New study shows how birds work to sing together

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A first-year Penn State College of Information Sciences and Technology doctoral student spent four months observing birds in an effort to learn what it would mean to design technologies from a more-than-human perspective. Her autoethnographic study contributes to addressing the challenging research problem of how to operationalize posthuman concepts into practice for human-computer interaction. House finchnigel. Credit: Wikimedia Commons

A new paper published in *Behavioral Ecology* finds that songbirds may coordinate both vocally and visually to enhance their singing partners' responses.

In many group-living animals pairs sing together to defend resources, but such signals can be much more complex than that of the acoustic stimulus on its own. In addition to songs, cooperating animals may produce movements that can be precisely combined between partners and with songs. Experiments with robot birds revealed that coordination of vocal and visual components of the Australian magpie-lark audio-visual display enhances the receiver's responses to this complex signal. Singing animals don't just sing together; they also dance.

Animals communicate with their whole bodies. In humans, for example, vocal expressions are naturally produced with associated movements of the face, which reduces speech ambiguity. Because voices and lip movements are physically linked, even small modifications have a deteriorating effect on reception of the message, so coordination is a challenge in that it requires continuous monitoring of the partner's behaviour.

Previous research showed that precise vocal coordination between cooperating animals increases the quality of their display; little is known, however, about the role of coordination between songs and movements. Partners of the rufous-naped wren, Campylorhynchus rufinucha, for example, combine multiple types of songs and body movements in a coordinated fashion. Researchers have suggested that movements such as these may improve vocal coordination within a pair. The movements' diversity and precise match with the songs suggest that both components signal jointly to other pairs.

This paper used robotics to analyze the coordination in the duets of the Australian magpie-lark Grallina cyanoleuca. Researcher here used a pair

of magpie-lark robotic models. The models used taxidermic skins, so the color, pattern, and surface texture were realistic. The tests combined vocal duet playback with robotic models that produced wing movements and tested whether audio-visual coordination enhances the receiver's responses during interactions in this species.

The researcher working on this study performed three experiments with two treatments each to test how magpie-larks respond to duets coordinated acoustically and visually between animals and audio-visually within an animal. The reaction was measured by the number of songs and flying toward the robots by the male and female.

Each experiment involved the same twelve pairs of birds, with at least four days between consecutive experiments with a pair. The experiments consisted of two treatments carried out on the same day with a pair. Such a scheme aimed at maximum precision of animal comparisons. The order of treatments and experiments was balanced by design with respect to the pair and sex of the duet initiator. Each treatment lasted 10 minutes.

The results indicated that magpie-larks responded differently to coordinated and uncoordinated duets. Both males and females initiated more songs in response to fully coordinated treatments than to treatments that were uncoordinated, suggesting that full coordination created the strongest signal. Overall, females initiated fewer songs than males. Similarly to song initiations, pairs produced more duets and were more likely to fly toward the model birds in response to coordinated treatments than to all uncoordinated treatments. Playbacks that were precisely coordinated in terms of either movements or songs without coordination in the other channel did not increase the perceived territorial threat of the display relative to playbacks that were uncoordinated in both channels between animals but coordinated between channels within an animal.

"Multimodality of signals can be beneficial for the signaller as well as for the receiver because there are many ways through which one signal component can improve the efficacy of the other, said the paper's author, Paweł Ręk. "The problem appears when signal components are not aligned in time because the mismatch creates illusions and conflicts from the perspective of the receiver. Multimodal coordination within individuals has been studied for many years but it concerned signals with mechanistically constrained components. This study shows that it is also important in cooperatively signalling species, in which coordination is not an effect of a physical constraint but motivation and experience of partners."

More information: Paweł Ręk et al, Multimodal coordination enhances the responses to an avian duet, *Behavioral Ecology* (2017). DOI: 10.1093/beheco/arx174

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