

Do we reflect while performing skillful actions?

Automaticity, control, and the perils of distraction

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Abstract: From our everyday commuting to the gold medalist's world-class performance, skillful actions are characterized by fine-grained, online agentive control. What is the proper explanation of such control? There are two traditional candidates: intellectualism explains skillful agentive control by reference to the agent's propositional mental states; anti-intellectualism holds that propositional mental states or reflective processes are unnecessary, since skillful action is fully accounted for by automatic coping processes. I examine the evidence for three psychological phenomena recently held to support anti-intellectualism (choking under pressure, expertise-induced amnesia, and expert confabulation), and argue that it supports neither traditional candidate, but an intermediate 'attention-control account', according to which the top-down, intention-directed control of attention is a necessary component of skillful action. Only this account recognizes both the role of automatic control in skilled action, and the need for higher-order cognition to thread automatic processes together into a unified skillful performance. This applies to bodily skillful action in general, from the world-class performance of experts to mundane, habitual action. The attention-control account stresses that, for intentions to play their role as top-down modulators of attention, agents must sustain the intention's activation. Hence the need for reflecting throughout performance.

Keywords: skill, expertise, habit, attention, automaticity, control, utilization behavior, dual process

1. Introduction

Actions involving skill and expertise are particularly controversial. This is illustrated by the remarks of Niki Nakayama, an expert chef, about the way she works:

Cooking is the one thing that I feel I can completely trust what I'm doing. When I'm planning a dish, my mind is completely shut off. It's all based on feeling: 'this has to be here, this has to be here, this feels right here, this looks right here.' I think it's similar to that meditative state that people can get to, where they're not listening to their minds anymore, but it's just that moment.

In claiming that when cooking her mind is not involved, but rather that feeling guides the whole process, Nakayama suggests that skillful action does not require higher-order, reflective mental processes. Her description rather resembles Csikszentmihalyi's view of flow, a state in which "there is no need to reflect, because the action carries us forward as if by magic" (1990, 155). But Nakayama adds:

The best advice that I've been given was to never stop learning. Because the moment you give up and think you know everything, you're done as a chef.¹

If the expert's mind is shut off during performance, why must she keep learning? Learning something new, or altering overpracticed routines, requires effortful reflection, and this may hinder the subtle, feeling-based flow described earlier. So if experts must learn continuously, this suggests that the mind is more active in skillful action than previously suggested.

What is it, then? Is skillful action controlled entirely by feeling and intuition, or does it require some element of reflection? Recently, a number of psychological phenomena (*choking* or *yipping*; *expertise-induced amnesia*; and *expert confabulation*) have been cited as evidence that skillful performers need not reflect, and moreover, that reflection can harm skilled performance.²

¹ Nakayama's statements are from the documentary series *Chef's Table* (dir. D. Gelb).

² See Dreyfus (2012); Di Nucci (2013); Papineau (2013); and Brownstein (2014) for discussion.

Choking / the yips

Some researchers hold that skillful action requires reflecting because it counts as an intentional action only if the agent can articulately answer ‘Anscombean’ questions (like ‘What did you do?’ and ‘Why did you do that?’) about it.³ Against this view, Michael Brownstein has invoked a set of phenomena variously called “choking”, “the yips”, and “Steve Blass disease”:

Steve Blass was a hugely successful Major League Baseball player who inexplicably lost his ability to pitch. [...] Suddenly and inexplicably, he couldn’t even hit the catcher’s mitt from the mound. [...] The common interpretation is that Blass’ problem stemmed from something like chronic over-thinking. This is a common enough “disease” in profession sports to earn its own name.
(Brownstein 2014, 557)

This is not unique to baseball: similar (although perhaps relevantly different) cases have been reported in several sports and disciplines. Brownstein argues, however, that these phenomena have a common cause: yipping, choking, and the like are caused by over-thinking, i.e. by the reflective self-awareness necessary to answer Anscombean questions. Multiple studies seem to confirm Brownstein’s claim,⁴ which in turn supports the view that the fine-grained sensorimotor control of expert performance does not involve reflection, but is rather intuition-based.

Expertise-induced amnesia

The repeated practice necessary to acquire a skill seems to generate “expertise-induced amnesia”,⁵ a disconnection between what is done and what is accessible to self-report. Many expert testimonies corroborate this. Take basketball star Larry Bird: “[a lot of the] things I do on the court are just reactions to situations [...] A lot of times, I’ve passed the basketball and not realized I’ve passed it until a moment or so later”; Hall of Fame NFL running back Walter Payton: “people ask me about this move or that

³ Velleman (2008); Railton (2009); Annas (2011).

⁴ E.g. expert golfers who have been describing their technique need twice as many attempts to sink a putt than those who had previously performed an unrelated task (Flegal & Anderson 2008); expert golfers were more accurate when their attention was diverted from their own performance than when they were instructed to focus on it, while novice golfers presented the opposite pattern (Beilock et al. 2004).

⁵ Term coined by Beilock & Carr (2001).

move, but I don't know why I did something. I just did it"; and philosophical baseball catcher Yogi Berra: "Think? How can you hit and think at the same time?"⁶

Expertise-induced amnesia speaks against the view that control over skillful performance requires reflection. For, arguably, if an agent's behaviour implies a reflective process, some aspects of what she did and how she did it must have been accessed by working memory; and if so, the agent should be able to report them (since reportability and working memory seem to be closely linked).⁷ Thus, to the extent that agents should be able to explain why and how they do what they do reflectively, the unreportability of control processes suggests that skilled action control is not a reflective process.

Expert confabulation

Expertise-induced amnesia notwithstanding, some experts do produce reports about what they do and how they do it. But such reports often seem to be mistaken, because the rules experts believe to be following (about e.g. how and where to focus attention) turn out to misdescribe what they actually do. Cricket batters, for instance, are taught to always keep their eyes on the ball, and experts seem to believe they do just that. But eye-tracking evidence suggests that the more experienced a batter is, the less time her eyes spend focusing on the ball: the expert batter's eyes move quickly away from the ball, making a "predictive saccade" to the place where she anticipates the ball will bounce.⁸ The more expert the player, the faster the saccade; so expertise is inversely proportional to the time spent watching the ball.

Cases like this support the view that skill is inversely proportional to reflective reliance on explicit rules. Moreover, the fact that the performer's explicitly held rules and beliefs misdescribe performance suggests that the semantic content of her reflective intentions does not play a role in the fine-tuned control over her skillful automatic processes.

Do these three psychological phenomena show that the intelligence and control of skill is all about feeling and intuition, and that reflection has no part in skillful action? This essay argues that, when examined closely, the psychological evidence actually supports a very different position. But before moving toward

⁶ Brownstein (2014, 555–6) reports these and several other similar expert testimonies.

⁷ Beilock & Carr (2001). More on the link between reflection and working memory below.

⁸ Land & McLeod (2000).

an answer, it will be useful to sketch a map of the philosophical debate, and to make a few conceptual clarifications.

1.1. Mapping the terrain

Intellectualism and anti-intellectualism

I have portrayed the aforementioned psychological phenomena as going against the view that acting skillfully requires reflecting, i.e. deploying higher-order mental processes that involve states like intentions, beliefs, or desires. The most traditional form of this view, often called ‘intellectualism’, relates the intelligence of skill with propositional knowledge:

Intellectualism: if you are acting skillfully, then you are reflecting, because the mental manipulation of propositions is a necessary component of control over skillful action.

Intellectualists hold that the intelligence displayed by a skilled agent’s performance is fully accounted for by her manipulation of propositional knowledge. The paradigmatic version of propositional intellectualism is *Stanley intellectualism* (after Jason Stanley’s work), according to which acting skillfully implies reflecting because knowing how to ϕ skillfully is knowing that some way w —the way you actually ϕ —is a way for you to ϕ .⁹ Stanley intellectualism thus holds that knowing-how is reducible to a kind of knowing-that, and therefore that there is no radical difference between skillful action and other kinds of intentional action.

Another version of intellectualism is *Anscombeanism*: the view that performing a skilled action implies reflecting because it requires that you know what, why, and how you do what you do; and it also requires that you act on the basis of this knowledge, and that you are able to articulate propositional explanations if asked Anscombean questions of the kind “Why did you do that?”.¹⁰

⁹ See also Stanley & Williamson (2001); Stanley (2011); Stanley & Krakauer (2013). For discussion see e.g. Noë (2005); Fridland (2014).

¹⁰ For discussion of Anscombeanism, and a criticism of the Anscombean theories in Railton (2009), Annas (2011), and Velleman (2008), see Brownstein (2014). The label has been applied to this view by Brownstein, but nothing hangs on whether or not it portrays Anscombe’s original views on action and skill accurately.

Stanley intellectualism is committed to a form of Anscombeanism: it holds that skilled agents are able to answer Anscombean questions, even if their answers rely heavily on demonstrative terms. Thus, when asked “Why did you do that?” or “How did you do that?” in relation to some aspect of her bicycle riding, the skilled agent can reply “Because *this* is the way in which *I* ride my bicycle”, or “I did it *like this*”.¹¹ On the other hand, Stanley intellectualism demands that knowledge-how be reducible to propositional knowledge-that, but Anscombeanism need not. Thus, Stanley intellectualism is the most demanding of the two views, given its commitment to the reducibility of knowing-how to knowing that.

However, these intellectualist views sketched above share the view that propositional processes account for the intelligence of skill, for its fine-grained agentive control. Thus they stand against

Anti-intellectualism: reflection is unnecessary for skilled action performance. Automatic, intuitive, or feeling-based control is sufficient for controlling skilled action.

This view has been influentially proposed by Dreyfus, inspired by the phenomenological work of Merleau-Ponty, and recently defended by appealing to the aforementioned psychological phenomena.¹²

The attention-control account

But another account is possible. For skilled performance may require a higher-order, reflective process that is nevertheless not propositional. From a dual-process perspective on human cognition, it makes sense to distinguish between *automatic* or *intuitive processes* that can be performed independently from working memory, and reflective processes whose performance requires the use of working memory.¹³ Here ‘working memory’ refers to the set of cognitive capacities that allow for the mental manipulation of

¹¹ Thus, Stanley distinguishes between the propositional knowledge required to perform skillfully, and the propositional knowledge required to articulately explain the details of such performance. However, agents can provide propositional reports by relying on demonstrative terms.

¹² Versions of this position are endorsed by Merleau-Ponty (1965/1942), Dreyfus (2002), Dreyfus & Kelly (2007), Di Nucci (2013), Rietveld (2008a; 2008b), Klaassen et al. (2010), Brownstein (2014).

¹³ I take these definitions of ‘reflection’ and ‘intuition’ from Evans (2010a) and Nagel (2010). Notice that this dual-*process* approach is significantly different from coarser dual-*system* approaches. (On the general outlook, and the difference between dual-system and dual-process accounts, see Evans (2008; 2010b); Evans & Stanovich (2013). On the concept of working memory, see Baddeley (2007).)

task-oriented representations.¹⁴ Tasks of relatively little complexity (e.g. recognizing a friend's face or solving '2+2= __') can be performed automatically or intuitively, but tasks of any considerable complexity (e.g. solving the Tower of Hanoi puzzle) require working memory. Whenever the agent must inhibit task-irrelevant stimuli to stay focused on task-relevant stimuli; sustain the activation of multiple items to combine or transform them; or change the rules under which the manipulation of such items is performed—in all these cases, working memory is required. Crucially, non-propositional tasks can be cognitively complex, simply because they require simultaneously manipulating multiple representations, inhibiting task-irrelevant stimuli from diverting attention away from task, or changing the way representations are processed. Additionally, reflective processes imply cognitive effort, because they require going beyond simply producing prepotent (or default) automatic responses to current environmental features, and instead threading multiple cognitive and behavioural processes toward the the performance of a task or the attainment of a goal.¹⁵

Thus, reflective processes (1) are higher-order mental processes that structure and coordinate multiple lower-order, automatic processes toward the completion of a goal; and therefore they (2) imply the sustained activation of the goal's representation. Add to this that reflective processes (3) require exerting some cognitive effort, since executive functions are costly mental operations; and (4) need not imply the manipulation of propositions, since there can be non-propositional cognitive complexity (as in mentally rotating a complex object or sustaining attention despite distracting forces). In short, reflection is required whenever our intuitive, automatic mental processes are insufficient for successful task performance, because multiple automatic processes must be unified and coordinated. This conception of reflection can give rise to an alternative account of skill:

The attention-control account: if you are acting skillfully, then you are reflecting, because performing a skilled action requires that throughout performance your attention is structured by a higher-order, performance-related intention.

¹⁴ There are broader and narrower notions of working memory. Here I use the term in its broad sense, which is coextensive with the executive functions (for discussion see Diamond 2013), and broadly coincides with Toner et al.'s (2015) "cognitive control".

¹⁵ On the link between reflection and cognitive effort, see Diamond (2007); Evans (2010a).

The account will be further specified in light of available empirical evidence, but here is a preliminary description. Take ‘intention’ here very minimally, simply as a (propositional or nonpropositional, conceptual or nonconceptual) representation of the agent’s goal. This intention can be a detailed step-by-step plan, or a pictorial or motor representation of the goal. This account thus differs from intellectualism, because the reflective process that explains skillful intelligence is not necessarily propositional, or even conceptual. But the account is also different from anti-intellectualism, since it states that a reflective, higher-order process must be invoked to account for the intelligence of skill. According to the attention-control account, skilled action requires the deployment of effortful, top-down cognitive control processes whose function is to structure and coordinate multiple lower-order (perceptual, mnemonic, affective, motor) processes toward the attainment of the represented goal. This coordination process involves the deployment of working-memory resources, and because of this there is a necessary component of skilled action that is not susceptible to automation, so that skilled action always requires the agent’s reflective engagement in what she is doing. This necessary higher-order cognitive element implies that accounting for the intelligence of skill requires referring to some reflective process, although not necessarily a propositional one.

Thus the attention-control account stands in a middle ground between intellectualism and anti-intellectualism: it claims that much of the online control in skilled performance is attributable to automatic and intuitive processes, but it holds that the reflective process of continuous attention control is also necessary to account for the flexibility of skillful agentive control. Given its middle-ground position, it seems a good candidate for preserving what is best from both sides. I argue below that, when examined carefully, the available evidence supports the attention-control account.

1.2. On the notion of ‘skill’

Skill and automaticity

The precise meaning of ‘skill’ is part of what is at stake here, but it seems clear that having a skill implies having automated the performance of some cognitive or sensorimotor sub-routines through practice. Thus, skillfully ϕ -ing implies that certain components of ϕ -ing have become automated, or ‘chunked’, and are thus performed without recruiting working memory. (E.g. skillfully typing these words implies

having automated the processes that associate specific letter strings to specific finger movements, so that I no longer reflect about finger movements while writing each word).

Automaticity is thus necessary for skill. But it does not seem to be sufficient, because not all acquired automatic associations would qualify as skills (e.g. those that constitute implicit biases, or mere associations between ideas). What else does skill need, then? At least an element of control is required, to unite automatic routines into a coherent performance and perform online performance corrections and adjustments. Skilled agents are able to fine-tune each of their body movements to the particular situation, direct their attention to exactly the relevant features, and make multiple precise corrections on the fly.¹⁶ The crucial question is: what cognitive processes underlie this control? Anti-intellectualists hold that only automatic, intuitive control can account for such fine-grained, fast-paced control, and that online reflection about these processes would lead to choking. Intellectualists would hold that mere automatic control cannot sufficiently explain the broader coherence and precision of world-class, expert performance. The task ahead is establishing which view is more strongly supported by evidence and argument.

Kinds of skills

‘Skill’ and ‘skilled action’ are quite ambiguous terms. It seems unlikely that the skills involved in my tying my shoelaces, a cricket batter’s batting, a physician’s reaching a diagnosis, and a chess player’s planning a strategy, all share some common essence. I will thus focus here on sensorimotor skills involved in bodily performances, like sport and dance, which seem like more of a unified class, and are traditionally considered most favourable for anti-intellectualism.

Skill and expertise

Some researchers understand skill as a continuum between novices and experts, and thus conceive of expertise as nothing but the highest degree of skill.¹⁷ Others think skill and expertise are qualitatively different, general skill largely consisting in automatic dispositions (and therefore susceptible to

¹⁶ Fridland (2014).

¹⁷ E.g. Logan (1985); Dreyfus (2002); Brownstein (2014).

stagnation), expertise including online reflective guidance toward continuous improvement.¹⁸

Intellectualists tend to support a qualitative distinction, whereas anti-intellectualists lean towards a quantitative distinction. It is important not to presuppose either view. Rather, the question whether differences between skilled and expert performers are quantitative or qualitative is an empirical one, so the views (and, through them, intellectualism and anti-intellectualism) can be put to the test in the light of available evidence.

2. Reflection and skilled performance: Interpreting the evidence

2.1. Choking, The Yips, and the focus of attention

According to Brownstein, choking, or the yips, reveals that “performing skilled actions well stands in an inverse relationship to self-focused awareness” (2014, 557). A performer’s reflecting on her ongoing behaviour, in a way that would allow her to answer Anscombe questions, hinders skillful performance. But let us take a step back: it is unclear whether ‘choking’ and ‘the yips’ are the same thing, different phenomena with common underlying causes, or independent conditions. Moreover, if the phenomena have to do with reflective over-thinking, it is unclear what it is that people are reflectively thinking about when they suffer from these problems, and whether the effects occur when people reflect on some features but not when on others. So more clarity is needed.

2.1.1. *Clarifying the terms*

On the eve of the 1994 soccer World Cup, a certain team was among the competition’s favourites: they had a brilliant set of players at the peak of their careers, and showed top-level performances in the qualifying games, famously beating another favourite 5–0. But when the moment of truth came, they failed. Actually, ‘failed’ does not do it justice. They flopped horrendously, going back home after a painful group-stage elimination. This was a clear case of choking under pressure, in the psychologists’ sense of

¹⁸ Annas (2011) and Montero (2015) make distinctions along these lines. Papineau (2014) proposes an analogous difference between practice (where the performer may automatically go along with the motions) and competitive performance (where the performer must keep stay focused on the task to seek any possible advantage).

the term: a performance that is below what is expected, given the agent's skill level, in a high-pressure situation (i.e. a situation where the agent feels that performing well is highly important).¹⁹

There are two main theories about why skilled performers choke under pressure.²⁰ Explicit monitoring theory holds that high pressure leads the agent to closely and reflectively monitor previously automated aspects of performance, thus disrupting automatic control and leading to performance breakdown. Distraction theory states that high pressure causes the agent to reflect on aspects extraneous to her task (e.g. the outcomes at stake), which thus occupy attentional and working-memory resources, thereby disrupting performance. Each theory points to a different relation between reflection and choking: the former suggests that reflective focus on the task leads to choking; the latter, that reflective focus on the task is required to avoid choking. So which one is right?

Both are, apparently. Two different kinds of pressure have two different effects on attention, which in turn cause two different performance failures. DeCaro et al. (2011) showed this by distinguishing between two kinds of pressure—the pressure of being monitored by others, and the pressure of high-stakes, performance-dependent outcomes—and distinguishing between two kinds of tasks—reflective tasks (which rely heavily on working memory), and intuitive tasks (which do not)—. They found that the pressure of being monitored tends to hinder intuitive task performance, but not reflective task performance, whereas outcome-related pressure has the inverse effect, disrupting reflective task performance and not intuitive task performance. This suggests that the pressure of being watched can lead agents to direct their attention to automated aspects of performance, thus hindering automatic control (as explicit-monitoring theory would suggest), while outcome pressure can lead agents to direct attention away from the task at hand, thus also hindering performance (as distraction theory would hold). Of course, both kinds of pressure can coexist, like when you are playing at the World Cup—and in those cases both kinds of performance failure can occur simultaneously.

This finding suggests that 'choking', 'the yips', and the like actually refer to at least two distinct phenomena. Papineau (2014) helpfully suggests that, although both phenomena are instances of what he calls "Not Having Your Mind Right", they deserve distinct names and explanations. I follow him in using "The Yips" for cases of performance failure due to directing attention to automated components of an action, and "Choking" for cases of performance failure due to diverting attention away from an action.

¹⁹ Baumeister (1984); Beilock & Gray (2007).

²⁰ Beilock & Carr (2001); DeCaro et al. (2011); Montero (2015).

Also illuminating is Papineau's (2014) version of the distinction between basic actions (behaviours that you can directly decide to perform without having to decide to do anything else), and the components of basic actions (behavioural routines that are constitutive parts of a basic action and have become automated through practice). There are many conceptions of 'basic actions' in the philosophical literature, so it is worth clarifying the specific sense at play here. The basic action / action component distinction is agent-relative: the same behaviour (e.g. riding a bicycle) may be the former for one agent and the latter for another. This is largely because skill and practice modulate what a given agent can perform as a basic action: to me, riding a bicycle is a complex action if to do so I must focus on maintaining my balance, keeping the handlebar straight, pedalling constantly, etc.; but after sufficient practice these sensorimotor routines get 'chunked', and I can focus on just riding my bike, without explicitly choosing to perform any of them. I can still explicitly decide to keep my balance or steer the handlebar, but this would now be different from simply riding my bike: I can just choose to do the latter without choosing to do the former; and when I do so I perform a basic action.

It seems to follow from the above discussion that directing attention to the action's components harms performance, while not focusing on the basic action also does. And given this, the evidence seems consistent with the claim that skilled agents must keep attention away from action components, but focused on their intended basic actions: focusing on action components leads to loss of fine-grained automatic control, and ultimately to Yipping, while taking focus away from the basic action leads to distraction, and ultimately to Choking.

When action components are brought into focus, fast and fine-grained automatic control is interrupted by slow, coarse-grained reflective control. This seems consistent with famous yipping cases, like those of Chuck Knoblauch, a New York Yankees second baseman who became unable to throw to first base, or Mackey Sasser, a catcher who could no longer throw the ball back to the pitcher, both usually interpreted as paradigmatic cases of Steve Blass disease (Blass himself became unable to hit the catcher's mitt from the mound). These are cases of losing control over tasks that are relatively simple, and initiated by the agent. The Yips affects performers whose function is initiating plays (e.g. pitchers and catchers in baseball or bowlers in cricket), but the condition is notoriously absent from responsive aspects of performance (like batting in baseball and receiving in tennis) and continuous action sequences (like most of soccer). One can see how the pressure of being watched may lead someone to Yipping: knowing others are waiting for me to make my move, I may worry about getting the

specific performance parameters right, which would lead me to reflectively direct my attention towards them just before I execute them, to check whether they are right.

Choking is notably different. The cause of losing focus on the task at hand seems to be a failure to inhibit task-irrelevant features of the practical situation (like worries about what will happen if I fail, or whether I might get injured again), leading to the relevant features being ‘lost in the noise’. While one may advise a Yipping-prone performer to let herself go and not think too much, proper advice against Choking would be to concentrate on what you are doing, to keep your eyes on the ball and your head in the game.

2.1.2. Do these phenomena support anti-intellectualism about skill?

Evidence for The Yips, Choking, and their causes, does not seem to support anti-intellectualism. The Yips is consistent with it, since it shows that performers should avoid trying to reflectively control action components while performing (although they may do so while practicing, e.g. while trying to correct or recalibrate a given gesture), and so, to the extent that performance is controlled automatically it is not explainable by reference to propositions or reflective processes. But Choking suggests that automatic control of action components, although necessary, must be subordinated to higher-order reflective processes of attention guidance. This speaks against anti-intellectualism and in favour of the attention-control account.

In this respect, Choking is analogous to slips, like when I leave the office intending to drive to the candy store, but end up driving home instead. When I slip, my behaviour is intentional and displays automatic control, no doubt, but the basic action’s overall unity dissolves because I fail to structure my attention in relation to my intended overarching goal, thus becoming unable to unify multiple threads of performance into the basic action I intended to perform.²¹ Analogously, when performers lose focus on their overarching strategy (perhaps because menacing and stressful thoughts overload the top-down control of attention), this leads to distraction, and ultimately to performance failure. Such lack of diachronic attention control can cost performers crucial points, or the whole game. But more radically, it can make the unity that characterizes skilled action dissolve into a pattern of incoherent, albeit controlled, automatic processes.

²¹ For a philosophical analysis of slips along these lines, see Amaya (2013).

So skilled action performance requires not only forming an intention, but also sustaining the activation of one's intention, since when the goal representation (i.e. the intention) is no longer active, its ability to structure attention dissipates, and exogenous forces may lead to distraction, and subsequently to slipping or Choking.²² Moreover, the more pressure there is on the agent to perform, the more reflective control seems to be needed, in order to avoid distracting forces from dissipating attention. Simply letting automaticity take control seems insufficient for skilled action performance, mainly because skilled performance situations are often crowded with distracting forces (like fans expectantly looking at you, fans of the other team yelling nasty things at you, your own worries about ability or future outcomes, exhaustion and bodily pain from recent performances, sheer nervousness, etc.) that may easily capture attention. In order for attention not to be captured by task-irrelevant features of the situation, it is necessary for the agent to exert continuous, effortful cognitive control to sustain the activation of her goal representation, so that this representation directs attention toward task-relevant features.²³

Now, what about everyday, familiar, habitual skilled actions? I would probably need to reflectively control attention in order to avoid distractions and win the World Championship of Knot Tying, but do I need reflective control of attention to tie my shoelaces? The more habitual and routine the skilled action is, the less clear it is that reflection must be so involved. Section 3 below addresses this issue.

2.2. Expertise-induced amnesia

2.2.1. *The anti-intellectualist case*

Anti-intellectualists hold that the routine automation implied by skill acquisition causes skilled agents to develop “expertise-induced amnesia” with respect to the way they perform their actions. Since anything

²² As discussed further below, this view has many commonalities with Wayne Wu's account of intentions as structural causes of action. However, when Wu discusses slips as potential counter-examples to the theory (2011, 63), he holds that slips “plausibly result from failure of attention”. This seems only partly correct: in slips, as in Choking, attention fails because it loses its structure; but this is originally caused by the agent's failure to reflectively sustain the intention as an active representation. This then originates the failure of attention. Thus, in order for intentions to structure attention, the agent must not only form the intention, but also keep it actively in mind. This is—I argue—one of the crucial reflective aspects of skilled action.

²³ Again, this goal representation may be propositional or nonpropositional. So evidence for Choking does not directly support propositional intellectualism.

accessible to working memory is presumably available for subsequent declarative report, experts' inability to report what they do or how they do it suggests that the cognitive processes that control performance are working-memory independent.²⁴ And given the link between working memory and reflection, the lack of reportability suggests skilled action is controlled automatically rather than reflectively.

This has suggestive empirical support. Beilock et al. (2002) studied the performance of novice and expert golfers while putting, and their reportability. Participants were asked first to list all the elements of a typical putt, and later to list all the specific steps they themselves had taken in performing their last putt. While experts gave overall longer generic descriptions of the steps involved in putting than novices, the generic descriptions of experts were much longer and more precise than their episodic descriptions of their own putt. In fact, the shortest of all episodic descriptions were those of experts. This supports the existence of expertise-induced amnesia: although experts have a large store of general explicit knowledge about their skill, what exactly they do while performing, and why and how they do it, is less accessible for them than for novices.

2.2.2. Intellectualist replies

To begin, it is worth noting that Beilock's studies do pose a challenge to intellectualism. Against Anscombeanism, the studies show that more skilled performers seem less able to reflectively access information about the what and why of skilled performance (as measured by their ability to provide a list of the steps taken to perform the skilled action) than novices. Stanley Intellectualists can reply that the propositional knowledge of expert agents may be reportable only in demonstrative statements like "You do it like this" or "This is the way I do it"; and so, it is no surprise that experts cannot express their knowledge in more detailed propositions. The appeal to demonstratives does offer a way out, but the fact that experts can offer detailed explicit reports about general ways in which one performs the action, but are unable to offer equally detailed reports about their own ways of performing the action, is an issue that remains to be accounted for. After all, if their propositional knowledge about ways to act can be expressed only via demonstratives, then why can they express their general knowledge about ways one acts in demonstrative-free propositions? Moreover, given that they can report general knowledge about putting

²⁴ Beilock & Carr (2001).

via demonstrative-free propositions, shouldn't they have a similar capacity to produce non-demonstrative reports of their own ways of putting?

The issues that emerge for intellectualism do not apply, however, to the attention-control account, because its main claim (that skilled agents must sustain a representation of their goal so that relevant environmental features become salient and irrelevant stimuli are inhibited) is compatible with experts having limitations in reporting what subroutines they perform and why they do so. Moreover, and more importantly, the evidence for expertise-induced amnesia is rather inconclusive.

A problem with taking Beilock's experimental findings as evidence for the nature of expert action concerns the very definition of 'expertise'. Beilock's studies assume a gradual conception of the skill-expertise distinction, calling those participants with higher degrees of skill 'experts'.²⁵ This begs the important question whether experts are just highly skilled agents, or whether expertise is qualitatively different from skill.

Barbara Montero defends the latter. She takes experts to be "those who have practiced their skill in a thoughtful, critical manner on a near daily basis for at least around 10 years and are still practicing their s[k]ills in such a way" (2015, 386). Understood this way, Beilock's experiments do not reveal the nature of expertise, because none of its participants are true experts. We still do not know whether professional experts would be able to produce detailed descriptions of the steps they took to produce their putt had they participated in Beilock's experiment.

On the other hand, the argument from expert reports like those mentioned above, being merely anecdotal, is not very solid on its own. But it looks even less so when contrasted with the expert reports found in studies that use retrospective methods (like diaries and verbal recollection) to find out what professional athletes think about while performing at the top level. When asked how they coped with pressure, it was found that "the most effective coping strategies that were used on a frequent basis were increasing concentration on task and increasing effort".²⁶ To maintain high-quality performance in

²⁵ They define the contrast between novices and experts differently in several experiments. In this case, *novices* were participants with no previous golf experience, and *experts* were "local high school and college students with 2 or more years of high-school varsity golf experience or a Professional Golfers' Association (PGA) handicap less than 8". (2002, 1214).

²⁶ Nicholls et al. (2006).

high-pressure situations, athletes report relying on “positive monitoring” strategies (such as “I focus on what I should do” and “I make sure that I work harder”).²⁷

Such reports seem to counter those in which experts claim not to know the whys or hows of their performance. It is likely that experts are unaware of why and how they structure their action components the way that they do (such structuring processes largely consisting in automatic-associative responses to the practical environment’s solicitations), but one thing experts seem aware of is that to perform consistently in high-pressure situations they must make an effort to stay focused on what they are doing. That experts describe skilled performance as effortful both physically and mentally suggests that expert action requires the reflective, executive control of attention. Experts may be unaware of why and how they structure their action components during performance; but they seem aware that in order to be able to do it, they must keep their focus on the action they intend to perform. Thus, expert reports suggest that, in order to cope with pressure, experts effortfully sustain the activation of their intended goal, so that their attention is directed at task-relevant features of the environment and they can therefore structure their sensorimotor sub-routines in accordance with the intention’s representational content.

From this perspective, attention-control theorists can counter the anti-intellectualist interpretation of the statements of Larry Bird and others. They need not be taken as evidence for the view that skilled action control consists solely in automatic, intuitive, feeling-based control. Bird’s claim that many things he does in the court are but reactions to the situation may be taken to mean that when he is in the right mindset (i.e. focused on performing) he does not seek to reflectively control action components; Payton’s statement that he does not know he does what he does can be taken in the same sense; and in claiming that you cannot think and hit the ball at the same time, Berra may mean that you must focus only on what you are doing: hitting the ball.

2.3. Expert confabulation

2.3.1. *Evidence for expert confabulation*

Not all experts remain silent when asked what they do and why they do it. Those who do talk about this often mention rules they claim to follow, some of which have been found to misdescribe what they

²⁷ Oudejans et al. (2011); cf. Montero (2015).

actually do. Strong evidence for such expert confabulation comes from the aforementioned study of cricket batters, which suggests that the popular ‘Keep your eyes on the ball’ rule—endorsed by many batters and coaches—does not coincide with what skilled performers actually do. Instead of following the ball, highly skilled performers perform predictive saccades to move the gaze ahead of the target, or catch up with it.²⁸

Additionally, cricket training emphasizes the importance of watching the ball at the precise time of hitting it. This is particularly unlikely, given the high speed at which the ball travels. Batters have been found to track the ball during the first 0.2 seconds after it is released, leave it behind to make the predictive saccade, then vaguely follow it as it approaches the bat, but ultimately lose sight of it near the end of its trajectory.²⁹ Furthermore, predictive saccades make functional sense, since they help the batter predict the ball’s trajectory, thereby increasing likelihood of contact. So experts seem wrong in reporting that they keep their eyes on the ball, that they do so at the crucial time of striking it, and even that doing it is what should be done.

2.3.2. “Expert”? “Confabulation”?

That said, Land and McLeod’s study seems susceptible to the same kind of terminological objection as those of Beilock and colleagues: ‘experts’ are roughly understood as ‘those participants with the highest degree of skill’.³⁰ This assumes a merely quantitative difference between skill and expertise, but it risks not finding qualitative differences between them due to the lack of top-level experts. Would world-class performers reveal the same performance pattern?

Mann et al. (2013) tested this by comparing elite performers (players with some of the highest historical records in the game) with highly-skilled club-level performers (who play at local cricket clubs). They found a couple of relevant traits proper to elite performers. First, only elite players follow

²⁸ There is evidence that this (i.e. using predictive saccades instead of directly following the ball) occurs not only in cricket (Land & McLeod 2000; Croft et al. 2010): baseball (Bahill & LaRitz 1984), table tennis (Ripoll & Fleurance 1988), and soccer (Savelsbergh et al. 2002) performers seem to do it too.

²⁹ Land & McLeod (2000, 1342). See also Bahill & LaRitz (1984); Ripoll & Fleurance (1988).

³⁰ Participants were “Mark, a professional cricketer who has opened the batting for Warwickshire; Charlie, a successful amateur who plays Minor Counties cricket for Oxfordshire; and Richard, an enthusiastic but incompetent amateur who plays low-level club cricket” (2000, 1345). Of course, objections concerning sample size could also be raised.

the ball with their heads, even if not with their eyes, throughout the whole trajectory in such a way that the ball stays in the same position relative to egocentric space; the ball may not be still in the expert's visual field, but it never leaves her visual field. Second, their eye movements are also unique: they make not one, but two predictive saccades, first toward the place where the ball may bounce, then toward the place where the ball may make contact with the bat. Crucially, the second saccade enables elite performers to see the ball as they hit it, much more reliably than club-level performers. Mann and colleagues compare elite batters' capacity to follow the ball with their heads to a "miner's torch" (2013, 6): imagining they had one, the light from their torch would continuously illuminate the ball throughout its entire trajectory. This ability seems to give elite players an advantage: it simplifies the cognitive problem of establishing the ball's trajectory, since the ball's position remains constant in egocentric space relative to the head; so, since they already know where (in egocentric space) the ball will be, all they need to figure out is when the ball will reach them.

The 'when' is then specified by the second predictive saccade. In fact, yet another crucial difference between the two groups in the study is that elite batters moved their eyes so that they were always looking either at the ball or ahead of the ball, whereas the eyes of club-level batters sometimes lagged behind, and had to make saccades to catch up with it. So only elite saccades truly deserve the name 'predictive': they anticipate the key moments and places of the ball's trajectory.

Land and McLeod concluded that skilled batters do not keep their eyes on the ball and fail to see the ball as it was hit, and that there is no "systematic difference" in eye movement between skill levels (2000, 3142), all of which would support expert confabulation. But the elite batters study puts all that into question. For one, it reveals that explicit coaching advice and performance rules are rather consistent with actual top level practice, since world-class batters (and only they) "keep their eyes on the ball" in the sense that they continuously keep the ball within their visual field, and actually look at the ball when they hit it. If other cases of bodily expertise are similar, reported rules and performance may be much more consistent than previously thought. Further empirical evidence is required to test this claim, but the available evidence of world-class expert performance speaks *against* expert confabulation.

Additionally, the study reveals qualitative differences between real experts and merely skilled agents: first, only experts reliably watch the ball as they hit it; second, only experts make two predictive saccades (one to predict the ball's bounce, the other to predict the ball's point of contact with the bat)

whereas skilled players make just one; third, merely skilled players often make non-predictive saccades (to try and catch up with the ball), but experts never do that. Thus it is not just that experts are better at attending; they structure their attention differently.

It may be argued that, while the behaviour of experts does not reveal confabulation, that of merely skilled performers does. After all, the latter are not following their own explicit rules: they do not keep their eyes on the ball, and do not watch it as they hit it. However, these rules are not about what they actually do, but about what they *should* do. Thus, from a failure to conform to them we should conclude that their performance only imperfectly approximates to the norm, rather than that their rule misdescribes their actual performance.³¹

In sum, there are reasons to doubt that the available evidence for expert confabulation proves the existence of confabulation in real experts; and there also are reasons to believe that when top-level experts are included in the sample there are qualitative differences to be found between expertise and skill.

3. The attention-control account of skilled action

After assessing the evidence for Choking and The Yips, expertise-induced amnesia, and expert confabulation, empirical support for anti-intellectualism does not seem so solid. In fact, these phenomena support the alternative view that continuous reflective focus on one's action is necessary for acting skillfully. This section offers a general articulation of the view, and tackles the question whether it also applies to non-expert skilled agents, to non-competitive situations, and to everyday, habitual action.

3.1. The two roles of reflection in skilled action

Evidence shows that while reflecting on the automated components of an action is harmful to performance (leading to Yipping), allowing focus to drift away from the basic action itself also harms performance (leading to Choking). This suggests that reflective focus on basic actions plays a key role in

³¹ It should also be noted that (1) although the evidence above suggests a qualitative difference between expert and skilled performers, it remains an open empirical question to what extent the qualitative difference claim is generalizable to other skills and activities. Also, (2) a qualitative leap between skilled performers and experts is compatible with merely quantitative differences between novices, amateurs, and highly skilled performers. The qualitative expertise-skill difference may depend on a particular devotion and commitment to the activity that is proper to experts, and lacking in other performers, whose skill levels may differ in merely quantitative measures, e.g. practice time.

unifying its multiple action components. Further, although experts often claim ignoring why or how they do what they do, they seem to be clear about the fact that in order to do it they must make efforts to concentrate on what they are doing, especially when under pressure. This further reinforces the view that reflection's attention-structuring role is key to the performance of skilled action. Finally, and despite appearances, recent evidence from world-class experts does not support expert confabulation, rather revealing that the general attention-orientation pattern of elite performers coincides with their explicit reports, suggesting a connection between the way attention is structured and explicit intentions.

From this reconsideration of psychological evidence emerges the view that the top-down, intention-directed modulation of attention plays a necessary role in the production of skilled action. The higher-order intention of performing a skilled action structures the performer's attention, and this enables lower-level automatic routines to unfold and mesh together properly, constituting the overall structure of the basic action the agent intends to perform.

Wayne Wu (2015) and Ellen Fridland (2014) have recently defended similar accounts, which may be expressed thus:

The attention-control account (I): if you are acting skillfully, then you are reflecting, because performing a skilled action requires that your attention is structured by a higher-order, performance-related intention.

However, this version does not sufficiently account for successful skilled action performance, because an intention may fail to effectively structure attention, giving way to Choking or other forms of distraction-related performance failures. In fact, even after the agent has formed an intention, performance situations can be rife with distractions to the point of rendering the intention incapable of modulating the attentional and motor sub-routines required for performing skillfully. Higher-order intentions have the power to "reconfigure" the patterns of intuitively-controlled sensorimotor subroutines; but if, after forming her intention, the agent leaves these subroutines to themselves (leaves them in auto-pilot, so to speak), then the overarching intention's power to modulate attentional and motor automatic routines may be interrupted by a distracting thought (say, a concern about the game's outcome or the agent's posture) or a feature of the environment that is not relevant to the action at hand, but is able to powerfully capture the agent's attention (screams from the haters, flashing camera

lights, etc.). As Papineau (2013, 189) writes, “when a long-term intention is formed, it reconfigures the basic [i.e. automatic] action-control system [...]. But this then means that the actual execution of the intention will be subject to the vicissitudes of the basic action-control system”. These vicissitudes mainly being the possibility of it responding to non-relevant situational features.

Thus reflection must play two roles in skilled action:

- (1) structuring and coordinating multiple lower-order, automatic processes toward the completion of a represented goal; and
- (2) continuously sustaining the goal’s representation.

The evidence suggests that (1) is necessary for the performance of skilled action because, although action components can be performed automatically without the involvement of higher-order processes, threading action components together into a coherent basic skilled action requires higher-order processes. But if (1) is necessary, then (2) is also necessary, because when the intention fades mid-performance the agent is susceptible to endogenous attentional capture leading to Choking, slips, and similar cases in which the overarching intention can no longer successfully modulate automatic attentional and sensorimotor automatic processes. The need for reflective processes to unify intuitive subroutines into basic actions, along with the intended action’s representation to be sustained throughout performance, leads to

The attention-control account (II): if you are acting skillfully, then you are reflecting, because performing a skilled action requires that your attention is structured by a higher-order, performance-related intention, whose activation is sustained throughout performance.

This account of skillful action raises several questions. Perhaps expert agents need reflection in some extreme performance circumstances, but how far does this need extend? Papineau (2013), for one, accepts both (1) and (2), but considers that they are necessary only in competitive situations: skilled agents need not be so strict about forming and actively sustaining their intentions while practicing or simply having fun. Moreover, anti-intellectualists might argue that (1) and (2) amount to adding otiose elements to the explanation, since past training, automated routines and the normativity of automaticity can in most cases do all the explanatory work: top-level expert performances aside, skillful

agentive control is no more than properly trained, norm-sensitive automatic routines that are appropriately chunked by prior experience.

The next two sections assess (3.2) whether the need for reflection extends to merely skilled (non-expert) actions and practice situations, and (3.3) whether habitual skillful actions require reflection too.

3.2. Why and when is continuous reflection necessary?

3.2.1. *Non-expert, skillful action: Telling affordances and solicitations apart*

What happens, then, if we descend from the level of world-class competitive performance to that of merely skillful action? Consider this example. When playing soccer with my good friend Lucho, a great number of the situation's aspects could activate many different automatic-associative behaviours, since my practical context is crowded with affordances (taken here as 'action possibilities that a situation's features present to a skillful agent').³² Seeing Lucho in the field affords reaching and chatting with him. But he happens to belong to the opposite team, and has just scored a goal, so noticing him around also elicits frustration and affords punching him. The acute soreness in my left foot affords taking the shoe off and taking a break. The dog running around the pitch affords petting. The water bottle next to the goal affords drinking. And the warm, sunny weather affords tumbling on the soft grass. My soccer skills (assuming I have any) also afford a set of potential moves conducive to a good performance.

Of all these possible sensory, affective, and motor affordances (to which I can intuitively respond given my past habituation and automatic control capabilities), how do I distinguish what is relevant from what is irrelevant in the moment? In more technical terms, how do I distinguish between mere affordances and *solicitations* (Dreyfus & Kelly 2007)? Affordance theorists acknowledge that this is "an urgent open research question" (Rietveld & Kiverstein 2014, 340), and attempt to provide bottom-up explanations (Rietveld 2008b). Yet a crucial lesson from the above discussion is that, even at the highest levels of skill, swift discrimination between relevant and irrelevant affordances is hardly possible, if at all, without the top-down modulation of attention on the basis of an occurrent higher-order intention. If I am to intuitively notice and respond to the soccer-based affordances, then they

³² I thus adopt a relational conception of affordances (Chemero 2003; Rietveld & Kiverstein 2014): affordances are relations between a situational feature (or aspect) and an ability or skill of the agent's; hence they are intrinsically normative, given that responding to them implies a proper or improper activation of a skill.

must appear in my experience as more attractive and alluring than the chatting, punching, petting, resting, etc. affordances (otherwise my automatic response processes will detour from the task at hand: playing soccer). And if the former are to appear as more attractive and compelling than the latter, my attentional experience has to be structured so that the former are primed and the latter are inhibited. Thus, I have to employ some level of effortful cognitive control to stay focused on playing soccer, and stop soccer-unrelated affordances from diverting my attention from the task at hand.

This seems to invite an objection: in affordance-rich environments like those of human skillful action, agents would face the potentially infinite reflective task of inhibiting a myriad task-unrelated affordances before they can intuitively respond to the situation.³³ But this jump to infinity is unnecessary: I need not inhibit each task-unrelated affordance individually; rather, I must keep in mind some representation of my goal, however minimal, and this alone has the required downstream attentional effect of priming task-related situational features and inhibiting task-unrelated features. Priming the ones and inhibiting the others turn out to be two sides of ‘inhibitory control’, one of the key functions of working memory (Baddeley 2007).³⁴ Given this, reflection (in the form of both the sustained activation of a goal representation, and the subsequent top-down modulation of attention) is necessary for skilled action performance. Only through these reflective processes can the relevant features of the situation acquire the special glow, the mandatory character that “carries me forward as if by magic” (to use Csikszentmihalyi’s expression), or that “summons” the correct response from me (in Dreyfus’ words). If attention was not hierarchically structured by a goal representation, all affordances would remain equally attractive, and so no affordance would really be all that attractive.

Rietveld and Kiverstein hold that “what we can call the ‘demand character’ or ‘solicitation’ of the affordance is related to the individual’s current *concerns*”, so that “affordances that command an agent to act on them here and now” are like “the door handle that invites pulling when we *wish* to enter a closed

³³ I thank an anonymous *Philosophical Psychology* reviewer for raising this point.

³⁴ It is therefore crucial that sustained goal representation causes *both* the priming of task-related features *and* the inhibition of task-unrelated features. Munakata et al. (2011) argue that actively representing one’s current goal (a task associated with prefrontal-cortex areas) has a double downstream effect: (1) the *direct inhibition* of neural activity in subcortical areas that would interfere with the task, and (2) the *direct excitation* of goal-related neural activity, which then outcompetes—and thereby *indirectly inhibits*—potentially distracting neural activity. This is how sustaining a goal representation can trigger the top-down modulation of attention.

room” (2014, 341–342; my emphases). Thus, even at the relatively low-order level of skillful coping, having some goal representation is a crucial aspect of relevance discrimination. If no goal is activated, the agent would have no way of distinguishing relevant from irrelevant, affordance from solicitation. (A documented case of this is utilization behavior, discussed below.)

3.2.2. *Cognitive effort and the need for sustained intention activation*

From this standpoint, anti-intellectualist descriptions of skilled action seem incomplete. Take Merleau-Ponty’s classic description of a player’s experience on the field (1942/1965, 168–169):

For the player in action the football field [...] is pervaded with lines of force (the ‘yard lines’; those which demarcate the ‘penalty area’) and articulated in sectors (for example, the ‘openings’ between the adversaries) which call for a certain mode of action and which initiate and guide the action as if the player were unaware of it. [...] The player becomes one with [the field] and feels the direction of the ‘goal’, for example, just as immediately as the vertical and the horizontal planes of his own body.³⁵

This vivid description does away with reflection’s role in skillful action by mentioning only the task-relevant lines of force, and remaining silent about any others. But complex environments like a football field are usually pervaded with way too many lines of force, calling for way too many responses that could guide behaviour in all sorts of incoherent directions. Automatic control over the action’s subroutines is necessary to explain why the fields of force guide the action as if the player were unaware. But automatic control alone cannot explain why only the relevant lines of force guide skilled action, while action remains unaffected by irrelevant lines of force. The need to inhibit such lines of force, and prime only those that are task-relevant, is the reason behind the recognition of experts that they must effortfully concentrate on what they are doing in order to do it: they might otherwise explode in anger and attack the opponent, take an untimely pause, go yell at some fans of the opposite team, keep celebrating the last goal for way

³⁵ Rietveld and Kiverstein (2014, 334) offer a more recent variation on the theme: “In acquiring a skill the individual becomes increasingly expert at responding adequately and appropriately to the actions a particular situation invites. He or she becomes progressively able to perform both skillfully and unreflectively without giving the matter of how he or she should act any thought. [...] He or she acquires a finer and finer capacity for discriminating between situations and for discerning the different types of action appropriate to the details of these situations.”

too long, have an emotional meltdown... or simply miss crucial but subtle perceptual and proprioceptive cues that enable the fine-grained guidance of motor behaviour.

The aspect of skilled action that remains unexplained by anti-intellectualism is the capacity to perform such inhibitory selection in the face of a myriad distracting affordances, such that action components actually add up to a basic action instead of a bunch of disconnected automatic routines. Skillful action needs reflection because orchestrating multiple (sensory, cognitive, and motor) automatic processes toward a unified action requires the top-down modulation of attention. In this context, Wu's (2011) suggestion that intentions are not mental events that play their causal role before action is produced (like a standard causal model would have it), but rather structural causes synchronic with action that guide it as it unfolds, is quite useful. According to Wu, the set of possible perceptual and mental inputs and the set of possible behavioural outputs constitutes a "behavioural space" populated with a multitude of possible mappings between inputs and outputs available to the agent. Intentions (broadly construed, i.e. goal representations) structure the agent's behavioural space by priming the links between the relevant sensory, mnemonic, affective, and motor possibilities to be more easily activated, while inhibiting the activation of irrelevant inputs and outputs. In Wu's account, acting amounts to appropriately solving "Many-Many Problems", i.e. successfully linking the relevant inputs and the relevant outputs, where what counts as 'relevant' is determined by the intention's representational content.

Novel theories of skilled action have emphasized the importance of intentions structuring attention, solving Many-Many Problems, and displaying agentic control.³⁶ But when it comes to skillful bodily actions, displaying such control and solving such Problems is not performed instantaneously: initiating action leads to changes in the perceptual environment, and these changes often imply attentional and motor adjustments. The more complex the action, the more online adjustments have to be made, and therefore the more susceptible action is to breakdown due to distracting affordances. Thus, in order to traverse the entire input-output trajectory, and perform the necessary online guidance and correction of said trajectory, the agent must continuously sustain her intention's activation throughout the duration of her action.

By means of top-down cognitive control, skilled agents keep their goal's representation in mind, thus structuring their attention so that the activation levels of automatic association patterns are

³⁶ See Sutton et al. (2011); Papineau (2013; 2014); Fridland (2014; 2015); Shepherd (2014); Wu (2015).

modulated, the relevant sensory features become salient and linked with the relevant affective and motor routines, and the irrelevant features become inhibited. Continuous activation of my intention is the missing piece in the explanation of how higher-order, conscious intentions are able to modulate deeply automated behavioural routines. It is what allows me to avoid hugging or punching Lucho while in the field (after the match I may do both), and instead anticipate his motions, steal the ball from him, and make a crucial pass to one of my teammates.

So even when playing just for fun, skillful agents need some continuous, top-down control of attention. This is more forcefully the case when agents intend their performance to lead to some improvement. Something that characterizes expert performers is their tendency to continuously seek new knowledge and techniques, to not get stuck on the same way of doing things, and therefore to avoid fully automating their performances. Toner and colleagues (2015) have shown (both empirically and theoretically) that satisfying this continuous drive for improvement requires that experts exert effortful, deliberate attention control also during practice sessions.

3.3. Habitual action and the perils of distraction

If the above is correct, the role of intentions as top-down attention modulators is crucial for skillful action performance. But what about habitual, everyday actions? In tying our shoelaces or commuting through the same old road, we seem to display many skills, but do we need more than automatic control to produce such modest, perhaps even mindless, actions?

Some escape this problem by claiming behaviours like shoelace-tying are too ‘behaviour-y’ to count as intentional.³⁷ Others resist that strategy:

Are there cases of spontaneous activity that, while plausibly classified as intentional, do not involve anything reasonably identifiable as an intention to act? If you unexpectedly throw a ball to me I might reach up and catch it. I catch it intentionally, but perhaps my catching it involves no intention to do something. (Bratman 1984, 395 n. 26)³⁸

³⁷ E.g. Annas (2011); Wu (2011, 62).

³⁸ Montero also seems to be a part of this group. She rejects the view that reflection interferes with expert skilled action, but is doubtful about whether to reject the view that reflection would interfere with “highly automatized, everyday skills” (2015, 112).

An expert fencer is standing with her niece in a toy store. At some point, the niece picks up a toy sword and pretends to lunge at her aunt who now automatically, reflexively, perhaps playfully moves in a way that expresses her training in respect of lunges with sharp implements. I don't think we need to postulate an intention to play with her niece here. The fencer acts skillfully but without explicit intention. (Wu 2015, 20; emphasis mine)

These are skillful, intention-independent sensorimotor behaviours which lack top-down reflective control (there is no intention at the top modulation), but are clearly intelligent, displaying subtle automatic control. They also seem intentional, since they are effective sensorimotor responses to felt tensions.³⁹ The crucial question is: are they also cases of intentional action? Here is a plausible strategy to advance toward an answer: the behaviours that concern us are

- *intentional*, since they display normativity of automaticity in dissolving felt tensions;
- *skillful*, since they constitute subtle ways of interacting with features of the environment acquired through practice;
- *intention-independent*, since this intentional automatic control takes place without being recruited by a higher-order intention (or any other reflective process).

Call these behaviours '*irreflective automatic skills*'. The question now is: do they intentional actions? If there are counterexamples (i.e. cases of irreflective automatic skills that fall short of intentional action), then we should conclude that reflection-independent, automatically controlled behaviour is insufficient for producing intentional actions.

I believe such examples exist: patients of a neurological condition called utilization behaviour seem to meet the description. They respond immediately to any of the situation's present affordances, and have lost any apparent sensitivity to broader practical concerns.⁴⁰ Thus, for instance, they continuously turn the light on and off when standing near a light switch; if they see a comb they may start combing their hair, regardless of who owns it; if they find themselves in a bedroom they may undress and go to bed, even if

³⁹ On the automatic normativity of felt tensions, see Rietveld (2008a); Brownstein & Madva (2012); Rietveld & Kiverstein (2014).

⁴⁰ Pandey & Sarma (2015). The condition was initially reported by Lhermitte (1983). It is often linked with frontal lobe lesions, but the specific compromised locations vary significantly across patients (see Iaccarino et al.'s (2014) review for discussion). See Pacherie (2007) for an analysis of the phenomenology of utilization behavior.

they are just visiting someone; and so on. Moreover, patients seem unaffected by the awkwardness generated by their behaviour: they seem to lack sensitivity to context, and nevertheless when asked why they do these things, they tend to provide short (and interestingly exogenous) rationalizations like ‘I thought this was the thing to do’ or ‘I thought you wanted me to do that’.

Utilization behaviour patients, while responsive to affordances, are arguably insensitive to the comparative relevance of different affordances. The cause seems to be that the condition’s associated neural damage disrupts the system in charge of generating endogenously-driven behaviour, i.e. of producing and sustaining intentions (with the aforementioned downstream inhibitory effects). The patient can properly respond to affordances that capture her attention (she can correctly execute the skillful behaviour called for by the environmental feature), but she cannot modulate these responses on the basis of internally generated priorities or motivations.⁴¹ In that sense, their behaviour seems to be entirely constituted of slips: complex routines that respond to environmental stimulations, but not to an overarching intention. Contrasting normal agents with utilization-behaviour patients, Rietveld writes:

When the perceptual process of online tuning to relevant stimuli works smoothly, for example in skillful absorbed coping, even stimulus-driven action is to some extent an instance of endogenously-driven behavior, because *the sensory system ignores irrelevant stimuli and contributes to the perception of currently relevant stimuli*. Our rapid unreflective responsiveness to affordances in absorbed coping probably has this relevance-tuned perception-action loop at its core. (Rietveld 2012; my emphasis)

Thus the capacity for everyday skillful coping is based on the ability to ignore environmental features that are potentially significant, but irrelevant given current goals. It therefore requires prior goal-based differential attributions of relevance. Rietveld calls this behaviour “rapid unreflective responsiveness”, probably taking ‘unreflective’ to mean ‘independent of calculation or deliberation’ (cf. Rietveld 2008b). And he is right to do so: *contra* intellectualism, skillful coping does not require calculation, deliberation, or the manipulation of propositions. But, *contra* anti-intellectualism, it does require that the agent exert some cognitive control (however slight) to keep the goal she seeks to realize actively in mind throughout

⁴¹ Lhermitte (1983) claims that “[t]he tactile, visuotactile and visual presentation of objects compels the patients to grasp and use them”, and stresses the point that behaviours are performed “without any internal motivation”.

the duration of her action. Agents who cannot keep their endogenously-generated intentions activated for a sufficiently long time (utilization behaviour patients seem to be an extreme case of this inability) can no longer perform this top-down control over their attention; and if they cannot do this, they lose even their ability to engage in meaningful skillful coping.⁴²

To move toward a conclusion, consider that utilization behaviours are in a sense correct: they involve skillful manipulations of objects which display successful automatic control (patients successfully comb their hair, turn the lights on and off, etc., and they can correct for unexpected environmental variations). They also count as intentional in the sense that they are alleviations of intuitively felt environmental tensions or appropriate responses to affordances. And they are devoid of endogenous motivations and intentions. They are, therefore, examples of irreflective automatic skills. That said, due to their utterly exogenous character, rather than calling them ‘actions’, it seems more appropriate to call them reactions to the environment’s affordances, environmentally-driven automatic responses based on attentional capture rather than on endogenous motivation.

But if we refuse to call these cases of irreflective automatic skills ‘actions’, why should any other irreflective automatic skill be considered such? There is no clear difference between utilization behaviour, slips, Wu’s fencing aunt, and Bratman’s ball-catcher.⁴³ All these behaviours seem equally exogenously generated. Merely automatic control may generate intentional behaviour (like the expert

⁴² The standard cognitive account of utilization behavior follows Shallice et al.’s (1989) work in attributing the the former to a failure of the top-down inhibitory system, stemming from frontal lesions. So far inhibitory function impairment is the leading explanation (e.g. Frith et al. 2000; Archibald et al. 2001; Pacherie 2007; Garry 2013; and Iaccarino et al.’s 2014 review), although alternative accounts remain possible. Besnard et al.’s (2011) “social hypothesis” provides a noteworthy dissenting voice, although their study paradoxically reports a significant correlation between utilization behavior and executive function impairment: perhaps the best available evidence for the inhibitory-control reading. (Their conclusion deviates from the inhibitory-control interpretation because the correlation no longer holds for *EDS* (“environmental dependency syndrome”, the conjunction of utilization behavior and imitation behavior). But this might speak against the validity of *EDS* as a construct, rather than against the inhibitory account of utilization behavior.)

⁴³ Bratman and Wu’s cases are tricky, because interpretation depends on framing. If the fencer’s response to her niece’s lunge is “playful”, as Wu describes it, it may count as endogenously-driven, in the sense that it partakes in the familial bond between them. Likewise, in catching the ball that you throw at me, I may be replying to your playful gesture, or move in a defensive response to your sign of aggression. So to the extent that action attribution depends on the situation’s description, the cases are still up for grabs. Theoretically, however, the distinction seems clearer: skillful behaviour counts uncontroversially as skillful action to the extent that it stems from the modulation of attention generated by an actively sustained intention.

fencer's automatic response to her niece's lunge), but it fails to generate intentional action properly speaking. For something to be an unambiguous case of skillful action, it has to be 'endogenously driven' by an actively sustained intention. On the other hand, for minimally complex agents in minimally complex environments, producing endogenously-driven behaviour implies the ability to focus on some environmental features and disregard others.⁴⁴ This is a task impossible to perform without a minimal capacity for the goal-oriented control of attention. To the extent that such processes count as 'reflection', performing skilled actions—of even the most habitual, everyday, apparently mindless kind—requires some degree of reflective cognitive control.

It follows that distraction (understood roughly as the capture of attention by goal-irrelevant affordances leading to exogenously generated behaviour) is inimical to skillful action. Utilization behaviour is an extreme case of distraction. Slips, procrastination, failures of self-control, and mind wandering are less radical versions which, when mild enough, do not destroy intentional action, but when sufficiently potent, can lead to the disruption of goal-structured behaviour. The more long-term and complex the goal, the more easily disrupted by distraction.

Conclusion

What emerges from the above discussion is the view that a proper account of the intelligence of bodily skill cannot reduce it to propositional knowledge of the ways in which I act, or the ability to answer Anscombean questions about performance; but cannot reduce it to lower-order automatic control processes either. The proper account of the intelligence of skill has a necessary top-down (albeit not necessarily propositional) component, namely the capacity to modulate attention by actively sustaining a higher-order goal representation. This higher-order component is necessary not only for competitive expert performance, but for skillful action more generally (from expert practice to habitual, everyday skillful actions). This *attention-control account* can make Niki Nakayama's claims consistent: while performing, the expert's mind is silent about how to perform and why—but it concentrates on performance itself. This way of structuring attention allows her to learn continuously; indeed, continuous learning and practice may be a necessary consequence of the constant focus of attention on the task at

⁴⁴ Cf. Wu (2011).

hand, in the sense that the refinement of attention is likely to lead to discovering novel nuances and action possibilities.

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