Supplementary Information

Simulations

To support the emergence of correlation between performance and network centrality in the experiment, we simulated the behavior of participants using a simple decision rule (figure S1). In the simulation, we formed a group of five individuals (i = 1, 2, …, 5) whose probabilities of choosing the correct initial answers (P_i) were randomly drawn from a beta distribution fitted to the observed data (α = 2.91, $ß$ = 3.09; figure S2). In each round, every individual chose the initial answer from five possible answers. The correct first answer was chosen with probability P_i, while any of the other answers had probability of being chosen $(1 - P_i)/4$. After selecting their first answer, they used social information with probability P_{social} to adjust their answers and ignored social information with probability $1 - P_{\text{social}}$. When they opted to use social information, they changed their answers with a probability proportional to a weighted majority of each answer. The weighted majority of the answer was calculated as the proportion of the number of individuals who chose the answer, where each individual's weight was multiplied by the past performance of the individual. To attain a number of copying instances similar to experimental observations (approximately 9 instances per group over all rounds), we set P_{social} = 0.35. We also included a spontaneous change of answers with a probability of P_{spont} = 0.04, based on observed data of single-user experiments. Each group repeated this process for 10 rounds.

Through simulated data, we investigated correlation between individuals' performance and their influence in a network in the same way we analyzed the observed data. We obtained networks by integrating the 2nd–5th rounds and 6th–10th rounds, and calculated a correlation coefficient between individuals' performance and their PageRank scores [1], respectively. We tested from 10 to 30 groups (10, 12, 14, ..., 30), with each group simulated 100 times.

Results

In line with the observed data, the simulation showed a stronger correlation between individual performance and network centrality over time (figure S3). The number of groups did not influence the strength of correlation.

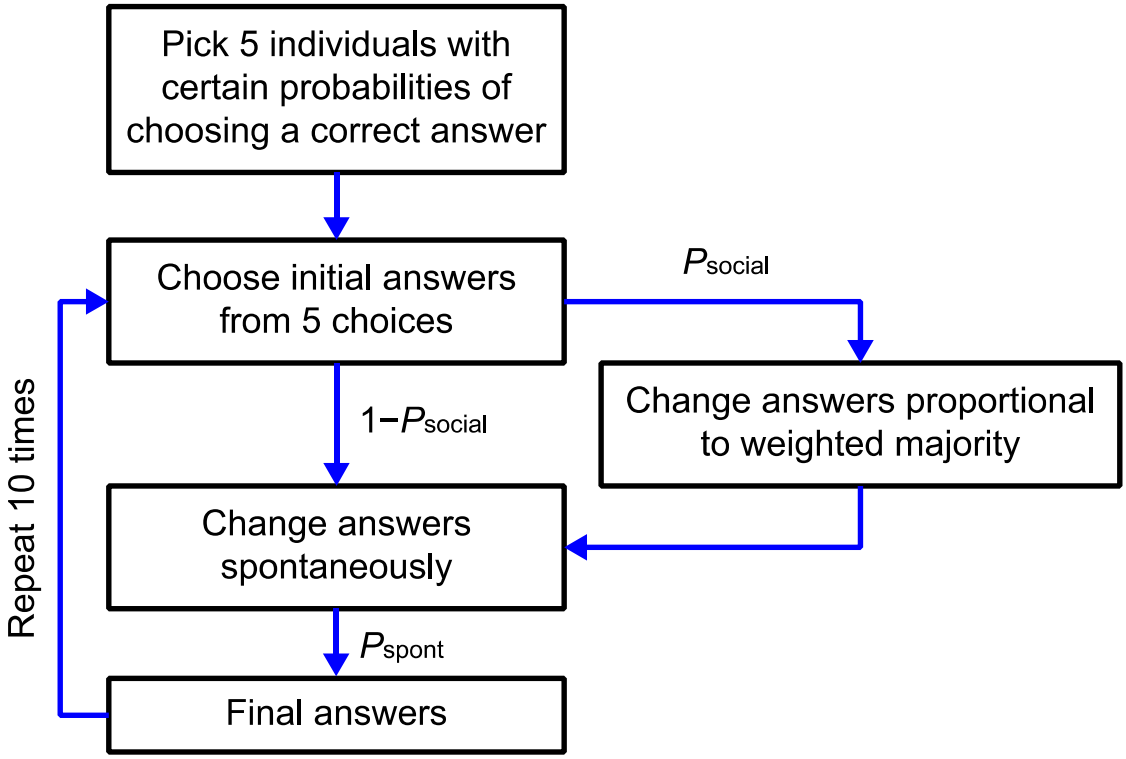

Figure S1. Flow chart of the simulation.

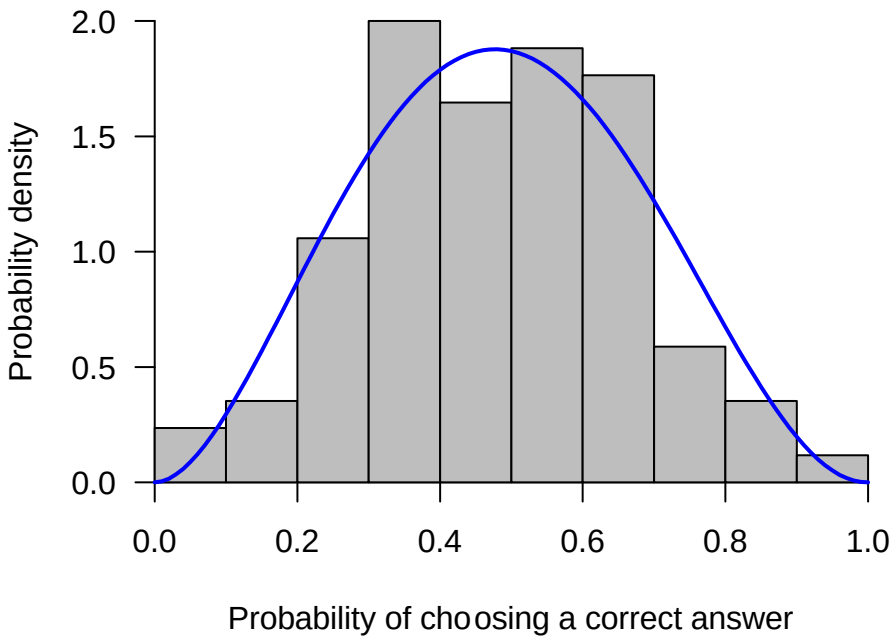

Figure S2. Probability of choosing a correct answer before seeing answers of other individuals.

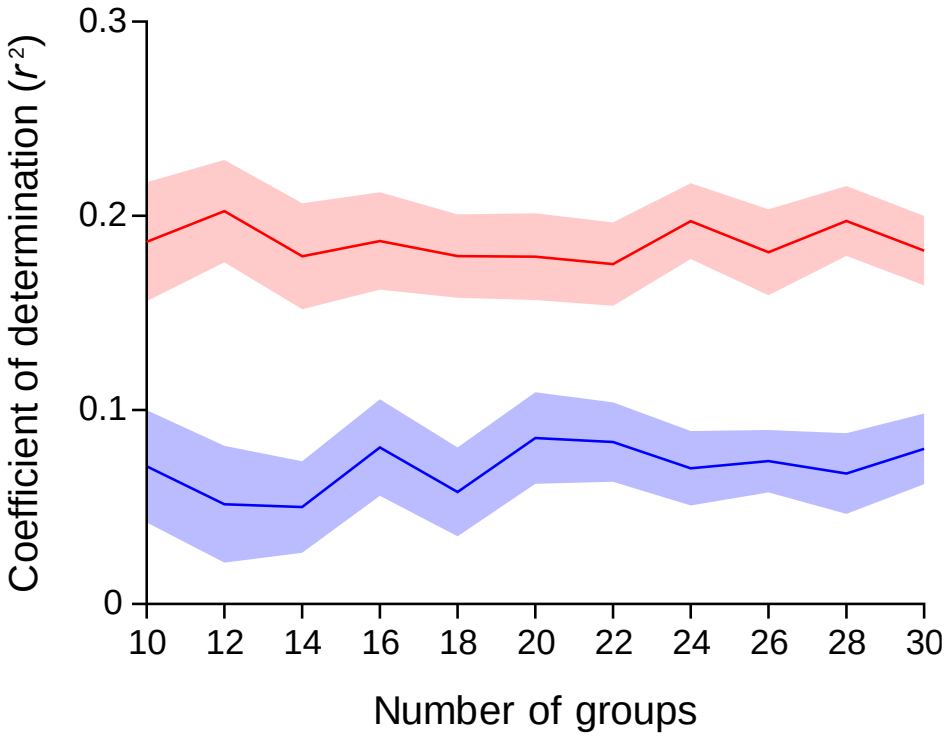

Figure S3. Correlation between individual performance and network centrality in the first half of the trials (blue) and the second half of the trials (red). Lines and shaded areas indicate means and 95% ranges of 100 simulations, respectively.

Reference

1. Brin, S. & Page, L. 1998 The anatomy of a large-scale hypertextual Web search engine. *Comput. Networks ISDN Syst.* **30**, 107–117.