

**CONSTRAINTS ON CUMULATIVE CULTURE IN CHIMPANZEES**

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Most researchers agree that humans are the only species with cumulative culture. By surveying the literature we found eight hypotheses proposed to explain this deficiency in nonhuman primates, although few have been explicitly tested. Some of the hypotheses are cognitive, such as a lack of teaching and imitation, whilst others are social, such as the relative dominance of individuals and ability to monopolise resources. We used a comparative study to investigate the abilities of chimpanzees and children to accumulate beneficial modifications to behavioral traits. Here we used a cumulative puzzlebox, which could be solved to gain three successively more desirable rewards using successively more complex manipulations, building on previous stages. We tested 76 chimpanzees, 35 in 4 groups with no trained demonstrator and 41 in 4 groups in which one individual was a trained demonstrator. We also presented the puzzlebox to 35 children in 8 groups in un-seeded open diffusion experiments. Only four chimpanzees learned to open the puzzlebox beyond the first, simplest, stage accessing only the least desirable food reward. In only one group did more than one chimpanzee learn to access the higher stages of the puzzlebox. Unlike the chimpanzees, multiple children in multiple groups accessed higher stages of the puzzlebox. By analyzing how and when individuals manipulated the puzzlebox and the social interactions between individuals, we assessed which hypotheses our data are consistent with. Accordingly we posit that a lack of imitation, teaching and cooperation in chimpanzees inhibits the evolution of cumulative culture outside *Homo sapiens*.

Keywords: Culture, Chimpanzees, Social learning, Cognition.