# Songbirds may give insight to nature vs. nuture

June 3 2013

On June 3rd, *JoVE* will publish a research technique that allows neural imaging of auditory stimuli in songbirds via MRI. The technique, developed by Dr. Annemie Van der Linden and her laboratory at the University of Antwerp in Belgium, will be one of the first published in *JoVE* Behavior, a new section of the video journal that focuses on observational and experimental techniques that seek to understand human and animal behavior through physiological, neurological, and genetic means.

Species of animals that are more vocal in their expression, like macaques, parrots, or the zebra finch used in the *JoVE* article, are unique as they provide a landscape for scientists to study song acquisition, storage, and regurgitation. Results from these test subjects provide strong parallels and insights to human language acquisition. The birds are also much easier to maintain and study in laboratories than other vocal animals like apes.

By utilizing a high-resolution functional magnetic resonance imaging apparatus (fMRI), Dr. Van der Linden and her colleagues can image the brains of live birds in a non-invasive environment. MRI is widely used with human beings, which makes any findings derived from songbirds highly applicable to working with the human brain.

"Until recently, fMRI in small animals was mainly focused on rats, and to a lesser extent on mice," Dr. Van der Linden explains. "Thus far songbird brains have been studied using electrophysiological and

histological techniques. However, these approaches do not provide a global view of the brain and do not allow repeated, long-term developmental measurements. Using the songbird model and MRI as an in-vivo tool allows us to answer many questions related to learning, language, and neuroendocrinological plasticity."

The Van der Linden laboratory hopes to use this technique to conduct experiments that be done with humans. For example, they are able to see how language acquisition may be different between animals raised in isolation and animals raised socially, or between genetically modified songbirds and naturally occurring ones. Results of these trials will allow researchers to gain insight into genetic and social components of behavior, bringing insight to the "Nature vs. Nurture" debate.

This article is a milestone for *JoVE* as it is one of the first articles in the new *JoVE* Behavior journal section. The expansion will mark *JoVE*'s eighth journal section after the recent additions of *JoVE* Chemistry and Applied Physics. Allison Diamond, *JoVE*'s Deputy Editorial Director for the Life Sciences, explains, "The addition of *JoVE* Behavior will allow scientists to learn and reproduce behavioral experiments, such as bird fMRI techniques as described in Dr. Van der Linden's article, which are both novel and technically complex. Increasing the understanding and ability to reproduce such methods will benefit behavioral research and provide greater insight into both animal and human cognition."

Proud to be included in this significant new section, Dr. Van der Linden says, "MRI imaging techniques should in the near future lead to major conceptual advances in the study of how the brain changes behavior and how behavior changes the brain, both in health and disease. These advances will be due mainly to the inherent capacity of fMRI for repeated measures over longitudinal studies. *JoVE* is the best way to 'show' how-tos of these experimental procedures."

**More information:** Van der Linden et al. Functional Magnetic Resonance Imaging (fMRI) with Auditory Stimulation in Songbirds. J. Vis. Exp. (76), e4369, doi:10.3791/4369 (2013).