

Supporting Information

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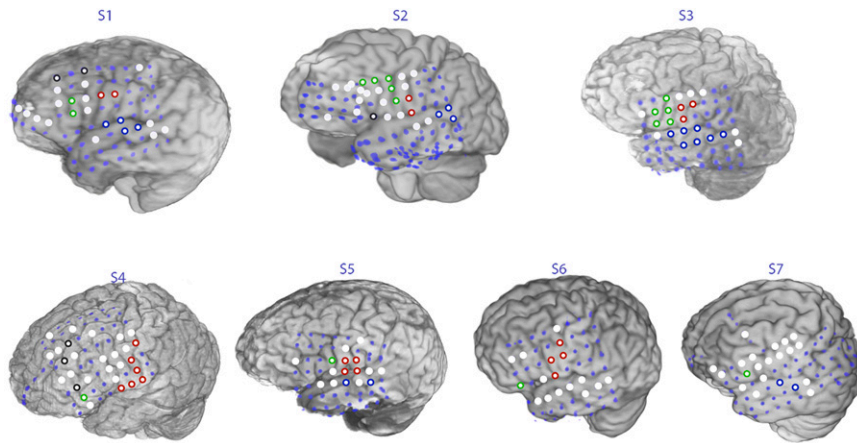


Fig. S1. Reconstruction of electrode positions in seven subjects. Electrodes with significant responses in one of seven frequency bands during the entire task (temporally collapsed; see *Materials and Methods*) are marked in white filled circles. Electrodes exhibiting temporally sustained significant high gamma responses are shown with anatomically based color-coded circles, where blue represents STG electrodes, green represents Broca's electrodes, and red represents motor electrodes. Black electrodes did not fall in one of the anatomical categories (they were included in analyses such as Fig. 2A but are not in groupings specifically referring to STG, Broca, and Motor). Subjects S4 and S7 did not participate in auditory repetition tasks and were not included in the ERC analysis.

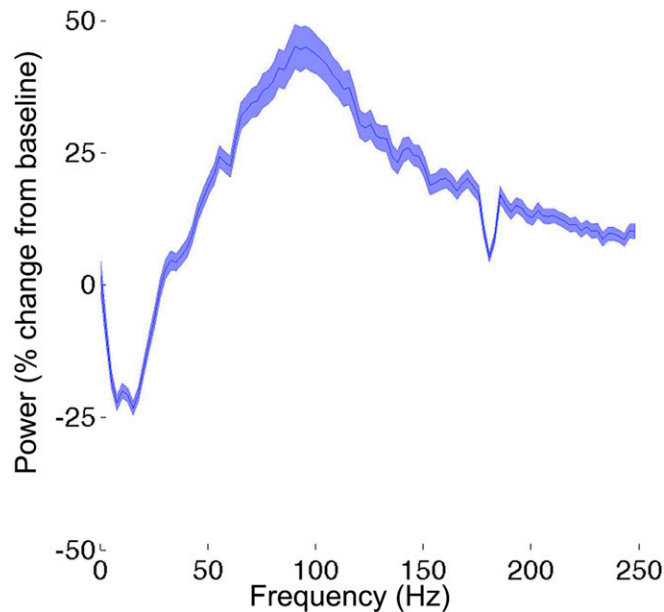


Fig. S2. Average power spectral densities (PSDs) were computed for each electrode and task across all subjects. The PSDs were computed for event-related windows following stimulus presentation up to 400 ms after speech production (consecutive windows of 400 ms using the Welch method). A separate PSD was computed for the baseline epochs (400 ms before stimulus presentation). The event-related PSDs were transformed to units of percentage change by subtracting and then dividing by the power estimates of the baseline PSD. The trace shows the mean PSD and SEM for all electrodes, tasks, and subjects ($n = 249$).

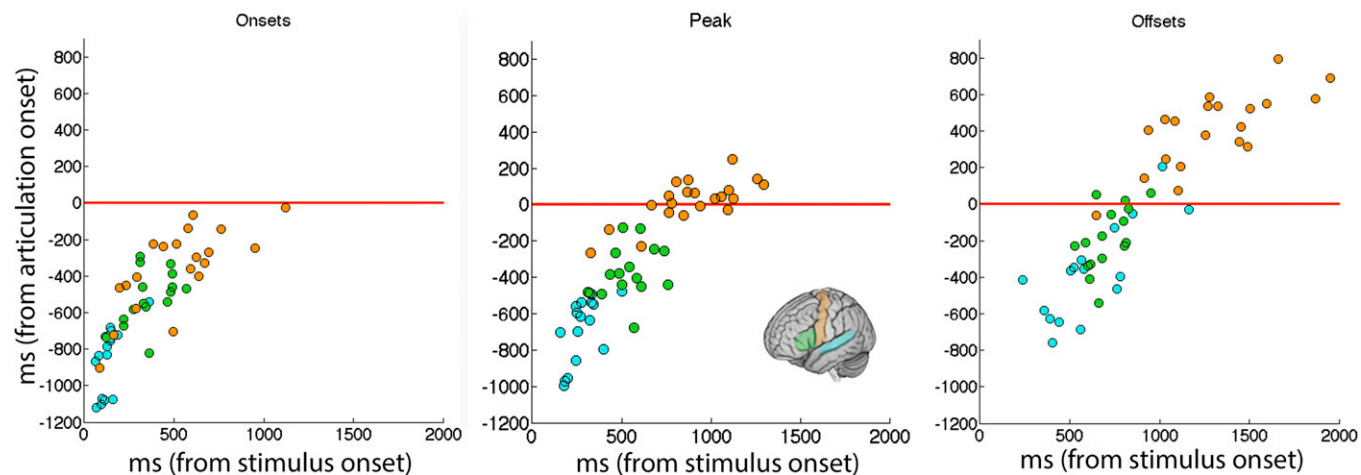


Fig. 53. Onset (*Left*), peak (*Middle*), and offset (*Right*) of significant activity locked to stimulus onset (x axis) and locked to speech onset (y axis) are displayed for electrodes in three anatomical locations: STG (cyan), Broca's area (green), and precentral gyrus (orange). Because the temporal latencies locked to stimulus onset and articulatory onset are intrinsically correlated, we focused our analyses on the articulatory onset that minimizes latency differences due to subject-related reaction time variability. Peak latencies locked to stimulus onset were used in a one-way ANOVA to test an effect of anatomical site. We found a significant difference across anatomical sites [$F(2,50) = 107.32, P = 8.1e-19$], and post hoc two sampled t tests revealed that STG had a significantly shorter latency than Broca's area [$t(30) = 5.47, P = 6.2e-6$] and that Broca's area had a significantly shorter latency than the precentral gyrus [$t(35) = 9.05, P = 1.1e-10$]. It is worth noting that peak latencies locked to stimulus onset were also significantly different [$F(2,50) = 52.9, P = 4.6e-13$]. Onset latencies locked to articulatory onset were significantly different across anatomical sites [one-way ANOVA, $F(2,50) = 30.43, P = 2.3e-9$], and post hoc two sampled t tests revealed that STG had a significantly shorter latency than Broca's area [$t(30) = 5.65, P = 3.7e-6$] and that Broca's area had a significantly shorter latency than the precentral gyrus [$t(35) = 2.62, P = 0.013$]. Offset latencies locked to articulatory onset were significantly different across anatomical sites [one-way ANOVA, $F(2,50) = 62.96, P = 2.2e-14$], and post hoc two sampled t tests revealed that STG had a significantly shorter latency than Broca's area [$t(30) = 2.32, P = 0.027$] and that Broca's area had a significantly shorter latency than the precentral gyrus [$t(35) = 8.97, P = 1.4e-10$].

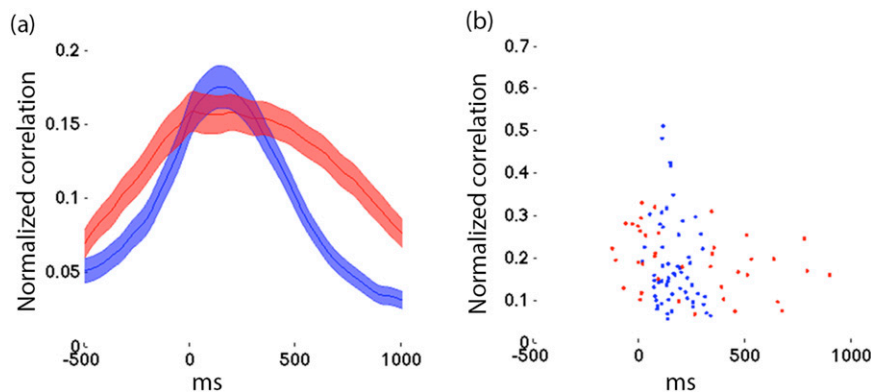


Fig. 54. (A) Averaged cross-correlations across all electrode pairs between Broca's area and STG (blue) and motor cortices (red). (B) Peak cross-correlation value and time lag for each electrode pair. Single trials were cross-correlated between electrodes (from different cortical sites) within subject. The cross-correlation time series were normalized within each trial so that the auto-correlations at zero lag were identical to 1.0. Cross-correlated time series (normalized correlation \times time lag) were assessed for each electrode pair, and the mean within the electrode pair was used for assessing the maximal correlation and time-lag values. The average cross-correlation time series across electrode pairs is shown in A. To quantify the variance evident by the Gaussian width in A, each electrode pair was assessed for the maximal correlation and the corresponding time lag (B). To plot the time values on the same scale, STG–Broca values were flipped such that positive values mean that Broca activity followed STG activity. STG–Broca correlations were conducted only on the auditory word repetition task as the STG electrodes were driven by auditory responses. Broca–motor correlations were conducted on all tasks (auditory and visual).

