Mice discriminate partial sounds just as humans do with partial words

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Credit: Martha Sexton/public domain

Micheal L. Dent, a University at Buffalo psychologist, listens to what is inaudible to others. And what she's hearing might one day help us better understand human hearing loss.

Dent studies ultrasonic vocalizations (USVs) in mice. These sounds are

above the human ear's upper limit, but they can be recorded and played back using specialized equipment that has allowed Dent to capture an impressive repertoire that when graphically represented shows a variety of sweeps, arcs, dips and curves. The tempo and intensity of these vocalizations change, as does their frequency bandwidth and the amount of frequency and [amplitude modulation](#).

"There is so much complexity in these USVs," said Dent, an associate professor of psychology in the UB College of Arts and Sciences.

Several studies suggest that mice use these vocalizations for acoustic communication, but it's not conclusive whether USVs, in fact, carry meaning. Though diverse, the resulting array is still not entirely understood, so Dent is first trying to learn if mice can tell the difference between the vocalizations.

If these USVs are behaviorally relevant to the mice, then being able to perceive and identify them accurately in the environment, even when portions of the calls are perceptually masked, would be beneficial to an individual's survival, she writes in the study, "Discrimination of partial from whole ultrasonic vocalizations using a go/no-go task in mice," with UB graduate students David P. Holfoth and Erikson G. Neilans. The study was published in the December edition of the *Journal of the Acoustical Society of America*.

Mice are being used increasing as models because their inner ear structure and auditory system organization are similar to humans. Mice also progressively lose their hearing and are completely deaf at 18 months old. They also have what Dent says is an undeserved reputation as being uncooperative subjects for behavioral research.

"It has been said that mice can't be trained. We have found that's not the case. We train them to detect sounds, discriminate between sounds,

localize sounds and categorize sounds using operant conditioning and positive reinforcement," she said.

For the current study, calls were broken into pieces to determine which piece led to better recognition of the whole call. It turns out that mice perceive the partial vocalizations as humans do with word onsets, in that each finds the beginning of the USV or word more similar to the whole than its ending.

"This result is an interesting parallel between two seemingly very different communication systems," said Dent.

Dent says these results don't prove the vocalizations have meaning, but they do at least point toward communication purposes. "Otherwise there would be no difference in the discrimination of the beginning of the vocalization as opposed to the end of the vocalization," she said.

The research is still in its infancy, but Dent believes this work strengthens the utility of mice as good models for human communication.

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