Introduction. Most of the existing neurophysiological literature on metaphors comprehension focuses on the processing conventional metaphors (Coulson & Van Petten 2002) or generic novel metaphors (Tartter et al. 2002, Lai et al. 2009). Except for a few studies including poetic metaphors in Hebrew (Arzouan et al. 2007, Faust & Mashal 2007), no extensive neurophysiological investigation on the processing of poetic metaphors has been carried out. Important theoretical insights have recently been offered by Relevance Theory in the framework of a general deflationary account of metaphor (Sperber & Wilson 2008): while not deviating from a normal use of language, poetic metaphors are likely to be more taxing due to the mass of weak implicatures involved in their comprehension (Pilkington 2000).

Starting from the hypothesis that the literary feature has a crucial impact on processing, this study explores the cognitive costs associated with poetic metaphor comprehension through an ERP experiment. Based on previous literature (Coulson & Van Petten 2002, Arzouan 2007), a two stage process is expected, i.e., a stage of semantic access (around 400 ms) and a following stage of pragmatic enrichment (around 600 ms). In addition, we hypothesized that the costs related to the array of weak implicatures postulated by RT for literary metaphors should be reflected in late ERP components.

Materials and methods. Stimuli consisted of 104 Italian poetic metaphorical phrases of the form “A of B”, taken from poems and novels, and an equal number of literal and semantically anomalous phrases (used as control condition): Metaphor: Somersaults of smoke / Literal: Prohibitions of smoke / Anomalous: Corns of smoke. Target words (“Bs”) were kept constant across conditions, while the first word in the phrase (“As”) was balanced for length and frequency. 135 students rated the stimuli for the major psycholinguistic features (concreteness, difficulty, familiarity, meaningfulness, cloze probability and aptness) in a paper-and-pencil test. 27 subjects (mean age 23 ± 3 years) took part in the ERP experiment. Brain activity (64 Ag/AgCl scalp electrodes, earlobes references, 250 Hz sampling rate) was recorded while subjects silently read the phrases (each word: 400 ms, interword interval: 200 ms) and performed a semantic-association task. After each phrase, a word pair was displayed, and subjects were instructed to choose the word that better matched the previous phrase. ERPs were time locked to the onset of the target word (“Bs”), while reaction times were measured from the onset of the task words until subjects made their choice. After the experimental session, subjects completed a paper-and-pencil debriefing questionnaire interpreting a sample of the metaphors read during the experimental session.

Results. Overall accuracy in performing the matching task was very high (M = 94%); significantly higher scores and shorter reaction times were recorded for literal phrases than for metaphors and anomalies (p<0.001). The analysis of the ERP amplitudes (Fig.1) focused on three time windows. In the N400 time window (330-430 ms), a repeated measures ANOVA revealed a significant difference between metaphors and literal phrases (p<0.05), and no difference between metaphors and anomalies (p>0.05). The component was larger over the fronto-central cluster of electrodes. In the P600 window (600-700 ms), metaphors converged with literal phrases (p>0.05) but differed from anomalies (p<0.05). Finally, metaphors were statistically equivalent to anomalies (p>0.001) in the Late Positive Component interval (LPC; 700-1000 ms), while both metaphors and anomalies differed from literal expressions (p<0.001). Both P600 and LPC amplitudes were larger over the centro-parietal region.

Discussion. The findings of the present study replicated previous investigations on novel metaphors for what concerns the N400 effect, because our results showed both a difference in
amplitude between metaphors and literal phrases (Coulson and Van Petten 2002, Arzouan 2007) and a lack of difference between metaphors and anomalies (Tartter et al. 2002, Lai et al. 2009). The present results suggest that literary metaphors and semantically anomalies are equally demanding with respect to the process of linking linguistic material to background knowledge and of retrieving context. Also in the LPC time window, anomalies and metaphors were statistically equivalent, even though both differed from literal expressions. While in the case of anomalies, this result may be interpreted as a comprehension failure, in the case of poetic metaphors it could be related to the halo of meaning and the resonance effects of weak implicatures, as assumed by RT, as confirmed by accuracy scores and debriefing results proving that, in almost all cases, metaphors were interpreted correctly by participants. Finally, the lack of difference between metaphors and literal phrases in the P600 time window may be due to the use of isolated phrases presented out-of-context which could have inhibited a full pragmatic resolution and enrichment at this stage of processing.

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Metaphor ——— Literal ——— Anomalous

![Fig.1 Selected ERP waveform of grand-averaged data](image)

Fig.1 Selected ERP waveform of grand-averaged data

**References**


