



Visible homonyms are ambiguous, subliminal homonyms are not: A close look at priming

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ABSTRACT

Homonyms, i.e. ambiguous words like 'score', have different meanings in different contexts. Previous research indicates that all potential meanings of a homonym are first accessed in parallel before one of the meanings is selected in a competitive race. If these processes are automatic, these processes of selection should even be observed when homonyms are shown subliminally. This study measured the time course of subliminal and supraliminal priming by homonyms with a frequent (dominant) and a rare (subordinate) meaning in a neutral context, using a lexical decision task. In the subliminal condition, priming across prime-target asynchronies ranging from 100 ms to 1.5 s indicated that the dominant meaning of homonyms was facilitated and the subordinate meaning was inhibited. This indicates that selection of meaning was much faster with subliminal presentation than with supraliminal presentation. Awareness of a prime might decelerate an otherwise rapid selection process.

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1. Introduction

One of the characteristics of intelligent thinking is flexibility, which is needed when ambiguous information is processed. For example, owing to our ability to resolve ambiguity, we intuitively assign different meanings to the word 'score' when talking about exams compared to when talking about music. Ambiguous words like 'score' or 'paper' are called homonyms, i.e. words that have at least two distinct meanings which cannot be distinguished by either the word's writing or pronunciation. Due to their ambiguity, homonyms are ideal for investigating presumed stages of word recognition, including access to meaning, selection of meaning and the role of context in this process.

Although most studies on homonyms have focused on the influence of context on meaning selection (e.g., Binder & Morris, 1995; Chen & Boland, 2008; Gottlob, Goldinger, Stone, & Van Orden, 1999; Marslen-Wilson, 1987; Moritz, Mersmann, Quast, & Andresen, 2001; Onifer & Swinney, 1981; Paul, Kellas, Martin, & Clark, 1992; Schvaneveldt, Meyer, & Becker, 1976; Simpson, 1981; Simpson & Krueger, 1991; Tabossi & Zardon, 1993; Tanenhaus, Leiman, & Seidenberg, 1979; Vu, Kellas, & Paul, 1998), one strand of research has concentrated on measuring meaning selection when *no* context or a neutral context is given. In single-word priming, neutral trials are usually formed by pairing homonym primes with unrelated target words (e.g., 'calf'–'wine') and experimental trials are formed by pairing homonym primes with targets related to one of their meanings (e.g., 'calf'–'cow'). The difference in reaction times between experimental and biased trials indicates the amount of priming related to the prime-target relationship. A couple of single-word priming time course studies using polar homonyms, i.e. homonyms with a dominant (more frequent) (e.g., 'calf'–'cow') and a subordinate (less

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Table 1

Examples of possible prime-target pairs within a test. In Experiment 1, control primes were neutral words. In Experiment 2, homonym primes and their subordinate/dominant related words were recombined to form unrelated pairs in the control condition.

	Prime	Target
<i>Experiment 1</i>		
Subordinate	PORT	WINE
Dominant	BANK	ACCOUNT
Control	POPPY	SCENE
<i>Experiment 2</i>		
Experimental – Subordinate	PORT	WINE
Experimental – Dominant	BANK	ACCOUNT
Control – Subordinate	BANK	WINE
Control – Dominant	PORT	ACCOUNT

Remark: English examples are given for illustration. See the Appendices for the word set and stimulus rotations.

frequent) meaning (e.g., ‘calf’–‘leg’) (e.g., Marcel, 1980; Simpson & Burgess, 1985), reported positive priming for both meanings of a homonym at short SOAs (i.e., SOAs between 0 and 300 ms), indicating that all meanings of a word are more accessible first, whereas later on, the dominant meaning has a clear advantage over other meanings (cf. Duffy, Morris, & Rayner, 1988; Simpson, 1981; Simpson & Burgess, 1985). A similar time course was found with sentence studies and single word studies with normal words (e.g., Tanenhaus et al., 1979; Till, Mross, & Kintsch, 1988). These findings of short-SOA priming were taken as evidence for an early parallel access to meanings (cf. Simpson, 1984; Simpson & Burgess, 1985), occurring within 300 ms after word presentation, followed by selection of one meaning and suppression of nonselected meanings.

Whereas researchers seem to agree on the conclusion that parallel access is automatic in nature (given that priming at short SOAs is likely to be automatic, cf. Neely, 1977; Neely, 1991), it is unclear whether the late selection/suppression pattern of priming is reflecting automatic competitive selection (interactive activation model, McClelland & Rumelhart, 1981; TRACE model, McClelland & Rumelhart, 1986; Contextual-Feature-Sensitive Model, Vu et al., 1998), or strategic and expectation-related controlled selection (e.g., Neely, 1977; Neely, 1991; Simpson, 1984). Modular selection accounts (e.g. Forster, 1976) identify this stage with context integration, during which one is in a state of openness for multiple interpretations of a word, or a readiness for revision of the first choice. In this study, we used subliminal priming to determine the extent to which processes of meaning selection are indeed automatic.

Subliminal presentation of primes was used to reduce the contribution of strategic, controlled processes in priming.¹ By using a design with several prime-target SOAs (100, 300, 600, 900 and 1500 ms), we sought to determine whether there was a time point at which priming for different meanings of the homonyms diverged. More specifically, the time point of automatic selection of a meaning would be indicated by the inhibition of one meaning (the subordinate meaning) compared to the other meaning of the homonym (the dominant meaning). For comparison, the same test was also used with visible primes.

The time course of subliminal and supraliminal homonym priming in a neutral context was measured in three experiments. Polar homonyms like ‘port’ were used, which have one dominant meaning (harbour) which is statistically chosen more frequently than the subordinate meaning (beverage) in neutral contexts. In Experiment 1, prime-target SOA was varied between 100 ms and 900 ms SOAs. Experiment 2 varied the prime-target SOA across a range of 100–1500 ms.

2. Experiment 1

In this experiment, priming of subordinate and dominant meanings of polar homonyms was measured at four prime-target SOAs (100 ms, 300 ms, 600 ms, 900 ms) using a lexical decision task. In the subliminal priming test, primes were sandwich masked using individually titrated presentation timing in order to ensure subliminal presentation. In the visible priming test, primes were shown without masks and were therefore clearly visible. In each test, two experimental conditions and one control condition was measured, whereby each prime and target word was shown not more than once across both tests. In the experimental conditions, homonym primes were paired with a target word related to the subordinate or the dominant meaning of the homonym. In the control condition, neutral primes were paired with unrelated targets, which were related to the subordinate or the dominant meaning of the homonyms used in the experimental condition (cf. Table 1). Priming was computed as the difference in lexical decision times to target words preceded by a related homonym and the same words preceded by an unrelated word.

¹ When using subliminal perception to reduce controlled processing, one has to be careful in controlling influences of attentional and strategic processes, which have been shown to still have influence on subliminal priming (e.g. Dehaene, Changeux, Naccache, Sackur, & Claire Sergent, 2006; Eckstein & Perrig, 2007; Van den Bussche, Van Den Noortgate, & Reynvoet, 2009). In this study, attentional requirements were identical in the masked and the visible priming tests and strategic influences were minimized by reducing across-trial repetitions of words.

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