Rule Discovery in the Balance Task Depends on Strategy and Problem Complexity

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Reasoning depends on two types of processing: Explicit (fast and rule-based) and implicit (slow and associative) (Sloman, 1996). This distinction has been documented in many tasks, including process-control tasks. Berry and Broadbent (1988) found that performance on such tasks depended on processing mode and information complexity. Learning salient rules was optimal when processed via an explicit, rule-seeking strategy, but more complex rules were learned better by participants who processed the information implicitly, unaware of the existence of an underlying rule.

The purpose of this study was to replicate and extend this finding with a different task (the Balance Scale) and by measuring individual differences in preference for rational and intuitive processing. The precise underlying rule for making all balance predictions is difficult to induce, though participants often recognize a rule that works only for balance configurations that are not very complex. We predicted an interaction of strategy and problem complexity. Participants explicitly seeking the rule and those who prefer rational processing should perform best on less complex problems. In contrast, accuracy on the most complex problems should be highest among those unaware of a rule and those who prefer intuitive processing.

Method

Participants were instructed to make predictions about the state of a two-arm balance based on configurations of weights at distances from the fulcrum. The 23 *explicit* participants were told to actively seek a rule that would help them make accurate predictions. The 23 *implicit* participants were instructed to make predictions without mention that an underlying rule exists. Problems varied in complexity such that 80 easy and 80 medium problems could be solved via an additive rule (Weight + Distance); 80 difficult problems could only be solved via a multiplicative rule (i.e., W x D). Problems were randomly presented in 4 blocks of 60 trials. Participants completed the Rational Experiential Inventory, which measures individual differences in preference for rational and intuitive processing (Pacini & Epstein, 1999).

Results

A 2 (strategy) x 4 (block) x 3 (complexity) ANOVA revealed a main effect of Complexity, $F(2, 264) = 129.8$, $p < .01$. The expected interaction was marginally significant, $F(2, 264) = 3.0$, $p = .055$ (see Figure 1). The strategy x problem complexity interaction was significant when comparing highly intuitive and highly rational participants, regardless of instruction type, $F(2, 108) = 3.69$, $p = .04$. Accuracy for difficult problems for the intuitive and rational participants was 52% and 34%, respectively.

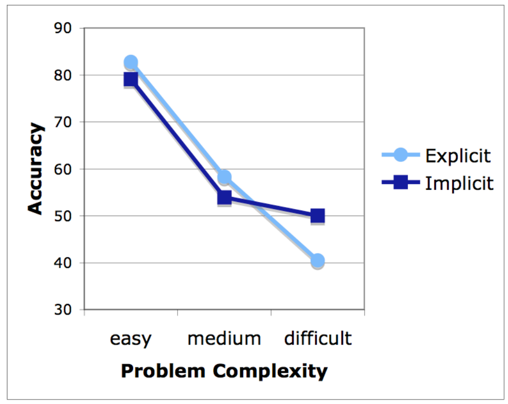

Figure 1. Accuracy as a function of problem complexity and strategy (explicit vs. implicit instructions).

Discussion

These results confirm and extend previous research. Task performance depends on both processing mode (whether manipulated or measured) and complexity of the task. On complex balance-scale problems, participants who explicitly sought the rule performed worse than those who were unaware of the existence of a rule. We argue that rule-seeking behavior can have a restrictive, fixating influence on hypothesis testing. When problems are so complex that a viable hypothesis does not come to mind, an implicit approach is more appropriate, allowing passively-acquired knowledge to be expressed.

References

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