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Transformative Embodied Cognition

DAVE WARD
University of Edinburgh

How should accounts that stress the embodied, embedded and engaged character of human minds accommodate the role of rationality in human subjectivity? Drawing on Matthew Boyle's contrast between 'additive' and 'transformative' conceptions of rationality, I argue that contemporary work on embodied cognition tends towards a problematic 'additivism' about how mature human capacities to think and act for reasons stand to sensorimotor capacities to skillfully engage with salient features of the environment. Additivists view rational capacities to reason and reflect as a distinct 'layer' or 'storey' of human cognition, with a normative structure that differs from that of the sensorimotor coping skills which support it. I argue that emphasizing the embodied and engaged character of human minds is better combined with a 'transformative' conception of rationality—one which holds that acquiring abilities to give and ask for reasons transforms the normative structure of our unreflective embodied dealings with the environment. And I argue that a transformative embodied cognitive science of human rationality is not only possible, but underway. Integrating existing work on embodied cognition with work on the cultural and developmental contexts that shape human minds suggests how human immersion in culture transforms the structure of sensorimotor engagements by bringing about the communicability and negotiability of the meanings to which those engagements attune us.

1. Introduction

Humans are clever beasts. All animals have sensorimotor capacities to negotiate the challenges of their environments—sensory capacities to discriminate adaptively salient features of their environment, linked to motor capacities to modulate their activity in light of that sensitivity. But mature humans are *rational animals*. Our lives involve more than being shunted around by sensations and impulses. At least some of our sensorimotor abilities are integrated with a grasp of what counts as a good reason for what—a grasp of the network of rela-

Contact: Dave Ward <dave.ward@ed.ac.uk>

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tions of justification, entailment and probabilification in which states of mind and world can stand to each other. This grasp can be reflected in our thoughts and actions, as when we think or do something in part because of that thought or deed's place in a network of rational relations. And our grasp of this network involves a self-critical component. We can sometimes reflect on and rework our take on this web of normative constraints, for example by changing our take on the judgments or actions that are made reasonable by things appearing to us in a particular way. For a rational animal the links of normative constraint that obtain between perceptions, actions, judgments and states of affairs are not matters of brute fact or habit—they can and should be revisited and revised when the situation calls for it, and rational animals are sensitive to this possibility.

The idea that a self-critical grasp of what counts as a good reason for what sets humans apart from other animals is influential, stretching from Aristotle to contemporary rationalists (Brandom 1979; McDowell 1996; Korsgaard 2009). How, if at all, might accounts of human minds that stress their embodied, active and situated character account for such rational capacities? Put another way, how does human animality relate to human rationality—what is the relationship between the sensorimotor capacities for perception and motivated action that we share with other animals, and the capacities to reflect, reason and judge that seem to set us apart?

Here I argue that proponents of 'embodied cognitive science'—the project of explaining psychological capacities in terms of an organism's embodied interactions with a structured environment—should pursue a *transformative* account of the relationship between human rational and sensorimotor capacities. The labelling is taken from Matthew Boyle (2016), who distinguishes *transformative* from *additive* conceptions of human rationality. Additivists construe human rational capacities as added on to a pre-existing stock of perceptual and agential capacities shared with nonhuman animals. Human rationality is like chocolate frosting on a plain cupcake—a layer of human psychology built upon, but qualitatively distinct from, a foundational layer of sensorimotor coping skills. Transformative views, by contrast, insist on an important sense in which human rational capacities are not autonomous with respect to our sensorimotor abilities—the rational capacities of mature humans fundamentally transform their perceptual and agential capacities. Mature human rationality is not like an independent layer of frosting perched on a cupcake of sensorimotor abilities. It is like chocolate that has been baked into the cupcake itself, permeating and changing its total structure.

Like Boyle, I think we should prefer the transformative class of views to the additive. Transformative views sidestep questions about the relationship between our capacities for perception, action, thought, and knowledge which look inescapable and intractable for additivists, who struggle to accommo-

date the ways in which our sensorimotor abilities to cope with our meaningful environment hang together with our abilities to know our way around in what Wilfrid Sellars (1956) called the 'space of reasons.' A mature human's perceptions, actions, and thoughts tend to hang together in ways that respect norms of rationality—principles about what counts as a good reason for what. What mature humans see can give them good reasons to think and act in particular ways; what they do can be rational in light of their experience of, or judgments about, their environment.

I worry that several nascent attempts to sketch accounts of the active, embodied and embedded roots of rational capacities tend away from transformationalism, and so will struggle to do justice to the integration of our rational abilities with our experiences and actions. I share the aspiration motivating these accounts—to explain mature human abilities to negotiate the space of reasons in a way that respects the embodied and situated nature of subjectivity. But I worry that many of my fellow travellers are, at best, working with an impoverished sense of the possible shape of such an account, at worst tending towards views that depict our rational capacities as untenably alienated from everyday embodied coping with the environment. Luckily, I will argue, we can recognize that human subjectivity is founded in embodied coping capacities while rejecting additivism. A transformative embodied cognitive science of human rationality is possible, and there are rich resources on which it might draw.

2. Embodied Cognitive Science

The 'embodied cognitive science' at issue here is a broad church, encompassing any approach that models and explains psychological capacities in terms of sensorimotor interactions with a structured environment.[1] This family of approaches is best brought into view by contrasting it with 'cognitivist' approaches—a way of studying and conceptualizing psychological states that emerged from twentieth century cognitive science, and which construes cognition in terms of the production and rule-governed manipulation of symbolic states (Fodor 1975; Haugeland 1978).

Consider the 'outfielder problem.' Beloved by embodied cognition fans, this is the problem faced by baseball outfielders of coordinating the speed and direction of one's running in order to intercept a falling ball before it hits the ground. It looks ripe for a cognitivist solution. Facts about the current positions of ball and

1. My reasons for casting the net this wide emerge below. In brief, I will suggest that most current approaches that employ this explanatory strategy tend towards a problematic additivism, but an ecumenical embodied cognitive science which employs this strategy while endorsing a transformative conception of rationality is possible.

fielder, the ball's flight path, laws of physics, and the geometry of the current situation, jointly specify where and when the ball will land, and thus what the fielder must do to get there in time. Outfielders seem to face a complex algebra problem which can be solved by representing task-relevant variables from their perceptible environment, and manipulating those represented values according to the rules and axioms of optical geometry and baseball physics. This strategy of rule-governed symbol-crunching illustrates the cognitivist model for explaining cognitive capacities: Work out how the representational states involved in the capacity of interest are produced, what those states represent, and the rules that govern their manipulation. In this case, it seems that the outfielder (or their visuomotor processing) must represent the current position, trajectory and acceleration of the ball relative to their own location, calculate the landing spot on that basis, and use the result to guide the speed and direction of their running.

But another explanation of ball-catching competence is available. Facts of gravity, human embodiment and optical geometry conspire to entail that running in a direction and at a speed such that the ball appears to be moving through one's visual field at a constant rate—that is, running so as to cancel out the ball's optical acceleration—will always get the outfielder to the landing spot on time (Chapman 1968). What looked like a complex geometrical problem can be solved in practice via a simple sensorimotor strategy—move so that things look a particular way to you. The sensorimotor skill of ball-catching thus involves being able to modulate the relationship between how things look and what you are doing in a way that will get you to the landing spot on time. This ball-catching strategy is available because of facts about embodiment and environmental structure, but outfielders needn't represent or compute over those facts. Because the relevant geometrical and sensorimotor regularities are real properties of the outfielder's embodied relation to their environment, the problem can be solved by simple sensorimotor coupling. Embodied cognitive science aims to push this explanatory strategy—replacing internal algebra with sensorimotor coupling to salient structures in the cognizing organism's environment—as far as it will go.

The embodied cognition movement encompasses many sub-genres, differing along several dimensions—for example, the relative explanatory emphasis placed on embodiment versus environmental structure, and spatial, temporal and structural variations in the kinds of embodied interactions appealed to.

Ecological psychologists and their followers appeal to the availability of rich, behaviour-specifying sources of information in an organism's perceptible environment that can drive adaptive behaviour without the need for the construction and manipulation of intervening representational states (Gibson 2014; Chemero 2011; Barrett 2012). The ball's rate of acceleration in the outfielder's visual field, for example, specifies where and how fast they should run to intercept it, obviating the need for internal representations and calculations.

Enactivists argue that the dependence of biological self-maintenance on cycles of interaction between organism and environment entails that the environments of living systems are replete with sources of organism-relative meaning and significance (Varela, Thompson, & Rosch 2017; Thompson 2010; Di Paolo, Cuffari, & De Jaegher 2018). Because such significance is a product of the organism's sensorimotor coupling with its environment—brought forth, or enacted, by the organism's sense-making activity—we needn't posit representational or inferential processes to explain how an organism can appropriately direct its activity towards the biologically salient properties in its niche. That salience, and the directedness of the organism's sensory and motor activity, are emergent byproducts of the self-perpetuating network of processes that allow the organism to persist within its environment.

Finally, various proponents of *distributed*, *scaffolded*, or *extended cognition* seek to show how cycles of sensorimotor interaction with structured environments can likewise obviate the need for internal symbol-crunching. Museum-finding behaviour may be guided not by computation over internally-stored representations of the museum's location, but by fluent, habitual patterns of interaction with external artefacts (Clark & Chalmers 1998); successful sensorimotor interaction need not rely on detailed, stable internal representations of the environment, since mobile organisms can often use the world as its own best model, actively modulating their sensory input to tap into behaviour-specifying information as and when required (Brooks 1991; Noë & O'Regan 2001; Hutto & Myin 2013).

There are important variations and disagreements between these subschools of embodied cognition. I zoom out and ignore these until later sections. My aim is to argue that the coarse-grained explanatory strategy these approaches share—shunning internal symbol-manipulation in favour of embodied interaction with richly structured environments—is best combined with transformationalism about the relationship between sensorimotor and rational capacities.

Cognitivism aspires to explain psychological processes and capacities in terms of the production and rule-governed manipulation of symbolic states. Embodied cognitive science aspires to explain them in terms of sensorimotor interactions with structured environments. These distinct explanatory strategies appear to pair naturally with distinct ways of understanding the relationship between sensorimotor and rational capacities. Cognitivism looks well-suited to modeling the kinds of inferential, norm-governed processes that seem to characterize mature human rationality. When all goes well, mature human perceptions, actions and thoughts hang together in ways that respect norms of rationality—what you can see makes particular beliefs and judgments reasonable or unreasonable, and makes particular actions rationally appropriate or inappropriate given your goals. If cognition consists in rule-governed symbol-manipulation

then the rule-respecting ways in which the contents of our perceptions, actions and thoughts hang together look easy enough to explain. Cognitivists can hold that subjects' psychological states have the particular contents they do in virtue of the particular representational states they are tokening, and hang together in the norm-respecting ways they do in virtue of the rules that govern their production, manipulation and transformation (Fodor 1975).

However, as forerunners and fans of embodied cognition have long noted (Dreyfus 1992; Gallagher 2017), cognitivism struggles to accommodate capacities for fluent, timely sensorimotor behaviour. Cognitivists must explain such behaviour in terms of the algorithmic transformation of sensory and bodily representations into motor commands. But in the idiosyncratic and changeable behavioural environments of living systems, the computational costs of swiftly and constantly manipulating and updating sensory and motor representations to keep real-time embodied interactions on track are formidable. Paraphrasing Andy Clark (1997: 60), cognitivism looks like a good explanatory model for systems that are good at logic, bad at frisbee. Construing cognition as embodied interaction with structured environments appears to have the opposite profile of explanatory strengths and weaknesses. It looks well-placed to accommodate simple sensorimotor skills like frisbee-catching, but it is unclear how this explanatory strategy might 'scale up' to account for capacities that do not seem to involve online sensorimotor interaction, such as paradigmatically conceptual capacities to reason, judge and plan (Clark & Toribio 1994).

It is tempting to conclude that additivism about the relationship between sensorimotor and rational capacities is written into the constitution of embodied cognition. Embodied cognitive science is committed to the explanatory priority of sensorimotor interaction over the tokening and manipulation of contentful states—to frisbee-catching over logic-chopping. Outfielders can catch fly balls without implicit or explicit thought about the fit between their actions and the perceptible environment. Capacities to critically reflect on what they are doing must surely therefore be subsequent to and independent of this sensorimotor capacity—an extra layer 'added on' to a sensorimotor foundation like frosting on a cupcake.

I think we find something like this line of thought in Hubert Dreyfus's side of his exchange with John McDowell (Dreyfus 2005a; 2007a; 2013; McDowell 2007; 2013a). Dreyfus's views on the primacy of skillful embodied coping with the environment push him towards an additivist conception of rational capacities. McDowell offers an alternative vision of rational capacities that aspires to acknowledge their embodied and situated nature whilst avoiding the problematic consequences of additivism. Working through some aspects of their exchange will highlight the problems that additivists face, the shape of the transformationalist alternative, and bring the outlines of a transformative embodied cognitive science into view.

3. Dreyfus, Embodied Coping, and Additivism

The impetus for the exchange is Dreyfus's disavowal of McDowell's 'conceptualism'—the view that exercises of mature human perceptual and practical capacities are always conceptually structured (McDowell 1996; 2013b). Mature human perceptions and actions, for McDowell, constitutively involve conceptual capacities to articulate and reflect on the reasons for our actions, or the rational constraints (on beliefs, judgments and plans) placed on us by what we perceive. Dreyfus argues that this picture overintellectualizes the mind, ignoring "the nonconceptual perceptual and coping skills we share with animals and infants" (Dreyfus 2005a: 61). Embodied capacities to cope with our meaningful environment—to catch frisbees and fly balls—are, Dreyfus argues, the "ground floor of pure perception and receptive coping [that] supports the upper stories of the edifice of knowledge" (61).

The context of this criticism is Dreyfus's influential phenomenologically-informed conception of cognition. Dreyfus takes phenomenologists like Heidegger and Merleau-Ponty to have shown that capacities for skillful, flexible embodied coping are developmentally and explanatorily prior to capacities for explicit categorization and abstract reflection (Dreyfus 2005b, 2007b). Thoughts about hammers and frisbees, and avowals of what we are doing with them and why, depend on embodied capacities for unreflective hammer-wielding and frisbee-catching. The mindedness manifested in such skillful dealings with the meaningful features of our environment is a fine-grained, context-sensitive and unreflective bodily attunement to our surroundings, the structure of which resists codification by a list of unambiguously applicable rules.

This phenomenologically-informed insistence on the priority of embodied coping was behind Dreyfus's path-breaking objections to cognitivism and its attempt to understand all cognition on the model of explicit logical thought, with its well-defined rules operating on states with unambiguous semantic properties (Dreyfus 1992)—objections which helped set the agenda for contemporary embodied cognitive science. Dreyfus takes this to point towards a separation between the psychological capacities involved in skilled coping, and those involved in rational thought. On the basis of his phenomenology of embodied skill, he depicts rational capacities as a distinct 'layer' or 'storey' of human psychology, added on to a sensorimotor foundation of embodied coping skills that does not differ in kind from what we find in prelinguistic humans and nonhuman animals.

His embrace of this picture makes him an additivist about the relationship between human sensorimotor and rational capacities, according to Boyle's (2016) definition of the term.[2] McDowell's conceptualism errs, thinks Dreyfus, as cog-

2. Dreyfus does not explicitly endorse this classification of his view (Boyle's terminology was introduced subsequently and independently). Nonetheless, his claim that the phenomenology of skilled coping points towards a kind of direct sensorimotor engagement with action possibilities

nitivism does—by lumping together the sensorimotor and rational aspects of human subjectivity, mistakenly supposing that they share a common structure.

These considerations about the primacy and uncodifiability of skillful embodied coping have been influential. It might seem that additivism follows straightforwardly from them. If the embodied coping of rational and nonrational animals alike depends on unreflective bodily attunement to significant environmental features, then the rational capacities distinguishing mature humans from nonrational animals must surely be separate from and added on to our unreflective bodily skills.

This is the tempting inference mentioned at the end of §1. But the possibility of a transformative conception of rationality blocks this inference. For transformationalists, rational capacities transform the structure of mature human perception and action. Rationality permeates mature human embodied coping like chocolate baked into a cupcake, rather than sitting atop it like chocolate frosting. Transformationalists can hold this while emphasising our important sensorimotor commonalities with nonrational animals, insisting that the generic structure of the capacities for embodied coping that we share with nonrational animals is crucial to understanding our minds. Mature human minds can be fundamentally composed of the same generic kind of concoction as the minds of nonhuman animals—essentially consisting in embodied abilities to discern and act on meaningful structures in our environment—whilst differing crucially in virtue of an added ingredient that transforms the whole. Just as the cakey base-layers of chocolate-frosted and a chocolate-suffused cupcake are different *species* of the *genus* 'cupcake,' the sensorimotor capacities of mature, enculturated humans are the same *generic kind* of capacities as those of nonrational animals, realized differently. The different realization consists in having rationality baked into their structure, such that we cannot fully understand mature human sensorimotor capacities in abstraction from their relationship to our rational capacities—just as you can't fully understand the nature of the cupcake-matter of the chocolate-suffused cupcake while ignoring the chocolate that permeates it (cf. Boyle 2016: 531).

So, when Nelly the dog and I each leap to catch a frisbee, transformationalists acknowledge a sense in which we are doing the same thing—unreflectively responding to how the perceptible situation solicits us to act. But transformationalists also emphasize *discontinuities* between the embodied activities of rational and nonrational animals—ways in which immersion in human

"that no longer falls within the domain of logos" (2005a: 51, quoting Heidegger), and which constitutes a "ground floor of pure perception and receptive coping" that mature humans share with "[nonhuman] animals and infants" (61) makes it hard to square his view with a denial of additivism. The significance and interest of his rich exchange with McDowell extends beyond the issues explored here—see the essays collected in Schear (2013).

culture transforms the structure of the dealings with the meaningful environment involved in human perceptual and agential capacities. When I leap to catch the frisbee, the perceived possibility of frisbee-catching, my frisbee-catching capabilities, and the fit between the two, are available to my capacities for judgment and deliberation. I could, if I wanted, reflect on or try to articulate why the frisbee's perceptible location makes it a good idea for me to move in this particular way, given my aims. Nelly probably can't reflect on such matters, and certainly can't attempt to articulate them. The transformationalist claim is that this standing capacity for reflection on my skillful sensorimotor activity entails that my capacity for frisbee-catching is present in me in a different form than it is for Nelly—and in this sense is a different capacity.

The claim needs to be spelled out further. We need to know more, for instance, about how and why sensorimotor capacities are transformed by participation in human lifeways. But the availability of such a position blocks the tempting inference to additivism from the shared dependence of human and nonhuman subjectivity on capacities for embodied coping. McDowell emphasizes this in his response to Dreyfus, writing:

> I do not have to ignore embodied coping; I have to hold that, in mature human beings, embodied coping is permeated with mindedness. And that is exactly what I do hold. (2007: 339)

McDowell agrees that an account of human subjectivity, including its conceptual and rational aspects, must attend to our embodied coping skills. The fact that mature human perceptions give their subjects reasons to judge and act in particular ways is, he insists, "intelligible only in a context that includes the embodied coping competence, the responsiveness to affordances, that we share with other animals" (McDowell: 344).

Transformationalists can thus agree that capacities for embodied coping play a privileged role in explaining and characterising mature human subjectivity. It is no incidental fact about chocolate-suffused cupcakes that their chocolate inheres in a cakey substrate—that's what makes them chocolate *cupcakes*. Likewise, it is no incidental fact about human subjectivity that it involves embodied, sensorimotor capacities to adaptively modulate our relation to the environment, including responsiveness to affordances. Such capacities are part of what makes us rational *animals*—a distinctive kind of animal, but animals nonetheless. What distinguishes transformationalists from additivists is their insistence that, in mature humans, the structure of some of these embodied capacities is transformed via integration with capacities to reason and reflect, just as the integration of chocolate into a generic cupcake-mix results in a qualitatively different sort of cupcake.

So, human and nonhuman subjectivity's shared dependence on capacities for embodied coping is not, by itself, a good reason to endorse additivism. And the transformationalist commitment to a qualitative difference in kind between the states of mind of rational and nonrational animals is compatible with acknowledging a privileged explanatory role for the capacities for embodied interaction that humans share with nonrational animals.

4. McDowell, Conceptualism and Transformationalism

I say more below about the explanatory role that appeals to embodied interactions with structured environments might play within a transformationalist framework. But first we need a better understanding of the motivations for transformationalism.

McDowell's transformationalism is driven by his view that exercises of mature human perceptual and practical capacities are conceptually structured (McDowell 1996; 2013b; Boyle 2016). In turn, the motivation for this conceptualism is that it easily accommodates some manifest facts about the normative constraints involved in mature human perception and agency. For example: seeing things normatively constrains our beliefs and actions—perceptual experience doesn't simply *cause* us to think and act in particular ways, it *gives us reasons* for some thoughts and actions rather than others. The donut on my desk affords sustenance to both me and to Nelly. We can both see it; we can both use what we see to guide hunger-sating behaviours. In these respects, additivists and transformationalists can agree, Nelly and I are psychologically alike. But we differ insofar as many of my donut-related sensorimotor abilities hang together with my abilities to think and act for reasons. The visible donut doesn't just cause me to sense and move in particular ways, it gives me reasons to think and do certain things: believing that a donut is on my desk; judging that my office contains baked goods; intentionally taking a bite. Believing, judging or acting in these ways is justified, made rational, by what I can see.

Nelly's perceptual sensitivity to the donut's affordances does not give her reasons to make particular judgments, or put her in a position to make knowledgeable claims—making explicit claims or judgments is not something she can do. Whilst there may be a legitimate sense in which the donut's visible presence gives her reasons to act in particular ways, Nelly cannot recognize those reasons *as* reasons. The sight of the donut might impel her to eat, and this might be a good reason for eating. But Nelly cannot recognize this reason for what it is. She cannot step back to consider whether the visible donut and her motivational state really yield a good reason for eating, rather than an ill-advised temptation. She lacks the self-critical grasp of what counts as a good reason for what that full-fledged rational capacities require.

My mature human subjectivity thus involves a different kind of *normative structure* to Nelly's; my perceptions, actions and thoughts stand in relationships of rational constraint to one another, and I can take a self-critical stand on those relationships. Nelly's environment might *motivate* or *impel* particular responses—but those responses cannot show up for her as *warranted* or *justified* in the way that they do for me. Additivists and transformationalists agree that the possession of rational capacities involves a qualitatively different mode of normative constraint than that which characterizes the sensorimotor life of non-rational animals. Their disagreement is over how to construe the relationship between unreflective sensorimotor abilities and the rationally interlinked states that exert constraints of warrant or justification on each other.

Additivists construe the normative structure of mature human rationality as an extra layer that leaves the distinct normative structure of embodied coping intact. Transformationalists hold that possessing rational capacities transforms the normative structure of sensorimotor interactions. As McDowell puts it,

> Becoming open to the world, not just able to cope with an environment, transforms the character of the disclosing that perception does for us, *including* the disclosing of affordances… Affordances are no longer merely input to a human animal's natural motivational tendencies; now they are data for her rationality. (McDowell 2007: 344, original emphasis)

For transformationalists it is an essential property of the perceptual states of mature, rational animals that they are potential food for thought. Their being potential food for thought consists in their having what conceptualists like McDowell call 'conceptual structure'—a structure that allows them to exert rational constraints on judgment and action.[3]

The main motivation for transformationalism is the ease with which it accommodates these normative relations between my sensorimotor capacities, thoughts, and deeds. My donut-perception gives me reason to judge that there is a donut before me, and (if I'm hungry) reason to reach out and take a bite. How can my perceptual relation to the environment play this reason-conferring role? Transformationalists have a simple answer—the fact that there is a donut before me is both

3. I leave the question of precisely how to construe 'conceptual structure' open here (see §6 for a little more). A simple interpretation (associated with McDowell 1996) identifies it with propositional structure. Propositions are paradigmatically the sorts of things that can stand in normative relations like entailment and exclusion to each other. A straightforward way that my perceptual experience could justify my claim to know that there is a donut on my desk is via the perception and the assertion both having propositional content, and the content of my perception entailing or making probable the content of my assertion. As McDowell (2013b) later argues, however, there may be good reason to construe perception as having non-propositional content of a form nonetheless fit to be exploited in propositional judgments or claims.

the sort of thing that I can see, and the sort of thing that I can judge. The fact that the donut affords hunger-sating is both the sort of thing that I can see, and the sort of thing that I can reflectively endorse as a good reason for donut-consumption, given current circumstances. In this sense, exercises of my capacity to perceive the world and its affordances have the same structure as my self-conscious claims to knowledge and reasons for action. That is how my capacities to see and do things hang together with my capacities to judge and know things.

However additivists aspire to make sense of the normative links between mature human perceptions, judgments, and actions, they can't do it quite like that. Given that we are construing thinking as an exercise of rational capacities, and a perception's having conceptual structure as its having a form thinkable by its subject, the perceptions of nonrational animals cannot be conceptually structured. Nothing in a nonrational animal's experience is present for them in thinkable form, because they are not thinkers in the sense at issue here—they lack a self-critical grasp of what counts as a good reason for what. And since additivists deny any difference in kind between the states involved in sensorimotor coping with the environment for rational and nonrational animals, they must hold that the perceptual states of mature humans aren't conceptually structured either.

Additivists thus face a problem that transformationalists avoid—that of explaining, as Dreyfus puts it, "how the nonconceptual given" supplied by our bodily openness to the environment "is converted into a given with conceptual content so that perception can do its justificatory job" (Dreyfus 2005a: 59, emphasis removed). Call this the *conversion problem*. As we will see below, a chief motivation of transformationalism is the worry that this problem is insurmountable, requiring dissolution rather than solution.

5. The Phenomenology of Skillful Coping

Dreyfus acknowledges that his view of unreflective embodied coping faces this 'conversion problem'. And he acknowledges (after McDowell's responses) that transformationalists can recognize a privileged role for embodied coping in their account of human subjectivity. But he remains convinced that the phenomenology of embodied coping favours an additivist picture of the relationship between sensorimotor skills and rational capacities. Consider some ingrained embodied skill of yours—tying shoelaces, descending staircases, driving cars. If you are truly skilled at your chosen activity, argues Dreyfus, no explicit, articulate thinking goes on during its execution. You needn't think about rules for shoelace-tying, or how to reliably land your foot on the next stair. Put differently, you don't exercise rational capacities for explicit, self-critical thought about shoelace-tying while fluently tying your laces—there is no explicit checking or affirming

that your ongoing movements are appropriate to your situation and its perceptible demands. Paradigmatic cases of embodied coping, for Dreyfus, include instances of peak performance in sport, where athletes feel in 'the zone' or 'flow.' Such experiences are characterized by an absence of reflection or deliberation, and feelings of total absorption in one's situation, which smoothly elicits fine-tuned bodily responses as and when required. We don't usually characterize fluent lace-tyers or stair-descenders as 'peak performers' or 'in the zone,' but this isn't because such activities lack the effortless attunement to the situation's demands that is distinctive of embodied skills—it's because these capacities for smoothly coping with our environment are so pervasive in our lives that most of them aren't worth remarking on.[4]

Dreyfus thinks this phenomenology of skilled activity speaks in favour of his view, and against conceptualism. Explicit thought disrupts fluent skill. Expert lace-tying or stair-descending becomes less fluent if you begin to reflect on what you are doing and why. This suggests to Dreyfus that skilled, smooth, unreflective coping differs in psychological structure from stilted, self-conscious performance, and thus that transformationalism should be rejected. He illustrates the point with the case of baseball infielder Chuck Knoblauch, whose fielding deteriorated once he began attending to his throwing mechanics. If Chuck's experience of, and interaction with, his situation was already conceptually structured then Dreyfus sees no way to explain the ruinous consequences of this overthinking. Chuck's overthinking must, thinks Dreyfus, do more than make explicit a latent conceptual structure. Rather,

> it must introduce some other sort of content. If it was the same sort of content as before reflection, there would be no way to explain why Knoblauch performs so well under one condition and so poorly under the other. (Dreyfus 2007a: 360)

But, as McDowell (2007) notes, transformationalists can straightforwardly explain such reflection-induced degradation in performance. Experiences can have conceptual structure—structure that allows them to be integrated with capacities for reflecting on what is a good reason for what—even if the subject is not currently exploiting that structure in an exercise of reflection. The difference between fluent, unreflective performance and stilted self-conscious performance can be explained in terms of whether or not the conceptual structure of the subject's experience is taken up and put to work in self-critical thought.

4. Dreyfus's account of peak performance as essentially unreflective has been criticized (Montero 2016, Høffding 2019). His objection to transformationalism requires only the more modest claim that some instances of reflective thought about what one is doing disrupt fluent performance, so I set these criticisms aside here.

For a skilled infielder like (pre-crisis) Chuck, it is a perceptible fact that some situations afford throwing to first base by moving in a particular way. Things go well when Chuck sees this fact and lets it unreflectively guide his performance. Things go badly when he sees this fact and actively reflects on it, exploiting his ability to think critically about which movements the situation calls for. Likewise, as a skilled lace-tyer or stair-descender, things go well when you let your awareness of your situation and its affordances unreflectively guide your movements, poorly when you reflect on the fit between what you see and what you are doing. Thought's detrimental effect on skilled performance needn't be explained, then, by a difference between the way in which your experiences of situations and their demands are structured. It can be explained by a difference between what you *do* with your structured experience—whether you think critically about it, or simply let it guide your ongoing activity.

A subject unreflectively guided by a conceptually-structured experience is still normatively constrained by the perceptible facts of her situation—her actions are guided by perceptible *reasons* the situation offers, rather than being brutely caused movements—because the elements of the situation and their relation to her intentions fall within the scope of her conceptual capacities. They fall within this scope insofar as she *could*, if she so chose, critically reflect on the ways in which the perceptible scene makes particular ways of responding good or bad ideas, given her aims. The transformationalist claim that the normative coherence of our perception, action and thought is enabled by their shared conceptual structure thus appears compatible with the phenomenology of skilled coping.

The compatibility is due to the modest, dispositional notion of conceptual structure to which transformationalism is committed. To have conceptual structure is to be potential food for thought. Food needn't be eaten to be food; it needs only to be *edible*. Likewise, an experience needn't be reflected upon to have conceptual structure—it need only be the sort of thing that *could be* reflected upon, that *would* normatively constrain any judgments or deliberations about it we engaged in. To oppose transformationalism, additivists must deny that the experience of mature human embodied coping has conceptual structure in even this modest sense. And this appears to commit them to holding that the experiences of skilled agents have a structure that *cannot* be exploited by their subjects in reflection. But this looks problematic, for two reasons.

First, recall the conversion problem: how can the putatively nonconceptual psychological states of skillful copers be 'converted' into states apt to rationally constrain deliberation and judgment? To oppose transformationalism, additivists must hold not only that the experiences of mature humans engaged in fluent coping *are not* (in most cases) put into active contact with capacities to reason and judge (transformationalists can agree with this), but that they *could not* be—their structure is fundamentally *incompatible* with our reflective capacities. This

commitment to the fundamental structural incompatibility of embodied coping with rational capacities makes it hard to see what shape a solution to the conversion problem could possibly take.

Second, the phenomenological claim that skilled coping has a structure that is fundamentally different from our conceptually-structured thought and talk about skilled coping threatens to undercut itself. If embodied dealings with the world principally consist in an openness to the environment that is unavailable to reflective and discursive capacities, how can we know or talk about this fact? How could this mode of openness constrain our thinking and theorizing, such that our characterizations of it, and its philosophical consequences, could be more or less accurate, justified, or entailed by the phenomena? Phenomenological philosophy, minimally construed, simply *is* the attempt to give perspicuous articulations of the structure of experience, and draw philosophical conclusions based on that structure. The viability of this enterprise appears to depend on the possibility of phenomenological claims, assertions and judgments being *justified* or *warranted by* the experiences on which they are reflecting, or at least doing a better or worse job of capturing their structure. But, as we have just seen, additivists appear committed to denying this possibility. If the experiences of skillful copers are not food for thought, how can they constrain phenomenological reflections?

The point of this tour through the McDowell/Dreyfus exchange has been to clarify the motivations for transformationalism and highlight some problems with additivism—so let's take stock.

Since transformationalists depict mature human experiences as available to our discursive and conceptual capacities, they face no deep problem as to how the perceptual openness of skilled agents to their environment can yield reasons to act and judge in particular ways.

Additivists, by contrast, face a 'conversion problem' with no clear candidate solutions. Additivists depict the phenomenology of embodied coping as involving a mode of openness to one's environment that cannot be integrated with capacities for reflection, articulation and judgment. This raises methodological puzzles about the possibility of providing descriptions of embodied coping that fit, and are justified by, the phenomena.

Transformationalists avoid these problems by depicting coping phenomenology as involving a conceptually structured experience of one's unfolding relationship to one's surroundings—things are presented in a way that could be reflected and deliberated upon—but this structure is not typically exploited in judgment, on pain of disrupting the absorbed and fluent character of one's activity.

So far, the states of their respective balance sheets favour transformationalism over additivism. But this stocktake tactfully ignores one bit of red in the transformationalist's ledger. Although they face no 'conversion problem,'

transformationalists need a story about how the normative structure of human embodied coping capacities is 'transformed' in ways rendering those capacities apt for integration with reflection and judgment. How might this be achieved within embodied cognition's explanatory framework?

6. Transformative Embodied Cognition

Dreyfus's antipathy towards 'intellectualist' conceptions of embodied subjectivity like McDowell's pushes him towards additivism, depicting human subjectivity in terms of a 'ground floor' of nonconceptual embodied coping skills shared with nonrational animals, plus an 'upper storey' of distinct, conceptually structured capacities. This picture goes hand in hand with a particular conception of what embodied cognitive science should look like—a bottom-up pattern of theorizing that involves starting with descriptions, models, or formal characterisations of simple, unreflective modes of sensorimotor interaction between agents and environments, then building towards a complete characterization of human psychology couched, as far as possible, in that language (Dreyfus 2005b; 2007b).

For Dreyfus, this involves extracting a vision of unreflective embodied coping from Heidegger and Merleau-Ponty that sets terms for embodied cognitive science. Embodied cognitive science becomes the study of 'intentional arcs' (patterns of sensorimotor feedback between perceiver and environment that progressively reshape how things appear), and tendencies of organisms towards 'maximal grip' on their environments (their abilities to adaptively cope with the environment without explicit deliberation or representation of goal states).

This bottom-up pattern is found in many embodied approaches. It is visible in attempts to model and explain aspects of mature human cognition using concepts, design strategies and modelling tools drawn from Rodney Brooks' insect-like mobile robots (O'Regan & Noë 2001; Hutto & Myin 2012), from ecological psychological analyses of simple sensorimotor coordination tasks like baseball-catching or obstacle-avoidance (Chemero 2009; Rietveld & Kiverstein 2014), from dynamical systems analyses of simple coupled interactions like the operation of Watt-governors or coordinated rhythmic movement (Van Gelder 1995; Chemero 2009; Anderson 2014), or from characterisations of the self-organising processes characteristic of metabolic life (Varela, Thompson & Rosch 1991; Di Paolo et al. 2017).

Within each of these subgenres of embodied cognitive science we find tentative attempts to 'scale up' successful analyses of ground-floor capacities for adaptive but unreflective sensorimotor interaction to accommodate forms of discursive cognition and normative constraint distinctive of mature human minds.

Theorizing according to this pattern need not entail additivism. We saw above, for example, that McDowell happily deploys the theoretical vocabulary of ecological psychology in his characterizations of mature human subjectivity. In this way, transformationalists can acknowledge that exercises of mature human rational capacities involve the pickup of affordances, sensorimotor coupling with props or artefacts that scaffold adaptive behaviour, cycles of self-perpetuating dynamic interaction, or all of the above. But transformationalists also insist that participation in human culture reshapes the web of normative constraints that weave these embodied interactions into the rest of a mature human's psychology, rendering them qualitatively distinct from their counterparts in non-rational animals. Rationality is folded through and baked into the sensorimotor life of mature humans like chocolate through cupcake batter. By working with a theoretical toolkit optimized for the study of unreflective sensorimotor dealings with the environment, bottom-up approaches risk depriving themselves of tools to accommodate this thoroughgoing integration. So whilst the kind of bottom-up theorizing that Dreyfus exemplifies does not strictly entail additivism, it risks pulling embodied approaches away from transformationalism.

What might an alternative explanatory strategy look like? An illuminating contrast to embodied cognition's prevailing bottom-up approach is provided by Jerome Bruner's *cultural psychology* (Bruner 1990; 1996). Bruner, like contemporary proponents of embodied cognition, is motivated by dissatisfaction with cognitivist depictions of mentality as dispassionate symbol-crunching. For Bruner, however, cognitivism's neglect of human cognition's cultural context is just as pernicious as its neglect of its embodied and sensorimotor basis. The webs of meaning and normative constraint structuring mature human subjectivity are, for Bruner, cultural products obtaining in virtue of human interaction patterns. Summarising key tenets of his recommended mode of cultural psychology, he writes:

> the evolution of the hominid mind is linked to the development of a way of life where 'reality' is represented by a symbolism shared by members of a cultural community … [and] conserved, elaborated, and passed on to succeeding generations who, by virtue of this transmission, continue to maintain the culture's identity and way of life …
>
> Although meanings are 'in the mind,' they have their origins and their significance in the culture in which they are created. It is the cultural situatedness of meanings that ensures their *negotiability* and, ultimately, their *communicability* … It is culture that provides the tools for organizing and understanding our worlds in communicable ways. The distinctive feature of human evolution is that mind evolved in a fashion that enables human beings to utilize the tools of culture. (1996: 3, my emphasis)

The scientific study of the psychologically distinctive properties of mature human cognition consists, for Bruner, in the multifaceted project of coming to understand the cultural context in which mature human minds operate. This involves understanding the distinctive structure of the interaction patterns making up that context, how those patterns arise and evolve, and the mechanisms and capacities that enable humans to enter into them. His approach shares embodied cognition's overarching commitment to understanding minds in terms of embodied interactions with structured environments, but begins its reflections on mature human cognition by attending to the cultural dimensions of that environment—the patterns and constraints within which human interpersonal interactions unfold. Rather than starting with simple abilities for sensorimotor interaction and seeing what sorts of capacities can be built from them, Bruner's cultural psychology starts by attempting to characterize the form of life in which mature human dealings with meaning are embedded, then aims to understand how participation in this form of life is enabled by sequences of embodied interactions with the cultural environments in which humans develop.

Bruner's approach dovetails with McDowell's. McDowell (1996) holds that human capacities to play the game of giving and asking for reasons—to grasp, articulate and reflect on what counts as a good reason for what—depend on habits of interaction with the world and with others instilled by a culturally situated upbringing, or *Bildung*. As he puts it:

> Our *Bildung* actualizes some of the potentialities we are born with; we do not have to suppose it introduces a non-animal ingredient into our constitution. And although the structure of the space of reasons cannot be reconstructed out of facts about our involvement in the realm of law, it can be the framework within which meaning comes into view only because our eyes can be opened to it by *Bildung*, which is an element in the normal coming to maturity of the kind of animals we are. (1996, p.88)

This emphasis on *Bildung*'s transformative role aligns with Bruner's view of how the cultural shaping of mature human cognition brings about a distinctive set of capacities for dealing with meaning. The game of giving and asking for reasons is a human cultural practice, and mature human perceptions, actions and thoughts are conceptually structured in virtue of their integration into that practice. As Bruner insists, the meanings of human psychological states are essentially situated in a distinctive cultural context—a shared form of life within which their meanings can be *communicated* and *negotiated*.

For mature humans, the meanings of states of mind and world are *communicable* due to their integration into a 'shared symbolism' via which a culture represents reality. The symbolism provides a common currency which allows

perceptions, actions, judgments and states of affairs to stand in rational relations to each other. Participation in human lifeways endows perceptions and actions with a structure that integrates them into the space of reasons because it inaugurates humans into the practices constitutive of this shared symbolism. The *negotiability* of the meanings of states of mind and world likewise exists only in the context of this shared symbolism and form of life. The symbolism provides a relatively stable framework within which participants can haggle over individual meanings and normative constraints; the shared form of life provides the code of conduct and interaction patterns that govern this haggling.

The capacity to grasp the web of normative constraints that states of mind and world exert on each other, and a rational agent's standing obligation to rework their take on this web in light of new evidence, exist in virtue of the communicability and negotiability of meanings enabled by participation in a shared culture. The project of a transformative embodied cognitive science of human rationality is to fill in the details of this broad-brush sketch—providing a naturalistic account of the process of *Bildung*, including the capacities it presupposes, and the developmental contexts, mechanisms and trajectories involved in its unfolding.

This is doubtless a challenging task. In particular, open-ended talk of a 'shared symbolism' should not distract from the fact that the canonical instance of a culture-borne symbolism within which meanings are embedded and negotiated is undoubtedly *language.* For mature humans, perceptions of donuts on desks are conceptually structured—apt for integration with rational capacities to think and act upon donuts—because a donut's visible presence and significance is the sort of thing that we can attempt to *articulate* and *argue about*. The culturally-instantiated webs of interaction that secure the communicability and negotiability of meaning required for conceptual structure involve, for mature humans, patterns of linguistic practice. However, there is plenty of recent work on which transformative embodied cognitive science can draw to provide an account of the emergence and cultural transmission of such practices.

For a template of such an account, consider the 'cognitive gadgets' framework of developmental psychologist Cecilia Heyes (2018). Heyes aims to explain how sophisticated cognitive capacities of mature humans can emerge from a minimal 'starter kit' consisting in a distinctive suite of affective, motivational and attentional dispositions, plus general-purpose capacities for associative learning. Her work explores in detail how capacities for interpersonal and linguistic cognition could arise from marinating these basic ingredients in the richly structured environments and patterned interactions distinctive of human culture. Rather than aiming to redescribe or reductively explain mature human capacities via the elements in her starter kit, her goal is to understand how immersion in culture allows qualitatively distinct capacities to emerge from these basic materials.

In this way, transformative embodied cognition can embrace much of the work on the bodily and interactive basis of human cognition to which theorists like Dreyfus appeal. Standard embodied explanatory tropes like direct sensorimotor coupling to behaviour-specifying ecological information, biodynamic sensemaking, or using the world as its own best model become candidate constituents of a 'starter kit' of capacities of embodied cognitive systems. The project of transformative embodied cognitive science is to catalogue the elements of this starter kit, explain how they enable our participation in human culture, and specify how this participation incrementally reshapes the range of dealings with meaning of which human minds are capable.

Viewed in this light, the problem with additivist embodied cognition's bottom-up strategy is the optimization of its explanatory toolkit for the kinds of unreflective sensorimotor dealings with the environment that characterize rational and nonrational subjectivity alike, neglecting the processes, capacities and contexts that allow rational capacities to emerge from this starter kit. Transformative embodied cognition requires an expanded toolkit, including apparatus for characterizing the distinctive features of mature human forms of life, and tools to describe and study the ways in which unreflective sensorimotor interactions can progressively acquire the normative structure of mature human cognition. And the toolkit must be expanded in a way that eschews appeal to algorithmic manipulations of content-bearing states, and emphasizes trajectories of embodied interaction with structured environments.

Happily, there are plenty of candidate tools for these jobs. Recent work on the comparative and developmental psychology of normative cognition looks for precursors to mature human sensitivity to norms in simpler modes of affect-laden interactions and skillful behaviour (Andrews 2015; Birch 2021; Westra & Andrews 2022); work on mindshaping and regulative views of interpersonal psychology explores the ways in which sophisticated social cognitive capacities and forms of normative constraint can arise as emergent byproducts of interactions between sociable, conformist agents (McGeer 2021; Zawidzki 2013; Fenici & Zawidzki 2021); work on cumulative cultural evolution and cognitive niche construction studies how incremental changes in the cultural environments that ancestors create for descendants can gradually ratchet up the powers of human minds (Sterelny 2003, 2012; Birch & Heyes 2021). Recent embodied and situated accounts of concept possession and use (Noë 2012; Rouse 2015) suggest construals of conceptual structure that render it more susceptible to the explanatory resources in this expanded toolkit. Finally, recent work by Kim Sterelny gathers many of these threads to suggest how gradual changes in hominin environments and lifeways could pave the way for a transition from simple expressive behaviours to the complex web of symbolic meanings within which the game of giving and asking for reasons is played (Sterelny 2021; Planer & Sterelny 2021).

Some of these lines of research have received little attention from researchers working on the sensorimotor and embodied foundations of cognition. An appealing feature of the transformative framework just sketched is its suggestion of how they might hang together in a unified study of human minds. The range of explanatory tools in the transformative embodied cognitive scientist's kit focus on embodied engagements with structured environments at different spatial and temporal scales. The aspiration is that, working in concert, this will afford a vision of how unreflective sensorimotor skills can gradually be bootstrapped into perceptions and actions with conceptual structure, integrated into abilities to give and ask for reasons.

7. Deflationist Embodied Cognition

Transformative embodied cognitive science, then, is the project of understanding the capacities and environmental structures that allow humans to soak up the practices of their cultural milieu, and of understanding how immersion in culture transforms the ways of dealing with meaning available to human animals. How does the transformational approach fit with specific contemporary frameworks within embodied cognition? To answer this question, a final corner of conceptual space must be acknowledged. The additivist/transformationalist binary doesn't exhaust the possibilities for embodied accounts of rational capacities. Additivists and transformationalists concur that rational capacities involve a distinct kind of normative constraint or structure to the unreflective sensorimotor capacities of nonrational animals. But one might deny this claim. Perhaps a suitably arranged pile of nonconceptual sensorimotor skills can somehow add up to a set of rational capacities when housed in a culturally situated human body. This would eschew both the additivist claim that rational capacities are 'added on' to a distinct fundament of nonrational sensorimotor skills, and the transformationalist claim that mature humans differ from nonrational animals insofar as some of their embodied skills take on a qualitatively distinct form—instead, mature humans simply have *more* embodied, embedded skills of the *same generic kind* as those of nonrational animals. Rather than frosting on a sensorimotor cupcake, or a distinct kind of cupcake, transformed by an added ingredient, rational capacities are just more cupcake. Let's call this final kind of approach *deflationist*, to reflect its denial of a qualitative distinction between rational capacities and embedded sensorimotor skills.

Recent work by Shaun Gallagher (2017; 2023) perhaps exemplifies this position. Gallagher argues that rational capacities should be understood in terms of mature human access to "a specialised affordance space that is nonetheless continuous with embodied coping" (2017: 200), and that reflective cognition

and embodied coping "share the same structure" (2017: 25). Canvassing ways of developing this proposal inspired by recent 'enactivist' work, he notes that mathematical and geometrical cognition can involve skillful manipulations of external artefacts—visible elements of equations, abacus beads, geometrical models or shapes—that allow cognizers to tap in to possibilities for valid inference or judgment that these features of the world afford (2023: 51–52). And he depicts this as a proposal that can "split the difference" between Dreyfus's emphasis on embodied coping and McDowell's emphasis on conceptual structure in their respective characterisations of mature human subjectivity (2017: 25).

Transformationalists, we have seen, can agree with much of this. They can acknowledge a sense in which reflective cognition and embodied coping share a common structure: conceptually-structured perception and action can, like the embodied coping of nonrational animals, consist in fluent and skillful engagement with perceptible affordances. Transformationalists also, like Gallagher, aspire to explain how rational capacities depend on a package of embodied skills tuned by and situated within a network of cultural practices. The key transformationalist claim is that, in a rational animal, some sensorimotor engagements take on a qualitatively different form, due to integration with abilities to self-critically reflect on what counts as a good reason for what. To remain distinct from transformationalism, deflationists need to deny this claim about qualitative difference. Doing so has costs and benefits.

On the plus side, it dissolves the conversion problem. Denying a qualitative distinction between unreflective sensorimotor skills and rational capacities removes the obligation to explain the distinctive kind of normative constraint that (for example) a conceptually-structured perception exerts on a rational subject's judgments and plans in terms of nonconceptual sensorimotor skills. Whatever sorts of normative constraint link together the perceptions, thoughts and actions of a rational animal are no different in kind, a deflationist must hold, from the constraint that a nonrational animal's perceptual sensitivity to its environment exerts on its unfolding embodied activity.

The cost of this dissolution, however, is an implausible deflation of rational capacities to a messy kludge of unthinking embodied skills. Additivists and transformationalists concur that mature human rational capacities involve a different kind of normative constraint than nonrational sensorimotor capacities for environmental interaction. From such a perspective, what is distinctive about capacities like mathematical cognition is not the ways in which mathematicians are impelled or motivated to move around external symbols, manipulate abacus beads, or motorically interact with other mathematicians, but the mathematician's open-ended and self-critical grasp of what, in the context of mathematical practice, counts as a good reason for what. Mathematical behaviours evince an understanding of mathematics only when they unfold in the context of an over-

arching grasp of this normative structure. A sequence of sensorimotor activities like shuffling abacus beads, scribbling on a blackboard, then giving a thumbs-up, expresses mathematical understanding only in the context of a grasp of the norms and principles that knit these behaviours into a unified field of practice, and a standing capacity to revisit and revise one's take on those principles if necessary.

Deflationists have two ways of responding to this last claim, neither of which look appealing. They can deny it, deflating reflective capacities like mathematical cognition to a bundle of self-contained sensorimotor routines, involving no grasp of an overarching normative structure. This option will be too deflationary for most tastes. It looks committed to denying any difference in kind between the behavioural responses of a mathematician to the interactive possibilities offered by an unfinished proof on a blackboard, and the sensorimotor responses of a moth to a lightbulb.

Alternatively, deflationists might try to accommodate the importance of an overarching grasp of normative structure whilst resisting transformationalism. But this needle looks impossible to thread. Transformationalists hold that the normative structure of the experiences and activities involved in reflective cognition differs in kind from that of the sensorimotor activity of a nonrational animal *precisely because and insofar as* a rational animal's embodied activities are integrated with an open-ended and self-critical grasp of what counts as a good reason for what. It is this integration that allows (for example) mature human perceptions to yield reasons for particular judgments and actions, rather than mere causes or impulsions towards them. And it is truistic to claim that being sensitive to reasons involves a different kind of normative constraint to being shunted around by causes or impulses. Acknowledging the importance of an overarching grasp of normative structure whilst resisting transformationalism appears to commit deflationists to denying this truism—they must at least say more about how a habitable bit of conceptual space could exist in this region. Even if they can do this, they must then show how this overarching grasp consists in or emerges from some suitable suite of abilities for unreflective embodied interaction with a structured environment. This is just the explanatory task which, I suggested above, requires embodied cognitive science to expand its toolkit.

Are there really any proponents of deflationist embodied cognition? I am unsure—hence my weaselly claim that Gallagher *perhaps* occupies such a position. Some other embodied treatments of reflective capacities like planning, language, or pretense are at least suggestive of deflationism, insofar as they stress the motoric and interactive dimensions of their explananda whilst remaining silent about the importance of an overarching grasp of the normative structure of the target behaviours. But proponents of embodied approaches do not explicitly locate their approaches within the additivist/transformationalist/deflation-

ist partitioning, and are usually fuzzy on the issues that determine where one falls within it. The key deflationist commitment is to denying that the normative constraints involved in exercises of rational capacities differ in kind from those involved in the sensorimotor coping of nonrational animals. Gallagher's characterization of his position is ambiguous here. His aim of eschewing McDowell's position, and his claim that embodied coping and exercises of rational capacities have the 'same structure' point towards deflationism; but the claim that rational capacities involve dealings with a 'specialised affordance space' leaves the door open for a transformationalist reading, if this 'specialisation' implicates a new mode of normative constraint.

The point of the additivist/transformationalist/deflationist partitioning is not that it reflects the ways in which proponents of embodied cognition currently classify themselves; rather, it highlights the challenges that different conceptions of the relationship between rational capacities and embodied coping face, and the tradeoffs involved in addressing or sidestepping those challenges. Approaches like Gallagher's construe exercises of rational capacities as enculturated forms of embodied engagement with the world. But we have now seen that this construal can be fleshed out in additivist, deflationist or transformationalist ways.

Additivists hold that some of the activities of mature, rational humans have a different normative structure from the unreflective modes of embodied coping they share with nonrational animals. This honours the insight that there is something normatively distinctive about the rational domain, but incurs an obligation to explain how this distinction emerges, and faces an intractable-looking conversion problem of explaining how our embodied dealings with the world and our reflective thought and talk can rationally constrain each other.

Deflationists avoid the conversion problem by denying the claim about normative distinction, but at the cost of an implausible conception of human rationality as a bundle of sensorimotor subroutines with no overarching structure.

Transformationalists, like additivists, take the distinctive normative structure of rational capacities at face value—they hold that it is the normative structure of an embodied, situated practice of giving and asking for reasons. But they avoid the conversion problem by holding that participation in this practice transforms the structure of human sensorimotor engagements, rendering them apt for integration with practices of communicating and negotiating meanings. Transformationalists must explain how this transformation and integration take place, and do so in terms of sensorimotor interactions with structured environments. But, I have suggested, this explanatory task looks tractable in light of recent work on cultural, comparative and developmental psychology.

8. Conclusion: Any Takers?

Might other existing embodied approaches be developed along transformationalist lines? Answering this question in a way that does justice to the nuance and diversity of the positions in the field is impossible here; instead, I conclude by briefly considering two further illustrative cases.

The 'radical enactivism' (or 'REC') of Dan Hutto, Erik Myin, and collaborators (Hutto & Myin 2013; 2017) depicts mature human rational capacities as built on a bedrock of 'basic cognition,' shared with nonhuman animals and consisting in nonconceptual and nonpropositional modes of embodied attunement to salient environmental features. Like transformationalists, proponents of REC acknowledge that immersion in shared practices of claim-making and reason-giving endows mature humans with rational capacities that our non-linguistic fellow creatures lack, and marks a qualitative shift (or 'kink') in the kinds of cognitive capacities we possess (Hutto & Myin 2017). When it comes to explaining the emergence of these capacities, they also recommend an expanded embodied cognitive science toolkit, and look to some of the lines of research mentioned in §6 above—work on niche construction, cumulative cultural evolution, and the comparative psychology of expressive communication—for candidate resources. But they frame their conception of the relationship between rational capacities and 'basic cognition' in additivist terms, holding that "there is a basement-level similarity between all cognitive creatures," and that "even those human minds that become capable of contentful cognition are not *wholly* transformed and thus not fundamentally different from animal minds, *pace* McDowell" (135).

Hutto & Myin thus reject the transformationalist claim that immersion in culture transforms the structure of mature human perception by rendering it apt for integration with capacities to reason and reflect. Instead, they endorse a "duplex account of contentless and content-involving perceiving" (176) in which putatively contentless modes of habituated perceptual response co-exist with a distinct set of culture-borne capacities for reflection and articulation. They recognise that this additivist picture faces a conversion problem of explaining how "contentless and contentful forms of perceiving enter into systematic commerce with one another" (171). But their account of how this commerce is possible is brief, amounting to the suggestion it can be explained "with reference to an organism's interactional history" (172). They illustrate this proposal with the example of perceiving a Mooney image in which the figure of a dalmatian is camouflaged within a mosaic of monochrome blobs (173). Whilst the 'basic' skill of perceiving the dalmatian gestalt requires no application of concepts or contentful thought, Hutto & Myin hold that:

> for those who have also mastered the relevant sociocultural practices they will not only effortlessly and irresistibly see a dog, they will be tempted, irresistibly, to judge "It's a dog"… the individual's history of interactions, though now bolstered by those of sociocultural kind, is what accounts for the tight connection between contentless and content-involving perceiving. (172–174)

This response, however, underestimates the severity of the conversion problem. The challenge for additivism is to explain the manifest way in which perceptual experiences can *give reasons* to think, act, or judge in certain ways, not how they can exert irresistible temptations to do so. Hutto & Myin's characterisation of the constraints that perception places on judgment elides the difference in normative structure on which additivists and transformationalists agree—whereas a nonrational animal's perception merely *impels* them to behave in particular ways, a rational animal's perception *gives it reasons* for particular actions or judgments. There is a tension in REC's story here. Hutto & Myin frame their discussion in a way that suggests they wish to respect the appearance that conceptually-structured cognition has a normative structure that is qualitatively distinct from that of the sensorimotor engagements of nonrational animals. But their sketch for an account of the relationships between perceptual and rational capacities looks deflationist, depicting dispositions to reason and judge as habituated impulses that may or may not align with the ways that 'basic' perception presents the world to rational subjects. We saw the difficulties deflationism encounters above. Eschewing it involves endorsing either additivism or transformationalism. Additivism straightforwardly respects REC's talk of 'basement layers' and 'duplex structure,' but faces a conversion problem that Hutto & Myin do not adequately address. Endorsing transformationalism avoids the conversion problem, but entails giving up on REC's claim that mature human perception and agency retains a 'duplex' normative structure, and is not 'wholly transformed' by its integration with capacities to give and ask for reasons. As we have seen, transformationalists hold that immersion in culture changes the normative structure of mature human perception and action by rendering the meanings to which our sensorimotor skills attune us communicable and negotiable.

I leave the question of how best to respond to this diagnosis to devotees of REC. But the above discussion shows how many of REC's core commitments are compatible with transformationalism. Like REC, transformative embodied cognition's schema for explaining human rationality involves eschewing cognitivist appeals to internal symbol-manipulation, focusing instead on suites of embodied skills, tuned by culturally-scaffolded interactions with structured environments. We have also seen that transformationalists can acknowledge foundational similarities between human and nonrational animal minds, and a sense in which the

perfusion of perceptual and agential capacities with rationality does not wholly transform mature human minds; the transformation of human sensorimotor capacities via enculturation is compatible with holding that human subjectivity remains a fundamentally embodied, engaged and situated phenomenon. Finally, transformative embodied cognition is compatible with REC's commitment to denying that "all forms of cognition, and in particular its root forms, are content-involving" (Hutto & Myin 2017: 10). 'Content-involving' cognition, for REC, is that which involves representational states with correctness conditions. Transformationalism entails that mature human perception and agency each involve a subject's being oriented to the world in a way that constrains the space of rationally acceptable thoughts and judgments available to them. There is conceptual wiggle-room as to whether such an orientation must be 'content-involving' in REC's sense (McDowell 2013b). But even supposing that it must be, note that the transformationalist claim pertains only to the perceptions and actions of mature humans. Insisting on it incurs no commitment as to whether the cognitive states of other creatures, or of immature humans, are content-involving, or to holding that all other cognitive states of mature humans are content-involving.

Lastly, consider 'bioenactivist' (Nave, forthcoming) approaches that emphasise the continuity of life and mind. Bioenactivists look for precursors of structures of mature human subjectivity in the organizational dynamics of living systems, arguing that rudimentary forms of teleology, affectivity, and self-concern are entailed by the self-perpetuating character of metabolic processes (Varela, Thompson & Rosch 2017; Thompson 2010; Di Paolo et al. 2018). As with Gallagher and 'REC,' determining where these approaches fall within the additivist/transformationalist/deflationist partitioning requires clarifying their attitude towards the relationship between the normative structure of mature human cognition, and that of the unreflective embodied activity of simpler organisms.

A deflationist bioenactivism would deny any difference in kind between the normativity involved in a simple organism's viability-preserving interactions with its milieu, and the normative constraints that obtain between the perceptions, actions and thoughts of mature humans. Additivist bioenactivism would recognise a qualitative difference in normative structure between the proto-subjectivity of simple organisms and the rational subjectivity of mature humans, but hold that both normative structures co-exist in the subjective life of mature humans. Transformationalist bioenactivism would hold that integration into practices of giving and asking for reasons transforms the normative structure of some organic processes; insofar as those processes figure in the perspective of a rational subject, they take on conceptual structure, becoming potential objects of judgment and reasons for action.

Like the other embodied approaches above, bioenactivist work tends not to make its stance on these issues fully explicit. Arguing that organic processes

implicate a minimal normative structure that sheds light on human subjectivity initially appears to align with deflationism—some bioenactivists are easily read as attempting to dissolve puzzles about human subjectivity by assimilating it to organic processes. However, most also stress the differences in organizational dynamics between metabolic, sensorimotor and intersubjective processes, and aim to show how distinct regimes of normative constraint emerge at each of these successive levels (Di Paolo et al. 2017; 2018). Evan Thompson insists that human subjectivity is "fundamentally social and cultural" (2010: 402) holding that it "emerges from developmental processes of enculturation, and is configured by the distributed cognitive web of symbolic culture" (2010: 383). These strands of bioenactivism lend themselves well to the transformationalist insistence on the distinctive normative structure of the lives of rational animals. Indeed, Di Paolo et al's (2018) enactive account of enculturation into language is, I think, best read as a sketch of the kind of transformationalist account I have tried to motivate above.

Where such bioenactivist approaches often appear to diverge from the blueprint for transformationalist embodied cognition sketched in §6 is in their choice of explanatory tools and frameworks. Despite their sensitivity to the difference between the normative structure of mature human cognition and that of nonrational animals, bioenactive theorising usually proceeds from the bottom up—seeking to show how simple metabolic or sensorimotor dynamics can progressively take on more sophisticated forms via iterated cycles of environmental interaction. This risks obscuring the equally important top-down character of the normative transformation wrought by human enculturation—practices which are prior and external to the developing human subject, and which have a normative character that is distinct from that involved in innate human metabolic and sensorimotor capacities, gradually configure the structure of mature human cognition during ontogeny. Those bioenactivists who restrict themselves to a theoretical toolkit optimised to describe biological and sensorimotor dynamics threaten to cut themselves off from rich seams of contemporary research that characterise and explain the distinctive normative structure and development of mature human cognition.

As well as clarifying the problems faced by additivists and deflationists, and avoided by transformationalists, I hope here to have removed at least one bad reason for proponents of embodied approaches to ignore the thriving lines of transformationalist-friendly research mentioned in §6. It is easy to suppose that the cognitivist conception of minds as mechanical rule-followers aligns with the rationalist vision of mature human perception and action as implicating a qualitatively different normative structure to that which governs the lives of nonrational animals, and hence that embodied cognition should reject such rationalist claims.

But rejecting them comes with costs. Once we separate the project of understanding our capacities for skillful embodied coping from that of understanding our capacities to think and act for reasons, it becomes hard to accommodate the manifest ways in which our capacities to see and do things hang together with our capacities to think and know things. Thankfully, I have argued, we can eschew cognitivism while endorsing a transformational conception of human rationality, and do so in a way that respects the roots of mindedness in embodied life.

For transformationalists, it is an essential fact about mature human embodied coping that it is permeated with rationality, and an essential fact about human rationality that it is concretely embodied in sensorimotor skills for dealing with the human world. Seeing that there need be no crypto-cognitivism lurking in the claim that mature human cognition is conceptually structured helps alleviate the pressure to explain the full suite of human psychological capacities using only theoretical tools forged to deal with biological organization, sensorimotor interaction, or embodied coping.

Transformative embodied cognition does not jettison the conception of cognition as embodied interaction, or abandon the important insights of enactive, ecological and distributed approaches, but aspires to integrate them with work on the cultural and developmental contexts that shape human cognition.

Human immersion in culture transforms the structure of sensorimotor engagements by bringing about the communicability and negotiability of the meanings to which those engagements attune us. A rigorous interdisciplinary study of this transformation and its preconditions is not only possible—it is well underway.

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