

## **When is irony influenced by communicative constraints? ERP evidence supporting interactive models**

Sendy Caffarra, Arman M. Haeri, Elissa Michell & Clara D. Martin (Basque Center on Cognition, Brain and Language)

[s.caffarra@bcbl.eu](mailto:s.caffarra@bcbl.eu)

Distinct theoretical proposals have described how communicative constraints (contextual biases, speaker identity) impact irony processing. Modular models assume a two-step processing where literal meaning is accessed first and figurative meaning is available only later on, when social and contextual factors are taken into account (Grice, 1975; Searle, 1979). Interactive models claim that, with supportive contexts (e.g., negative contexts), figurative meaning can be accessed as early as literal meaning (Gibbs, 1986). A more extreme interactive proposal (constraint-satisfaction model) further assumes that speaker's characteristics (e.g., accent) as well as contextual biases (e.g., negative and positive contexts) can compete early on to support the most likely sentence interpretation (either literal or figurative; Katz et al., 2004; Pexman, 2008).

The present ERP study teased apart these models by testing the impact of contextual biases and speaker's features on the time course of irony analysis. Thirty-six Spanish native speakers were presented with 240 Spanish utterances that could be ironic or literal. Contextual biases were manipulated so that each target sentence was embedded in a negative or a positive context (with negative contexts corresponding to the most frequent and prototypical type of irony; see Table 1). Speakers' characteristics were manipulated so that each Spanish story could be uttered in a native (Spanish) or a foreign accent (English; with foreign speakers corresponding to the speakers with presumably less refined pragmatic skills). Pre-study ratings ensured that the accent type (native, foreign) was easily recognized by Spanish native listeners. Acoustic features (i.e., duration, pitch, speech rate) of the target word and of the target sentence were matched across conditions. Grand-average ERP waveforms were time-locked to the onset of the target word. Repeated-measures ANOVAs were conducted on early (150-300 ms) and late (500-1000 ms; 1000-1500 ms) time windows defined based on visual inspection. The analysis included the following within-subject factors: Irony (ironic, literal), Context (positive, negative), Accent (native, foreign), and topographic factors (Hemisphere; Anteriority). ERP results showed that contextual biases and speaker accent interact with irony processing as early as 150 ms after stimulus onset (Irony x Context x Accent:  $F(1,35)=4.47$ ,  $p<.05$ ; see Figure 1). Greater N400-like effects were reported for ironic relative to literal sentences only when the context was positive and the speaker's accent was native (negative context: no Irony effect, all  $F(1,35)<1$ ; positive context, Irony x Accent:  $F(1,35)=4.61$ ,  $p<.05$ ; native accent:  $t(35)=2.18$ ,  $p<.05$ ; foreign accent:  $t(35)=1.36$ ,  $p=.18$ ), possibly suggesting semantic difficulties during the interpretation of non-prototypical irony produced by natives. A P600 effect was reported in response to any type of irony (500-1000 ms:  $F(1,35)=4.09$ ,  $p=.05$ ; 1000-1500 ms:  $F(1,35)=6.65$ ,  $p<.05$ ; in line with previous ERP studies; e.g., Regel et al., 2011; Spotorno et al., 2013). However, longer-lasting P600 effects were reported in the case of positive contexts (1000-1500 ms: Irony x Context:  $F(1,35)=4.22$ ,  $p<.05$ ; negative context : no Irony effects,  $F(1,35)<1$ ; positive context:  $F(1,35)=7.35$ ,  $p<.05$ ), indicating greater inferential processing costs when irony is used in unusual circumstances.

The present findings are not compatible with modular models (Grice, 1975; Searle, 1979), but they are rather in line with interactive models (Gibbs, 1986; Katz et al., 2004; Pexman, 2008). Specifically, the early interactive effects reported here fully support the constraint-satisfaction model and they suggest that multiple communicative constraints are weighted and can interact from the earliest stages of irony analysis (Katz et al., 2004; Pexman, 2008).

**References:**

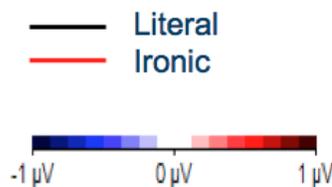
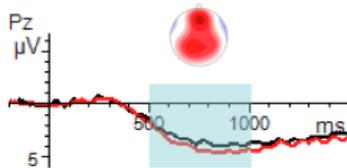
Gibbs, R. W. (1986). *J Exp Psychol Gen*, 115, 3-15.  
 Grice, H. P. (1975). In *Syntax and Semantics* (pp. 41-58).  
 Katz, A. N. et al. (2004). *Cur Dir in Psychol Sci*, 5, 186-189.  
 Pexman, P. M. (2008). *Cur Dir in Psychol Sci*, 17, 286-290.

Regel, S. et al. (2011). *J Cognitive Neurosci*, 23, 277-293.  
 Searle, J. (1979). In *Metaphor and thought* (pp.92-123).  
 Spotorno, N. et al. (2013). *Plos One*, 6, e66839.

	Negative context	Positive context
<b>Literal</b>	I bought a lottery ticket in my town. I read more details online. The first prize was a 5 € sausage. I said to my boyfriend: <i>What a <u>sad</u> prize!</i> In the end I didn't win anything.	I bought a lottery ticket in my town. I read more details online. The first prize was a 10.000 € trip. I said to my boyfriend: <i>What a <u>tempting</u> prize!</i> In the end I didn't win anything.
<b>Irony</b>	I bought a lottery ticket in my town. I read more details online. The first prize was a 5 € sausage. I said to my boyfriend: <i>What a <u>tempting</u> prize!</i> In the end I didn't win anything.	I bought a lottery ticket in my town. I read more details online. The first prize was a 10.000 € trip. I said to my boyfriend: <i>What a <u>sad</u> prize!</i> In the end I didn't win anything.

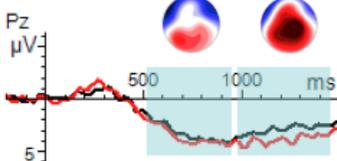
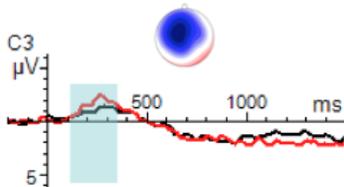
**Table 1.** Examples of experimental materials (translated in English). Target sentences are in italics. Target words are underlined and the underlining style marks the EEG comparisons of interest.

**NEGATIVE CONTEXT**

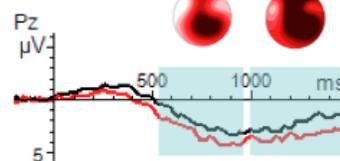
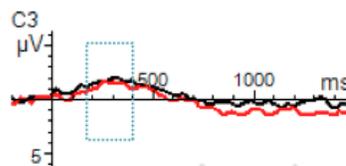


**POSITIVE CONTEXT**

**Native accent**



**Foreign accent**



**Figure 1.** Grand-average waveforms for each context. Negativity is plotted upwards. The blue time windows mark the time range where Irony effects were reported. The topographic distributions of the corresponding effects are also shown (calculated based on the difference between ironic and literal conditions).