EXPLORING OUR INNER-APE: SHARED UNDERSTANDING OF GESTURE BETWEEN CHIMPANZEES AND HUMANS

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1. Introduction

Decades of great ape gesture research revealed various parallels to human language, such as diverse repertoires of intentional signals used flexibly across varied, everyday interactions (Pika et al, 2005; Liebal, Pika, & Tomasello, 2006; Hobaiter & Byrne, 2011). Evidence for a shared origin to 'ape' gestural communication is supported by extensive repertoire overlap between extant apes, which increases between more phylogenetically related species (Byrne & Cochet, 2011; Graham et al, 2018). While it remains unclear how human fits within this shared system of gesture, borrowing methods from ape gesture research seems promising. For example, Kersken and colleagues (2019) used 'ape-typical' observational methods to find that children aged 1-2 years share 89% of their natural gesture use with chimpanzees (46/52 gestures).

To understand how human development and ability of language affects our retention of innate 'ape' gestures, we use a novel online experiment that tests human understanding of chimpanzee gestures when they are performed by other humans in a controlled environment. Using human models allows us to control additional cues and contexts present in the ape environment that may affect participant performance, while also ensuring that participants do not accommodate their interpretation of the signaler's intended gestural meaning based on personal perceptions and knowledge of nonhuman great apes.

2. Methods

We pilot a novel online experiment (hosted on *Gorilla.sc*) that tests how adult humans interpret the intended meaning of 10 established chimpanzee gestures (Hobaiter et al, 2014; Byrne et al, 2017) when performed by expert researchers. Each video had participants choose one of four potentials 'meanings', with the correct response(s) varying depending on the gesture's natural flexibility. There were four *Tight gestures* with one correct response, and six *Flexible gestures* with two correct responses (see Table 1). Trial order was randomized but each gesture's available responses were consistent. Binomial tests were used to determine if participants were above chance at detecting correct chimpanzee response(s) – note that we used the following corrected values of hypothesized chance based on the available correct responses: *Tight gestures*=0.25, *Flexible gestures*=0.5; and *overall* (all gestures combined)=0.4.

3. Results

We analyzed n=3000 responses from n=300 participants. Overall, participants performed above chance across all 10 gestures (chance=0.4; binomial n=0.568, p<0.001, LL=0.553, UL=1.000) but performed comparatively better on the six *Flexible gesture*s (chance=0.5, binomial: n=0.740, p<0.001, LL=0.722, UL=1.000) than the four *Tight gesture*s (chance=0.25, binomial: n=0.309, p<0.001, LL=0.287, UL=1.000). Binomial tests for each gesture revealed significance for 6/10 gestures (see Figure 1); 5/6 *Flexible gestures* (arm swing, beckon, grab hold, hit object, reach palm) and 1/4 *Tight gestures* (hand fling); with four gestures at or below chance (arm raise, hand shake, push, reach wrist).

4. Discussion

Our experiment shows successful use of a new 'proof of concept' approach in understanding the root of 'ape' gesture, and supports the hypothesis that humans retain some access to this shared system. Higher adherence of chimpanzee responses in *Flexible gestures* than *Tight gestures* suggests our evolution may have favored retaining more ambiguous gesture-types, and the mixed results across individual gestures may represent our specified range of overlap to chimpanzees. However, additional factors may influence our results, such as our specific selection of gestures (we avoided unusual gestural forms and meanings for this type of typical human interaction, such as 'pirouette' and 'sexual-solicitation'). Additionally, *Tight gestures* naturally have greater specificity that may not have fit well within the context we presented (two adult humans resting on a couch); while the less-specified *Flexible gestures* could include natural use within similar contexts. Overall, we demonstrate practical adaptation of studying chimpanzee gestural retention in humans and our results may hint at a shared, underlying 'ape' gestural origin to human language.

5. References

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