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Echo suppression in budgerigars (Melopsittacus undulatus)

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" Auditory experiments on the accurate localization of sounds in the presence of reflections, or echoes, that arrive later and from many different directions are critically important to understanding hearing in natural environments. Such experiments usually simplify the natural situation somewhat by presenting a leading sound and, after a set delay, presenting a lagging (echo) sound from a different spatial location. The perceived location of the auditory image, and the influence of the echo on that auditory image, can change depending on the time delay between the presentation of the two sounds.
The phases of echo suppression have been examined psychophysically or physiologically in humans and a number of animals, and here we extend those results to include budgerigars, small Australian parrots. Budgerigars make interesting subjects for these experiments for at least two reasons. First, they have unremarkable sound localization abilities but nevertheless show large amounts of binaural unmasking in the free field. Second, they are much more sensitive to changes in temporal fine structure than are humans. Here, operant conditioning and the Method of Constant Stimuli were used to measure the discrimination performance between a stimulus presented at + and - 90 degrees azimuth with a short delay (left-right presentation), from the same two stimuli presented with the opposite delay (right-left presentation). At very short delays, where humans experience fusion, budgerigars also have difficulty discriminating between the presentation types. With increasing delays, where humans experience localization dominance, budgerigars show an increase in discrimination performance. At even longer delays, where the echo threshold is found in humans, discrimination performance falls again and the birds are less able to discriminate between the stimuli. These results suggest that budgerigars exhibit the phases of echo suppression and that the time-courses are similar to those found in humans and other animals.
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