CALL COMBINATIONS IN CHIMPANZEES

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Through combining a finite set of words into larger compositional phrases, human language can express an open-ended, limitless number of messages. This *syntactic* capacity has been argued to be a key feature distinguishing language from any other non-human animal communication system. However, recent experimental evidence of syntactic-like structuring in monkeys has challenged this assumption and suggests syntax might be evolutionary more ancient with its origins deeply rooted in the primate lineage. Comparable data in great apes, our closest-living relatives, are central to reconstructing the more recent evolutionary history of syntax, yet are currently lacking. In this study, we address this issue and provide the first robust evidence for rudimentary syntactic structuring in our closest-living relatives, chimpanzees (though see Crockford and Boesch 2005; Leroux et al. 2021, for evidence of combinatoriality). Chimpanzees produce "*alarm-hoos*" when surprised or frightened and "*waa-barks*" when potentially recruiting other group members during aggression or hunting. Anecdotal data suggested chimpanzees also combine these two calls together, specifically when encountering a snake while being isolated from the main group. Through presenting wild chimpanzees with model snakes we i) confirmed combinations were more likely to occur when an individual encountered the snake separated from the group and ii) investigated receivers' responses showing they were more likely to join the caller after hearing the call combination compared with singly-occurring "*alarm-hoos*". Finally, to confirm these findings and verify the

meaning-bearing nature of the call combination, we conducted systematic experiments, playing back an artificial call combination and both calls produced independently. Chimpanzees reacted most strongly to the combination, showing quicker and longer responses, compared with both individual calls. We conclude the "alarm-hoo + waa-bark" combination represents a compositional syntactic-like structure, where the meaning of the sequence is derived from the meaning of its parts. Our work supports previous work in monkeys and indicates language is unlikely to have evolved de novo in the human lineage but rather the cognitive building blocks facilitating syntax were already present in our last common ancestor with chimpanzees and are perhaps even older.

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