

Processing of Ironic and Non-Ironic Sentences Examined with ERPs

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Introduction

Compared to literal language understanding, the comprehension of ironic sentences needs additional, i.e. contextual and pragmatic, information. This suggests a more demanding processing than literal language understanding. Controversial findings from behavioral studies (Gibbs 2002, Giora & Fein 1999, Schwobedl et al. 2000) support several views of irony processing differing in their time course of context influence (see Table 1).

Table 1

	assumptions	ERP effects at the target sentence final word
Standard pragmatic model* (Grice 1975)	<ul style="list-style-type: none"> initial activation of the literal, non-ironic meaning → semantic integration problem inferential processes to derive the ironic meaning 	N400
Direct access view (Gibbs 2002)	<ul style="list-style-type: none"> initial context influence on lexical access direct comprehension of the ironic meaning 	no irony related ERP effect
Graded salience hypothesis (Giora 2002)	<ul style="list-style-type: none"> simultaneous computation of lexical and contextual information initial activation of the most salient (most frequent and conventional) meaning incompatibility between salient meaning and context triggers additional processes 	N400

*In behavioral studies, the standard pragmatic model had been transferred as a processing model for figurative language comprehension.

Procedure

- Experimental items (480) were divided into 4 blocks such that each item was only presented once in each block. Experimental conditions were apportioned (i.e. 30 trials for each condition).
- Trial:** The auditory/visual presentation of a specific discourse (i.e. context) immediately followed by the target sentence) was followed by a visually presented comprehension task after an ISI of 1500 ms (see Table 2). Immediately after the response was given, the next trial started.
- Comprehension task:** Participants were asked to judge whether the test statement reflect the discourse or not via button press (yes/no). Half of the statements were correct, half incorrect.

Recordings and Data Analyses

- EEG was digitized at 250 Hz. Bipolar horizontal and vertical EOG was recorded to monitor eye movements.
- Latency windows: 100-400 ms and 500-900 ms after visual inspection.
- Repeated measures MANOVAs were performed.

Participants

- In each experiment 40 native German-speaking students participated. All of them were right handed, normal hearing and had normal or corrected to normal vision. In Exp.1: 22 female, mean age 24.6 years (SD=8.4), in Exp.2: 20 female, mean age 24.9 years (SD=6.2).

Methods

Materials

- Whether or not a specific sentence is perceived as ironic or non-ironic depends primarily on its foregoing context besides other cues, e.g. prosodic or visual ones.
- For each potential target sentence we created a
 - negative discourse context leading to an **ironic** sentence meaning and a
 - positive discourse context leading to a **non-ironic** sentence meaning.
- Target sentences consisted mainly of five words. The sentence final word was critical for understanding the sentence meaning within the relevant context (see Table 2).

Pretests

- Cloze procedure:** Sentence final words of ironic and non-ironic target sentences both showed high expectancy rates (ironic completion 91%, non-ironic completion 96.7%).
- Rating study:** Ironic and non-ironic target sentences were perceived as such (rating score difference of about 3 on a 5-point scale, paired t-test: $p < 0.001$).

Prosodic realization

- All items were spoken either in a natural normal or in a natural ironic way leading to two prosodically different realizations.

Experimental Conditions

- Experiment 1:** Prosodically marked sentences (*ironic/non-ironic*) and context type (*negative/positive*) were fully **cross-spliced**. Thus, 4 experimental conditions were received: in two of them the target sentence prosody was congruent with the preceding context, in the other two prosody was incongruent (see Table 3).
- Experiment 2:** Instead of prosodic cues, the visually presented target sentences contained either quotation marks or non. Quotation marks (*with/without*) and context type (*negative/positive*) were fully crossed leading to two congruent and incongruent conditions (see Table 3).

Table 2

	Ironic Discourse	Comprehension task
negative context	Ann and Chris are spending their holidays at the sea in a nice little motel. In the next morning they receive only toast with a little bit of jam for breakfast. Chris is quite upset and says:	Their breakfast was opulent.
target sentence	That's really rich.	
	Non-Ironic Discourse	Comprehension task
positive context	Chris invites Ann to dinner at the new pizzeria. In the restaurant they choose quickly and order their meals. When their food arrives, Ann looks astonished at her opulent dish and says:	Ann got a small meal.
target sentence	That's really rich.	

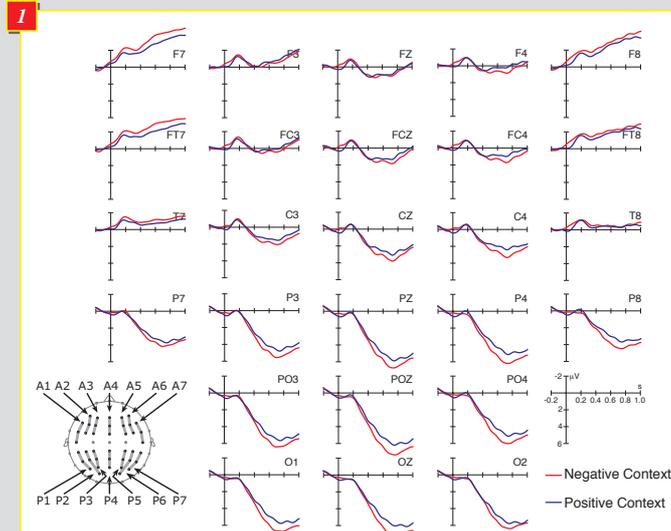
Table 3

Exp. 1 acoustic Exp. 2 visual	Prosody of target sentences Quotation marks at the target sentence final word	
	ironic with	non-ironic without
negative	negative & ironic negative & with	negative & non-ironic negative & without
positive	positive & ironic positive & with	positive & non-ironic positive & without

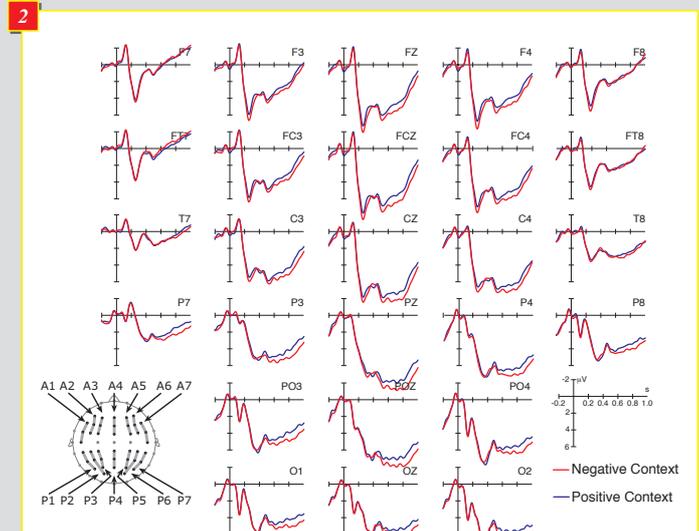
The four experimental conditions used in the experiments. Grey fields indicate the two incongruent conditions.

Results

Experiment 1: At the sentence final word no irony related N400 effect was present. Only effects of Context were elicited, but none of prosody (see Figure 1). Interactions have not been observed.



Experiment 2: Again any irony related N400 effect was absent. Main effects of Quotation marks and of Context were found, but no interactions (see Figure 2 and 3).



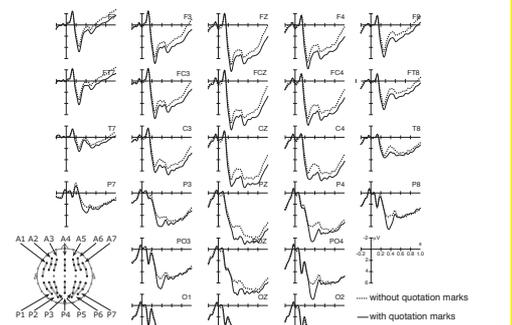
Discussion

The absence of an N400 effect in both experiments is inconsistent with the assumptions of the standard pragmatic model, as well as the graded salience hypothesis. The semantic integration of both literal and less salient, ironic meanings (as presented in the experiments) was not complicated for any of the sentence meanings. The results do also not endorse the direct access model because differences in ERPs at the end of target sentences were found. The early negativity was only observed in the acoustic modality. Therefore, it might reflect a modality specific processing. The posterior positivity elicited in ironic discourses could be interpreted as reflecting pragmatic processes, e.g. computing and evaluating the intended utterance meaning. Such evaluation may have caused more demanding inferential processes and suggests that additional processes are involved in a complete understanding of irony.

References

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Effects of Quotation marks: Sentence final words presented without quotation marks evoked a sustained anterior negativity starting around 200 ms. This negativity was still present in the 500-900 ms latency window.