



AUDITORY NEUROSCIENCE LABORATORY

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SUMMARY – BIOLOGICAL IMPACT OF COMMUNITY-BASED MUSIC INSTRUCTION

Publications from Harmony Project Collaboration - 2014

Kraus lab 2014 papers on the effects of music training are the collective product of a multi-year partnership with the Harmony Project, a long-standing community-based music and mentorship program serving disadvantaged youth in Los Angeles's gang reduction areas. Harmony's founder came to us seeking answers. Did participation in the program explain the surprising academic success of Harmony's students, with many continuing on to college? Could we help figure out what was happening in these students' brains?

NU researchers traveled to LA to conduct a comprehensive battery of scholastic and perceptual tests. To assess brain function, our lab has developed a unique biological approach that indexes "what the brain hears" –the accuracy, size, speed and consistency of the brain's response to sound, providing a snapshot of the hearing brain's efficiency.

Using this biological approach, we found that 2 years of training improved students' neural responses to speech, a brain measure linked to literacy¹. We saw this improvement with 2 years of training, but not just 1. Music, then, can't be thought of as a quick fix. Results also showed that students actually involved in music making –those who attended class more frequently, those who were judged by their teachers as more engaged, and those who played an instrument rather than taking a music appreciation class—showed greater neural improvement^{2,3}. Finally, in contrast to the control group whose literacy performance declined (as expected for low SES students), a possible similar dip was instead buffered by music training, with music students staying on track with national norms⁴.

In fact, we found an actual change in the neural signature that is a part of the profile of children of poverty⁵. Previous research in our lab has shown that poverty negatively influences neural encoding, resulting in less efficient, less consistent, and "noisier" processing of sound. Evidence of music training's ability to alter and improve this signature is a welcome answer to Harmony's question, "What's happening in students' brains?"

No one doubts that afterschool music programs can bring children joy. Our Harmony collaboration shows these programs also offer the potential to stimulate biological changes in neural processes important for everyday communication. Educators and legislators responsible for policy making can look to our findings with renewed determination: accessible community-based training programs can – and do—promote positive change.

We encourage you to explore our website, www.brainvolts.northwestern.edu. The website is a labor of love; we update it almost daily. Be sure to check out the *friendly overview slideshow* offered for each *lab project*. For an overview of our biological approach to measure brain activity, you can look at the animated *demonstration* at the bottom of our homepage.

...see publications below:

PUBLICATIONS

¹Kraus N, Slater J, Thompson E, Hornickel J, Strait D, Nicol T and White-Schwoch T (2014). [Music enrichment programs improve the neural encoding of speech in at-risk children](#). *Journal of Neuroscience*. 34(36): 11913-11918.

²Kraus N, Slater J, Thompson E, Hornickel J, Strait DL, Nicol T, White-Schwoch T. (2014). [Auditory learning through active engagement with sound: Biological impact of community music lessons in at-risk children](#). *Frontiers Aud Cogn Neurosci*. 8(351). doi:10.3389/fnins.2014.00351.

³Kraus N, Hornickel J, Strait DL, Slater J, Thompson EC. (2014) Engagement in community music classes sparks neuroplasticity and language development in children from disadvantaged backgrounds. *Frontiers in Psychology, Cognitive Science*.

⁴Slater J, Strait DL, Skoe E, O'Connell S, Thompson E, Kraus N. (2014) Longitudinal effects of group music instruction on literacy skills in low-income children. *PlosOne*. doi: 10.1371/journal.pone.0113383.

⁵Skoe E, Krizman J, Kraus N (2013) [The impoverished brain: Disparities in maternal education affect the neural response to sound](#). *Journal of Neuroscience* 33(44):17221–17231.

Kraus N, Strait DL. Review, (in press). Emergence of biological markers of musicianship with school-based music instruction. *Annals of the New York Academy of Sciences*.