David Sudnow, *Ways of the Hand: A Rewritten Account* (Cambridge, MA: MIT Press, 2001), from whom we borrow and extend the notion of 'instructional nudges'.
- 68** These interviews were conducted by Ed Cooke. Likewise, in a more formal study by Juanita Weissensteiner, one of the best Australian cricketers of recent times reports that his multimodal routine includes essential verbalized components: 'Well, in the lead-up, I mark my crease, I turn towards the stumps, I mark my crease, I tap my right foot about three or four times on the toe, then I turn around and I tell myself to have my arms either as loose as possible or whatever I've actually been working on at the time. ... I get that right to start off, then I tell myself "play straight, play straight" or the other one I might use is "be sharp, be sharp". I do this until it gets to the point of delivery where all my intention, all my focus goes on him letting go of the ball': Juanita Weissensteiner, Bruce Abernethy and Damian Farrow, 'Towards the Development of a Conceptual Model of Expertise in Cricket Batting', *Journal of Applied Sport Psychology* 21 (2009), pp. 276–92, 288.
- 69** On self-talk and the non-semantic looping roles of verbal tags and maxims, see Andy Clark, 'Magic Words: How Language Augments Human Computation', in *Language and Thought: interdisciplinary themes*, eds P. Carruthers and J. Boucher (Cambridge: Cambridge University Press, 1998), pp. 162–83; Clark, 'Material Symbols', *Philosophical Psychology* 19 (2006), pp. 291–307; Clark, *Supersizing the Mind: Embodiment, Action, and Cognitive Extension* (Oxford: Oxford University Press, 2008), pp. 129–33.
- 70** Compare concert pianist Gabriela Imreh's comment, while learning Bach's extraordinarily demanding *Italian Concerto (Presto)* that 'the practice I needed was in my head': Roger Chaffin and Gabriela Imreh, 'Practicing Perfection: Piano Performance as Expert Memory', *Psychological Science* 13 (2002), pp. 342–9, 344. See also John Sutton and Kellie Williamson, 'Embodied Remembering', in *The Routledge Handbook of Embodied Cognition*, ed. L. Shapiro (London: Routledge, 2014), pp. 315–25.

- 71** Elizabeth A. Behnke, 'Edmund Husserl's Contribution to Phenomenology of the Body in *Ideas II*', in *Issues in Husserl's Ideas II*, eds T. Nenon and L. E. Embree (Dordrecht: Kluwer, 1996), pp. 135–60, 154. Behnke acknowledges the Sartrean mode of embodied experience which Dreyfus celebrates, the body 'passed over in silence, transcended toward the task, pre-reflectively geared in with the situation, ... utterly undisturbed either by the visibility of this comportment to others, or by one's own reflective glance; one is oblivious to oneself, completely caught up in whatever one is doing': but she notes that this mode of bodily 'self-effacement' is for Sartre only one possible ontological dimension of the body, and identifies it as a potential 'locus of crisis in need of a critique of corporeal experience', to be supplemented (if not replaced) with other modes in which distinctive fields of experiential possibility can be accessed. See Behnke, 'The Socially Shaped Body and the Critique of Corporeal Experience', in *Sartre on the Body*, ed. K. J. Morris (Basingstoke: Palgrave, 2010), pp. 231–55, 235–6.
- 72** Elizabeth A. Behnke, 'Interkinaesthetic Affectivity: A Phenomenological Approach', *Continental Philosophy Review* 41 (2008), pp. 143–61, 146.
- 73** Elizabeth A. Behnke, 'Matching', in *Bone, Breath, and Gesture*, ed. D. H. Johnson (North Atlantic Books, 1995), pp. 317–37. (First published 1988).
- 74** Elizabeth A. Behnke, 'Contact Improvisation and the Lived World', in M. Diaconu (ed.), *Kunst und Wahrheit* (Bucharest: Humanitas, 2003), p. 49.
- 75** Elizabeth A. Behnke, 'Ghost Gestures: Phenomenological Investigations of Bodily Micromovements and Their Intercorporeal Implications', *Human Studies* 20 (1997), pp. 181–201.
- 76** Erik Rietveld, 'The Skillful Body as a Concernful System of Possible Actions', *Theory & Psychology* 18 (2008), pp. 341–63, especially pp. 350–1; Wayne Christensen, John Sutton and Doris J. F. McIlwain, 'Cognition in Skilled Action: Meshed Control and the Varieties of Skill Experience', *Mind & Language* 31 (2016), pp. 37–66.
- 77** K. Anders Ericsson, 'Development of Elite Performance and Deliberate Practice', in *Expert Performance in Sports*, pp. 64–5.
- 78** Jack Reynolds, 'Dreyfus and Deleuze on *l'habitude*, Coping, and Trauma in Skill Acquisition', *International Journal of Philosophical Studies* 14, pp. 539–59.
- 79** Ivar Hagendoorn, 'Cognitive Dance Improvisation: How Study of the Motor System Can Inspire Dance (and Vice Versa)', *Leonardo* 36 (2003), pp. 221–7.

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