By keeping the beat, sea lion sheds new light on animals' movements to sound

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This image shows Ronan, the sea lion. Credit: American Psychological Association

A California sea lion who bobs her head in time with music has given scientists the first empirical evidence of an animal that is not capable of vocal mimicry but can keep the beat, according to new research published by the American Psychological Association.

The study's authors suggest that their findings challenge current scientific theories that an animal's ability to synchronize its movements with sound are associated with the same brain mechanisms that allow for vocal mimicry in humans and some birds such as cockatoos, parrots, and budgerigars. The findings were published online April 1 in APA's *Journal of Comparative Psychology*.

"Understanding the cognitive capabilities of animals requires carefully controlled, well-designed experiments," said study co-author Colleen Reichmuth, PhD, with the Institute of Marine Sciences at the University of California at Santa Cruz. "This study is particularly rigorous because it examines, step-by-step, the learning conditions that supported the emergence of this complex behavior."

Ronan, a 3-year-old sea lion, demonstrated her ability to bob to the beat in six experiments led by doctoral candidate Peter Cook at the Long Marine Lab at UCSC.

"Dancing is universal among humans, and until recently, it was thought to be unique to humans as well," said Cook. "When some species of birds were found to have a similar capability for rhythmic movement, it was linked to their ability to mimic sound. Now we're seeing that even mammals with limited vocal ability can move in time with a beat over a broad range of sounds and tempos."

Ronan's first musical "dance" lesson was to the tune of a simplified section of John Fogerty's "Down on the Corner," the study said. Once Ronan was trained to bob her head to music, the researchers tested her

with two pop songs, "Everybody" by the Backstreet Boys, and "Boogie Wonderland" by Earth, Wind and Fire. Without any prior exposure to the songs, Ronan was able to bob to the beat of both songs over the course of multiple trials, according to the study. She then showed that she could follow along to five different tempos of "Boogie Wonderland."

Ronan's bobbing skills markedly improved over the course of the trials and apparently endured, the study found. The researchers gave her a follow-up test a few weeks after the final session and she was successful in keeping the beat with each of the sounds previously used, maintaining a minimum of 60 consecutive bobs to each of the various beats.

At the beginning of the experiments, Ronan was first trained to move in time to a hand signal, which was replaced by a simple non-musical sound signal. When she successfully completed tests by bobbing her head to various rhythmic sounds, she was rewarded with a fish, the study said.

The researchers varied the types and speed of the sounds to verify that she was actually following the rhythm by bobbing her head. To rule out that she wasn't simply bobbing her head in response to the previous beat, they tested her using two computer-generated, metronome-like ticks – one that did not miss a beat and the other that did. Ronan kept the beat going even when the metronome missed a beat, according to the study.

  More information: "A California Sea Lion (Zalophus californianus) Can Keep the Beat: Motor Entrainment to Rhythmic Auditory Stimuli in a Non Vocal Mimic," online April 1, 2013, *Journal of Comparative Psychology*.

Provided by American Psychological Association