

brain based on the dynamics within the speaker's brain and we find extensive speaker-listener coupling, extending well-beyond auditory cortex. This coupling vanishes when participants fail to communicate. Moreover, while on average the listeners' brain activity mirrors the speaker's activity with a delay, we also identify areas that exhibit predictive anticipatory responses. We connect the extent of neural coupling to a quantitative measure of story comprehension and show that the greater the coupling, the greater the understanding, with anticipatory couplings capturing over 50% of the behavioral variance. We argue that the observed alignment of production- and comprehension-based processes serves as a mechanism by which brains convey information.

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III-32. Firing rate oscillations underlie motor cortex responses during reaching in monkey

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The study of primary motor cortex has historically assumed that neural activity represents movement parameters. This view derives from an analogous approach to primary visual cortex, where activity represents the pattern of light falling on the retina. Yet it is unclear how well this analogy holds, and there is a marked lack of agreement regarding which movement parameters might be represented. We ask whether a better analogy might be with primitive motor systems. A common principal of movement generation across the animal kingdom is the production of oscillatory activity by dedicated pattern generators. We therefore investigated whether oscillatory responses are present in the motor cortex of reaching monkeys. We analyzed data from four monkeys and report three central findings. First, oscillatory responses are readily observed in the mean firing rate of individual neurons. These oscillations are in the 1-3 Hz range, and thus appear unrelated to higher-frequency oscillations observed in the LFP. Second, oscillations are coordinated at the population level. We used a novel dimensionality-reduction method, termed 'jPCA,' to isolate data projections where activity evolves in a coherent fashion. The jPCA projections capture much of the data variance, and reveal strongly oscillatory patterns. Finally, we asked whether such oscillations might be sufficient to drive reach generation, even though reaches were not themselves periodic. We fit the recorded EMG activity using a simple model that produced windowed oscillations. Using just two oscillation frequencies, fits were generally excellent with correlations ranging from 0.97 to 0.99. Our results indicate that oscillatory patterns are a prominent aspect of motor cortex activity, even for non-periodic movements. Such oscillations may be present because they form a basis for the production of muscle activity. Our results argue for a view in which motor cortex functions as a flexible pattern generator, and 'represents' movement only in an indirect sense.

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