How the Central System Works? It Uses Fast and Frugal Heuristics

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There are two serious contestants as to how the mind works: the Modularity (MT; Fodor, 1983) and the Massive Modularity theses (MMT; Tooby & Cosmides, 1992). Both visions have been targets of criticism Decision making research suggests that one criticism faced by the MT can be overcome by assuming the central system relies heavily on simple heuristics. In this paper fast and frugal heuristics are presented. It is argued that fast and frugal heuristics are the unencapsulated solutions to the central system's potential computational tractability problem, thus supporting MT. Moreover, it is discussed how these heuristics are task-specific but not domain specific, thus undermining MMT.

Modularity vs. Massive Modularity

The MT (Fodor, 1983) is the thesis that the mind is made up of a few modular systems plus a domain-general, unencapsulated central system that serves higher-order functions, like decision-making. The MMT (Tooby & Cosmides, 1992) is the idea that the mind is like a Swiss Army knife, a collection of specialized tools designed to solve adaptive problems. MMT contrasts with MT in that it claims that central capacities can also be divided into domain-specific mechanisms. The two approaches are at opposing sides of a debate and yet they share concerns like computational tractability and domain-specificity. However, for MMT domain-specificity is non-negotiable at all levels. For MT unencapsulation of the central system is the non-negotiable item.

Both visions face challenges. MT faces the obvious criticism that an unencapsulated central system is prone to computational intractability problems. MMT has been criticized for being based on the unwarranted premise that domain-specific mechanisms outperform domain general ones in principle, and for not accounting for the holistic nature of human thinking (Fodor, 2000).

Fast and Frugal Heuristics

The idea that individuals have limited resources, such as time, money, and cognitive capacity, has lead some to propose that people often rely on simple but accurate, fast and frugal heuristics (Gigerenzer, Todd, & The ABC Research Group, 1999).

Different fast and frugal heuristics have been so far identified and tested, including the Take-the-Best and the Recognition heuristics for pair-comparison tasks, and the Quickest heuristic for estimation tasks. These heuristics have been proven to be accurate (i.e., providing more often right than wrong decisions), but also faster (i.e., requiring less computations) and more frugal (i.e., requiring less information) than more standard decision models like multiple regression. Moreover, fast and frugal heuristics are more robust than these latter models when cross-validation is concerned. The reason simple heuristics are so successful is they exploit the structure of decision environments. Importantly, it has been shown that people use such simple heuristics (for a review see Gigerenzer et al. 1999).

Unencapsulated, Domain-general Heuristics

Crucial to the argument exposed here is that simple heuristics can be conceptualized as decision devices which are both information- and processing-frugal without being encapsulated. The fact that they are not encapsulated supports MT. The fact that they are not domain-specific contradicts MMT. Let us evaluate these claims by considering one prototypical heuristic, TTB.

In order to arrive at a decision about which of two objects scores higher on a criterion TTB does the following: (1) it retrieves the cue values of the best predictive cue for that criterion from memory; (2) assesses if one object has a higher value on that cue than the other; (3) if the cue discriminates it chooses the object with the highest value, if the cue does not discriminate, TTB looks up the second best cue, and so forth, until it makes a decision. If no discriminating cues are available TTB guesses.

TTB is not encapsulated in the sense that it has access to all beliefs *in principle* (e.g., beliefs about the value of a cue). However, for TTB there is a limited set of beliefs that it needs to use to reach a decision. In sum, TTB makes decisions in a computationally tractable way not by being encapsulated but by having a stopping rule (i.e., stop search and decide after finding a discriminating cue).

TTB is task-specific because it can only be applied to pair-comparison tasks. However, TTB is domain general because it can be applied to any domain (e.g., social, food choice). Importantly, it has been shown that people use TTB across domains (see Gigerenzer et al. 1999).

From this perspective, one might be lead to think that the central system is but a collection of simple heuristics. However, we still need MT's concept of a central system that chooses between heuristics and reasons about which cues are the best and should therefore be considered first (see also Payne, Bettman, & Johnson, 1993).

References

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