

Getting Sophisticated: In Favor of Hybrid Views of Skilled Action in Expertise

Author Information

Spencer Ivy
University of Utah, Department of Philosophy
Salt Lake City, Utah – USA
Spencer.ivy@utah.edu
<https://orcid.org/0000-0002-6890-9312>

Abstract

The long history of research and debate surrounding expertise has emphasized the importance of both automaticity and intelligent deliberation in the control of skilled, expert action – and often, their mutual exclusion of one another. To the contrary, recent developments in the cognitive science of skill implicate the likelihood of a third, hybrid line of interpretation and a new path forward. This paper surveys these recent developments, arguing that hybrid models of expertise and skill are the most fruitful way forward in interpreting and conducting research on experts. I categorize a new set of interpretations of skill as ‘sophisticated hybrid models’ owing to the fact that they deny the mutual exclusion of automaticity from intelligent action control. I then argue that this interpretive strategy is the most fruitful way forward to making clear much of the complexity of skilled action and expertise.

Keywords: Expertise, Attention, Automaticity, Skill, Action

Essay Word-Count: 2942

Document Word-Count (including references and title page): 3893

INTRODUCTION

The contemporary understanding of the phenomenology and cognitive architecture of expertise diverges at a point of disagreement concerning the extent to which experts act automatically (anti-intellectualism) or are rather in strict cognitive control of their performances (intellectualism). It is often argued that expert action is based on the expert's use of superior knowledge and focused attention when coping with the task at hand. On this intellectualist view, it is because experts are both able to perceive and conceptualize to a degree unfathomable by the non-expert that their actions are so impressive and successful. In opposition to these arguments, anti-intellectualists claim that it is precisely the absence of deliberately focused attention on the task at hand that yields results. Or, in other words, although expert knowledge is *instrumental* to expert performance, it is only so in the same way that landing gear is instrumental for a plane's taking off the ground. Once in the air, the plane no longer needs its wheels and is precluded from having a smooth flight as long as they remain out. Thus, experts are able to proceed *automatically* to reliably produce desired outcomes within their domain of expertise *because* they are disposed to use their expert knowledge without concurrently thinking about it. These two camps typically understand themselves to be opposed to one another; each citing and interpreting their own evidence for their respective claims that either automaticity or cognitive activity impedes expertise. However, as both the cognitive science and philosophical work on expertise shows, is that expertise is a *complicated* phenomenon. In this paper, I argue that each of these camps focuses on a single feature of expertise, mistaking that feature to be its essential one. And as often happens in debates concerning complex human phenomena, the rigidity of a theory that affords conceptual parsimony likewise (in)conveniently ignores its countervailing evidence. Consequently, I argue that models which aim to blend the intellectual and anti-intellectual camps are superior to alternatives. Further, I suggest that a particular brand of hybrid view is the most fruitful for modelling skilled action in expertise – a model I call the *sophisticated hybrid view*.

I. THE CONTEMPORARY STATE OF PLAY

It is popularly believed that when we are at our very best, we become lost in our actions. Our bodies and minds are absorbed into our surroundings as if we were one with the world about us. We lose our sense of self, of time, and of ego – finding instead an immediacy of Being in joyful activity without thought or worry beyond the afforded requirements of the task at hand. The phenomenon is often called 'being in the zone,' or 'in the flow' and has roots in both academic and popular culture. Eugen Herrigel, for instance, writes in his famous monograph *Zen and the Art*

of Archery, that in order to become a master archer, one must cease to be present in one's activity and allow "the bow to shoot itself." Similarly, empty-mindedness is often taken to be a paramount virtue in the psychology of sport. The athlete at their very best does not think; they *just do it* (a concept so intuitively apparent that it fuels Nike's famous tagline).

It's a pretty thought, and one that is often intuitively aligned with personal experiences of expertise. But are these popular accounts correct in claiming that optimal expert performances are mindless ones? There are plenty of recent *anti-intellectualist* views in the philosophy of cognitive science that argue in the affirmative (Ratcliffe 2007, Masters & Maxwell 2008, Di Nucci 2013, Brownstein 2014, Bergamin 2017). On its face, there is much that is empirically appealing for a view of expertise that places a heavy importance on automaticity for skilled action. For instance, 'expert induced amnesia' is a phenomenon often cited as evidence of an action's automatic mindlessness. Experts can have trouble reporting on what they did after the fact due to a lack of active working memory employed during complex task performance. Additionally, 'the yips' or 'choking' is an often-cited reason why experts ought not to think while they perform. In high-pressure situations too much thought is said to get in the way of action and can become paralyzing (Masters 1992, Beilock & Carr 2001, Papineau 2013, Dreyfus 2013). Hence, it is supposed that experts get in their own way when they over-cogitate as they act.

Yet, just as commonly as you might find the foregoing arguments present in the anti-intellectualist literature, their objections and re-interpretations are equally common in the *intellectualist* literature (see Montero 2016, Bermudez 2017, Christensen 2019 for differently thorough responses). Intellectualists of skilled action reinterpret the stories told by the empirical data presented above. In doing so, they tend to forward one of two types of argument. They either argue that conscious action controls are ubiquitous in skill (experts are *always* thinking), or otherwise they discount mindless actions without conscious controls as non-expert (thinking is a necessary condition for skill). For instance, Carlotta Pavese (2020) argues that actions are encoded with corresponding instructions so that if an instruction is given, its associated action will be performed. Experts are able to perform complex sets of actions with relatively little cognitive effort by 'chunking' together associated actions under the heading of a simple instruction as, for instance, in piano playing. To the expert pianist, individual notes are often categorized together as chords which, in synchrony, grow into motifs and phrases, and may then even evolve into entire melodies and periods. The expert pianist only requires a practical instruction for one of these holisms to set its tune in motion (See also (Stanley & Krakauer, 2013) and (Krakauer, 2020) for interesting legion-studies revealing a similar necessity for propositional

instruction in complex task control). Consequently, intelligent conscious effort is a necessary condition for action control generally – especially as actions grow increasingly complex as in the case of piano playing.

Even so, if conscious propositional content is required to instruct or guide the control of complex actions, there is nothing that, in principle, would invalidate the possibility of an action that *follows* a propositional instruction being automatic. An instruction could be given to perform a series of chunked actions which, between instructions, would flow fluidly and automatically (Bergamin 2017). When the original instruction was complete, the next action would likewise need a new propositional or *practically represented* instruction (Pavese 2020). And further still, if automaticity can act as an inhibition to success, surely this is only when it's taken to the extremes of mindlessness; as one might fall into autopilot on the long highway commute home from work. But again, the extreme cases of mindlessness shouldn't invalidate the potential utility of fluidly performing automatic actions for experts – especially when (automatically) done *responsibly*. At least theoretically, automaticity and intelligent conscious control in skilled action need not run against the grain of the other.

Researchers who share these intuitions forward *Hybrid* views of skilled action. For example, *Dual Process* models claim that expertise involves an optimal interplay of both mindless performance and active conscious decision making through two distinct action forms. According to the dual process theorists, *Type 1* actions are fast, automatic, nonconscious, intuitive, and independent of cognitive ability. On the other hand, *Type 2* actions are slow, controlled, conscious, rule-based, and correlated with cognitive ability (Stanovich 1999, Kahneman 2011, Evans & Stanovich 2013). Both Type 1 and Type 2 actions play an essential role in expert performance according to different dual process models. The *Default Interventionist* model, for example, has it that experts, by default, operate in a type 1 mode until they become unable to solve a problem or overcome an obstacle. Once troubled out of their zoned-in, automatic Type 1 actions, the expert thinks through their problem in Type 2 until they are able to default back to acting automatically (Furley 2015; Papineau 2013).

Like the anti-intellectualists, dual process theorists would agree that optimal expert performance is dominated by type 1 action. And, like the intellectualists, dual process theorists also agree that conscious controls are necessary to guide and instruct the expert through complex challenges that outstrip the scope of an expert's predispositions for type 1 performance. Part of expert performance is being faced with complex, novel challenges that their background set of engrained behaviors cannot always account for. To respond to these novel challenges as they arise, and then to

subsequently continue on towards success, is as impressively *expert* as mere elegant type 1 fluidity (at least, for the dual-process theorist). Hence, the dual process theorist takes the best of both anti-intellectual and intellectual models and argues that they are compatibly contained under the concept of skilled action.

II. GETTING SOPHISTICATED

Common to all of the foregoing arguments and interpretations of skilled action is an intuition that automaticity and intelligent conscious control (or type 1 and type 2 actions) are mutually exclusive with one another. In the cast of anti-intellectual views, the expert must excise their intelligent control in favor of automaticity to exercise skill. For the intellectualist, it is the opposite. The dual process theorist takes the best of both worlds and says that sometimes skillful actions are automatic, and sometimes they are intelligent. The intuition dates at least as far back as some of the very first research in the field. Schiffrin & Schneider (1977) drew the spectrum of skilled action along a scale bounded by automaticity on one end and conscious control at the other (see also – (Fitts & Posner 1967, Anderson 1982, Tenison & Anderson 2015)). According to these views, when consciously controlling an action, it is not automatic. Further, the benchmark for skill is to automatize more and consciously control less. Hence, the more automated and less intelligently controlled a skill is, the more expert its performer will be.

The foregoing intuition that skill is dichotomously split between the mutual exclusion of conscious and automatic action control rests at the heart of the anti/intellectual debate. But the intuition has its problems that new hybrid views, which I shall distinguish as *sophisticated hybrid models* of expertise, take issue with. Ellen Fridland (2015, 2017), for instance compellingly argues that automaticity in skilled actions should not be thought of as mindless or *unintelligent* as the intuition implies. She states that some automatic processes “bear robust, systematic relationships to personal-level contents” and that just because a state of mind during automatic action is not strictly conceptual, does not likewise mean that the action is necessarily *mindless*. Even if an action is (automatically) performed without the conscious representation of a direct intention to act as such, the action’s sensitivity to and causal history in intelligent, identity-specific states raises it a cut above a mere unintelligent, ballistic mechanism. Consequently, she proposes a new class of *intelligently automatic* actions that operate somewhere in the middle of propositionally instructed actions and mechanically ballistic ones.

This idea – that automatic actions can be sensitive to identity-specific states and intelligent conscious controls – is a popular one for sophisticated hybrid model theorists (Fridland 2015, Montero 2016, Levy 2017, Shepherd 2017).

According to one such view, Christensen (2016) argues that skilled action is best characterized by what he calls a ‘*Mesh*’ model in which most of what an expert does is intelligently automatic. According to the Mesh model, “controlled and automatic processes are closely integrated in skilled action, and cognitive control directly influences motor execution in many cases (43).” Similarly, Myolopoulos (2020) highlights the *flexibility* of automatic actions in response to environmental stimuli as evidence of those actions’ sensitivity to intelligent controls. “Motor mechanisms flexibly adapt to ongoing changes in the environment in a way that does not conform to a pattern of brute reflexes.” The upshot of these views is that intelligence and personal-level attitudes influence and guide actions that proceed automatically even when conscious cognitive controls are not explicitly (re)present(ed). Yet, however automatic they may be, those actions are not only sensitive to an expert’s cognitive controls, but also importantly send feedback to the expert so that they may decide how best to continue performing (see also, Bermudez 2017). The result is a *sophisticated* hybrid model for skilled action claiming that experts have the capacity to flexibly perform using as much conscious control as is necessary to fluidly cope with the challenges that they are met with – and this flowlike engagement is neither ballistically mindless nor intentionally rigid, though sufficiently automatic.

There are (at least) three significant strengths that these sophisticated hybrid views of skilled action have over their predecessors. The first is that the sophisticated accounts are able to make sense of the automatic fluidity of an expert’s performance without falling in to the trap of thinking that all fluidly automatic actions must be unintelligent. The second, similar to the first, is that these accounts are able to make sense of empirical data collected from experts that are otherwise confounding to their less sophisticated counterpart models. For example, studies on elite athletes have shown a significant effect of anticipatory cognitive states on near-instantaneous behaviors (Muller & Abernethy 2012, Loffing & Hagemann 2014; Murphy et al. 2016; Runswick et al. 2018). Runswick (2018) found that elite cricket batsmen perform significantly better than novices in response to pitches when given as little as 80ms of time to anticipate how the ball would travel over the plate. This incredibly small amount of time is not enough to propositionally anticipate, decide, then swing the bat. Rather, the anticipatory judgment influences the batters’ swing only after the swing had been initiated: “Final judgment may not occur until after a response action [a swing] has had to be initiated with these movements being initiated in such a way that they can be updated based on later predictions.” In such an instance, there is no way that the expert could consciously represent the correct instruction to act before adjusting their swing to the ball within the 80ms window; there is just not time. However, the superior performance of the experts compared to that of novices is indicative of an *intelligence* at play in their *automatic* swinging which

causes adjustments within the fraction of a second that batters are given. Dual process and anti-/intellectual models of skilled action would be confounded by such a result – it’s unclear where the automatic ends and intelligent control begins. Further, the whole sequence of action-anticipation-adjustment involves elements of automaticity and intelligent control, all of which add up to a single skillful performance. In contrast, *sophisticated* hybrid models have conceptual tools at their disposal to explain the expert batsmen’s adjustments.

The third benefit is that the sophisticated hybrid models, like their predecessor dual process models, ‘zoom out’ on skilled action and are less conceptually exclusive than anti-/intellectual views. What I mean by this is that the invocation of ‘skilled action’ need not be specific to a particular action form (e.g. beginning to swing automatically, or making an anticipatory judgement, or adjusting ones swing to the anticipatory judgment), but may rather be considered a characteristic of the expert’s performance on the whole (i.e. the whole process of swing-anticipation-adjustment). The intelligent and the automatic work together through a skilled *performance* in varyingly dominant degrees of control. Sometimes actions are more automatic than intelligent (e.g. the effect of 80ms of anticipation on batting) and other times actions are more intelligent than automatic (e.g. the calculations of a chess grandmaster under time control). The important criteria of skill in action then, and consequently also in expertise, is just that the two strategies are in enough sync with one another to render high level performances fluid, flexible, and successful on the whole.

III. WRAPPING UP

The simple matter of fact is that expertise is complex – as complex as there are domains of activity for which someone can be considered an expert. All sorts of domains of expertise require different strategies. Chess grandmasters competing in classical over the board competitions are incredibly *cerebral* in their action control (de Groot 1978). Expert radiologists skimming through hundreds of images in just seconds are incredibly *mechanical* in the automatic movements of their eyes seeking targets (Kundel 2007, Drew 2013, Ivy 2021). Yet even within domains, the strategies that experts employ can change. The same chess grandmasters competing in speed-chess must rely far more heavily on *intuition* than conscious calculation. Likewise, radiologists who don’t find targets right away *shift* out of their dominantly automatic processing to slowly and methodically investigate areas of interest (Nodine & Mello-Thoms 2000). Further still, even when performing the same task, experts with different sets of strengths may approach

success variably based on their particular abilities consistent with those strengths (there's more than one way to make an omelet).

Given the diversity of expertise and forms of skilled action, contriving of explanations for skill as '*necessarily* involving conscious effort' or vice versa, and otherwise discounting one action form or the other as 'non-expert' is simply unhelpful in the aim of coming to better understand expertise. For this reason, one of the great strengths of the new, sophisticated hybrid models is that they tend not to examine the qualities of any single action to determine if it should count as 'skilled.' Because they do not adhere to the dichotomous intuition, an action's automaticity, or conscious control is not the primary measure of its skillfulness. Rather, for a sophisticated account, the primary measure of skill has to do with how a holistic *series* of automatic and consciously controlled actions fit together to successfully respond to an environment of complexities. It is for this reason that we should rely upon sophisticated hybrid models in our future research on expertise: we get the best of both anti/intellectual worlds in a package that is sensitive to diversity in expressions of skill in action.

Works Cited

- Anderson, J. R. 1982. Acquisition of cognitive skill. *Psychological Review*, 89(4), 369–406.
- Beilock, S. L., & Carr, T. H. 2001. On the fragility of skilled performance: What governs choking under pressure? *Journal of Experimental Psychology: General*, 130(4), 701–725.
- Bergamin, J.A. Being-in-the-flow: expert coping as beyond both thought and automaticity. 2017. *Phenom Cogn Sci* 16, 403–424.
- Bermúdez, J. P. 2017. Do we reflect while performing skillful actions? Automaticity, control, and the perils of distraction. *Philosophical Psychology*, 30(7), 896–924.
- Brownstein, M. Rationalizing flow: agency in skilled unreflective action. *Philos Stud* 168, 545–568 2014.
- Christensen, Wayne & Sutton, John & McIlwain, Doris. 2016. Cognition in Skilled Action: Meshed Control and the Varieties of Skill Experience. *Mind & Language*. 31. 37-66.
- Christensen, W., Sutton, J., & Bicknell, K. 2019. Memory systems and the control of skilled action. *Philosophical Psychology*, 32(5), 692–718.
- Di Nucci, Ezio. 2013. *Mindlessness*. Newcastle, UK: Cambridge Scholars Publishing.
- Drew, Trafton, et al. “Informatics in Radiology: What Can You See in a Single Glance and How Might This Guide Visual Search in Medical Images?” *RadioGraphics*, vol. 33, no. 1, 2013, pp. 263–274.
- Dreyfus, Hubert. “The Myth of the Pervasiveness of the Mental.” *Mind, Reason, and Being-in-the-World: the McDowell-Dreyfus Debate*, by Joseph K. Schear, Routledge, 2013, pp. 15–40.
- Evans JSBT, Stanovich KE. Dual-Process Theories of Higher Cognition: Advancing the Debate. *Perspectives on Psychological Science*. 2013;8(3):223-241.
- Fitts PM, Posner MI. *Human Performance*. Brooks/Cole Pub. Co; Belmont, CA: 1967.
- Fridland, E. Automatically minded. *Synthese* **194**, 4337–4363 (2015).
- Fridland, E. (2017). Skill and motor control: Intelligence all the way down. *Philosophical Studies*, 174(6), 1539–1560.
- Furley, P. et al. “The two modes of an athlete: dual-process theories in the field of sport.” *International Review of Sport and Exercise Psychology* 8 (2015): 106 - 124.
- Ivy, S., Rohovit, T., Lavelle, M. et al. Through the eyes of the expert: Evaluating holistic processing in architects through gaze-contingent viewing. *Psychon Bull Rev* 28, 870–878 (2021).

- Kahneman, D. (2011). *Thinking, fast and slow*. Farrar, Straus and Giroux.
- Krakauer, J.W. 2019. The intelligent reflex. *Philosophical Psychology* 32 (5): 822–830.
- Kundel, Harold L., et al. “Holistic Component of Image Perception in Mammogram Interpretation: Gaze-Tracking Study.” *Radiology*, vol. 242, no. 2, 2007, pp. 396–402.
- Levy, N. 2017. Embodied savoir-faire: Knowledge-how requires motor representations. *Synthese* 194 (2): 511–530.
- Loffing, F., & Hagemann, N. (2014). Skill differences in visual anticipation of type of throw in team-handball penalties. *Psychology of Sport and Exercise*, 15(3), 260–267.
- Masters, R. S. (1992). Knowledge, knerves and know-how: The role of explicit versus implicit knowledge in the breakdown of a complex motor skill under pressure. *British Journal of Psychology*, 83(3), 343–358.
- Masters & Maxwell (2008) The theory of reinvestment. *International Review of Sport and Exercise Psychology*. 1:2. 160-183.
- Montero, Barbara. *Thought in Action: Expertise and the Conscious Mind*. Oxford University Press, 2016.
- Muller, Sean & Abernethy, Bruce. (2012). Expert Anticipatory Skill in Striking Sports: A Review and a Model. *Research quarterly for exercise and sport*. 83. 175-87.
- Murphy, Colm P., et al. “Contextual Information and Perceptual-Cognitive Expertise in a Dynamic, Temporally-Constrained Task.” *Journal of Experimental Psychology: Applied*, vol. 22, no. 4, 2016, pp. 455–470.
- Mylopoulos, Myrto. “The Intelligence of Motor Control By Myrto Mylopoulos.” *The Routledge Handbook of Philosophy of Skill And Expertise*, Routledge, 2020, pp. 258–268.
- Nodine, Calvin, and Claudia Mello-Thoms. “The Nature of Expertise in Radiology.” *Handbook of Medical Imaging*, edited by Richard Van Metter et al., vol. 1, SPIE Press, 2000, pp. 859–894. Physics and Psychophysics.
- Papineau, D. (2013). In the zone. *Royal Institute of Philosophy Supplement*, 73, 175–196.
- Pavese, C. (2020). The psychological reality of practical representation. *Philosophical Psychology*, 32(5), 785–822.
- Ratcliffe, M. (2007). *Rethinking commonsense psychology: A critique of folk psychology, theory of mind and simulation*. Palgrave Macmillan.
- Runswick. et al., 2018a O. Runswick, A. Roca, A.P. McRobert, A.M. Williams, J.S. North The temporal integration of information during anticipation. *Psychology of Sport and Exercise*, 37 (2018), pp. 100-108
- Shepherd, J. (2017). Intelligent action guidance and the use of mixed representational formats. *Synthese*.

- Shiffrin, R. M., & Schneider, W. (1977). Controlled and automatic human information processing II: Perceptual learning, automatic attending and a general theory. *Psychological Review*, 84, 127–189.
- Stanley, J., & Krakauer, J. (2013). Motor skill depends on knowledge of facts. *Frontiers of Human Neuroscience*.
- Stanovich, K. E. (1999). Who is rational? Studies of individual differences in reasoning. Mahwah, NJ: Erlbaum.
- Tenison, C., & Anderson, J. R. (2016). Modeling the distinct phases of skill acquisition. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 42(5), 749–767.