Event-related brain potent effects of actions and role relations during second language picture-sentence verification

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opercularis), a premotor response profile was evident with significant activity prior to speech onset for all five production tasks. Portions of the anterior IFG (including pars triangularis) showed early activity locked to stimulus onset which was selective to one task or a subset of tasks. A similar profile of task-selective pre-articulatory responses was seen in the posterior MFG adjacent to precentral gyrus locked to both stimulus and speech onset. These data suggest two speech production components in IFG and MFG, a motor-related component shared across tasks, and a task-selective component reflecting task demands and route of word retrieval.

Topic Line: LANGUAGE: Other

D55 Event-related brain potent effects of actions and role relations during second language picture-sentence verification

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Previous ERP research suggests that native language processing mechanisms for role-relation versus verb-action congruence differ. In a picture-sentence verification task, Knoeferle et al. (2014) asked participants to first inspect a clipart scene with for instance a gymnast punching a journalist. Subsequently, a sentence about these characters was presented word by word. The scene either matched the sentence completely (e.g., The gymnast punches the journalist), mismatched in action depiction (e.g., The gymnast applauds the journalist), mismatched in role relations (e.g., The journalist punches the gymnast), or mismatched in both action and role (e.g., The journalist applauds the gymnast). Participants verified picture-sentence congruence. The present study investigated the functional brain responses associated with these world-language relations in L2 comprehenders (16 German natives, pilot study). The materials and setup were identical to Knoeferle et al. (2014). Similar to the original study, including only correctly answered trials, the analyses revealed reliably larger mean amplitude negativities to role mismatches vs. matches during the first noun (gymnast) and the first 100ms of the verb. Action mismatches yielded larger mean amplitude negativities than matches in the N400 verb time window, replicating the effects of the original study. Between study differences emerged in the relativity of the effect and in that an additional mean amplitude difference emerged between role mismatches versus matches in the verb N400 time window.

Topic Line: LANGUAGE: Semantic

D56 A comparison of three vector space models of word meaning for mapping the semantic system

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What are the relative utilities of different vector space models of word meaning for mapping the semantic system in the brain? In this preliminary study, we investigated the neural correlates of three models of word meaning, using fMRI and representational similarity analysis (RSA). Ten neurologically normal participants were scanned with 3 Tesla fMRI as they processed single words in an event-related paradigm. Semantic similarities between all pairs of words were calculated using three distinct models of word meaning: the experiential attributes model (Binder et al., 2016), fastText (Bojanowski et al., 2016), and GloVe (Pennington et al., 2014). A searchlight approach was then used to calculate correlations between patterns of semantic similarity and patterns of neural similarity centered at each voxel in the brain. Voxelwise t-tests across participants were performed on the resulting correlation maps to identify regions where model-based semantic similarity and neural similarity were reliably correlated. Group maps based on each of the three models revealed a left-lateralized semantic network including the angular gyrus, middle temporal gyrus and inferior frontal gyrus, consistent with prior characterizations of the semantic network (Binder et al., 2009). A series of paired-sample t-tests revealed no significant differences between maps based on the three different models of word meaning, although this may reflect our limited sample size (c.f., Abnar et al., 2018). In sum, our findings suggest that diverse models of word meaning can be used to identify brain regions that encode semantic representations.

Topic Line: LANGUAGE: Semantic

D57 Hemispheric asymmetries in processing semantic relationships during reading

Melissa Troyer, University of Western Ontario, Marta Kutas, University of California San Diego

Though each cerebral hemisphere is sensitive to sentence-level context, studies of how they jointly contribute to real-time language processing suggest asymmetries. We used event-related brain potentials (ERPs) combined with lateralized visual presentations of critical words to examine hemispheric processing of two types of semantic relationships (categorical, event-based) in sentences about the fictional world of Harry Potter (HP). Participants who varied in their HP knowledge read sentences ending in a word which was variously contextually supported (appropriately completed an HP 'fact'); unsupported/unrelated to the sentence context; or a 'related anomaly' that was unsupported but from the same category as the supported word or related to the overall event/episode described by the sentence. Replicating previous results using central visual presentation, we observed effects of contextual support (unrelated minus supported words) and related anomaly (unrelated minus related words) on ERPs in the N400 time period (250-500 ms), with effects being larger for individuals with greater knowledge. To examine hemispheric asymmetries, we focused on HP 'experts' (N=20). The two hemispheres were similarly sensitive to effects of contextual support, but only the right hemisphere was sensitive to the related anomaly manipulations. The exact pattern of results depended on the nature of the relationship (category, event).

Topic Line: LANGUAGE: Semantic

D58 Voice- and species-sensitivity in the event-related potential of miniature pigs

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Neuroimaging studies identified brain areas in humans, in non-human primates and recently, in non-primate mammals that preferentially process conspecific vocalizations compared to other vocalizations and environmental noises. The relative contribution of voice- and conspecific preference to these reported processing biases remained unclear. We examined for the first time the event-related potentials for voice perception in awake miniature pigs kept as companion animals (n=6) with non-invasive EEG. We played 80 pig-, 80 dog-, 80 human-vocalizations, and 80 environmental sounds in random order to pigs. We applied 4 electrodes, a frontal (Fz), a central (Cz) and a right temporo-frontal electrode and an electrode next to the left eye. EEG data was segmented from 200 ms before to 1 s after stimulus onset, and baselined. We removed movement artifacts 1) by automatic artifact-rejection based on extreme amplitude values, then 2) by observation of eye- and muscle-movements in the video-recordings and 3) by visual inspection of the EEG of the remaining trials. Using permutation statistics in 50 ms long time-windows, we found significant differences between the event-related potentials (ERPs) of conspecific and human voices (300-350 ms) and between the ERPs of conspecific and dog voices (400-450 ms) at Cz. ERPs of conspecific voices were different from ERPs of environmental sounds at 450-500 ms at the right temporo-frontal electrode. The ERP results suggest