Title
Developmental Trends in Children's Reasoning about the Monty Hall Dilemma

Journal
Proceedings of the Annual Meeting of the Cognitive Science Society, 27(27)

ISSN
1069-7977

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Publication Date
2005

Peer reviewed

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Introduction

The notorious, brain teasing Monty Hall Dilemma was adapted from a popular TV game show where host Monty Hall asks his final guest to choose one of three doors. One of the doors conceals a valuable prize. After the guest makes a selection, host Monty Hall opens one of the non-chosen doors to show that it contains a dud. The guest is then asked if she wants to stay with her first choice or switch to the other unopened door.

From a normative point of view, the best MHD strategy is to switch to the other door. However, most people have the strong intuition that whether they switch or not the probability of winning remains 50% either way. This erroneous belief has been attributed to the "number-of-cases" heuristic ("if the number of alternatives is N, then the probability of each one is 1/N"). Since only two doors remain people will automatically assign a 50% chance to each door. A smaller group of participants erroneously believe that sticking to the original chosen door would be advantageous. This "stick with your pick" intuition is assumed to be based on an anticipation of regret.

Reasoning theories assume that adults reasoning is impeded precisely because of the automated nature of the "50%" response. For adults the "equal chance" heuristic is so self-evident that it will literally dominate their thinking. However, for young children, the conclusion that since two doors remain both will have a 50% chance of hiding the prize should be less evident and might require more active, resource demanding computation. Bluntly put, for younger reasoners the switching response should be less counter-intuitive than for adults. Therefore we suspected that children might select the switching response more frequently than adults. On the other hand, children's difficulty to compute the "equal chance" heuristic should result in a lower selection rate of this response. These predictions were tested by presenting a total of 132 students in grades 8 to 12 a standard MHD version in which they could choose between three answer alternatives (stick – switch – chances equal). Performance was compared with that of 253 university students.

Results and discussion

As Figure 1 shows, the "chances are equal" heuristic is indeed becoming less and less dominant in the younger age groups. The preference for the "stick" response, on the other hand, decreases with age. These findings indicate that the "stick with your pick" belief is based on a more basic and computationally less complex heuristic than the "chances are equal" belief. Cognitive maturation over the high school years seems to be especially boosting the number-of-cases heuristic.

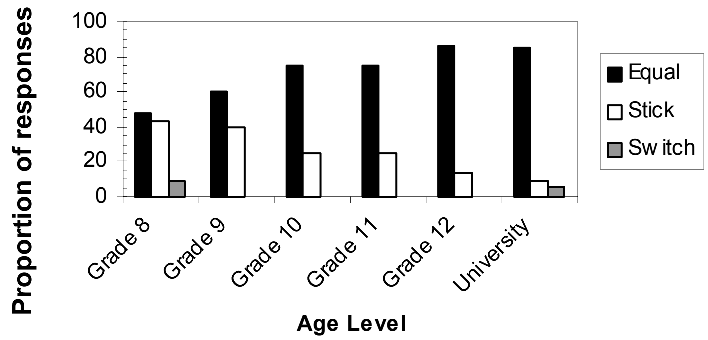

Figure 1. Proportion of the three possible MHD responses in different age groups.

None of the students in grades 9 to 12 managed to give the correct switching response. However, the youngest participants in our study, the twelve year old eight graders, showed about 10% switching responses (vs. 5% for university students). As we suggested, the higher rate of correct responding for the youngest reasoners can be attributed to a "Less Is More Effect". Adults reasoning is impeded precisely because of the automated nature of the "50%" response. For a twelve year old reaching the conclusion that since two doors remain both will have a 50% chance of hiding the prize will be quite difficult. In this sense children thus actually benefit from a lack of resources. The point is not that twelve year olds are actively computing the correct switching response but rather that twelve year olds are less tempted by the heuristics that are impeding adult reasoning.

Acknowledgements

Preparation of this manuscript was supported by grants from the Fund for Scientific Research (FWO).