Cognitive and sensory influences on speech perception by cochlear implant listeners

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Project details
Cochlear implants (CIs) restore hearing to deaf people by electrically stimulating the auditory nerve. Although many CI listeners understand speech well, the variation in outcomes is large and some patients struggle even in quiet backgrounds. Furthermore, new methods of programming CIs also vary in their effectiveness, with some patients showing a substantial benefit while others show no benefit or even perform worse with the new method. Previous attempts to understand the factors underlying good and bad performance have correlated speech scores with the outcomes of various sensory and cognitive tests and with demographic factors; they have been largely unsuccessful probably because the different tests correlate with each other. The proposed project will adopt a different approach which is to separately manipulate sensory and cognitive factors, for example by blurring speech sounds and imposing a secondary non-auditory task. We then study how these factors affect speech perception on their own and on how and whether they interact. The experiments will initially be performed with normal-hearing (NH) people listening to simulations of CI hearing and then applied directly to CI listeners. It builds on our previous work showing how cognitive factors such as attention can sharpen sensory representations, and help us understand why methods for improving CI hearing, including those developed in our lab, help some patients more than others. Eventually we hope to apply the findings to provide patient-specific solutions to improving speech perception by CI users.