Can children invent communication systems using entirely novel signals?

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Studies in experimental semiotics, which investigate how human communication systems might have originally emerged, demonstrate that, when creating a shared system, interlocutors start by producing motivated (e.g. iconic) signs and subsequently align, refine and conventionalise their use (Lister & Fay, 2017). So far, such studies have been conducted mainly with adults. However, because under some accounts children are viewed as playing a prominent role in language evolution (Lupyan & Dale, 2016; Senghas, Kita & Özyürek, 2004) it is important to understand whether children can adhere to the expressivity constraints required to negotiate efficient communication systems. The present study probes children's ability to create novel communication systems using entirely unfamiliar signals, which puts them on a level playing field with older participants in terms of prior familiarity with the signalling domain.

We used binary auditory sequences produced using two buzzers programmed to emit a high and a low tone to label a set of unfamiliar referents. In previous research, we had used such signals to study negotiation of novel communication systems for a 2 (size) x 2 (shape) x 2 (brightness) meaning space using a referential communication task where participants played a Director-Matcher game over five rounds. We found that while adults had some success in aligning use of shared signs using magnitude symbolism (longer signals for bigger referents) 7-year-old children failed to create such motivated signs or align and refine their signal use (Kempe, Gauvrit, Gibson & Jamieson, 2019). However, the dimensionality of the meaning space may simply have been too high for children to be able to monitor efficiently. The present study attempted to replicate the findings using a simpler, 2 (size) x 2 (shape) meaning space and allowing participants to familiarise themselves with the signals prior to the game. The results confirmed 7-year-old children's inability to create a shared communication system with peers. However, 7-year-old children paired with adults adopted the iconic length-size association introduced by the adults while at the same time failing to adopt whatever arbitrary association between referent shape and another signal feature (e.g. pitch) the adult may have introduced. This was in stark contrast to a group of 13-year-old participants who succeeded in creating efficient shared communication systems using this unfamiliar signalling domain.

These findings extend the Iconic Bootstrapping Hypothesis (Imai & Kita, 2014) to novel communication systems by showing that children can benefit from iconicity to ease the burden of learning novel signal-meaning mappings. However, children do not introduce motivated signs spontaneously; rather, they seem to rely on adults to provide them. Moreover, children's inability to forge referential pacts based on arbitrary signal-meaning mappings is in line with a sizeable literature demonstrating children's difficulty with communicating novel meanings for which linguistic labels are unavailable (e.g. Krauss & Glucksberg, 1969). Further studies currently underway explore whether this failure is due to children's cognitive capacity limitations restricting memory for arbitrary signal-meaning mappings or due to children's pragmatic limitations in understanding that communication relies on agreed conventions.

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