

Sweet music or sour notes? The test will tell

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An online study by UB psychologist Peter Pfordresher and colleagues will be used to evaluate people's ability to match specific tones and melodies when they sing.

Most people rarely sing publically outside of a duty-bound rendition of "Happy Birthday." And since that particular song is usually offered as a group performance, even the reluctant join in the spirit of the occasion, hoping their individual shortcomings will be cloaked by the chorus.

"I can't sing," says the hesitant performer. But a University at Buffalo psychologist believes that most people are not as bad at singing as they might think and he is collaborating on the development of an online test that will evaluate participants' ability to match specific tones and melodies.

Peter Q. Pfordresher is among seven researchers in psychology, neuroscience and music education from across the country working on the "Seattle Singing Accuracy Protocol (SSAP), a name derived from a 2013 workshop where the collaborators agreed on a set of core tasks that could be used to measure singing accuracy.

A description of that protocol will appear early next year in a special issue of the journal *Music Perception* that Pfordresher is co-editing with

Steven Demorest, a professor of music education at Northwestern University.

The National Association for Music Education (NAFME) is funding the project.

Pfordresher says there are many ways to evaluate singing, but his research - and this project - is about accuracy not aesthetics.

"I study whether people are hitting an intended pitch or not," he says. "It's accurate versus inaccurate."

Pfordresher has always been interested in listening to people sing and identifying where they make mistakes. Formal study, however, began when he was still a student in graduate school working on a project that measured singing accuracy.

"That work got me thinking about what has to go right when we're singing tunes," says Pfordresher. "Is there a hierarchical structure in music that makes certain aspects easier to get right and certain aspects harder to get right?"

Research shows that most people have the gist, but miss the details. For instance, they usually don't mistake the direction of pitch changes when reproducing a melody. The notes they produce may be wildly inaccurate, but the changes in pitch direction, whether up or down are frequently spot on. They're also good at correctly reproducing large and small pitch intervals. Think of the two syllables in "somewhere" from the beginning of the Academy Award-winning ballad "Somewhere over the Rainbow" as a large interval and the two syllables in "over" as a small interval.

Yet a lot can still go wrong.

Singing involves low-level perception issues, such as pitch, duration, timbre and intensity. There is also a motor plan of action involving respiration, phonation and articulation. Pfordresher concentrates his research on the area between

perception and action: what's called sensorimotor translation, or the ability to translate sound into action.

And it is, in fact, a form of translation.

"What goes on in our peripheral nervous system during listening is incredibly different than what has to go on when making sounds," says Pfordresher. "Production involves an entire network of muscles that all interact. So moving from listening to singing is like taking one language and translating it into another."

The SSAP will measure how well people handle the translation.

The program first guides participants through warmup exercises that determine their vocal range and arrives at a comfortable key in which to take the test. Then they hear a target melody and sing that melody back. Afterward, the performance is scored and wave forms display where their singing fell in relation to the target melody.

Pfordresher envisions three primary applications for the program.

"Early music education programs usually involve large groups. Generally, there isn't time to work extensively with individual students. This measure can provide educators with a tool to manage their time by pinpointing which students might need extra attention."

He says there is also a scientific application that will allow for broad-based measures of musical ability.

"The third reason is that people are interested," he says. "They want to know more about their musical abilities. I can see people taking this test and scoring better than expected. This can break down inhibition. Singing is fun, but many don't engage in it and research shows there are many benefits to doing so, from being helpful in social situations to stress reduction. More people singing is a good thing."

Intervention, though not part of the project, is the next big step.

There is suggestive evidence that visual feedback would be helpful. Poor-pitch singing might be, in part, an inability to imagine the right pitch. That failure of imagination is due to the inaccessibility. Singing requires an ensemble of muscles, but it is nearly impossible to observe those muscle movements. We can watch a tennis serve and subsequently model the movements, but such visualization in singing is not so easy.

"Evidence from research I conducted with Andrea Halpern concerning auditory imagery and singing shows that when we imagine a melody there is activity in various motor areas of the brain that are designed for motor planning," says Pfordresher. "People who are poor singers report significantly less imagery."

Pfordresher says we can also enhance the associations between pitch and voice. Poor singers tend to use a restrictive pitch range when imitating melodies - something they don't do when speaking - so poor singers may not have explored the full range of their [singing](#) voice.

"These are among the possible avenues of treatment," he says. "Whether they work is something to be determined."

Provided by University at Buffalo

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