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# Individual and Group Decision-Making on an Optimal Stopping Problem

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The Secretary Problem (SP) has been used by mathematicians, economists, psychologists and others to study optimal stopping policies as well as individual decision-making heuristics (Lee, O'Connor & Welsh, 2004). Despite the fact that people often make decisions within a group context, very little work has concentrated on group performance in a cognitive context. We extend this work to consider how individuals respond to the secretary problem when part of an interactive group making decisions by consensus, majority or hierarchy. The work outlined here presents preliminary findings of a wider cognitive modeling research program.

## Procedure

Each problem consisted of a series of sequentially presented, uniformly distributed numbers ranging between 00.00 and 100.00. Decision-makers (DMs) selected or rejected one number at the time it was presented. A selection was correct if it was the largest value in that set. If no item was selected, the final number was chosen by default. Participants also rated their confidence in each decision.

Participants first completed three sets of secretary problems working as individuals. Participants then completed three sets of problems working as a member of a group of five participants. For each item, participants would indicate their *pre-member* selection, then, following feedback on how others in the group voted, they would make another, *member*, decision. All problems were presented on computer screen with participants linked by a local area network. In both individual and group conditions, the three sets were of 5, 10, and 20 items in length. A Latin square design was used to balance factors of problem length and group condition – unanimous consensus, majority and hierarchy by randomly appointed leader – with presentation order.

## Results

There were 15 male and 25 female participants, comprising eight groups, with an average age of 24.4 (SD=9.10). Across all problem lengths, groups (M=.57 SD=.07) performed better than individuals. *Member* accuracy (M=.55, SD=.08) was marginally higher than *pre-member* (M=.52, SD=.08) and individual (M=.45, SD=.09) accuracy suggesting that being a part of a group improves individual performance. Individuals tended to select items earlier than groups. Being part of a group also increased the confidence that participants had in their responses (member M=4.1 SD=.51, pre-member M=3.7 SD=.51, individual M=3.3 SD=.45).

Previous findings that longer problem lengths decrease performance were replicated in the current study (individuals 5-point M=.59 SD=.07, 10-point M=.45 SD=.14, 20-point M=.31 SD=.15) – there was no evidence of a group advantage on longer problems.

People changed their minds most in the consensus condition. Most importantly, when people changed their minds, it was almost exclusively for the better. That is, their change resulted in selecting the highest item.

The hierarchy condition resulted in the best (on 5-item problems) and worst (on 20-item problems) performance.

## Discussion and Future Work

Bayesian Models of how an individual determines their stopping heuristic may be able to predict individual decision-making on this form of the secretary problem. Also, it has been shown that individual DMs adopt stable heuristics in attempting to solve repeated SPs. However, our experiments have shown that some DMs change their decision as a result of group pressure; therefore at least their apparent heuristic has changed. This suggests that there may exist a tension between the individual DM's preponderancy to a decision outcome and the group's leaning, and that the balance between these tensions determines whether a DM acquiesces to the group or not. This also raises the question as to whether the group dynamics are complex enough to support the emergence of group heuristics. Therefore future work will focus on developing mathematical models of the processes involved in solving the group SP.

Finally, it appears that some individuals do equally well on problems of different length. Partitioning individuals in order to model the different strategies that people employ is an area of active research (Lee & Webb, in press).

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