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## **Having "perfect pitch" may depend on language**

Study of speakers using tonal speech offers teasing clues

BY JAMES GLANZ

Most native speakers of languages that use tones to convey meaning may have a form of perfect pitch, according to new research that suggests that many or even most babies may be born with perfect pitch, but lose it if they do not learn a tonal language or undergo early musical training.

The brain processes acoustic tones in certain regions of the temporal lobes. Neural cells at different points in those regions are sensitive to different tones.

But while most people find it easy to perceive and sing musical tones relative to one another, an ability called relative pitch, the ability to place them on an absolute scale is much less common. Absolute or perfect pitch turns up in no more than one person out of 10,000 in Western countries, according to some estimates.

The languages studied in the new research were Vietnamese and Mandarin Chinese, in which different rising and falling tones can impart different meanings to the same combination of vowels and consonants.

For example, the Mandarin word *ma* can mean mother, hemp, reproach or horse, depending on whether the spoken tone is flat, rising, falling, or falling and then rising.

While the differences in meaning are conveyed largely by relative rather than absolute pitch, the researchers, led by Diana Deutsch, a psychologist at the University of California-San Diego, found that speakers retain an absolute tonal standard.

In the study, which Deutsch described Thursday at a meeting of the Acoustical Society of America, the researchers recorded Vietnamese and Mandarin speakers as they read lists of words that covered a wide range of tones, and then repeated the exercise days later. A computer analysis of the recordings showed that individual speakers uttered the same words at the same absolute pitches to within fractions of a semitone -- the musical step from one key on a piano to an adjacent one.

``It really sounds as though the person is sitting there immediately repeating the sound," Deutsch said. ``Which is really, to my mind, amazing."

While the new findings have surprised many scientists, some said that more research needs to be done to show that the ability displayed by Vietnamese and Mandarin speakers is identical to perfect pitch as it is understood in music.

``It is still possible that the subjects may not actually see or realize a connection between tone as they use it in language, and pitch as a musical concept," said Donald Hall, a physicist at California State University-Sacramento who studies musical acoustics and is a church organist with perfect pitch.

Other research has shown that the prevalence of perfect pitch is higher in Japan, where the language is not tonal, but where many young children receive Suzuki music training. Perfect pitch is also more common among

professional musicians, but studies so far have not established whether the talent arises from youthful practice or led the musicians to their vocation in the first place.

Still, some scientists said the new findings suggest that most babies are born with perfect pitch but retain it only by learning a tonal language or undergoing some sort of early musical training.

“There could be a much higher incidence of absolute-pitch musicians out there if all of us were exposed to music much earlier,” said Dr. Gottfried Schlaug, a neurologist at the Beth Israel Deaconess Medical Center in Boston who has studied how structures in the brain are related to absolute pitch.

Others believe that most people, even in Western countries, do retain an almost perfect “pitch memory” but simply lack a means of giving names to each pitch and putting the ability into practice, as speakers of tonal languages can do.

“What it means to me is that people have a very accurate memory for musical pitch,” said Daniel Levitin, a cognitive psychologist at McGill University in Montreal who has studied perfect pitch. “You and I don’t have the ability to attach these labels to it.”

Another conceivable explanation for the results could lie in innate differences between Western and Asian populations, but Deutsch dismissed that possibility as “extraordinarily unlikely.”

For the study, Deutsch, a psychologist, collaborated with Trevor Henthorn, an audio engineer at the Center for Research in Computing and the Arts at UC-San Diego, and Dr. Mark Dolson, a specialist in audio signal processing for Creative Technology Limited in Scotts Valley.

In one series of measurements, the team asked seven native speakers of Vietnamese to read a list of words that spanned the range of tones in that language. Days later, the task was repeated, and recordings of each word were broken up into five-millisecond intervals on a computer and analyzed for their average tonal content.

The differences of pitch between the two repetitions of a word by a particular speaker were all less than 1.1 semitones, and four of the seven speakers displayed pitch differences of less than half a semitone.

The results for 15 Mandarin speakers were perhaps even more striking, with nearly all of the speakers showing differences of fractions of a semitone from session to session.

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