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Article

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Behavioral origin of sound-evoked activity in mouse visual cortex

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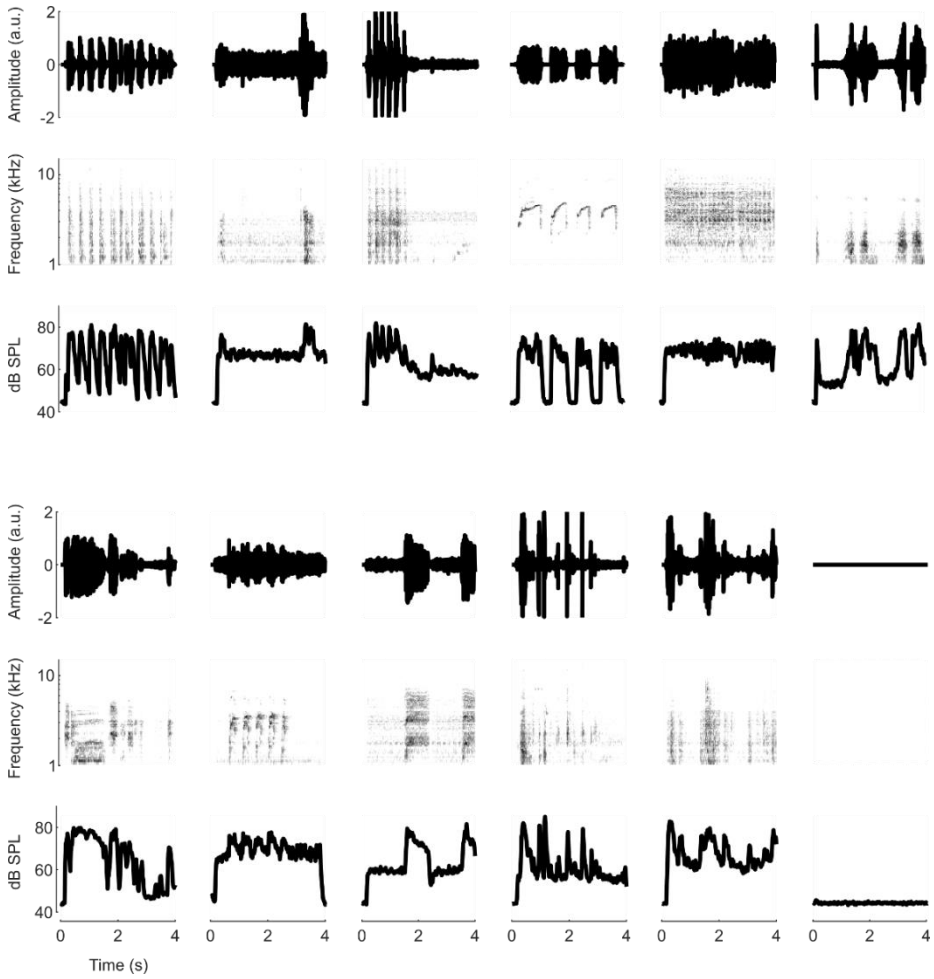
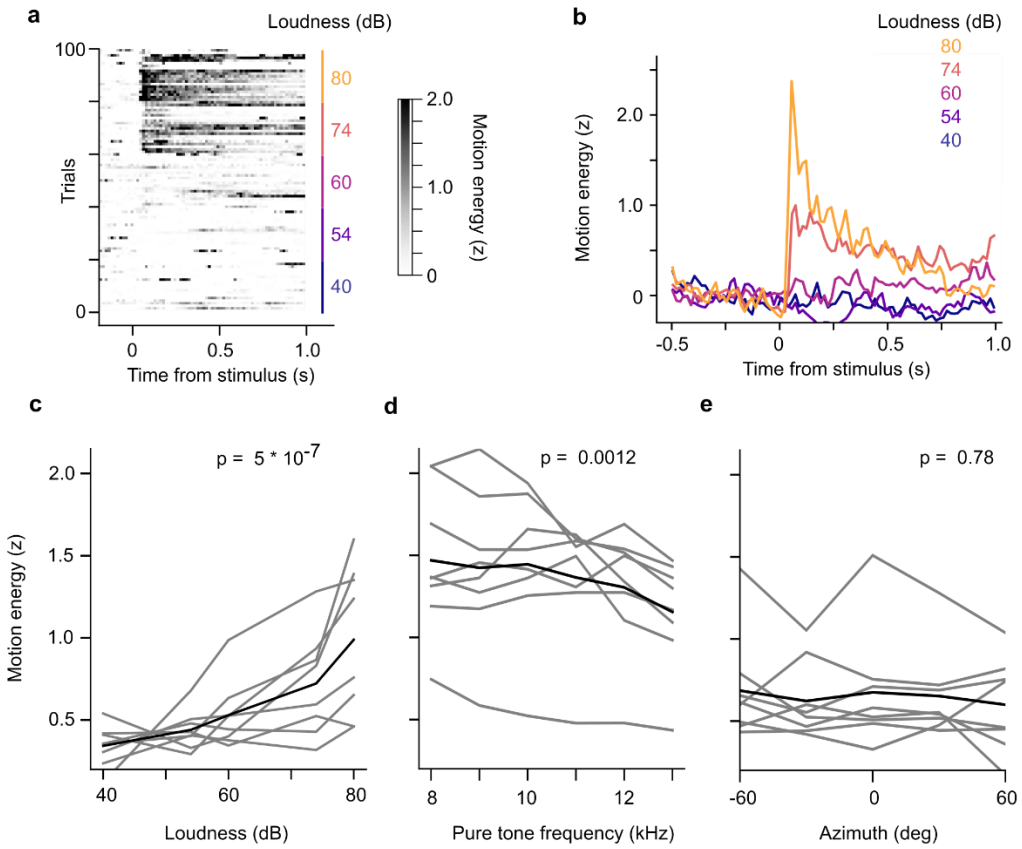
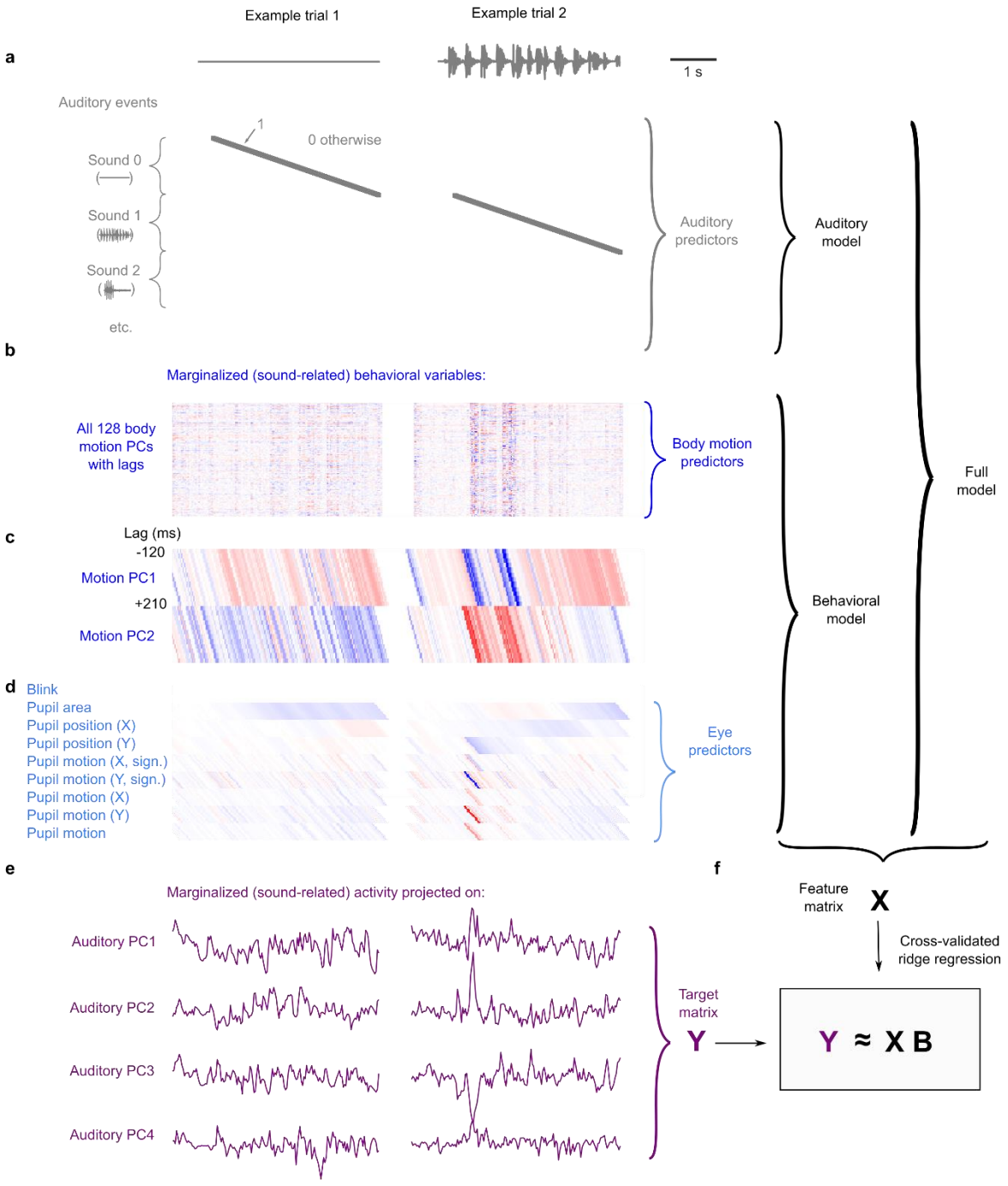
Supplementary information



Supplementary Fig. 1. **Naturalistic sounds used in this study: spectral content and loudness.** For each of the 12 sounds, each column shows the sound amplitude (*top*), frequency spectrum (*middle*) and loudness (*bottom*).



Supplementary Fig. 2. **Loudness is the main driver of uninstructed behavioral responses. a.** Raster of the average motion of an example mouse in response to white noise bursts of different loudness (from 40 to 80 dB SPL). **b.** Peri-stimulus time histograms of the average motion for the same example mouse for different sound volumes. **c.** Average motion energy of 6 different mice as a function of loudness. **d**. Same as **c**, but for a pure tone of different frequencies (60 dB). **e**. Same as **c**, but for a white noise burst played from different azimuthal locations (80 dB). P-values were computed using repeated-measures ANOVA with either the sound loudness, frequency, or location as a factor.



Supplementary Fig. 3. **Structure of the models. a.** The feature matrix for the auditory model involves only the auditory predictors. It is 1 in the time bins during which a sound is played (grey dots), and 0 otherwise. **b**. The feature matrix for the behavioral model includes all 128 motions PCs with 12 lags (from -120 to +210 ms). **c**. A closeup for the first 2 motion PCs allows for a better visualization of the predictors with different lags. **d**. Same as **b**, but for various eye variables. The same lags are used. **e.** The target matrix **Y** is composed of the projections of the marginalized activity (sound responses only) onto the sound-related subspace (first 4 auditory PCs). **f.** The feature matrix **X** depends on the model: auditory, behavioral, or full model (which combines both the auditory and the behavioral predictors). It is fitted to the target matrix **Y** using 3-fold cross-validated ridge regression to obtain the matrix of regression weights **B**.