Commentary on De Neys (2022)

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When a thinker does not want to think: Adding meta-control into the working model

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Abstract

De Neys (2022) proposes an elegant solution to several theoretical problems of the dual-process theories but underspecifies the role of motivation in initiating, intensifying and ceasing deliberation. Therefore, I suggest including a meta-cognitive control component in the working model that can moderate deliberation, for instance by affecting the deliberation threshold.

I applaud Wim De Neys (2022) for proposing a new working model of the dual-process theory that solves its two theoretical conundrums. Admirably, the proposed model integrates recent evidence, offers precise, testable hypotheses, and can be computationally implemented. It provides an elegant answer to the questions of what makes us think and what makes us stop thinking. However, it primarily focuses on bottom-up processes and underspecifies top-down processes, such as the role of motivation in initiating, intensifying and ceasing deliberation. In other words, the working model should have a suite of mechanisms that help us decide when hard thinking is needed but also when it is worthwhile.

Imagine, for example, a situation where a person faces a complex mathematical problem, which does not trigger any initial intuition, and deliberation has been activated. According to the working model, it ceases only if the uncertainty parameter, *U*, decreases under the critical deliberation threshold, *d* (e.g., reaches the conflict resolution). So, deliberation cannot stop if a person cannot achieve a sufficiently significant decrease in the uncertainty parameter (e.g., it does not resolve the conflict between the two conflicting intuitions). But a thinker cannot deliberate endlessly since deliberation is costly. Simply put, the current working model does not account for situations when a thinker does not want to think—so hard, so long or at all—about the problem. Yet, prior research in higher cognition identified empirical and theoretical arguments supporting the critical importance of motivation to deliberate (e.g., Evans, 2011; Stanovich & West, 1998). For instance, in one dual-process model, motivational factors regulate the level of critical effort, which determines whether a reasoner will endorse the default answer as justified or try to correct it (Evans, 2011).

To resolve these issues, I propose expanding the "opportunity cost factor" suggestion presented in the target article (De Neys, 2022, pp. 43–44) and including a meta-cognitive component of control allocation into the working model. Such control allocation mechanisms have been proposed in the literature investigating control allocation over lower cognition tasks, such as Stroop tasks, and have been supported by behavioural and neuropsychological evidence (e.g., Kool et al., 2017; Shenhav et al., 2017; Shenhav et al., 2021). For instance, the control allocation component can compute the efficiency of the deliberation to achieve the desired outcome while taking the cost and benefits of deliberation into account. Some initial evidence points to the fact that people consider the costs and benefits of deliberation when correcting reasoning (Sirota et al., manuscript). For instance, the performance reward and imposed cost affect how much time individuals allocate to correcting their initial errors and, in turn, problem-solving accuracy. So, the meta-cognitive control component is involved in the switching (on and off) of thinking by considering the efficacy of deliberation and its cost and benefits.

There might be different pathways by which meta-cognitive control can interact with uncertainty monitoring; for instance, it can directly affect uncertainty (De Neys, 2022). It can also modulate the deliberation threshold: it might decrease or increase the critical deliberation threshold while not affecting the uncertainty parameter. For instance, it can make the deliberation threshold high and, in turn, make deliberation more challenging to switch off if the overall value of reaching the correct answer by deliberating is big (e.g., a maths problem solved during an important exam). So, the uncertainty parameter must be minimal to reach the deliberation threshold. On the other hand, the meta-cognitive control can make the threshold low and, in turn, deliberation easy to switch off if the overall value is small (e.g., a maths problem solved during an anonymous experimental session that participants found

tedious). Thus, even weak intuitions generating high uncertainty can pass it. For instance, if the uncertainty initiated deliberation, but the deliberation was not as efficient as assumed with the type of problem, or the costs of deliberation were too high, then the threshold might be lowered. Here, the control's overall value is driven not only by the cost (whether intrinsic or opportunity costs) but also by the control efficacy and the reward one can ascribe to deliberation. Furthermore, to avoid the same theoretical traps outlined in the target paper, one can assume that this component computes such values more or less effortlessly, whether by retrieving cached information about the reward and cost associated with the task or by estimating the value heuristically from task cues (see Kool et al., 2018).

Finally, one can also speculate whether such a meta-cognitive component can help to resolve other open questions concerning deliberation listed in section 4.3. First, the control allocation component can modify the deliberation intensity—not only the duration. For instance, with high-stakes outcomes, control allocation can intensify, not just prolong deliberation. Second, it can also assist with deciding which type of deliberation processes are carried out (e.g., default answer justification, default answer correction). For instance, a reasoner might compare the overall values of deliberation needed to justify and correct the default answer and decide that justification is a more beneficial use of deliberation resources.

Thus, including the meta-cognitive component of control allocation into the working model can resolve several open questions of the working model. It can also better integrate research and theory on the role of motivation in thinking and be combined with the other model components.

Competing Interests

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