DOI: 10.1111/mila.12209

WILEY

ORIGINAL ARTICLE

Chess and the conscious mind: Why Dreyfus and McDowell got it wrong

Barbara Gail Montero

Philosophy Program, City University of New York, New York City, New York

Correspondence
Barbara Gail Montero, Philosophy Program, The CUNY Graduate Center, 365 Fifth Ave., Rm. 7113, New York, NY 10016.
Email: bmontero@gc.cuny.edu

Funding information
Research for this article was funded by a 2015–2016 National Endowment for the Humanities Research Fellowship (FB-57978-15).

Is it possible to deliberate consciously during a 1-min-per-player chess game? I argue that, in contrast to views of the philosophers Hubert Dreyfus and John McDowell, even 1-min-per-player chess games involve conscious thought and deliberation. In making my case, I rely on experimental results from two small-scale studies I conducted on chess players, chess players' first-person reports, and theoretical considerations that distinguish automatic skills from consciously controlled skills. This work bolsters Yu-Hsuan Chang and David Lane's 2016 study suggesting that simultaneous chess exhibitions and speed chess allow time for calculation. It also aims to inspire future, larger-scale studies investigating the role of declarative thought in 1-min-per-player games.

KEYWORDS
chess, chess intuition, consciousness, de Groot, Dreyfus, skill

1 | INTRODUCTION

Though not as drawn out as they used to be, tournament chess games unfold slowly. The standard amount of time allotted to each player is 120 min (90 min for the first 40 moves, followed by 30 min for the rest of the game), with an additional 30 s time delay per move from the start of the game. This permits players to think about the results of possible moves and then deliberately choose, recheck, and finally make the move that, given the long but still limited time, they have judged as best. Thus, chess, when it proceeds slowly, is a paragon of rational action.[1] But what happens during a lightning

[1] This is not an entirely uncontroversial view; for example, Dreyfus's account of speed chess informs his account of chess in general. However, it is widely accepted by cognitive scientists who research chess, and I defend this in Montero & Evans, 2011 and Montero, 2016. The current paper in part recounts, develops, clarifies, and at times reconsiders my research as presented in those two earlier works.

 © 2018 John Wiley & Sons Ltd

chess game, which allows a total of only 1-min-per-player per game and no extra time per move? Do players still have time to think when they play this fast? With 2 s left on the clock, can a player's actions be rational? Or in such a situation, is checkmate more like a trained reflex than a deliberate choice?

The question "what is the role of the mind in lightning chess?" is interesting in itself: how *do* they do it? But it also has a larger significance since chess is often seen as a test case for theories of skilled action more generally. Accordingly, understanding the role of deliberation and rational choice in lightning chess is thought to help us understand the role of these mental processes in everything from the highly practical, life-or-death skills of nurses to the less practical, though still enormously valuable, skills of musicians, from the muscularly taxing skills of the triathlete to the minimally muscular skills of the mathematician, from the everyday skills of the commuter driving to work to the highly trained skills of the elite race car driver ripping through the Indianapolis 500. "Chess is life," Bobby Fisher purportedly said, and the research on it brings this point home.

This larger goal of helping us to understand skilled action in general is what the philosophers Hubert Dreyfus and John McDowell hope to attain in their theorizing about the role of the mind in lighting chess.[2] According to Dreyfus (Dreyfus, 2013; Dreyfus & Dreyfus, 1986), a grandmaster's ability to play chess extremely quickly illustrates how expert, or high-level, action, at its best, occurs without engaging the conscious mind at all.[3] Other researchers have also used chess to illustrate a domain of skill in which intuition reigns supreme (Kahneman & Frederick, 2005; Klein, 1998). However, Dreyfus takes this idea further as he sees optimal chess, when played by the experienced player, as not even the product of the unconscious mind. Rather, in Dreyfus's view, although chess players analyze and deliberate over their moves in situations where they are not playing at their best, optimal chess is "nonminded" as it "depend[s]… not at all on analysis and comparison of alternatives" (2005, p. 53). Rather, he explains, "after much experience, the chess master is directly drawn by the forces on the board to make a masterful move" (2013, p. 35).[4] High-level chess, according to Dreyfus, is therefore bred neither in the heart nor in the head but out there on the 64-square board.

Dreyfus's nonminded world of optimal skill is governed by external forces, not reasons. Chess players, in his view, when playing well, do not make moves for a reason: they capture a rook, for example, not because they judge that this will lead to a more favorable position but because they are "drawn" to do so, because their relationship to the board "pulls" the move out of them. In contrast, McDowell's theory of expertise places reasons center stage. In his view, by the time we reach adulthood, all our actions are "permeated with rationality," by which he means, at a minimum, that the perceptions on which actions depend are conceptualized; they are perceptions of the world in a certain way, or with a certain interpretation (2007, p. 339). In catching a ball, for example, we might perceive the ball as high and to the right and as roughly the size of a grapefruit. In chess, we might perceive the board as "open" or a piece as

[2] I use the phrases "speed chess" and "lightning chess" to refer to 1-min-per-player games, as does Dreyfus in recent work. Such games are also sometimes referred to as "bullet chess" (by, e.g., Nakamura & Harper, 2009), although (as Nakamura and Harper point out) "bullet" is often used to refer to games that are less than 3-min-per-player in length.

[3] For simplicity of exposition, and with apologies to Stuart Dreyfus, I refer to (Hubert) Dreyfus's theory of skill, even when I am referring to work developed by both him and his brother Stuart Dreyfus. I thank Fernand Gobet (2012) for very politely and very indirectly showing me the importance of recognizing this omission, which in prior work I had failed to do. That said, I should also point out that Stuart, more recently, has substantially tempered his view expressed earlier with his brother (Dreyfus, S. E. 2014).

[4] Dreyfus does not deny, of course, that the brain sends messages to the appropriate nerves, which in turn spark a player's hand to move a piece. But not all neural processes are mental processes, and it is the mind, according to Dreyfus, that does not enter the picture.

"pinned."[5] In this way, according to McDowell, skilled action necessarily engages the mind; thus, chess, according to McDowell, is *minded.* For Dreyfus, in contrast, the perception–action pathway in optimal chess play does not need to pass through a stage of conceptualization. Rather, as Dreyfus puts it with respect to driving, "what must be done, simply is done" (Dreyfus & Dreyfus, 1986, p. 253).

As different as McDowell's and Dreyfus's accounts of skill are, they nevertheless agree on one point: that conscious thought, and particularly "explicit commentary (on the passing scene or on what one is doing)," hinders high-speed skills, such as those involved in playing lightning chess (McDowell, 2007). True, McDowell claims that an expert's actions are always done for a reason. However, he thinks that such reasons need not be conscious and, when it comes to speed chess, that they are never conscious or, at least, they are never conscious when one is playing well. During a 1-min-per-player game, he tells us, "chess master[s]…do not explicitly think [about their moves]… unless the flow is broken" (p. 46). Thus, in line with Dreyfus, McDowell tells us that the view that a lightning chess player "deliberates about what to do and acts in the light of the result…should be rejected" (McDowell, 2013, p. 47). In what follows, drawing in part from two small-scale informal experiments I conducted on lightning chess, and in part from chess players own thoughts on this issue as well as theoretical considerations about the role of the conscious mind in expert-level skill, I argue, in contrast to both Dreyfus and McDowell, that high-level speed chess players can and likely do consciously deliberate over their actions and that such deliberations appear to be compatible with optimal performance.

2 | EARLIER RESEARCH ON THE ROLE OF CONSCOIUS THOUGHT IN CHESS

Going at least as far back as Alfred Binet's (1893/1966) discussion of chess player Paul Morphy's incredible memory for games he had played, and with increasing vigor since Adrian De Groot's (1946/1978) archetypal research investigating differences between grandmaster and master-level chess thinking, psychologists have been probing the cognitive processes that underlie high-level chess skill. This literature makes it clear that conscious deliberation—in the form of calculating the outcomes of possible moves as well as strategizing—plays an important role in standard chess (De Groot, 1946/1978, Charness, 1981; Gobet, 1986, 1998; Saariluoma, 1995, Bilalić, McLeod, & Gobet, 2008). But it also makes it clear that "intuitive," or very quick insight—what allows highly skilled chess players to look at the board and immediately see a good move as well as to immediately narrow down the array of possible lines of play during deliberation—is also highly important (De Groot, 1946/1978, Klein, Wolf, Militello, & Zsambok, 1995, Campitelli & Gobet, 2004, Gobet, 2012). What exactly underlies these fast, intuitive processes is debated but is typically understood as a type of "pattern recognition," which in turn is thought of as an implicit, or nonconscious, process that allows chess players to see the board as sufficiently similar to board positions they have previously encountered (Gobet & Chassy, 2009; Chase & Simon, 1973; Newell & Simon, 1972).

That high-level standard chess players employ both intuitive and slow-thinking processes is uncontroversial; even Dreyfus accepts this. What is controversial is the relative importance of conscious deliberation compared to intuitive choice (see, e.g., Holding & Pfau, 1985; Gobet & Simon, 1996; Chabris & Hearst, 2003). Here, Dreyfus upholds the extreme view that slow thinking, when it

[5] An open board is one with relatively few pieces on it, allowing for much movement; a pinned piece cannot move without exposing a piece of higher value to attack.

occurs in high-level, standard time-control chess, provides assurance that one's intuitively generated choice is optimal, but it rarely leads to better moves: "quality of move choice" he tells us, "depends surprisingly little on anything beyond pure intuitive response" (Dreyfus & Dreyfus, 1986, p. 36). In the chess psychology literature, a related, though more moderate, position is captured by what has been referred to as the "recognition-action theory," according to which the most important factor differentiating higher- and lower-level play in chess is players' ability to immediately see good moves (Chang & Lane, 2016). In this theory, deliberation helps high-level players, but it is not nearly as important as the ability to instantly see the right move.

Support for the recognition-action theory has been thought to come in part from think-aloud studies, such De Groot's (1946/1978), which have found that, among very good chess players, the macrostructure of their search does not distinguish the weaker of this group (the candidate masters) from the stronger (the grandmasters). Some of these data have been questioned. For example, De Groot (1946/1978) comments that, even though his experiments did not uncover this, given sufficient time and motivation, stronger players are capable of searching both wider and deeper than less skilled ones (p. 320; see also Hearst, 1977), and data collected by Charness (1981), based on a think-aloud protocol, support this. Furthermore, a reanalysis of de Groot's original data by Reynolds (1991) suggests that there are differences unnoted by de Groot that indicate that grandmasters are more adept than less-skilled players in terms of their tactical thinking.[6]

The recognition-action theory, however, is also seen to derive support from analyses of grandmasters' level of play during standard chess compared to their level of play during speed chess that have been interpreted as revealing an insignificant decrease in skill from standard chess to chess played with abbreviated time controls (Calderwood, Klein, & Crandall, 1988); Burns, 2004), or at least a less-than-would-be expected decrease in skill (Gobet & Simon, 1996). Because limiting one's time for a game compromises players' ability to calculate more than it compromises their intuitive thinking (since calculation takes time while intuition works immediately), grandmasters' insignificant drop in ratings from standard to highly limited time control games is thought to indicate their greater reliance on intuition over tactical thinking. However, the interpretation of such data is mixed. For example, while Gobet and Simon (1996) argue that because Kasparov's chess rating drops from 2,750 to 2,646 when playing in a simultaneous chess exhibition (a "simul"), which restricted the amount of time for each game, limiting high-level players' time for calculation has a relatively minor effect on the quality of their play, van Harreveld, Wagenmakers, and van der Maas (2007) take the same decrease to be "a significant decrease," pointing out that, at the time they were writing the paper, such a drop in rating would place Kasparov, who was then the strongest player in the world, at somewhere around 60th place (p. 572, fn. 1).

Beyond the question of whether we ought to consider Kasparov's rating drop as significant is the question of how to determine the cause of a rating drop during simuls and speed chess games. As van Harreveld and colleagues point out, in speed chess, dexterity and the ability to handle the pressure that may accompany such shortened time controls come into play (van Harreveld et al., 2007, p. 595, also Burns (2004). Moreover, and most relevantly, one can question the degree to which abbreviated time controls impede time for calculation. For example, a recent study by Chang and Lane (2016) casts further doubt on the idea that a comparative analysis of speed chess versus standard chess supports recognition-action theory by investigating how much time high-level players

[6] How important tactical thinking is for high-level players likely depends on a number of factors. For example, players ranked at the master level and higher seem to rely largely on pattern recognition for simple or familiar positions, but in difficult or unfamiliar positions, slower processes seem to play an important role (Campitelli & Gobet, 2004; Bilalić et al. 2009). The degree to which grandmasters rely on tactical thinking may also depend on their age, with younger players relying more on tactical thinking than older players of the same rating (Charness (1981, p. 30).

spend on moves of varying difficulty during 5-min-per-player games. Their analysis of 100 such games found that stronger players, while moving quickly through easy positions, slowed down substantially before making certain key moves, which, as they conclude, is "difficult to reconcile with the view that speed chess does not allow players more than a trivial amount of time to look ahead" (2016, p. 8; see also Sigman, Etchemendy, Slezak, & Cecchi, 2010; Moxley et al. 2012).

In questioning both Dreyfus's and McDowell's claims that well-played speed chess does not allow time for conscious thought about what moves to make, the present paper can be seen as bolstering Chang and Lane's (2016) conclusion that simultaneous exhibitions and speed chess allow time for calculation. Beyond this, I hope that it might suggest directions for future, larger-scale studies investigating the role of declarative thought in 1-min-per-player games.

3 | IS THINKING ALOUD POSSIBLE DURING 1-MIN GAMES?

In Dreyfus's view, when playing well, high-level speed chess players cannot "say anything at all about [their] reasons for making a particular move" and "could only respond to the demand for a reason by saying 'I made the move because I was drawn to make it'" (Dreyfus, 2013, p. 35). McDowell tells us that because speed chess players do not deliberate explicitly, "if one compels a [chess master] to *say* what he thus knows in response to the question 'what are you doing[?]' one will break the flow" (McDowell, 2013, p. 46). Are these claims correct?

To address this question, I conducted an experiment. I had four accomplished chess players—two masters, one national master, and one (retired) international master—who were also experienced speed chess players, think aloud, saying what came into their minds, if anything, as they were playing online lightning chess games.[7] After I explained the task, my participants all expressed doubts about their ability to comply with it; they think all the time, they said, but thinking aloud while playing, they felt, would likely slow them down so much that they would not be able to play well—and as they were playing real games, against real opponents on an internet chess site where they were registered as themselves, they were hesitant to take the risk. Indeed, the first player I was scheduled to test made such a convincing case for this, I almost skipped over the 1-min game trials and moved on to the 5-min ones. However, all my participants eventually conceded, and the results surprised them. As soon as they were paired with their online opponent and their clocks started ticking, they started talking, very rapidly and more or less nonstop, about their reasoning processes as they were playing.[8]

This result shows that some high-level lightning chess players are able, at least when asked, to provide reasons for making their moves as they are playing. Thus, we ought to reject Dreyfus's claim that, during lightning chess, players cannot "say anything at all about [their] reasons for making a particular move" (Dreyfus, 2013, p. 35). All of my participants said quite a bit about their reasons for making their moves, and in no case did they need to resort to claiming anything even vaguely similar to "I made the move because I was drawn to make it" (Dreyfus, 2013, p. 35).

Admittedly, much of what they said was elliptical. For example, at one point during a game, I heard: "if I play b6, he plays f3; is that the idea? b6, f3; what about c5, d5–d5? d5? If he plays d5 I get into a Leningrad-y thing; but I don't want a Leningrad-y thing…" And from another: "I want to attack on the king's side but nothing's happening; I guess I'll just go here because I think he might

[7] They played via the Internet Chess Club, and I recorded all sessions and listened to them and transcribed selections of them myself—philosophers are, after all, supposed to be a bargain for the university.

[8] The 5-min trials were not necessary, but I conducted them for comparison purposes anyway on the same group of chess players I had play 1-min games and found that, even with just four more minutes, the deliberation was much more extensive.

castle queen's side."[9] Moreover, because they need to play so quickly, even if the players were to fill in their thought processes, presumably, much of their reasoning would be suboptimal or sometimes even woefully mistaken. Yet such comments, I would say, count as reasons nonetheless. As Grandmaster Hikaru Nakamura (who has been ranked the number one lightning chess player on the Internet Chess Club, which hosts the best lightning chess players worldwide) explains, lightning chess "won't often help you in your search for 'chess truth' [the objectively best moves]…[but it] will teach you a lot about chess psychology, as there is always a reason that any particular move is played. It may not be a good reason, and it may not have much to do with the actual position, but there is always a reason" (Nakamura & Harper, 2009).

Of course, Nakamura does not explicitly say that there is always a *conscious* reason that any particular move is played. However, what he says suggests that, at least sometimes, this is so, telling us that, in lightning chess, players must "recognize the need to take the time and think at the critical moments" (Nakamura & Harper, 2009, p. 47)—a claim that Chang and Lane's (2016) study beautifully illustrates. In any event, my participants' reasons, which were stated aloud, would seem to count as conscious reasons for making their particular moves; that is, they seem to capture the conscious thought processes upon which the players were basing their actions. Thus, they seem to capture what both Dreyfus and McDowell claim does not exist.[10]

Could it be that the players' conscious reasoning process is entirely an artifact of my request for commentary? Even if this were the case (and, as I shall suggest in section 5, phenomenology gives no indication that it is), the experiment still seems to counter the position that providing such reasons, even on request, is not possible. Dreyfus claims that high-level lightning chess players "could only respond to the demand for a reason by saying 'I made the move because I was drawn to make it.'" My experiment speaks against this.[11]

This is not a grand claim as it says nothing about whether such oral deliberations interfere with chess prowess, nor about whether players deliberate during games when they are not prompted to provide reasons for their moves. (These are two issues I go on to address: in section 3, I argue that thinking aloud may very well impede skill but likely only to a small degree, and in section 5, I argue that there is good reason to maintain that lightning chess players in real-life settings do think and deliberate during games and that such deliberation does not impede their skill.) Nonetheless, it is a claim worth making. My participants were surprised that they were able to express (some of) their thoughts aloud while playing, and I assume that both Dreyfus and McDowell would find this surprising as well.

4 | DOES THINKING ALOUD INTERFERE WITH 1-MIN GAMES?

My experiment suggests that chess players can consciously think and deliberate about their moves during lighting chess. A further question, however, is whether such thought and deliberation would break the flow (McDowell) or reduce the high-level players' skills to the novice level (Dreyfus).

[9] With respect to these two examples, in the first case, the intuitive first move was the move ultimately made, while in the second case, it was not.

[10] Also suggestive of the existence of conscious processing during the participants games is that at least some of the participants have long-term memories of the games they played during the 1-min per player trials. Indeed, I stay in touch with these players and, even after 2 years, one player (the cribbage player) told me that he has complete recall of the moves the games he played during the think aloud protocol.

[11] Here, Dreyfus may be overstating his view as his more considered position is that high-level lightning chess players, *when playing well*, cannot provide reasons for their moves. Addressing this more considered view is my goal in section 3.

How did the think aloud protocol affect my participants' games? In terms of outcomes, the results were what would be expected given the pairings: when paired against slightly weaker players, they won; against slightly stronger ones, they lost, making for three wins and one loss. This suggests that thinking aloud while playing does not significantly hinder chess performance. However, given the small number of trials and given my coarse-grained means of evaluating their level of skill (which took into account only outcomes of the games and did not employ an independent analysis of the quality of the moves), it was not possible to determine whether the wins were due to the players playing as they normally would or whether the skill differential permitted them to win despite playing slightly worse than normal. Indeed, as grandmaster Michael Rhode commented when I explained the experiment to him, it may very well be that because "doing anything extra is going to take attention away from the game…[the participants' skill will be impacted since] saying your thoughts out loud is extra."[12] Thus, although the experiments do suggest that thinking aloud is compatible with high-level play, they leave open the question of whether the speak aloud task was a distraction that interfered with their performance to a small degree.

Beyond being able to infer from the experiments that reason giving does not seem to have a large negative effect on lightning chess play, I think it is possible to draw some conclusions regarding flow, when "flow" refers not to McDowell's presumably intended sense of "flow," according to which flow is broken when one performs worse than is to be expected, but rather to the psychological state of *experiencing* your own performance as proceeding unencumbered, *experiencing* it as proceeding no worse than it typically does. This conception of flow, though not McDowell's, is in line with the use of the term by Mihaly Csikszentmihalyi (1990), the psychologist responsible for identifying a set of experiences that occur when people feel engaged in what they are doing. If we understand flow as describing a type of experience rather than a level of performance—such as describing the *experience* of playing as one normally plays—then my participants' comments on their game place pressure on the view that explicit commentary breaks the flow (in this sense) as the players all felt that they performed at least as well as they usually do, with one saying, "I think it actually helped my game." Another said, "I never think I play well, but I played like I play."

Although none of my participants answered my question, "did it break the flow?" in the affirmative, it was not always apparent how they interpreted my question. "Flow" according to Csikszentmihalyi (1990) is not merely a state of feeling as one is performing as one typically does; he also often describes it as a state of complete enjoyment in one's activities, and it is often thought to involve a feeling of effortlessness. It is not clear if my players experienced effortlessness during the game, but it is also not clear if effortlessness characterizes their experience of playing chess in the wild. For example, one of my participants, after I asked "did it break the flow," told me, "flow is—I suspect—a superstitious concept as far as chess players are concerned. Sometimes I seem to think more clearly than other times.. . but it's never easy; I think the term is basically a meaningless." In any event, whether or not they accept the existence of flow, the players felt that the think aloud protocol was compatible with having the experience of performing as they typically perform.

Does their personal evaluation of how well they perform indicate anything about how they actually performed? That the players won the games they were expected to win does suggest that they

[12] Grandmaster Jan Gustafsson's vlog "Banter Blitz" (https://www.youtube.com/watch?v=FAd0Jdd_f1A) occasionally illustrates this. Gustafsson plays 5-min games against much weaker online opponents and thinks aloud (and also chats about other things and responds to incoming messages) as he plays. Although he usually provides real time in-depth analyses of his games, occasionally, when he is down to the last few seconds and things are looking grim for him, he does silence the narrative. Dreyfus might claim that, to be at his best, Gustaffson had to silence not just the banter but the thinking and reasoning as well. I would claim, however, that, consistent with Grandmaster Rhode's comment, Gustafsson needs to devote all of his attention to the thoughts themselves and cannot afford the attention drain and extra time it would take to say these thoughts aloud.

were not playing significantly worse than usual. However, whether their personal evaluations indicate anything about how well they played is another matter. In general, I think one ought not to place much weight on personal evaluations of objective performance. And, as I said, I assume that grandmaster Rhode is correct in thinking that the additional task of formulating one's thought in words negatively impacted his or her performance to a degree. That said, given that high-level chess players recall the moves of their games and are used to analyzing their own play, especially with the luxury of being off the clock during a postgame analysis—and all my participants did critically analyze parts of their games after completing the task—there is reason to think that they would have some insight into whether they played more or less as they usually do. Still, I suspect that high-level chess players are subject to the same types of self-deceptions as the rest of us. For example, photos of me are invariably taken from a bad angle or are poorly lit because, in reality, I look much better than that! Chess players' insights into how they actually played compared to how they normally played might be similarly skewed. However, if players are subject to this type of self-deception, they might be more inclined to think that, normally, they play better than what they were able to do during the think aloud trial—I am actually a much better player than that!—in which case, their claims to playing as at least as well as they normally did would not be thrown into doubt. Nonetheless, a larger study, which also included an independent analysis of the games—perhaps even looking, as Chang and Lane (2016) did, into the correlation between quality of move and time spend on the move—could better address the question of the degree to which the think aloud protocol interfered with their games.

5 | A FEW WORDS IN DEFENSE OF THE THINK ALOUD PROTOCOL

The validity of using think aloud protocols for studying chess cognition, both concurrent (whereby participants verbalize their thoughts as they occur) and retrospective (whereby participants, after a task, provide an account of what went on in their minds), has been defended by De Groot (1946/1965), De Groot and Gobet (1996), and Gobet (2009). A defense of think aloud protocols, in general, is found in Ericsson and Simon (1993), Ericsson (2006), and Fox, Ericsson, and Best (2011). However, because, as these researchers also recognize, there are limits to the method, some words of defense are in order.

I proceed with the methodological assumption that, unless there are good grounds for doubting others' introspective claims, one ought to believe such claims. For example, unless there are good grounds for doubt, we should believe that my chess player quoted above does not want to get into a "Leningrad-y thing." Are there such grounds?

One limitation of the think aloud protocol for chess that De Groot and Gobet (1996) point to is that chess players' visuospatial cognitive processes might not be adequately expressed in a verbal protocol. In other words, there may be more thought than meets the ear. This seems likely, yet it does not, of course, detract from my conclusion that high-level lightening chess players can consciously deliberate in action. However, as Gobet (2012) points out, chess players have been known to be mistaken about what goes on in their own minds when they play: research indicates that although chess players, when looking at a position on a board, claim to be searching for solutions better than the one they considered initially, eye tracking data indicate that players stay fairly focused on the initially considered solution (Bilalić et al., 2008). Were my participants similarly deluded into believing that they were consciously deliberating?

Although the study Gobet points to does suggest a way in which introspection can be flawed, it should not cast doubt, or at least not much doubt, on the accuracy of my participants' reports because,

while the eye-tracking study uncovers a mismatch between *retrospective* reports and eye tracking data, I base my conclusions on concurrent reports (or at least relatively concurrent as one might argue that the vocalization of the thought takes longer to complete than the thought itself). In fact, it would seem difficult to claim to be (currently) thinking about attacking with the bishop, for example, without thinking at least a little bit about attacking with the bishop. This could happen. For example, if the claim were part of a highly rehearsed monologue, the words might be formed while the mind wanders onto other matters. But that was not the situation. In addition, Bilalić et al.'s, 2008 study does not show that players are entirely wrong when they claim to think about alternative possibilities. Rather, it shows that they think about the original choice more than they (retrospectively) indicate, as well as—and this is the main point of the paper—more than they should if they are to play optimally (2008, p. 659). So, while fascinating, this study leaves the reliability of my participant's reports more or less unscathed.[13]

Nonetheless, arguably, there is room for disparity between one's stated, even concurrently stated, reasons for an action and the causes of that action (Nisbett and Wilson 1977; Libet et al. 1983). However, I have left open whether the players' deliberations, per se, cause their actions. Rather, I argue that they provide a *reason* for the chess player to move; they allow for the chess player to answer the question "Why did you make that move?"[14] Might Dreyfus's theory of skill—a theory which implies that, when chess players are playing well, their actions are not done for a reason—be grounds enough to reject the view that chess players have reasons in mind for their actions? If Dreyfus's theory is strong enough, it certainly might, but lightning chess players' purported inability to provide reasons for their actions is supposed to be a pillar of support for his view, and that is precisely what I am questioning.

Perhaps there are other grounds for questioning my player's insights into their thinking. But if so, I leave it to those who maintain that there are to make the case for this on their time clock.

6 | THINKING DURING LIGHTNING CHESS IN THE WILD

My experiment shows that high-level chess players can think and deliberate during lightning chess when prompted and that such thinking can occur without significantly impeding skill. But do lighting chess players think and deliberate during real-life games? The experiment hints at an answer to this question as one would expect that, if lightning chess players' actions are normally guided by intuition alone, the think aloud protocol would likely constitute a major disruption to their approach and, thus, that a correspondingly large performance impairment would be apparent. In contrast, if deliberation is part of normal performance, then one would expect that the additional requirement of thinking aloud would only pose a minor disruption and thus that their performance would not be impaired significantly, which is what I found.

What do chess players' first-person accounts tell us about this issue? Do chess players' descriptions of the experience of playing lighting chess well in normal situations when they are not being prompted to provide reasons for their moves indicate that they experience themselves as thinking?

[13] One might also question my methodology by alluding to the wealth of examples of the ways in which our introspective faculties fail us are brought up in Schwitzgebel (2011). However, his examples concern what philosophers refer to as "phenomenal experience"—visual, auditory, and tactile experience and imagery—and emotions, rather than the content of occurrent thought.

[14] I have, however, made the causal claim that the players' deliberations did not have a significant negative affect on their games. This claim was based on the results of the games as well as—more tentatively, though still with some confidence—on the participant's insights into whether they were playing as they normally do. But these insights are not insights into what is causing them to play as they normally do but are rather insights into whether they are playing as they normally do, the validity of which I admitted was open to question but also defended to a degree.

Dreyfus (2005) maintains that they do not. The phenomenology of lightning chess, he argues, supports his view that optimal high-level lightning chess is devoid of deliberation:

> "as far as [grandmasters] can tell, they are simply responding to the patterns on the board. At this speed [grandmaster] must depend entirely on perception and not at all on analysis and comparison of alternatives. Thus, phenomenology suggests that, although many forms of expertise pass through a stage in which one needs reasons to guide action, after much involved experience, the learner develops a way of coping in which reasons play no role" (2005, p. 53).

McDowell, though he of course does not lean on phenomenology to argue that reason is a subpersonal component of action, is eager to point out that his views are consistent with Dreyfus's claims about the phenomenology of skill, as indeed they would seem to be because, if the chess player's deliberations are implicit, such deliberations would leave no phenomenological trace (McDowell, 2007).

I would like to suggest, however, that the empirical findings paint a different picture. As I mentioned, prior to my think aloud experiment, my four participants all commented that they think and reason during lightning chess games, even though they were hesitant to try to verbalize their thoughts. Moreover, other high-level lightning-chess players with whom I have spoken all tell me that they think consciously while playing. Cory Evans, for example, who for a time was ranked in the top 10 among lightning chess players on the Internet Chess Club,[15] explained that although 1-min games are, to a large degree, guided by heuristics (which are general rules about how to move, such as *control the center* or *make even trades when you are ahead*), deliberation, albeit very fast deliberation, still occurs at crucial junctures. He explained that while in a normal game one might deliberate over, say, the advisability of launching an attack and the appropriateness of a certain sacrifice, in lightning chess, one tends to deliberate more over the simple brute tactical details of the game, such as, "does Nxf7 win a rook with a two-move combination?" And being able to analyze his moves so quickly is something he worked at. When he played lightning chess daily, part of his training included rapid-fire analysis of positions, with an aim of completing deliberations in fewer than 5 s. The psychologist Fernand Gobet (2012)—who, besides having produced an impressive body of research on chess, is also a (retired) international master—claims that the idea that lightning chess incorporates conscious deliberation "fits my own experience of playing such games, and I would guess that this must be even more the case with top-level grandmasters" (p. 241).[16] And when I asked International Master Alex Ostrovsky whether he thinks consciously during a 1-min game, he said that he most certainly does, explaining that, in comparison to standard games, he does not think as deeply but that the thinking is "more dense; kind of like a black-hole."

Phenomenology is not foolproof (so few things are), and one imagines that Ostrovsky's analogy is somewhat of an oratorical flourish. Nonetheless, these chess players' comments should make us at least question whether Dreyfus's description of the phenomenology of grandmaster play is accurate. In any case, the first-person accounts I have encountered do not support the view that grandmasters, rather than reasoning about the positions on the board, are simply responding to them.

---

[15] He has been rated over 2,700 at lightning chess on the Internet Chess Club, which is trafficked by most of the serious lightning players worldwide.

[16] Do weaker lightning chess players not deliberate? Wayne Martin (2008), who plays recreational chess, explains, in line with McDowell's account, that although he makes judgments when playing lightning chess, he does not deliberate consciously but rather experiences his judgments as "issuing more-or-less instantaneously" (p.2).

Beyond this, it might be possible to draw some conclusions about whether thinking and deliberating in action impacts the quality of play in the wild. If we assume that top lightning chess players, such as Nakamura, do think during lighting chess (as his 2009 book suggests and as he has attested to when questioned about this in personal communication with Evans, who has conveyed the information to me), then it would seem that thinking is not disadvantageous to performance because, in general, it would seem that one does not rise to the top by engaging in deleterious practices.

7 | ATTENTION AND PERFORMANCE

I have argued that, when thinking aloud, the participants in my study were articulating the thoughts that were consciously present to them and that phenomenological insights from players about real-life games give no reason to think that such ratiocinations were only artifacts of my request to verbalize what is going on in their minds. The question of how the think aloud protocol affected their games was more difficult to answer. However, I have argued that, during the experiment, it appears not to have hurt their play substantially, and in the wild, silent conscious, thought is not disadvantageous at all.

But does conscious thought help? If Dreyfus is correct, such thoughts are, at best, superfluous because chess players can play just as well (or nearly as well) when distracted. He cites an experiment he conducted in support of this (Dreyfus & Dreyfus, 1986, p. 33). The experiment pitted international chess master Julio Kaplan against a slightly weaker player in a game of lightning chess (where each player has 1 min to play the entire game[17]). In the experiment, Kaplan was orally presented with addition problems, at a rate of about one per second, and had to present the answer aloud as quickly as possible. The result, he tells us, is that "even with his analytic mind completely jammed by adding numbers, Kaplan more than held his own against the master in a series of games" (Dreyfus & Dreyfus, 1986, p. 33). This experiment, he seems to think, indicates that attending to one's moves is not important or essential to chess expertise. "Deprived of the time necessary to see problems or construct plans," Dreyfus tells us, "Kaplan still produced fluid and coordinated play" (p. 33).

Does Kaplan's performance indicate that attending to the game is not necessary for expert performance (and, correlatively, that the thoughts expressed by the lightning chess players in my study were, at best, superfluous to their prowess)? Certainly, Kaplan still played well, but did the lack of attention cause him to play less well than he normally does? It is difficult to say as the experiment is underdescribed. We do not know, for example, how much weaker the "slightly weaker" player was than Kaplan. Maybe Kaplan was distracted but, because of the ability differential, was still able to hold his own. Moreover, we do not know whether "holding his own" means winning. If Kaplan lost to the slightly weaker player, the experiment would seem to indicate that attention is important to the game. But even if Kaplan had won, it may be that he was still attending to the game, for it may be that calling out the answer to additional facts was so automatic for Kaplan that this did not interfere significantly with his attention to the game.[18] Finally, as Kaplan was adding numbers out loud and

[17] Dreyfus and Dreyfus (1986) actually describe the game as a 5-s-per-move game, which is generally slightly more time than players have during a lightning chess game.

[18] And there have been some studies indicating that very simple but not automatic tasks (ones that involve generation rather than mere reaction) interfere with chess performance. For example, when Robbins et al. (1996) asked master-level chess players to solve chess problems while generating random letters, it resulted in a 33% decrease in ability, and when they asked them to reproduce board positions that they had just seen while doing this, they found it resulted in a 66% decrease in ability. Both experiments indicate that attention is important in chess. Spatial tasks may also encumber performance more than verbal ones; see Saariluoma and Kalakoski (1998)

playing his opponent face to face, it is possible that this distracted his opponent, making it easier for Kaplan, even if distracted himself, to hold his own.

To try to better understand the addition experiment, I ran another experiment. I had my two master-level players each play master-level opponents online while giving the answers out loud to single-digit addition problems. I had written down a series of problems and would fire one off 1 s or so after hearing their answer to the previous one. In line with Dreyfus's results, both participants felt that they played as well as they usually did (and both happened to win their games). However, both also stopped adding when the game got complicated, with one, for example, taking an extremely long time to add 8 plus 1.[19] The other player also initially made some arithmetic mistakes. Prior to completing their own trials, neither observed the other nor spoke to the other about the experience, but both said that, far from their analytic minds being jammed by the addition task, they focused almost entirely on the chess and let the addition proceed without thought. The one who made the arithmetic mistakes at the start said, "I'm a cribbage player, so once I figured out that you were giving me all single-digit numbers, I can do that all automatically." The other commented that the addition task "was like a fly buzzing around my ears; I concentrated on the game and brushed away the questions as you called them" (though, apparently, during the period when he could not provide an answer to the question "what is 8 plus 1?," he let the fly buzz for quite a while). This suggests that at least part of the reason Kaplan held his own was that he was still fully or nearly fully attending to the game.

I also tested how double digit addition would affect play by having the (retired) international master play lightning chess with the same setup, but this time adding double digit numbers. He performed the addition correctly—though at one point pausing for around 5 s before giving an answer—but he lost the game and was not at all pleased with his performance. In response to my question "How do you feel you did?," he replied: "What do you mean, how do I feel? How do you think I feel? I'm playing an IM [international master] while adding double-digit numbers. I'll tell you how I feel: I'm going to go back to the cabin right now and slit my wrists." Fortunately, he did not follow up on his plan; nevertheless, I learned that good chess players really hate to lose, and in fact, it was only the one retired player who was willing to try this experiment. Of course, part of the reason the game was lost was that he was playing against a player rated at nearly the same level as he was (and, moreover, he said he had not noticed this initially and was thus perhaps not putting his all into the game at first). Still, his perception was that adding the numbers significantly interfered with his performance (a perception, as I have mentioned, that can be misguided, yet which I would suggest nonetheless carries some weight). Of course, presumably even Dreyfus would say that chess players would not perform just as well no matter how distracted they are. However, that the Kaplan experiment is open to other reasonable interpretations suggests that Dreyfus has not even shown that a minor distraction fails to interfere with the game, for we do not know whether Kaplan played optimally in the experiment and we do not know whether the addition task was performed basically automatically (and was thus, in a sense, not distracting at all).

8 | A DIFFERENCE THAT MAKES A DIFFERENCE

According to Dreyfus, the actions of a skilled chess player, when playing at her best, are analogous to Charles Taylor's (2005) description of how he can flawlessly navigate around obstacles during an uphill climb, even while his mind is entirely focused on an impending, difficult conversation. As

for an illustration of how the Brooks's letter task, which involves counting the corners on block letters, hinders chess performance. For a view on awareness in chess that is quite similar to the view I present here, see Gobet and Chassy (2008) and (2009).

[19] He was not silent during this long interval, however, as he started deliberating aloud about chess.

Dreyfus (2005) explains, "responding to [the features of the terrain] does not require noticing them" (p. 56). In cases such as these, Dreyfus thinks, we do not pay attention to what we are doing. But what counts as cases such as these? It seems that, although one may scale a hill without attention, chess is more like the difficult conversation than the hike.[20] And this is because serious tournament chess is not just something one does; it is a passion. Chess players want to win. Desperately. In contrast to Taylor, who presumably did not care about summiting a few seconds later than he might have had he been fulling concentrating on his hike, chess players do not spend time thinking about other things because a fraction of a second can be the difference between a win and a loss, between happiness and despair. One might even say that it is this passion to win, as Hume foreshadowed,[21] that ultimately permits high-level chess players to think and reason consciously in action. Quotidian well-learned skills, such as walking (for most of us who are not race walkers), driving to work, tying shoelaces, and typing (for those who are not professional typists), are performed dispassionately, and one is rarely motivated to try to get better at them. In contrast, the top chess players are engaged in an ongoing quest to improve: they analyze their past games as well as the games of others and are constantly thinking about and talking about how to better their skills. And this practice allows them to bring the same analytical, thoughtful approach to their games. Tying one's shoes is not like that. Beyond the time it takes to learn the skill as a child, most of us do not ever try to improve but instead let the skill become automatic so that we can be free to focus on such things as ensuing difficult conversations. And it is easy to see how an evolutionary advantage could accrue to those who could think about more important things during everyday tasks. However, during a tournament chess game, there is nothing more important.

The fact that everyday skills are rarely practiced with an eye toward perfection could account for why, if Dreyfus is right about it, conscious thought is not implicated in "every day coping," in what Heidegger refers to as "pressing into possibilities"; that is, it could account for why, in everyday activities, "what we are directly open to [in every day coping] is neither rational nor even conceptual…[but is rather] the affordance's solicitation—such as the attraction of an apple when I am hungry" (Dreyfus, 2007, p. 357). The drive that is required to become an expert at any level generally does not disappear once a goal has been met, or if it does, that is when it is time to retire. To be sure, lightning chess is generally approached as a less serious endeavor that regular chess: it is supposed to be fun. Nonetheless, serious players are passionate about winning, and because of this, they want to improve their skills. Besides, in chess, that very attractive apple is often poisoned. Thus, letting yourself be pulled along by the forces on the board may lead you right into your opponent's trap.

This drive to improve, according to the psychologist Anders Ericsson, is especially prevalent at the highest levels of attainment. Indeed, by reaping information from training logs and diaries, Ericsson, Krampe, and Tesch-Romer (1993) have arrived at the view that the top strata of experts in a wide range of domains are those that work the hardest. And the type of work they engage in is what he and his colleagues refer to as "deliberate practice." In contrast to the mindless practice of merely doing actions over and over again—such as when making coffee or driving to the office—deliberate practice encompasses working on aspects that are difficult and, after practice, analyzing one's own successes and failures or, in short, aiming to improve. Deliberate practice is well illustrated in high-

[20] This view resonates with Christensen, Sutton, and McIlwain's (2016) hybrid theory of expert action, according to which skilled action encompasses both cognitive and automatic processes.

[21] In Hume's words, from book II in the *Treatise on Human Nature*, "Reason is and ought only to be a slave to the passions." I leave open the question of whether the chess player necessarily needs a passion to move to a certain square before being able to reason over whether that is a good move Rather, my point here is merely that, without a passion to win, one has little motivation to put in the hard work of consciously thinking about one's moves. (For discussion of the role of emotion in expert decision-making, see Tikhomirov & Vinogradov, 1970).

level chess where it is de rigueur for players to carry out postgame analyses of how well they played. Compare this to Dreyfus's (2013) view that "in all domains, masters learn primarily not from *analyzing* their successes and failures but from the results of hundreds of thousands of actions" (p. 35). If this were so, high-level expertise and everyday coping would be more similar than I am suggesting that they are and that Ericsson's work would lead us to believe.

9 | WHY DREYFUS AND MCDOWEL GOT IT WRONG

So far, I have presented my account of *where* Dreyfus's and McDowell's views about the relationship between conscious thought and high-level lightning chess went wrong. My small-scale experiments, chess player's first-person reports, and the disanalogy between chess, which is a passion, and everyday skill, for which automaticity is the norm, all point to lightning chess being a viable arena for conscious thought and deliberation. If so, both Dreyfus and McDowell are wrong in maintaining that lightning chess players do not consciously deliberate over their games unless they are to break the flow. But *why* did they get it wrong?

Uncovering motivation is tricky. But here is my analysis. One reason both Dreyfus and McDowell fail to attribute conscious decision-making to experts in action in general, and lightning chess players in particular, is that they take insights about everyday skills that they are familiar with—like driving—and apply these insights to professional-level skills, such as those of the grandmaster playing lighting chess. However, as I suggested, driving, for better or worse, is something one often does not put one's heart and soul into. It is a life-or-death matter, but we do not treat it as such and so would rather chat with the person in the passenger seat than give it our all. And apart from an initial learning period and the modicum of studying one does to renew a license, it is not something that we train to improve. For this reason, it is not well suited as a generalization base for high-level lightning chess. Perhaps if they would have started with their phenomenological insights into the practice of philosophy—something that they are experts at and do put their hearts and souls into—they would have had better results.

Dreyfus and McDowell, in trying to take at least the conscious mind out of lightning chess play, are also apparently motivated by their desire to avoid Cartesian dualism and their belief that, if rational thinking is necessarily conscious, we end up with a disembodied mind reflecting on the body. In criticizing the view that during highly skilled action, an agent's mind reflects on his or her actions—a view, according to McDowell, Dreyfus mistakenly attributes to him—Dreyfus (2013) tells us that it exhibits "the Cartesian separation between the world and the perceivers and agents to whom the world is given" (p. 17), and McDowell (2013), in defending himself against these accusations, emphasizes that it is not the case that rationality enters the picture only with consciousness but, rather, that rationality is part and parcel of our basic bodily actions, and by making mindedness "operative even in our unreflective perceiving and acting, we can regain [from the reins of Cartesianism] an integrated conception of ourselves as animals, and—what comes with that—beings whose life is pervasively bodily, but of a distinctively rational kind" (p. 56, quoted from McDowell, 2007. p. 370). But just how steeped in Cartesianism is the picture of the lighting chess player engaging her conscious mind to deliberate over moves?

It is not clear that there is anything at all particularly Cartesian about this picture, or if there is, it is something both Dreyfus and McDowell accept exists in domains of skill outside of lightning chess play. First, the picture does not seem to imply Cartesian dualism, according to which the mental is distinct from the workings of the brain, for one can consistently maintain both that grandmaster chess players (and other skilled individuals) are consciously thinking about their actions and that

Cartesian dualism is false if one holds that the mind doing the thinking, or reflecting, is a higher-level feature of the brain or, if you prefer, is itself simply neural processes. This mind, though not bodily in the sense of "body" where body is contrasted with head or brain, is bodily in the sense of lying on the body side of the mind–body problem.[22]

Dreyfus and McDowell's distaste for the Cartesian picture, however, is not just a rejection of the idea that the mind is an immaterial substance entirely separate from anything bodily. They also both think it is a mistake to understand the causes of the chess player's arm moving as internal or as entirely internal. And they may see explicit consciousness as entirely internal, as the type of consciousness that could exist in a brain in a vat. But why must consciousness be an entirely internal affair? The view I have been defending is neutral with respect to what constitutes consciousness, be it an immaterial soul, a network of social interactions, or the light waves that reflect off the fire engine that Mary sees upon leaving her black and white room.[23] I do claim, however, that whatever it comprises, it is capable of providing the type of conscious, reflective thought that, according to Dreyfus, occurs during a highly skilled chess game when "no intuitive response is present." Neither Dreyfus nor McDowell thinks that such a mode of thought fails to exist: they think that, when performing at our best, we are not consciously reflecting but that, at other times, we sometimes do. However, just as confining the attribution of immortal souls only to humans, or perhaps only to true believers, makes the traditional dualist picture no less dualistic, confining explicit conscious thought to suboptimal performance would seem to make the internalist picture of the mind no less internal. Thus, if their motivation for not attributing conscious thought to the lightning chess player is that such an attribution results in an internalist picture of the mind, this motivation would seem misguided because, first, it is not clear that consciousness must be an entirely internal feature of a human being and, second, the picture of the mind as sometimes consciously reflecting (no matter whether one wants to call this Cartesian or not) is a picture they accept. It is merely that, in their view, in contrast to mine, it is not something that experts do when playing at their best.

Finally, it might also be that Dreyfus and McDowell base their views on the role of the mind in lightning chess in part on their own observations of skilled chess players during games. From an outside perspective, it might seem that a 1-min-per-player match proceeds so quickly that it precludes conscious deliberation. Hands fly over the board or move the cursor on what seems to be mere impulse. However, appearances in lightning chess, and elsewhere, can be deceptive, or as it is also said, "it's not as easy as it looks."

ACKNOWLEDGEMENTS

I am extraordinarily grateful to John Sutton, National Master Cory Evans, International Master Alex Ostrovsky, and Grandmaster Michael Rhode for their thoughts on this work. The experiments I conducted were given approval by the IRB (File #2015–0216).

REFERENCES

Bilalić, M., McLeod, P. & Gobet, F. (2008). Why good thoughts block better ones: The mechanism of the pernicious Einstellung (set) effect. *Cognition*, *108*, 652–661.

Binet, A. (1893/1966). *Mnemonic virtuosity: A study of chess players*. Provincetown, MA: Journal Press.

Burns, B. D. (2004). The effects of speed on skilled chess performance. *Psychological Science*, *15*, 442–447.

Calderwood, R., Klein, G. A. & Crandall, B. W. (1988). Time pressure, skill, and move quality in chess. *American Journal of Psychology*, *101*, 481–493.

[22] Precisely how to understand the "body side" of the mind–body problem is the focus of Montero, 1999, 2001 and 2009.

[23] For a defense of the latter, see Thau, 2002.

Campitelli, G. & Gobet, F. (2004). Adaptive expert decision making: Skilled chess players search more and deeper. *ICGA Journal*, *27*(4), 209–216.

Chabris, C. F. & Hearst, E. S. (2003). Visualization, pattern recognition, and forward search: Effects of playing speed and sight of the position on grandmaster chess errors. *Cognitive Science*, *27*, 637–648.

Chang, H. & Lane, D. (2016). There is time for calculation in speed chess, and calculation accuracy increases with expertise. *The American Journal of Psychology*, *129*(1), 1–9.

Charness, N. (1981). Search in chess: Age and skill differences. *Journal of Experimental Psychology: Human Perception and Performance*, *7*, 467–476.

Chase, W. G. & Simon, H. A. (1973). The mind's eye in chess. In W. G. Chase (Ed.), *Visual information processing* (pp. 215–281). New York, NY: Academic Press.

Christensen, W., Sutton, J. & McIlwain, D. (2016). Cognition in skilled action: Meshed control and the varieties of skill experience. *Mind & Language*, *31*(1), 37–66.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York, NY: Harper & Row.

De Groot, A. D. (1946–1978). *Thought and choice in chess* (first Dutch edition in 1946). The Hague: Mouton Publishers.

De Groot, A. D. & Gobet, F. (1996). *Perception and memory in chess*. Assen: Van Gorcum.

Dreyfus, H. L. (2005). Overcoming the myth of the mental: How philosophers can profit from the phenomenology of everyday expertise. *Proceedings and Addresses of the American Philosophical Association*, *79*(2), 47–65.

Dreyfus, H. L. (2007). The return of the myth of the mental. *Inquiry*, *50*(4), 352–365.

Dreyfus, H. L. (2013). The myth of the pervasiveness of the mental. In J. K. Schear (Ed.), *Mind, reason, and being-in-the-world: The McDowell-Dreyfus debate* (pp. 15–40). New York, NY: Routledge.

Dreyfus, H. L. & Dreyfus, S. E. (1986). *Mind over machine: The power of human intuition and expertise in the era of the computer*. New York, NY: Free Press.

Dreyfus, S. E. (2014). System 0: The overlooked explanation of expert intuition. In M. Sinclair (Ed.), *Handbook of research methods on intuition*. Cheltenham: Edward Elgar Publishers.

Ericsson, K. A. (2006). Protocol analysis and expert thought: concurrent verbalizations of thinking during experts' performance on representative tasks. *Cambridge handbook of expertise and expert performance* (pp. 223–241). Cambridge: Cambridge University Press.

Ericsson, K. A., Krampe, R. T. & Tesch-Romer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review*, *100*(3), 363–406.

Ericsson, K. A. & Simon, H. A. (1993). *Protocol analysis: Verbal reports as data*. Cambridge, MA: Bradford books/MIT Press (revised edition) (Original edition published in 1984).

Fox, M. C., Ericsson, K. A. & Best, R. (2011). Do procedures for verbal reporting of thinking have to be reactive? A meta-analysis and recommendations for best reporting methods. *Psychological Bulletin*, *137*, 316–344.

Gobet, F. (1986). *Effets de l'incontrôlabilité sur la résolution de problèmes d'échecs [Effects of uncontrollability on chess problem solving].* (Unpublished Master's thesis). University of Fribourg, Switzerland.

Gobet, F. (1998). Chess thinking revisited. *Swiss Journal of Psychology*, *57*, 18–32.

Gobet, F. (2009). Protocol analysis. In T. Bayne, A. Cleeremans & P. Wilken (Eds.), *The Oxford companion to consciousness* (pp. 538–540). Oxford: Oxford University Press.

Gobet, F. (2012). Concepts without intuition lose the game: Commentary on Montero and Evans. *Phenomenology and the Cognitive Sciences*, *11*(2), 237–250.

Gobet, F. & Chassy, P. (2008). Towards an alternative to Benner's theory of expert intuition in nursing: A discussion paper. *International Journal of Nursing Studies*, *45*, 129–139.

Gobet, F. & Chassy, P. (2009). Expertise and intuition: A tale of three theories. *Minds and Machines*, *19*(2), 151–180.

Gobet, F. & Simon, H. A. (1996). The roles of recognition processes and look-ahead search in time-constrained expert problem solving: Evidence from grandmaster level chess. *Psychological Science*, *7*, 52–55.

Hearst, E. (1977). Man and machine: Chess achievements and chess thinking. In P. W. Frey (Ed.), *Chess skill in man and machine*. New York, NY: Springer-Verlag.

Holding, D. H. & Pfau, H. D. (1985). Thinking ahead in chess. *The American Journal of Psychology*, *98*, 271–282.

Kahneman, D. & Frederick, S. (2005). A model of heuristic judgment. In K. Holyoak & R. G. Morrison (Eds.), *Thinking and reasoning* (pp. 267–293). New York, NY: Cambridge University Press.

Klein, G. (1998). *Sources of power: How people make decisions*. Cambridge, MA: MIT Press.

Klein, G. A., Wolf, S., Militello, L. & Zsambok, C. (1995). Characteristics of skilled option generation in chess. *Organizational Behavior and Human Decision Processes*, *62*, 63–69.

Libet, B., Gleason, C. A., Wright, E. W. & Pearl, D. K. (1983). Time of conscious intention to act in relation to onset of cerebral activity (readiness potential: The unconscious initiation of a freely voluntary act). *Brain*, *106*, 623–642.

Martin, W. M. (2008). *Theories of judgment*. New York, NY: Cambridge University Press.

McDowell, J. (2007). What myth? *Inquiry*, *50*(4), 338–351.

McDowell, J. (2013). The myth of the mind as detached. In J. K. Schear (Ed.), *Mind, reason, and being-in-the-world: The McDowell-Dreyfus debate* (pp. 41–58). New York, NY: Routledge.

Montero, B. (1999). The body problem. *Noûs*, *33*(3), 183–120.

Montero, B. (2001). Post-physicalism. *Journal of Consciousness Studies*, *8*(2), 61–80.
Montero, B. (2009). What is the physical? In B. McLaughlin & A. Beckermann (Eds.), *Oxford handbook in the philosophy of mind* (pp. 173–188). Oxford: Oxford University Press.
Montero, B. & Evans, C. (2011). Intuitions without concepts lose the game: Mindedness in the art of chess. *Phenomenology and Cognitive Science*, *10*(2), 175–194.
Montero, B. G. (2016). *Thought in action: Expertise and the conscious mind*. Oxford: Oxford University Press.
Moxley, J. H., Ericsson, K. A., Charness, N. & Krampe, R. T. (2012). The role of intuition and deliberative thinking in experts' superior tactical decision-making. *Cognition*, *124*, 72–78.
Nakamura, H. & Harper, B. (2009). *Bullet chess: One minute to mate*. Milford, CT: Russell Enterprises.
Newell, A. & Simon, H. A. (1972). *Human Problem Solving*. Englewood Cliffs, NJ: Prentice Hall.
Nisbett, R. E. & Wilson, T. D. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Review*, *84*, 231–259.
Reynolds, R. I. (1991). The application of a search heuristic by skilled problem solvers. *Bulletin of the Psychonomic Society*, *29*(1), 55–56.
Robbins, T. W., Anderson, E. J., Barker, D. R., Bradley, A. C., Fearnyhough, C., Henson, R., … Baddeley, A. D. (1996). Working memory in chess. *Memory and Cognition*, *24*(1), 83–93.
Saariluoma, P. (1995). *Chess players' thinking: A cognitive psychological approach*. London: Routledge.
Saariluoma, P. & Kalakoski, V. (1998). Apperception and imagery in blindfold chess. *Memory*, *6*(1), 67–90.
Schwitzgebel, E. (2011). *Perplexities of consciousness*. Cambridge, MA: MIT.
Sigman, M., Etchemendy, P., Slezak, D. F. & Cecchi, G. A. (2010). Response time distributions in rapid chess: A large-scale decision making experiment. *Frontiers in Neuroscience*, *4*, 1–12.
Taylor, C. (2005). Merleau-Ponty and the epistemological picture. In T. Carman & M. Hansen (Eds.), *The Cambridge companion to Merleau-Ponty*. Cambridge: Cambridge University Press.
Thau, M. (2002). *Consciousness and cognition*. Oxford: Oxford University Press.
Tikhomirov, O. K. & Vinogradov, Y. E. (1970). Emotions in the heuristic function. *Soviet Psychology*, *8*, 198–203.
van Harreveld, F., Wagenmakers, E. J. & van der Maas, H. L. J. (2007). The effects of time pressure on chess skill: An investigation into fast and slow processes underlying expert performance. *Psychological Research*, *71*, 591–597.

How to cite this article: Montero BG. Chess and the conscious mind: Why Dreyfus and McDowell got it wrong. *Mind Lang*. 2018;1–17. https://doi.org/10.1111/mila.12209