

The effects of cultural inheritance on problem solving ability

Pierce Edmiston¹ Maxime Derex² Gary Lupyan¹

1 Department of Psychology, University of Wisconsin-Madison

2 Biosciences Department, University of Exeter

Cumulative cultural evolution depends on the ability of populations to solve increasingly complex problems that isolated individuals would struggle to solve on their own. Previous lab experiments investigating cumulative culture have shown that groups in which solutions are shared vertically over generations and groups in which solutions are shared horizontally within a single generation can both result in group performance greater than isolated individuals attempting the same problems. However, it may be that groups outperform individuals because of their extended time budget, and not that cultural inheritance actually improves problem solving ability beyond what could be achieved individually. To test this, we compared the performance of isolated individuals to the performance of groups inheriting information vertically or horizontally while controlling for labor time. We find that two-person groups outperform individuals given the same total amount of time in a single session, suggesting that the benefits of information-sharing in groups may extend beyond a savings in labor time. Specifically, we show that two-person groups are more efficient at searching the space of possible solutions compared to individuals in a single session who are slowed by fixation on previous and incorrect solutions. In comparing the effectiveness of vertical and horizontal forms of transmission, we find that the strategies differ in scalability, as adding two generations to a vertical transmission chain improved performance more than adding two individuals to a group working in parallel. Finally, we compare the effectiveness of vertical transmission over four generations to an individual returning for four separate sessions, finding support for the hypothesis that cultural inheritance via vertical transmission may be more effective than isolated labor when individuals become fixated on previous and incorrect solutions. This work helps reveal some of the mechanisms by which human populations can arrive at solutions that individuals could not on their own.

Participants ($N = 602$) were undergraduates enrolled at the University of Wisconsin-Madison.