

Why do users neglect suggestions?: Effects of semantic relatedness and task on word recognition

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We report work in progress on the question “Why do searchers frequently fail to use potentially valuable query suggestions?” [1,2]. We hypothesize that failure is due, at least in part, to interference with the searcher’s ability to recognize a semantic relationship between the words used in a query and the words in a suggestion. In our study, we measure *semantic priming* as an indicator of a searcher’s recognition of relationships between words. This poster presents preliminary results from one experiment in the study.

1. INTRODUCTION

Generally, our research objective is to investigate people’s recognition of related words in the context of interaction with a search system. More specifically, we are interested in how the tasks of formulating a query or scanning a results page affect recognition. In our broader study, we approach these questions in a series of controlled experiments that isolate effects due to factors such as semantic relatedness, context, and task.

This abstract and the poster are organized as follows. First, we briefly define and describe the principal element of our methodological approach: *semantic priming*. Next, we describe our baseline study, which uses a standard approach for measuring semantic priming, the *lexical decision task*. Then, we describe a new experimental approach, which is designed to invoke a decision task that occurs in the course of interactive search. Our poster presents results from an experiment conducted using this new task.

2. SEMANTIC PRIMING

Semantic priming is a well-established, extensively investigated cognitive phenomenon [3]. Psychologists and linguists use measures of semantic priming in a wide range of studies, including areas such as memory, reading, and perception. Semantic priming refers to an increase in the availability of a word in memory, where the increase is caused by the processing of a preceding, semantically related word or other stimuli such as an image. For example, the word *kitten* “primes” the semantically related word *cat*; the unrelated word *table* does not prime *cat*. The difference in availability is termed the *semantic priming effect*. There is a large literature on the many factors that affect semantic priming. In our experiments, we manipulate semantic

relationships between words, the order of words, and the subject’s task, as independent variables. We measure *semantic priming* as the dependent variable.

3. BASELINE STUDY

In our baseline experiment, we used a standard methodology for measuring semantic priming: the *lexical decision task* (LDT). During one iteration of this task, a volunteer sees a sequence of computer screens (see Figure 1). The first screen displays a fixation point, which draws the volunteer’s eye to the center of the screen. Next, a real English word is displayed very briefly (~150 milliseconds); because it is processed first, this word is called the *prime*. A blank screen then flashes very quickly (~50ms). Finally, a second string of letters is displayed; this string is called the *target*. The target can be a real English word or a pronounceable non-word. The volunteer must decide very quickly (within 1 second) whether the target is a real English word (the *lexical decision*). The volunteer indicates the decision by pressing one of two buttons. The time taken to press a button is called the *response time* (RT).

For each iteration of the task, a volunteer may experience one of three possible target conditions:

- **Related-word:** the target is a real word, and the prime is related to the target
- **Unrelated-word:** the target is a real word, and the prime is unrelated to the target
- **Unrelated-nonword:** the target is a nonword

Our baseline measure of semantic priming compares response times under the related-word and unrelated-word conditions. The semantic priming effect is the difference between mean response times under the two conditions.

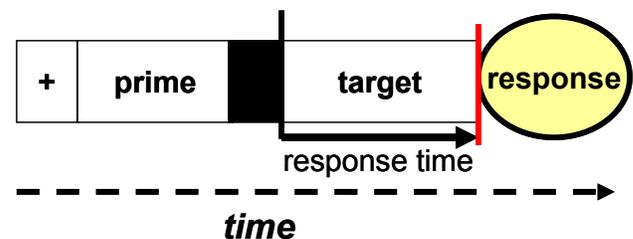


Figure 1. Sequence of screen displays and response in lexical decision task

Baseline results: lexical decision task

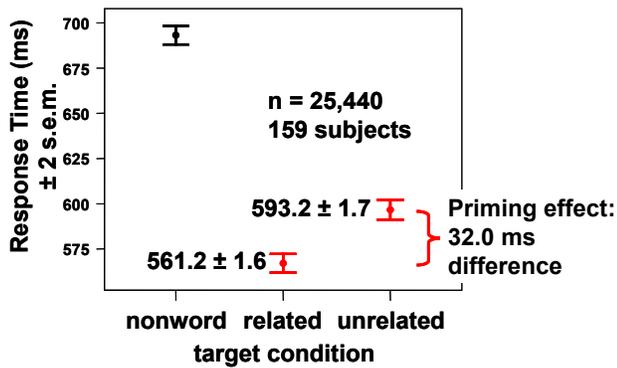


Figure 2. Semantic priming effect in baseline experiment

159 volunteers participated in our baseline experiment, each of whom completed 160 lexical decisions. We find a statistically significant difference in response time for target conditions ($F(2, 25280)=2087, p<.001$). Post-hoc analysis using Scheffé’s test indicates that response time is significantly different in each of the three target conditions. On average, response time was 32 milliseconds faster in the related-word condition (see Figure 2, above).

4. THE EFFECT OF TASK ON PRIMING

In the design of our larger study, we assume that the words in a searcher’s query “primes” the recognition of words in a subsequent display. In this way, we relate primes to query-terms and targets to words displayed in query suggestions. The results reported in our poster show how semantic priming is affected by the task of looking for a word on a two-item list.

For this work, we have used target displays that contain two strings, with one displayed above the other on the screen. For each iteration of a task, a volunteer experiences one of 14 possible target conditions. Table 1 shows an example of the possible target conditions for the prime word *cat*. We have developed a new experimental task, which we call a *presence decision task* (PDT). The task is similar to the LDT, except that rather than deciding whether the target contains a real word, volunteers decide whether the prime word is *present* in the target. Volunteers participating in the reported experiment were assigned randomly to either the PDT (n=55) or the LDT (n=51). For the LDT, volunteers decided whether *both* strings in the target display were real English words. We know of no other semantic priming study that has examined the effect of searching for the prime word *within* the target display.

Table 1. Example of target conditions for the prime word “cat”

position in target display	BOTTOM STRING IN TARGET				
		<i>repeated prime</i>	<i>related word</i>	<i>unrelated word</i>	<i>non-word</i>
TOP STRING IN TARGET	<i>repeated prime</i>	---	cat kitten	cat army	cat glive
	<i>related word</i>	kitten cat	kitten tiger	kitten army	kitten glive
	<i>unrelated word</i>	army cat	army kitten	army table	army glive
	<i>non-word</i>	glive cat	glive kitten	glive army	---

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5. REFERENCES

[1] Kelly, D., & Fu, X. (2006). Elicitation of term relevance feedback: An investigation of term source and context. In Proceedings of the 29th Annual ACM International Conference on Research and Development in Information Retrieval (SIGIR '06), Seattle, WA, 453-460.

[2] Kelly, D., Gyllstrom, K., and Bailey, E. W. (2009). A comparison of query and term suggestion features for interactive searching. In *Proceedings of the 32nd international ACM SIGIR Conference on Research and Development in information Retrieval (SIGIR '09)*, Boston, MA, 371-378.

[3] McNamara, T. (2005). *Semantic priming: Perspectives from memory and word recognition*. New York, New York: Psychology Press.