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Tone Deafness and Bad Singing May Not Go Hand in Hand

When the singer is just awful, the problem may be more than faulty perception.

By Greta Munger and David Munger

When most people think of someone who's tone deaf, they're likely to conjure up images of an American Idol contestant who's is shocked when the judges tell her she's got a horrible singing voice—or perhaps the man who belts out every hymn in church but always seems to be at least two notes off from the rest of the congregation.

Being tone deaf often doesn't refer just to poor hearing, but also to poor singing. But it's also possible that bad singing isn't actually caused by bad hearing. A recent report by cognitive neuroscientists Peter Q. Pfordresher at the State University of New York at Buffalo and Steven Brown at Simon Fraser University suggests that poor music perception is actually just one of four possible causes of tuneless warbling. Yes, bad hearing might be at fault, but poor control of the vocal system is another possible factor. In other words, even if you can hear the note, you still might not be able to produce it. Third might be an inability to imitate: you can hear the sound and you know what sound you want to produce, but you can't combine the two—just as a baseball player might see a pitch and know how to swing the bat, but still strike out. Fourth, it might be that awful singers have bad memory: between the time they hear a song and when they sing it back, they forget the notes.

Types of Tunelessness

Although there have been many studies of perceptual tone deafness, or amusia, few have compared people's ability to hear differences between musical notes with their ability to produce good music. This fact is what makes the recent study by Pfordresher and Brown so interesting. They tested 79 college students on both their ability to discriminate between musical notes and their ability to sing accurately. First they identified the poor singers. They asked singers to imitate recordings of a singer producing four notes in varying simple patterns: the singers repeated the same note four times, they repeated two notes twice, or all four notes were different. Such short patterns should be easy to remember, removing bad memory as a potential issue. Based on this test, 10 of the 79 singers were identified as "pitch poor" because their average error while singing was more than a semitone (equal to the distance between B and C on a piano, between "ti" and "do," or between any natural note and a flat or a sharp). These people aren't just a little off; they're singing a completely different note. The first graph above illustrates the difference between the poor singers and the good singers [*to see the graph, click on the "next" arrow underneath the photo of the man with the boombox]*.

The bad singers were significantly worse than the good singers, and dramatically so. No matter the circumstance, they were off by more than two semitones, as far apart as any consecutive notes on the scale, even when repeating just a single note. In a second phase, where a recording of a professional was playing in headphones along with their own voice, the poor singers did even worse. They were off by as many as three semitones, or the distance between A and C on the scale! In other words, pitch-poor singers are worse when they accompany someone else; they can't even match a simultaneously presented pitch.

But when they were tested on their ability to detect changes in pitch, the results were very different [*to see the second graph, click the "next" arrow once again*].

The second graph above shows how well listeners could distinguish between two notes that differed in pitch in variable amounts. There was no significant difference in the results for good singers and poor singers. So even though some of these singers' vocals were truly hideous, they were just as good at detecting changes in notes as the good singers. No relation appears to exist between amusia and singing ability.

A Second Experiment

Given the relatively small number of poor singers in this experiment, the researchers felt it was important to reproduce the findings with a larger group. In a second experiment, the researchers match a new set of poor singers with a group of good singers, and found the same results again. There was no relation between ability to perceive music and produce music. Indeed, some very good singers were quite awful at detecting the difference between musical notes. In this second experiment, the researchers also asked the poor singers to do a vocal sweep of their entire singing range. Good singers and bad ones displayed no difference in vocal range.

So what might be the cause of bad singing? Pfordresher and Brown say it's probably not amusia or poor perception of sound: if so, then bad singers also would have been bad listeners, and good singers would have been good listeners. Instead, there was no difference in the musical perception abilities of either group. It may be that some people with profound amusia also can't sing. But based on these results, in the general population, most bad singers can discern musical notes just fine. They also say it's probably not bad memory. Even when they were accompanying a professional, bad singers still sang badly. Finally, poor motor control doesn't explain the difference either: bad singers have a similar vocal range as good singers.

What bad singers don't seem to have is the coordination between music perception and music production. They're just like the batter who can see a baseball pitch and swing a bat, but still strikes out.

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