Failure to Generalize Implicitly Learned Behavior on the Monty Hall Problem

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Background and Purpose

The Monty Hall problem demonstrates non-normative probabilistic reasoning (Krauss & Wang, 2003). Granberg & Brown (1995) found that 13% of participants chose the probabilistically advantageous option of switching from their chosen door to the remaining door once a losing door had been revealed. We examined whether participants demonstrated implicit learning given repeated trials with feedback, and whether this learning would be generalized to new variants. We expected participant choices to improve over time—reflecting their sensitivity to outcome frequencies (Estes, 1976)—but it was unclear whether such learning gains would carry over to new distributions.

Study Description

Ten participants, unfamiliar with the Monty Hall problem, played the computer in a series of "rounds." Round 1 used the standard 3-door game. The participant read that behind one door there was a car, and behind the remaining doors there was a goat. Participants guessed the car door. The program revealed a losing door from the remaining two. Participants then decided whether they wanted to switch to the remaining closed door or stick with their original choice. The program then revealed what was behind the two remaining doors. The participant completed 50 games.

Round 2 comprised 50 games of a 5-door version. Participants chose two doors and two doors were revealed. The participant chose whether to stay with their two doors or switch to the one remaining door. (The advantageous choice is to switch.) Rounds 3 - 6 consisted of five trials of a 7-door game without feedback. In round 3 the participant chose two doors and four were revealed. In round 4, three doors were chosen and three revealed. In round 5, four doors were chosen and two revealed. In round 6, five doors were chosen and one was revealed. (The player should not switch in rounds 5 and 6; the number of chosen doors exceeds the unselected doors).

Results and Implications

Figure 1 shows the percentage of games where participants switched to the remaining door. Participants increased switch-moves within the 3- and 5-door rounds, but there was little evidence of generalization between rounds. Any learning gains form one round disappeared, even though the underlying rule governing the problems stayed consistent, and between rounds 2 and 3 the participants were picking two doors.

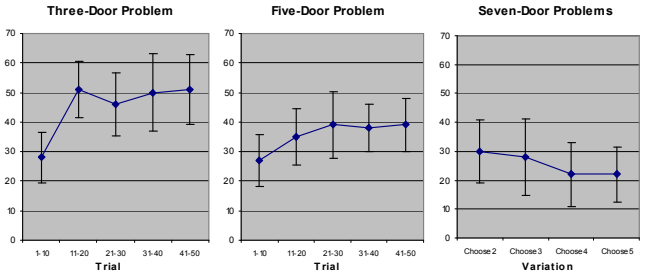

Figure 1: Percentage of switches for each set of trials.

More precisely, there were four types of learning behaviors (Fig. 2) defined by whether participants showed evidence of using a rule and whether they improved over the course of the trials. The switching percents on the 7-door problem suggest that implicit learning is better for subsequent learning than rule adoption, if the rule is not understood. Rigid adherence to a rule reduced exploration of alternatives.

	Rule	No Rule
Improve	**Always Switch (n=2)** 7 Door Choose 2/3: 0% Choose 4/5: 5%	**Probability Matching (n=3)** 7 Door Choose 2/3: 50% Choose 4/5: 47%
Not Improve	**Never Switch (n=3)** 7 Door Choose 2/3: 13% Choose 4/5: 10%	**Random Switching (n=2)** 7 Door Choose 2/3: 50% Choose 4/5: 20%

Figure 2: Four types of learning behaviors and their relation to switching on the 7-Door problems.

References

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