false-belief task, the same participants showed incorrect looking behaviour in an object-identity false-belief task. The switch from processing a location false-belief task to a numerical-identity false-belief task did not influence the usual age-related improvements in participants' explicit verbal judgements, as predicted. This is not just a hint that there is more than one process: Seeing the same signature limit in adults as in infants (Edwards & Low, 2019; Fizke, Butterfill, van de Loo, Reindl, & Rakoczy, 2017; Woo & Spelke, 2021), we infer that the fast process (and the conditions in which it occurs and the outputs it generates) does not completely overlap with the slow process (though not everyone would agree; Thompson, 2014). You cannot reject the exclusivity feature and use the method of signature limits. The view from mindreading therefore indicates that the exclusivity assumption is solidly grounded after all.

Given that the empirical basis for rejecting the exclusivity assumption is tenuous – at least in the context of mindreading research – it is important to evaluate the theoretical considerations offered by De Neys. He argues that, given the plausibility of automatization, any conclusion arrived at by a slow process could, in principle at least, also be arrived at by a fast process. However, this theoretical argument is less challenging than it first appears. Automatization tells us that any conclusion arrived at by a slow process could be arrived at by *some* fast process but not *which* fast processes could arrive at that conclusion.

Here we face a problem. A model of the interplay of fast and slow processes is needed, as De Neys argues. But De Neys's own elegant model is unavailable because it "forces us to get rid of exclusivity" (target article, sect. 2.2, para. 1). Further, developmental evidence speaks against it. On De Neys's model, the slow process should only be triggered if fast processes generate conflicting responses, leading to uncertainty. But consider children's responses to a mindreading context set up by Ruffman, Garnham, Import, and Connolly (2001). The children watched Ed acquire a false belief. They were then invited to place bets on which of two slides Ed would come down. Their bets revealed they felt no uncertainty (younger children went all in on the wrong slide). But Ruffman et al. also measured children's anticipatory looking as Ed was about to emerge, and this measure indicated a correct prediction. We take the betting to index a slow process and the looking to index a fast process. In this case we seem to have neither conflict among fast processes nor uncertainty (although of course we cannot entirely rule this out).

Is there an alternative to De Ney's model? The key is to understand what other than conflict in fast processes might trigger (and halt) slow processes. One candidate is low cognitive fluency. In Ruffman et al.'s (2001) study, asking children to choose in which of two locations to place their bets interrupts their processing and so triggers deliberation; as they reason through the problem (Ed will go where his chocolate is), they regain cognitive fluency. Because this does not require that slow processes concerning a question are driven by fast processes generating responses to the same question, this proposal leaves room for discretion whereby individuals are free to make explicit judgements which conflict with implicit responses. Just as the developmental evidence indicates.

In sum, widening De Neys's view to consider mindreading highlights the potential of more diverse methods than commonly employed in research on reasoning, and points towards empirical and theoretical obstacles to the proposed advance. Taking a step back, though, we find ourselves on common ground with De Neys: His critique shows both that more evidence is needed and that the interplay of fast and slow processes is truly a deep problem.

Competing interest. None.

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Automatic threat processing shows evidence of exclusivity

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doi:10.1017/S0140525X22002928, e131

Abstract

De Neys argues against assigning exclusive capacities to automatic versus controlled processes. The dual implicit process model provides a theoretical rationale for the exclusivity of automatic threat processing, and corresponding data provide empirical evidence of such exclusivity. De Neys's dismissal of exclusivity is premature and based on a limited sampling of psychological research.

De Neys argues that assigning exclusive capacities to automatic (i.e., intuitive, system 1) versus controlled (i.e., deliberate, system 2) processes is unsupportable in current dual-process frameworks and unsupported by evidence. Dismissing such exclusivity, however, is premature and based on a limited sampling of psychological research. In particular, the dual implicit process model (DIPM; March, Gaertner, & Olson, 2018a, 2018b) details how automatic threat processing is fundamentally distinct from automatic valence processing and deliberate processing. According to the DIPM, a neural architecture that facilitates survival evolved to preferentially process immediate survival threats relative to other negatively and positively valenced stimuli. Such preferential processing manifests as faster and stronger perceptual, physiological, and behavioral reactions to physically threatening stimuli. Because of the necessarily fast time course of those reactions, their functional utility could not be supported by deliberate (system 2) processing.

March, Gaertner, and Olson (2017) provided initial evidence of the exclusivity of automatic threat processing based on reactions to four categories of stimulus images: threatening (e.g., snarling predators, gunmen), negative (e.g., feces, wounded animals), positive (e.g., puppies, babies), and neutral (e.g., doorknobs, cups). Three studies presented those stimuli in visual search, eye-tracking, and startle-eyeblink paradigms. Consistent with the exclusivity of automatic threat processing, threatening stimuli (relative to the other stimuli) were detected faster, more frequent targets of initial eye-gaze, and elicited stronger startle-eyeblinks (with responses occurring between 200 and 1,000 ms). March, Gaertner, and Olson (2022) provided even stronger evidence of exclusivity by suboptimally presenting those stimuli below conscious perception at 15–21 ms in three additional studies. Despite participants being unable to describe what was presented (based on two pilot studies), threatening stimuli (relative to the other stimuli) elicited stronger skin-conductance and startle-eyeblinks and more negative downstream evaluations. Automatic threat processing (but neither automatic valence processing nor deliberate processing) evoked functional responses to stimuli below conscious perception. It would be a strange argument indeed to suggest that participants deliberately reasoned skin-conductance and startle-eyeblink to vary uniquely with images of survival threats that they were unable to describe.

The DIPM provides a theoretical rationale for the exclusivity of automatic threat processing and is empirically supported by evidence of such exclusivity. The DIPM, however, is just one example and there are others. In the arena of implicit social cognition, research indicates that automatic processes can commence immediately upon perception of a relevant object, render decisional and behavioral outputs within milliseconds, and return to baseline within a second or so, well before one might wager a guess about the price of a ball (Bargh & Ferguson, 2000; Fazio, 2007). In evaluative priming studies, a prime presented for 150 ms can facilitate categorization of a valence-congruent target, but its spreading activation effect dissipates within a second (Hermans, De Houwer, & Eelen, 2001). At least in this context, system 1 culminates well before any deliberative decision making can occur, which might offer some insight into the "unequivocal threshold" problem posed by De Neys (target article). In contrast, to even understand the problem posed to a participant in a ratio bias task or a cognitive reflective task (CRT) problem takes several seconds. By then, system 2 is likely to be already up and running. Thus, the decision processes involved in the sorts of tasks De Neys focuses on are likely to miss the very early effects of system 1. By broadening the scope of dual-process models and research paradigms considered, De Neys would have realized that exclusivity is theoretically and empirically supported.

Financial support. This research received no specific grant from any funding agency, commercial, or not-for-profit sectors.

Competing interest. None.

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Hoist by its own petard: The ironic and fatal flaws of dual-process theory

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doi:10.1017/S0140525X22003077, e132

Abstract

By stipulating the existence of a system 1 and a system 2, dual-process theories raise questions about how these systems function. De Neys identifies several such questions for which no plausible answers have ever been offered. What makes the nature of systems 1 and 2 so difficult to ascertain? The answer is simple: The systems do not exist.

Dual-process theories of human reasoning have yet to provide plausible answers to basic questions about the nature of system