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Semantic and Gender Priming in Frontotemporal Dementia

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Abstract. Modifications of language processing can be observed both in normal aging and in the most common forms of degenerative dementia, such as Alzheimer’s disease and the spectrum of frontotemporal dementias. The present experiment tests at the same time semantic and syntactic aspects of language processing in patients with frontotemporal dementia, using an online paradigm that allows researchers to evaluate the real linguistic competence of the patients.

Keywords. Semantics, gender, priming, frontotemporal dementia

Introduction

Priming is largely based on automatic processes, that enable to bypass execution deficits, such as slowed motor response, proper to healthy older people and patients suffering from cognitive deterioration. Semantic priming is the facilitation induced by a prior activation of items semantically related to the target, and results in faster responses to the target if compared to a baseline condition. In gender priming, the facilitation is due to the gender agreement between the prime and the target. Semantic and gender priming have been studied on young people by Bentrovato [1]: they found a large, additive facilitation effect of both gender and semantics. These results were taken to indicate that normal subjects could take advantage of both source of information, with no significant interference when they are both discordant. The same procedure, then, has been applied in a sample of patients with diagnosis of Alzheimer’s Disease (AD), compared with a sample of normal aging subjects [2]. Researchers found effects of facilitation due to the concomitant congruence of both gender and semantics in both the groups; by opposite, a striking difference between controls and patients was discovered, when both information (semantic and gender prime) were discordant. An interference effect appeared, suggesting that AD patients could feel the effect of difficulties in inhibiting irrelevant information. The present study aimed to test

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gender and semantic priming in a sample of patients suffering from different variants of frontotemporal dementia.

1. Methods

Twenty-four patients with diagnosis of frontotemporal dementia, who received a complete neurological and neuropsychological evaluation, entered this study. The test used was the Italian Word Reading Test [1]: it is featured by brief two-sentences stimuli, orally presented, with a visually presented target word. Auditory sentences provide the semantic and gender context and represent the primes. The sentence context ends with an article, that provides gender cue and precedes the target word. Different priming conditions have been created manipulating semantic and gender agreement. Table 1 illustrates examples of the sentences used in each condition.

Subjects were seated in front of a computer screen, wearing headphones with a microphone, that were connected to the sound amplifier port of the computer. Response times were collected in milliseconds through the Carnegie Mellon Button Box. Experimental design was implemented on PsycScope [3].

Subjects were instructed to listen carefully the auditory sentence context looking at the fixation point (++) on the screen and, when the sentence was halted, to read as quickly as possible the word appeared in the place of the fixation point.

Table 1. Examples of prime-target pairs for each condition

<table>
<thead>
<tr>
<th>Prime</th>
<th>Target</th>
<th>Prime</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quando vado a letto prima</td>
<td>UN LIBRO</td>
<td>per questo mia mamma mi ha regalato una collezione di romanzi gialli</td>
<td>G+S+</td>
</tr>
<tr>
<td>addormentarmi</td>
<td>(masc) (book)</td>
<td>(masc) (mouse)</td>
<td>G+S-</td>
</tr>
<tr>
<td>i leggo sempre</td>
<td>UN TOPO</td>
<td>(fem)</td>
<td>G-S-</td>
</tr>
<tr>
<td>(when I go to bed before falling asleep)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silvia ha fatto un test in inglese: doveva ripetere</td>
<td></td>
<td>LIBRO (book)</td>
<td>per 5 volte. L’insegnante ha detto che è l’unico modo per migliorare la pronuncia (five times. The teacher said that was the only way to improve her pronunciation)</td>
</tr>
</tbody>
</table>

2. Results

In order to assess the effect of gender and semantic congruence, a 2X2 Anova within-subjects was conducted. The results indicated an effect of gender [F(1,23) = 5,608; p = 0,023] and semantics [F(1,23) = 14,567; p = 0,001], while the interaction gender X
semantics was not significant \([F(1,23) = 3.810; p = 0.063]\). At this point it was important to determine the direction of priming; to do that, we compared reaction times of each condition with the ones of the neutral baseline. Four independent sample t-tests were conducted: a significant facilitation was observed for the G+S+ condition \([t (23)= 3.706; p= 0.001]\); no other condition reached significance, even if G-S+ and G-S- showed a trend close to significance in opposite effect direction (respectively facilitation and interference) \([G-S+: t (23)= 1.913; p=0.068], [G-S-: t (23)= -1.900; p=0.069]\).

3. Conclusion

The present findings indicate that frontotemporal patients behave similarly to AD patients for what concern language processing: in fact in both groups, a significant facilitation due to concomitant congruence of gender and semantics was found. The lack of interference effect in FTD when there is a complete incongruence (G-S-) is in contradiction with one of the main feature of frontal lobe disease, that is the difficulty to inhibit irrelevant information; this result could be explained considering the small size of sample.

References