In Search of Selective Inhibitory Processes[1]

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Abstract

These studies discuss two possible explanations for the selective effects observed in lexical ambiguity studies: one is selective inhibition and the other is attention. The two views make different predictions when a neutral target item is introduced between presentation of a homograph and a subsequent related target. The data show little signs of selective suppression, but they do suggest that attention may increase priming without producing selectivity.

Introduction

The term inhibition is often used to refer to the suppression of some concepts or nodes in memory to allow some conscious mental representation of another. One form of general inhibition is presented by Posner and Snyder (1975). General inhibition in their terms is a product of attention such that all things not currently attended to are less likely to come to consciousness. Other researchers have proposed the existence of selective inhibitory proceses within the memory system in which there is suppression of specific pathways in memory to allow conscious representation of a competing one (e.g. Marcel, 1980; and Neill, 1977). The resolution of lexical amibiguities is one instance in which this seems to occur. In the classic study by Schvaneveldt, Meyer and Becker (1976) a series of three letter strings were presented for word-nonword judgements, and in each of the experimental trials the second word of the series was always ambiguous with the first and third words in some way related to it. Schvaneveldt et al. demonstrated that lexical decisions on the third word were faster when the first and third words were related to common meanings of the ambiguous word (e.g. SAVE-BANK-MONEY), but not when the words were related to different meanings (e.g. RIVER-BANK-MONEY). This is typically what is found from studies presenting isolated single words as stimuli (see Marcel, 1980). When the ambiguous word is embedded in a sentence (e.g. Conrad, 1974 and Swinney 1979; Tanenhaus, Leiman and Seidenberg, 1979) the typical finding is for both meanings to exhibit evidence of activation followed by a rapid decline in the

priming effects for contextually inappropriate meanings. Thus, these data can be viewed as evidence for the selective inhibition view. Although selective inhibition explanations are appealing, it is possible that the observed selective effects are a result of attention focussing on certain parts of semantic memory

This paper presents a technique designed to determine if these selective suppression effects found in lexical ambiguity studies are due to selective inhibitory processes or if they are a result of focussed attention. The experiments described use a sequential lexical decision paradigm similar to the Schvaneveldt et al. study but include an additional factor referred to as the "separated" factor. If a related target appears immediately after the ambiguous word it is called unseparated if it appears one item later in the series it is called separated. To accommodate this additional factor all trials consisted of four items. Completely crossed with the separated factor were relatedness conditions. These were as follows: Congruent - the word preceding and following the homograph were related to common meanings; Incongruent - the word preceding and following the homograph were related to different meanings; Unbiased - the word preceding the homograph was unrelated, but the word following it was related.

Both views predict selective suppression effects in the unseparated cases, providing a replication of the Schvaneveldt et al. work. In the separated trials the semantic suppression view predicts continued suppression of the incongruent meanings, while the attention view predicts comparable facilitation for all conditions. Equivalent facilitation is predicted because the neutral item presented between the homograph and the subsequent related target word induces a shift of attention thereby dislodging its focus from one particular meaning. Hence, subsequent shifts of attention from this neutral point would give equal opportunity for either meaning of the ambiguous word to exhibit priming due to semantic activation.

Experiment 1

In this experiment subjects were presented a sequence of four items on each trial. In the experimental trials the second word presented always had a double meaning. In all trials the first two items were always words and they were only read by the subjects. The first item was presented for 500 msec. before the second word appeared directly below it. The two words remained on the screen for 1000 msec. followed by a blank period of 250 msec. At this point the first lexical decision target was presented which was the third item in the series. After a response there was another blank period of 250 msec. before the last lexical decision target was presented.

The means of subjects' median reaction times for the related target following the homograph are presented in Table 1. From these data there appears to be some priming in the Congruent condition but very little in the other experimental conditions. These differences are not reliable. A further analysis was performed, however, which suggested that some priming of related targets actually had occurred. This analysis involved splitting each subject's reaction times within a condition into two parts, on either side of the median, then averaging these scores together to give a fast and slow score for each subject in each condition. The rationale for performing such an analysis arose from the assumption that only a portion of the trials were affected by preceding context because they were, for some reason, more difficult to process than other trials. This idea reflects the findings by some researchers that context has a greater influence on slow readers (people with slower lexical access) (Perfetti, Goldman and Hogaboam, 1979; Stanovich and West, 1981). Consequently, one might expect more pronounced context effects in the slow trials than in the fast trials, and this is what was found (see Table 1). There are reliable differences between the Congruent and the control conditions in slow trials and virtually no differences between conditions in the fast trials. These data are not appropriate for examining the effects of the separated factor since the unseparated trials do not demonstrate the selective effects found by Schvaneveldt et al.

Experiment 2

In this experiment the target stimuli were the same as in the previous experiment, but the task was to perform a lexical decision on each item in the series. In performing a lexical decision it is assumed that subjects search for a meaning that can be associated with the letter string presented, and in this way attend to the semantic code for the word. Each item was presented in isolation with a 250 msec. interval between a response and the next target.

The means of subjects' median, fast and slow scores are presented in Table 2. Very strong nonselective priming effects are observable in all three breakdowns of the data. Thus, as predicted from the first two studies, having subjects attend to the semantic aspects of the priming words lead to much stronger effects. However, since I was unable to replicate the results of Schvaneveldt, et al., the intended comparison betwcen the selective inhibition view and the attentional view to assess the basis of selective suppression effects cannot be made on these data.

General Discussion

These studies present a method for identifying the processes that underly selective suppression effects often found in lexical ambiguity studies. The method is concerned with whether they arise from selective inhibition or from attention. To perform this test it is assumed that observable differences between the two views arise only after selective suppression is obtained. Although this seems to be a common finding for single word lexical decision studies these experiments were unsuccessful in reproducing the effects and so the test for selective inhibitory processes could not be conducted. This suggests that the finding of selective suppression with this paradigm may not be as common as initially thought.

Even though these experiments were not successful in fully explaining what produces selective suppression effects, other interesting points deserve mention. The first is the role of attention in obtaining larger priming effects. When subjects were forced to attend to the semantic aspects of the first two words (experiment 2) very large general priming effects were observed in all conditions. Notice, however, that priming in general increased for all conditions, but that no advantage for one meaning over the other was found. The order of the priming effects for each condition is compatible with the selective suppression predictions, but statistically the experimental conditions do not differ from each other. This result is troublesome for the attention view since according to it an increased focussing on the semantic code should lead to greater selective suppression effects. Instead, it only leads to increased priming overall, which is observable in all analyses (the median, fast, and slow scores).

When the data from the first experiment were analyzed globally negligible effects of condition were observed. Splitting each subject's data into fast and slow times produced a measure that was more sensitive to priming effects. The global statistics themselves were effective in picking up the effects in the last experiment in which attending to semantic aspects of the primes boosted the context effects. This suggests that the slow reaction time analysis is more sensitive in picking up weak effects in data, whereas the more global descriptive statistics will only pick up very strong effects and will mask weaker trends in the data.

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TABLE 1

Median, fast and slow reaction times to the related targets following a homograph in each condition in experiment 1. Proportion of errors in each condition are shown in parentheses.

UNSEPARATED

	FAST	MED	SLOW
CONGRUENT (.03)	620	713	854
INCONGRUENT (.04)	648	746	948
UNBIASED (.03)	654	759	940
CONTROL (.03)	627	744	1006

SEPARATED

	FAST	MED	SLOW
CONGRUENT (.03)	580	669	834
INCONGRUENT (.02)	602	690	860
UNBIASED (.04)	599	689	848
CONTROL (.03)	580	687	961

TABLE 2

Median, fast and slow reaction times to the related targets following a homograph in each condition in experiment 2. Proportion of errors in each condition are shown in parentheses.

UNSEPARATED

	FAST	MED	SLOW
CONGRUENT (.03)	429	482	594
INCONGRUENT (.05)	457	520	638
UNBIASED (.06)	446	506	612
CONTROL (.13)	506	584	781

SEPARATED

	FAST	MED	SLOW
CONGRUENT (.11)	482	545	672
INCONGRUENT (.11)	499	567	709
UNBIASED (.12)	490	565	701
CONTROL (.19)	539	625	851