The Hearing Lab

A field guide to hearing science

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Welcome

As an independent journalist–audiologist, I'm excited to bring the latest in hearing science research to a broad audience through hearinglab.org.

I have nothing to sell nor any ax to grind. If you share my fascination with hearing and the advances being made in hearing science, please join me in exploring our sense of hearing, a source of frustration — and so much joy.

Periodically I write an original article covering a current topic for Top Stories. These are carefully researched and timely news features that takes a fresh look at hearing science for a general audience.

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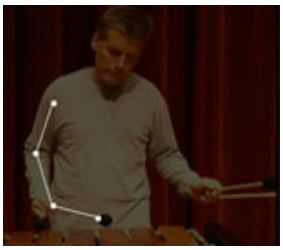
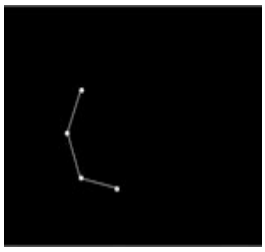
Do you see what I'm saying?





Michael Schutz's lab uses customized testing software to research audio-visual integration. This software generates point light displays mimicking the striking motions used by marimbists. For more information about how Schutz's lab created the software, visit Maple Lab.

Study opens doors for new hearing and autism research

February 12, 2012 | by Nedra Floyd-Pautler, MA (Journalism), MA (Audiology), *The Hearing Lab*
Comments

We absorb music through our ears — and our eyes.

A study by Michael Schutz, PhD, an assistant professor of music at McMaster University, Hamilton, Ontario, Canada, demonstrates that even for knowledgeable listeners, what they see integrates with the physical sounds in a musical performance.

Schutz, a professional percussionist, also researches how hearing is affected by seeing and uses music to understand how auditory and visual information are integrated, primarily with the aim of

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Listen with eyes open or closed?

Depends on what you are looking for, says Michael Schutz, assistant professor of music at McMaster University, Hamilton, Ontario, Canada.

Closing your eyes at a live performance can allow you to hear more accurately by reducing distractions. But, it can also eliminate important musical information.

In some cases body movements allow performers to side-step acoustic limitations of their instruments, providing a better listening experience.

One approach is not inherently better than the other, Schutz says, they simply offer different tradeoffs.

"I'm fascinated by how this gives audiences the ability to help to shape their own listening experience."

An insider's

For daily updates, either check out the links under the News topics on the horizontal bar above the feature or link to the topic area below the feature. News links to articles produced by other outlets, which are always cited.

General topics in hearing science and in dealing with hearing loss are covered under The Basics.

Let me know what interests you.

Be Well,

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understanding music perception. As director of the Maple Lab, he supervises a team conducting research in music, acoustics, perception and learning.

His work now may help researchers in hearing science and autism better understand the connection between seeing and hearing, and what it means when the sense of hearing is diminished or the brain's ability to process sound is impaired.

Events in the world—a falling rock, for example—create energy and each of our senses detects that energy in different ways. Our brains instantly integrate this information to give us a unified experience of the world. This experience is, in a sense, an illusion as our brains constantly make inferences as to what the incoming sights and sounds represent.
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For most of us most of the time that's close enough to competently go about our daily lives and occasionally be provided with amazing 'how'd-he-do-that' entertainment in the hands of a clever magician.

Even though combining what we see with what we hear is incredibly complex, we don't usually give it any thought. Movie theaters are great showcases for seamless auditory-visual integration. Movie theater sound comes from speakers fixed to the wall. Yet the actors' voices seem to move around the screen with them. To the audience it sounds like they're in the middle of the action.

"The brain is so engaged in the quest to put things together that go together, it actually fixes the problem (stationary speakers) for you," says Schutz. "It gives you an experience of the voices bouncing back and forth between the actors. It is bending over backwards to try to give you an experience that makes sense."

But, lots can go wrong: our senses or our brain's interpretive abilities may malfunction. With hearing loss for instance, our brains receive only partial messages. And occasionally our brains process energy from the senses in unusual ways, such as in individuals with disorders like autism and dyslexia.

By examining the difference between the physical world (acoustics/sound waves) and the audience experience (perception), Schutz showed that arm gestures can control the perceived length of a tone without changing the length of the physical sound wave. What you see influences what you hear. In his study, Schutz had fellow marimbist Michael Burritt perform individual notes using either long or short gestures.

The audience, undergraduate music majors, heard a longer tone when a longer gesture was used and a shorter tone when a shorter gesture was used, even though the gesture did not change the length of the physical sound waves.
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In the article, The Mind of the Listener: Acoustics, Perception, and the Musical Experience (Percussive Notes, November 2009) Schutz

view of Asperger's

For a glimpse at how auditory-visual integration difficulties can affect a person's experience of the world watch the movie, Temple Grandin.

It's the story of a university professor and author of several books, including The Way I See It, who has Asperger's disorder. The movie pulls you inside Grandin's mind and helps you see and hear the world as she does.

Her different look at the world contributes to her social problems, but also leads her to find solutions others don't see.

wrote about the tremendous power vision plays in hearing marimba music based on the arm movements of the performer.

"That gestures influenced ratings so strongly despite instructions to ignore visual information suggests integration is obligatory. It is no more possible to ignore the gesture than to read the letters D-O-G without understanding they refer to the four-legged animal commonly known as 'man's best friend.'"

The technique used in his music perception experiment also opens new possibilities for studying hearing loss and perceptual disorders. Drawing on his background in computer science, Schutz manages a team of programmers developing software to generate computer-rendered representations of marimbists' body movements. This innovative software package enables scientists to study auditory-visual integration in a more natural listening environment and frees them from the more sterile lab protocols using clicks and beeps. By teaming up with other researchers, Schutz is broadening the scope of his work beyond music perception.

Audiologist Kristi Buckley, PhD, University of Buffalo, and Schutz are coupling another auditory-visual illusion—the McGurk Effect (video)—with the marimba task to see how much people with hearing loss rely on their sight compared with people with normal hearing. The McGurk Effect demonstrates the interaction between vision and hearing in speech perception. Seeing lips move is considered equivalent to turning the volume up a couple of notches for people with impaired hearing. Through an American Academy of Audiology grant, Buckley and Schutz expect to learn more about how people with hearing loss rely on visual cues. Other visual aids may become apparent as more is understood about auditory-visual integration.
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The study of autism and related conditions also could benefit from Schutz's marimba task. Often people with these conditions process sensory information in unusual ways.

With Autism Spectrum Disorders (ASD), affecting one in every 110 children in the United States, according to the Centers for Disease Control, improving our understanding and finding treatments is an increasingly important focus of health-related research.

Laura B. Silverman, PhD, a clinical and research psychologist at the University of Rochester Medical Center, is one of those scientists. As an assistant professor of pediatrics, she examines communication and social skills in kids with high-functioning autism spectrum disorders. She is particularly interested in understanding what they see and hear.

A couple of years ago Silverman was looking for a task using a natural motion along with a sound other than speech for an National Institutes of Health (NIH) research proposal. She found her answer one evening when she stepped out of the lab and into a reception for new faculty. Marimbist Burritt provided music for the reception, and Silverman was enthralled with his performance. The next day

she searched his name on the Internet. Finding him linked her to Schutz's marimba study and the natural-motion task she was seeking for her research.

In an earlier study, Silverman showed that people with autism have trouble automatically binding together the speech they hear with the hand gestures that they see people making while they speak. Other autism studies have looked at integration of higher-level skills, like speech and lip movement or lower-level skills, using beeps and flashes.

"I wanted to look at how people with autism process this audio-visual information really broadly," Silverman says. "And I needed a lower-level task that wasn't as complicated as language and that related to things that could actually happen in the real world. What was really nice about Schutz's research was that it looks at how people integrate sound with body movement in a natural kind of situation.

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The National Institutes of Health funded their grant, providing $300,000 to support a three-year investigation of gesture and sound integration abilities in autism. Nearly 40 adolescents have completed diagnostic phase, which assesses learning, memory, and language skills. Six adolescents have completed the second phase, which includes a series of tasks focusing on gesture-speech integration, including Schutz's marimba task.

Finally, subjects will undertake tasks in a simulated school setting where someone tells a story, sometimes using gesture and sometimes not, and then ask the subjects to retell the story.

"Our goal is to see how much they remember and to come up with some recommendations for teachers and parents," Silverman says. "Most people think that gestures and signs help children with autism learn, but this may not be the case in certain situations. We want to better understand how to teach individuals with autism in a way that improves their learning capabilities."

"It really tickles me," Schutz says. "After a talk I gave someone mentioned that it would be interesting to work with people with autism on integration. I agreed, but unfortunately I did not have the background to pursue it. Literally four days later Laura contacted me out of the blue. It was one of those beautiful moments in research—the law of unintended consequences."

He hopes the studies in hearing loss and autism will lead to even broader use of his marimba task in the effort to pinpoint the mechanisms of auditory-visual integration. Additionally, Schutz is hopeful that this work will demonstrate the importance and significance of basic research on music cognition.

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