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Patterns of Cortical Activation Correlate With Speech Understanding After Cochlear Implantation

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Abstract: Cochlear implantation is a standard intervention for deafness, yet the ability of implanted patients to understand speech varies widely. To better understand this variability, we used functional near-infrared spectroscopy to image auditory cortex activation in response to different classes of sound and compared that to behavioral measures of speech perception. Both control and implanted participants with good speech perception exhibited greater cortical activity to natural speech than to unintelligible speech. In contrast, implanted participants with poor speech perception produced pronounced cortical activation across stimulus classes. Moreover, the ratio of cortical activation in response to normal speech relative to that of scrambled speech directly correlated with their comprehension scores, though not with auditory threshold, age, side of implantation, or time after implantation. Because implanted adults with low speech perception scores produced indistinguishable cortical activation across stimulus classes without preferential response to speech, we interpret this as demonstration of compensatory processing effort.