Researchers find similarities in the way birds and babies learn to 'talk'

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Credit: CDC.gov

(Phys.org) —A team of researchers from Japan, Israel and the U.S. has found evidence that suggests birds and human infants learn to string syllables together in roughly the same way: through stepwise improvement. In their paper published in the journal *Nature*, the team describes how they taught songbirds to sing a new tune and compared an analysis of the results with sounds made by human infants saved in a database.

The remarkable process that allows humans to learn to talk as they move through various stages of development has been the focus of a lot of research. To gain some insight into the process, researchers have often turned to the animal world—less complicated systems are easier to study. In this new effort, the researchers looked first at zebra finches. Prior research has led most in the field to believe that songbirds such as finches learn how to voice syllables by listening to the birds around them. After that, the ability to string them together into song is innate—it just happens. In this new research, the team has found evidence that it's not innate, but is instead the result of a lot of work on the part of the bird.

To come to this conclusion the team removed three young finches from others of their kind and taught them to sing in the lab. As expected, the birds picked up syllables rather quickly, mimicking the sounds they were played. Next, they were taught to string two syllables together, such as sound A and sound B. Then, they added another syllable, but introduced it as a pair, BC. Then finally, they asked the birds to sing the whole song, ABC, ABC, etc. But that was only the beginning, next the researchers taught the birds to sing another song that was made up of the same sounds, but in a different order: ACB. In studying how the birds went about learning the new song, the researchers discovered that they did so in stepwise fashion, trying out different parts before putting the whole song together. That proved, the researchers claim, that learning songs in songbirds, is not innate.

But that wasn't the end of the study, the researchers found another team in Japan had been conducting a very similar study with Bengalese finches and came up with nearly identical results. Intrigued, they began looking at sounds made by babies that have been stored in a research database. After much analysis, they discovered that the infants were following a nearly identical path in learning to string syllables together to make words as the birds had done to make songs.

The results of this research suggest that the basic underpinnings that lead to language development in people, is similar to song development in birds.

More information: Stepwise acquisition of vocal combinatorial

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Abstract
Human language, as well as birdsong, relies on the ability to arrange vocal elements in new sequences. However, little is known about the ontogenetic origin of this capacity. Here we track the development of vocal combinatorial capacity in three species of vocal learners, combining an experimental approach in zebra finches (Taeniopygia guttata) with an analysis of natural development of vocal transitions in Bengalese finches (Lonchura striata domestica) and pre-lingual human infants. We find a common, stepwise pattern of acquiring vocal transitions across species. In our first study, juvenile zebra finches were trained to perform one song and then the training target was altered, prompting the birds to swap syllable order, or insert a new syllable into a string. All birds solved these permutation tasks in a series of steps, gradually approximating the target sequence by acquiring new pairwise syllable transitions, sometimes too slowly to accomplish the task fully. Similarly, in the more complex songs of Bengalese finches, branching points and bidirectional transitions in song syntax were acquired in a stepwise fashion, starting from a more restrictive set of vocal transitions. The babbling of pre-lingual human infants showed a similar pattern: instead of a single developmental shift from reduplicated to variegated babbling (that is, from repetitive to diverse sequences), we observed multiple shifts, where each new syllable type slowly acquired a diversity of pairwise transitions, asynchronously over development. Collectively, these results point to a common generative process that is conserved across species, suggesting that the long-noted gap between perceptual versus motor combinatorial capabilities in human infants1 may arise partly from the challenges in constructing new pairwise vocal transitions.