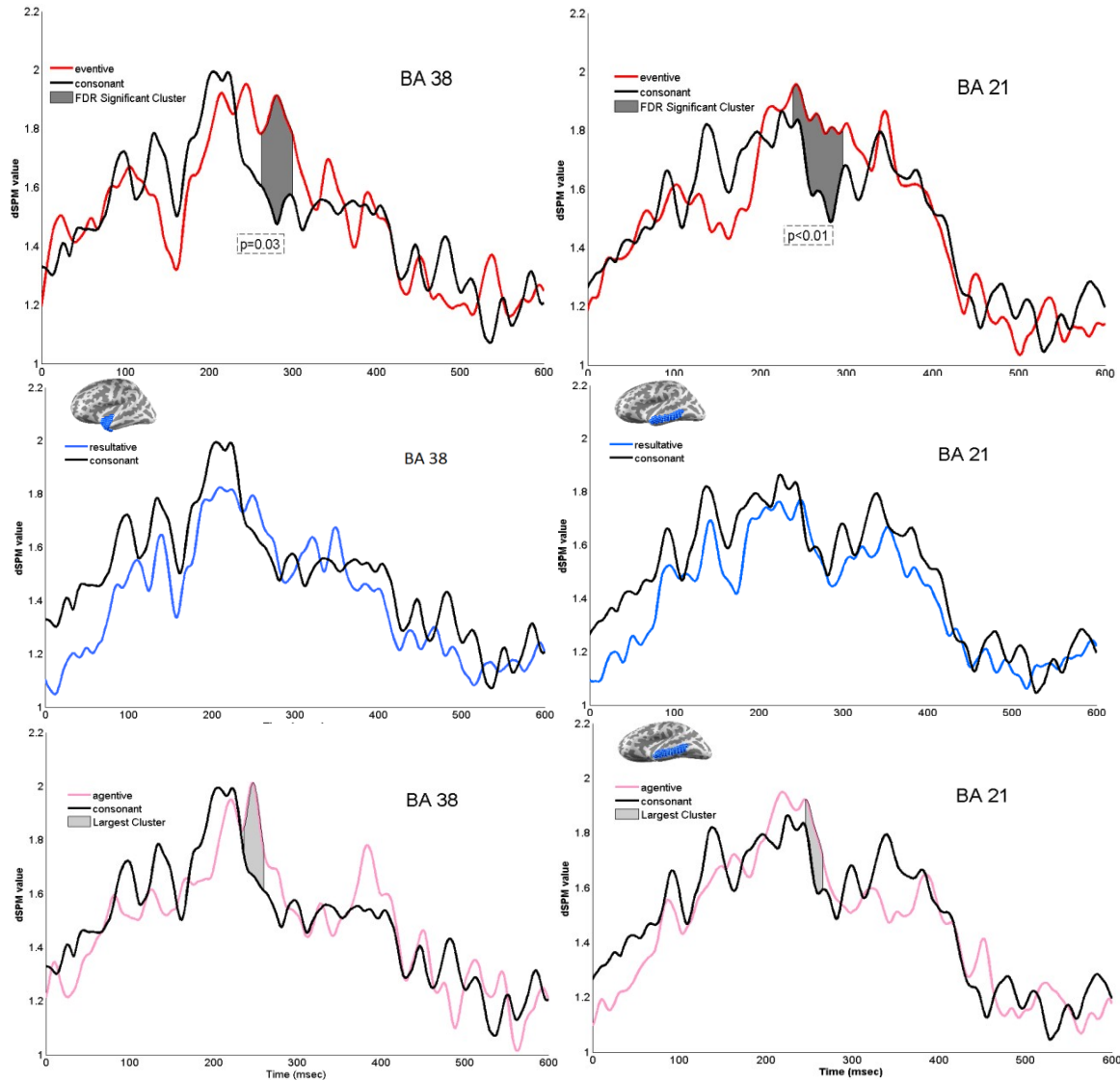


Adverbial composition in the left anterior temporal lobe

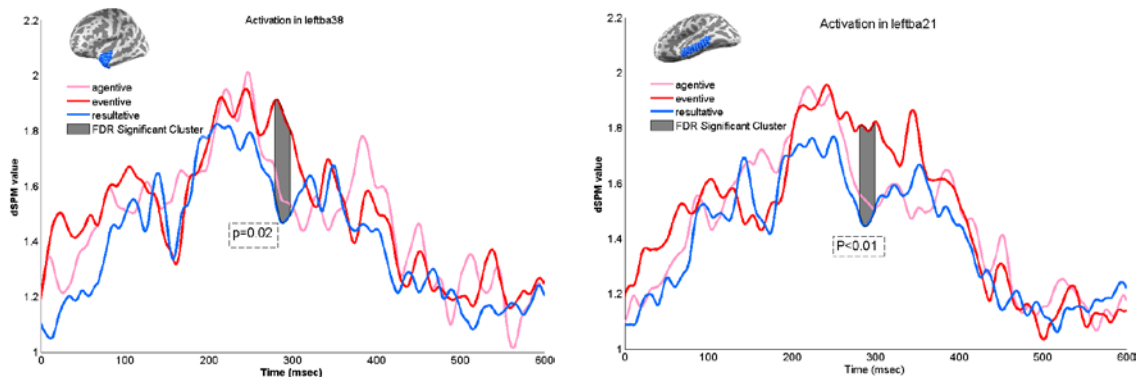
Songhee Kim (New York University)

The left anterior temporal lobe (LATL) has been one of the most robustly implicated brain areas with regard to combinatory semantic processing. The composition related activity in the LATL typically appears between 200-300ms after the onset of the target word, preceding the timing of the N400, which has traditionally been considered an index of semantic processing in the field. To give a plausible account for this rather early timing, we hypothesized that the early composition effect in the LATL corresponds to an early phase of composition at which only the most readily accessible meaning can be composed. As one test of this hypothesis, we compared the LATL activity elicited by the modification of a verb by different types of adverbs: eventive (e.g., *slowly paints*), agentive (e.g., *reluctantly paints*), and resultative (e.g., *vividly paints*). Among these adverbs, only eventive adverbs directly modify the event described by the verb, whereas agentive and resultative adverbs make reference to event participants that are not described by the verb (or overtly expressed in our stimuli). Thus we expected that, upon the presentation of the verb, the composition activity at 200-300ms post-stimulus would be observed only in the eventive condition, integrating the content of the modifier word with the action denoted by the verb. Consistent with our hypothesis, the composition effect was exhibited only in the eventive condition (i.e., a significantly increased activity for *slowly paints* compared to *cxqzt paints* in the left BA38 and the left BA21) at 200-300ms post-verb. Neither the resultative nor the agentive conditions showed reliably increased activities compared to the control condition (i.e., *cxqzt paints*) (See Figure 1). Also, among the three combinatory conditions (i.e., eventive, agentive, and resultative), the eventive condition turned out to elicit a reliably larger activity than the resultative condition in the region of interest (See Figure 2).

Overall, our results support the early composition hypothesis that the LATL composes an early phase of composition and thus needs the lexical features provided by a modifier to stand in a simple relation with the following modified word, without requiring any further information from the context.



[Figure 1] Pairwise t-tests performed over BA20/21/38 over 200-300ms post-verb onset showed that only the Eventive condition is reliably different from the control condition ($p=0.03$, BA38, $p<0.1$ BA21, FDR corrected).



[Figure 2] 1x3 ANOVA conducted on BA20/21/38 over 200-300ms post-verb onset showed the main effect of Adverb Type within the combinatory conditions: BA38, 279-297ms, $p<0.05$, BA21, $p<0.01$, 281-299ms.