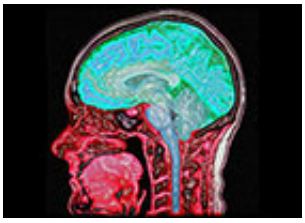
Medical Xpress

Study of vocal impersonations reveals how we manipulate our voices

June 19 2013



A study of vocal impersonations has shown for the first time how speech production and voice perception systems in the brain interact to influence the way our voices sound. The research, supported by the Wellcome Trust, marks a significant step towards understanding how our brains affect our speech and vocal identity, and could one day help with the rehabilitation of stroke sufferers whose speech has been impaired.

Our voices are highly flexible and dynamic; like faces, they express many aspects of our identity. From hearing a few words, we can estimate a person's gender, their age and where they are from, as well as making more subtle observations about their mood or health.

A team at the Institute of Cognitive Neuroscience, UCL, used functional magnetic resonance imaging (fMRI, which measures levels of activity in the brain through changes in blood flow) to measure activity in the brains of 23 English-speaking adults performing spoken impressions.

In the scanner, the participants - who were not professional voice artists or impressionists - repeatedly recited the opening lines of a familiar nursery rhyme. They were asked to do this under three different speaking conditions at random: in their normal voice, impersonating individuals, and impersonating regional and foreign accents of English.

The researchers observed increased neural activity in the speech production areas of the brain when participants talked in different accents and when they impersonated a person's voice, compared to when they spoke normally. The new findings reveal that deliberate voice changes primarily recruit the left anterior insula and inferior frontal gyrus, areas of the brain supporting speech planning and production - indicating that these areas influence the way we speak, not just what we say.

The researchers also demonstrated increased activation in the right temporal regions (an area previously implicated in perceiving and recognising voices) when participants performed specific impersonations compared with accents. These regions also showed greater connectivity with speech planning sites at the front of the brain during the performance of impersonations. This offers a novel demonstration for a selective role for these voice processing sites, relevant to individual identities, in changing the expression of voices.

Professor Sophie Scott, Wellcome Trust Senior Research Fellow, who led the study at the Institute of Cognitive Neuroscience, said: "Our voices express a lot about our identity - we talk differently all the time depending on who we are talking to, sometimes without realising. For example, people tell me I talk exactly like my mother after I've been speaking with her on the phone, but I can't tell that I am doing it.

"We've shown that the engine running speech production can be broken down into different components, responsible not just for what we say but

for how we say it too. The next step is to repeat the experiment with professional impressionists - early indications show that professionals focus more on visualising the person they are impersonating than non-professionals, rather than what they sound like."

Dr John Williams, Head of Neuroscience and Mental Health at the Wellcome Trust, said: "We tend to take our vocal identities for granted, but following a stroke some people find they sound different, which can be very frustrating and upsetting and can affect their sense of personal identity. We hope that further research into understanding how our brains control voluntary speech changes will help with the development of therapeutic approaches for these patients."

The study is now available online in the *Journal of Cognitive Neuroscience*, and Professor Scott is currently recruiting professional voice artists and impressionists to repeat the experiment.

More information: McGettigan C et al. T'ain't what you say, it's the way that you say it - left insula and inferior frontal cortex work in interaction with superior temporal regions to control the performance of vocal impersonations. *J Cogn Neurosci* 2013 (epub ahead of print).

Provided by Wellcome Trust