

Repetition-priming effect: a cognitive task for the definition of a clinical assessment

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ABSTRACT

This research aims to study how semantic priming words can influence behavioral measures (RTs, accuracy), to develop an experimental paradigm to differentiate visual neglect and hemianopia. 69 experimental subjects were involved in four experiments. In each experiment target words were preceded by word primes semantically related, neutral or unrelated to the target. The four experiments differed in terms of: number of prime, prime duration and distance between PC monitor and subject. In general, related primes should improve facilitatory effect in target recognition more than unrelated primes, reducing RTs and increasing response accuracy. After repeated ANOVA analysis applied to each experiment and paired comparisons, it is possible to point out that single related primes, shown for 150 ms, greatly improve response behavior in terms of RTs reduction. For future applications to the clinical field, we assume that neglect patients should be facilitated in these specific experimental conditions, due to implicit contralesional prime processing. On the contrary, hemianopics should nowise be facilitated, due to visual field deficit.

Keywords: Semantic priming; Implicit perception; RTs; Neglect; Hemianopia

1. INTRODUCTION

It is widely assumed that priming entails facilitation or inhibition effects when it is shown before a target stimuli (Tulving & Schacter, 1990). In particular, when a prime is semantically related to the target, the facilitation effect is greater than those one observed with orthographically or phonologically related primes (Kanne, 2002; McClelland & Rumelhart, 1981). This evidence is explained as a hierarchical information processing within the theoretical construct of spreading activation model (Collins & Loftus, 1975; Meyer & Schvaneveldt, 1971). Priming effect was moreover widely used as proof of implicit information processing (Ladavas, Paladini & Cubelli, 1993).

This work will focus on the specific aim to find a task which could be used as assessment test to differentiate between neglect and hemianopia. Patients with neglect can implicitly perceive and process stimuli presented in the neglected field (Balconi, Sozzi, Ferrari, Pisani & Mariani, 2012; Balconi, Amenta, Sozzi, Cannatà & Pisani, 2013; Sozzi & Balconi, 2012; Van Vleet & Robertson, 2009). This information, even though not consciously available, seems to influence later decisions, because of the spared ability to encode the neglected information to a level of meaning (Marshall & Halligan, 1988). On the other hand patients with homonymous hemianopia should not detect controlesional stimuli due to a visual-field loss following post-chiasmatic lesions, although in some cases this could be possible (e.g. blindsight; Weiskrantz, 2004). In order to achieve this aim we realised a study with healthy participants with four different experiments. In each of them we modified the duration onset of the prime, number of primes and the distance from the monitor, in order to find which experimental conditions best fit with our purposes. Therefore our first aim was to study how lexical primes can influence behavioural measures (RTs). In the present paper we discuss the first step of the research concerning results on healthy participants.

2. METHOD

2.1. Participants

Sixty-nine healthy participants took part to this step of the research subdivided in four different experiments. Mean age was 23.53 (SD = 4.08; range = 18-39); all of them was Italian-native speakers, had a normal or correct-to-normal vision, and did not report any neurologic illness.

2.2. Stimuli and procedure

After a fixation point a word prime occurred on the horizontal central line in six different positions, three on the left (column “A”; “B”; “C”) and three on the right (column “D”; “E”; “F”). The prime was then followed by a mask (50 ms), and after a 250 ms blank the target word appeared in the centre of the screen. Three conditions were present: related (same prime and target), unrelated (different prime and target) or neutral (“×” string before the target). Both target and prime words consisted of 90 bisyllabic Italian words. Participants were required to press the spacebar when the target belonged to a “living” category. In Experiment 1 a prime with a contralateral distractor was presented for 50 ms and the subjects were sat at 50 cm from the screen. In Experiment 2 a single prime was shown for 50 ms and the distance was the same of the Experiment 1. In Experiment 3 we modified the prime onset which was at 200 ms. Finally, in Experiment 4 we modified the distance at 100 cm, with 200 ms prime. Each experiment consisted of five sections, with 36 stimuli each.

3. RESULTS

Repeated measure ANOVAs were used for each experiment, through a general linear model, in which were considered both “prime position” (six levels: “A”; “B”; “C”; “D”; “E”; “F”) and “prime relation” (three levels: “neutral”; “related”; “unrelated”). In Experiment 1 we did not find any significant effects (see Figure 1).

In Experiment 2 the main effect “prime relation” and the interaction between “prime position” and “prime relation” were significant (see Figure 2).

In Experiment 3 we also found both a main effect “prime relation” and an interaction effect between “prime position” and “prime relation” (see Figure 3).

In Experiment 4 only a main effect concerning “prime relation” arose (see Figure 4).

Thus, only in this last experiment there was no significance on interaction between “prime position” and “prime relation”. This evidence supports the fact that in each position there was the same prime effect and, consequently, healthy subjects processed prime stimuli although located in different part of the space.

Figure 1.
A prime with a controlateral distractor was presented for 50 ms; subjects were sat at 50 cm from the screen

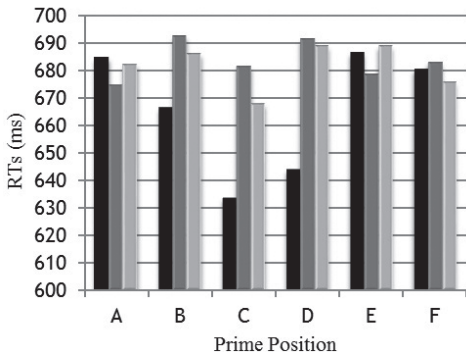
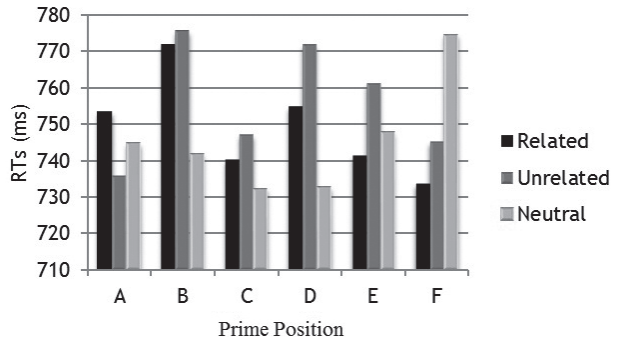


Figure 2.
A single prime word was shown for 50 ms; the distance between subjects and the screen was of 50cm, the same of Experiment 1

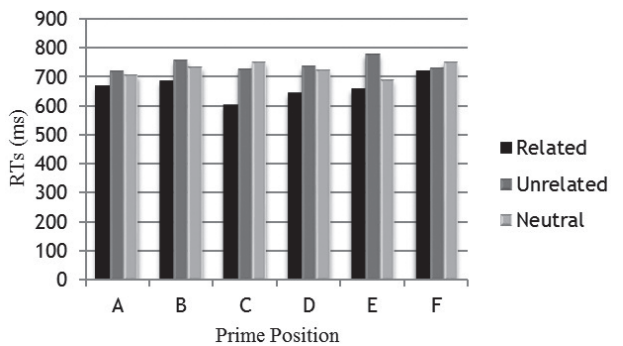


Figure 3.
A single prime was presented for 200 ms; the distance between the subjects and the screen was the same of previous experiment (50 cm)

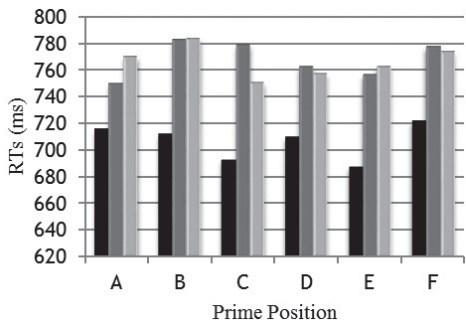


Figure 4.
A single prime was presented for 200 ms; the subjects were sat at 100 cm from the screen

4. DISCUSSION

The aim of this work was to find a task in which an implicit information processing was possible on all the width of the screen.

First of all, we found a significant main effect of “prime relation” in all the experiments excluding the first one. Furthermore, the statistical analysis pointed out that the semantic relation was better when prime words were presented in central positions, as shown in Experiments 2 and 3. Best conditions were single prime and a prime onset at 200 ms. It was demonstrated indeed that related primes reduce RTs significantly more than neutral and unrelated conditions do. On the contrary, the distance between the subject and the monitor was shown to be less relevant to modulate the prime effect.

5. CONCLUSION

These data suggest that an implicit information processing on different spatial positions could be possible with a prime at 200 ms. Therefore, this experimental procedure could be tested on brain-damaged patients in order to differentiate between neglect and hemianopia. We are now collecting first clinical data which will be discuss in next papers.

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