Postscript: Fast and Frugal Heuristics

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In their postscript, Dougherty, Franco-Watkins, and Thomas (2008) asserted that models of fast and frugal heuristics have been vaguely specified. We strongly reject this claim. The computational models of search, stopping, and decision rules allow for precise predictions. In fact, many researchers have tested under which conditions people follow which heuristic (e.g., Bröder & Schiffer, 2003), compared the predictions of heuristics to those of rational models (e.g., Bergert & Nosofsky, 2007), and studied the ecological rationality of different heuristics through statistical analysis and computer simulation (e.g., Hogarth & Karelaia, 2007).

Our point that ecological validity (the relationship between cue and criterion in the environment) is not the same as cue validity (the perceived relationship between cue and criterion in a person's mind) is not a "new found clarity;" it was made in Gigerenzer, Hoffrage, and Kleinbölting's (1991) article. It has nothing to do with the accuracy of predictions. As in Brunswik's (1955) lens model, ecological validity refers to what is in the environment, and cue validity (Brunswik's cue utilization) refers to what is in the mind. Because people typically have imperfect knowledge of environmental structures, they accordingly rely on sample-based estimates. Dougherty et al. (2008, p. 212) took this to imply that Take The Best "operates on ANY subjective cue order, even if it were completely idiosyncratic." This claim is incorrect. A proper test of search rules used by people is fairly straightforward. First, the predictions of several models (not just one) for ordering cues—say, validity, success (Bayesian expected information gain), and beta weights (Brunswik's intuitive statistician)—are derived for the experimental task. Each prediction is based on the ecological measures of validity, success, and beta weights, or, if learning samples are small, on the sample-based measures. Next, each individual pattern of judgment (rather than the aggregate) is tested against the predictions of each model. If an individual's cue order is, for instance, closer to the ecological measures of success than to those of validity and beta weights, then he or she would be classified as relying on success (e.g., Rakow, Newell, Fayers, & Hersby, 2005). In the same way, competing models of stopping rules and decision rules can be tested. We are interested in knowing which cue orders are elicited by which situation and not in proving that everyone always orders cues by validity.

Now consider simulations. Here, the situation is different because, unlike the participants in an experiment, the researcher knows the exact ecological validities (or other measures of correlation). Many simulations tested Take The Best with the ecological validities and then compared it with other models, such as multiple regression, with the ecological beta weights. For instance, Garcia-Retamero, Takezawa, and Gigerenzer (2006) used Take The Best with ecological validities as a benchmark and showed by means of simulation that social learning can boost accuracy beyond that reached with ecological validities alone. Dougherty et al. (2008) quoted from this article (and two other articles using simulations) and incorrectly claimed that we also wrongly equate ecological validities with cue validities. This is not the case. In simulations, one can test every model (not just Take The Best) with the ecological weights, but this does not imply that a real person would have exact knowledge of these weights.

Dougherty et al. (2008) also argued that the recognition heuristic might be vague because "to derive predictions based on the recognition heuristic, one needs to instantiate it at the level of a recognition memory model, as has been done by Pleskac (2007) and Schooler and Hertwig (2005)" (p. 213). We would like to mention that this work is in fact from our research group: Schooler and Hertwig's (2005) article is from our lab at the Max Planck Institute, and Pleskac worked in Hertwig's lab while he wrote his recognition article. We wish that Dougherty et al. (2008) had instead dealt at greater length with the fundamental questions that arise in their postscript.

General Purpose or Domain Specific?

Leibniz (1677/1951) hoped to reduce rational thinking to a single, universal calculus. Although he failed to realize it, his beautiful dream persists in many forms in current cognitive psychology, including formal logic, expected utility theory, and Bayesian inference. By definition, a single calculus is general purpose, so theories of cognition based on Leibniz's ideal do not have to address the question of ecological rationality (i.e., the question of which cognitive strategies match which environmental structures). However, if—like Dougherty et al. (2008)—one assumes a small number of general-purpose strategies rather than Leibniz's one, then this question must be addressed. Because their proposed "general-purpose" strategy of choosing the most familiar object is not viable in all situations, the question is as follows: How do minds decide when to make a judgment by familiarity and when to switch to another "general-purpose" strategy? That requires research on the ecological rationality of the familiarity heuristic and, more generally, on how people select between several general-purpose strategies.

How Do People Select Between Heuristics?

We listed this important question as a topic of future research in Table 1 of our reply, and it is also essential for understanding how a mind would operate with several general-purpose heuristics. Had Dougherty et al. (2008) argued that the present knowledge of heuristic selection, as opposed to models of heuristics, is rather vague, then they would have made a fair point. However, there is progress on the issue of selection as well. The study of ecological rationality has identified environmental structures in which, for instance, tallying is more accurate than Take The Best, and this provides testable conditions for when people switch between these heuristics. Moreover, in the case of individual learning by feedback, members of our

group have developed a formal model of strategy selection (Rieskamp & Otto, 2006).

Criticism can be fruitful, even more so if several theories were to be evaluated and compared using the same criteria. Moreover, understanding the respective advantages and blind spots should serve not only criticism of other theories but also theory integration. What psychology lacks in comparison with economics or physics is an integrated system of theories. Now is the time to ask what we can learn from other points of view and how we can integrate disparate theories to secure the future of psychology. Cumulative progress can hardly be achieved otherwise.

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