This is your brain on a musical instrument

Greg Toppo, USATODAY 6:03 p.m. EDT September 2, 2014

(Photo: Michael Penn AP)

Learning to play a musical instrument produces such profound changes in children's brains that kids actually can hear and process sounds they couldn't hear otherwise, according to researchers using high-tech sensors.

The findings, published Tuesday, could provide a boost to music education programs that invite kids to play instruments rather than simply listen to music.

The study, by researchers at Northwestern University, examined a community music program serving low-income children in Los Angeles. They attached special electrodes to children's scalps and measured how their brains responded to sounds. The children's average age was about 8.

Researchers found that those who played an instrument for two years showed a stronger "neurophysiological distinction" between certain sounds than children who didn't get the

instrumental training. For instance, the music-makers more easily could tell the difference between the words "bill" and "pill," a key skill in learning to read.

The Los Angeles program already has shown improved academic results for kids, and the new research may offer an explanation, or at least part of one. The study found that the more hours kids played, the greater the neurological benefit.

"We're really able to measure what the nervous system has become, based on the experience that these children have had with sound," said Nina Kraus, a neuroscientist at Northwestern who led the research.

The new findings, she said, shouldn't be confused with those reported years earlier on the cognitive benefits of listening to certain types of music. The so-called "Mozart Effect" involved listening, not playing a musical instrument. "It turns out that playing a musical instrument is important," Kraus said. "We don't see these kinds of biological changes in people who are just listening to music, who are not playing an instrument. I like to give the analogy that you're not going to become physically fit just by watching sports."

She isn't sure why the difference is so pronounced but noted that playing music involves "not just the information that comes through our ears." Musicians experience the music through their fingers and throughout their bodies. And the work required to learn to play an instrument engages the brain's cognitive, sensory and reward circuits. The new research, she said, "is the tip of the iceberg."

The findings appear in *The Journal of Neuroscience*.