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Abstract

The study addresses a number of issues related to the effects of biasing semantic contexts on the processing of words with more than one meaning (homographs). Biasing contexts have been taken to either constrain "lexical access" to a contextually relevant meaning of a homograph (selective access), or to exert a selective effect only after access to all, or some subset of, the meanings of a homograph (multiple access). Recent findings based on the two-factor theory of attention (Posner & Snyder, 1975a) suggest that lexical access occurs in two stages, where the first stage involves automatic activation of all meanings and the second involves a rapid attentional selection of the contextually relevant meaning. A three word priming paradigm (Schvaneveldt, Meyer, & Becker, 1976) was employed to test the stages hypothesis. Subjects were required to name only the final target word, and their reaction time was the dependent variable. The critical trials involved presentation of two word primes, where the first prime was a word related to one meaning of the second prime, which was a homograph. The comparison of most interest was between targets that were semantically congruent or incongruent with the biased homograph (e.g., oar-row-PADDLE and oar-row-COLUMN, respectively). These conditions were compared to two baselines: One employing two neutral primes (e.g., xxxxx-xxxxx-PADDLE), and one employing the biased homograph followed by an unrelated target (e.g., oar-row-GREEN). The stimulus onset asynchrony (SOA) of the homograph was varied, as well as the strategies that subjects were instructed to use in attending to the context stimuli. Some evidence was found for the stages view of ambiguity resolution: At brief SOAs, congruent and incongruent targets were facilitated, whereas at a longer SOA, facilitation was significantly reduced for incongruent targets. Attentional strategies had less effect than anticipated. Also, results with the neutral baseline were discrepant with earlier findings. Discussion focused on the research hypotheses and characteristics of the naming task that might account for the discrepant findings. A brief theoretical overview concluded.

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Introduction

In the "priming" paradigm (Beller, 1971; Posner & Mitchell, 1967), the subject is presented advance information (a prime or cue) about the identity of a letter or word target to which some type of overt response (e.g., classification, matching, or pronounciation) is required. It is hypothesized that as the parameters of the prime's presentation are varied (e.g., temporal duration, or the likelihood that the prime will match the target), the processing of the target also varies. Therefore, the processing of the advance information, and its effect on the processing of the target, can be inferred from the pattern of responses to the target. Studies using versions of this paradigm have addressed a number of issues in human information processing. For instance, attention and attentional strategies have been studied using Stroop tasks (Dyer, 1973), Stroop-related tasks (Flowers, 1975; Flowers, Warner, & Polansky, 1979; Taylor, 1977), and matching and classification tasks (Myers & Lorch, 1980; Neely, 1976, 1977; Posner & Snyder, 1975a, 1975b). The structure of semantic memory and the time-course of its activation have been examined (Fischler & Goodman, 1978; Taylor, 1977; Warren, 1977), as well as the nature of conscious and unconscious semantic processing (Allport, 1977; Marcel & Patterson, 1978; Shallice & McGill, 1978). Considerable use of the technique has been made in the study of lexical access and contextual effects using as priming stimuli both words (Fischler, 1977; Schvaneveldt, Meyer, & Becker, 1976; Holley-WIlcox & Blank, 1980; Tweedy, Lapinski, & Schvaneveldt, 1977) and sentences (Fischler & Bloom, 1979; Foss, Cirilo, & Blank, 1979).

Of particular interest for the present study is the application of priming techniques, and rationales like the two-factor theory of attention (Posner & Snyder, 1975a; Shiffrin & Schneider, 1977), to the study of ambiguous word (homograph[1]) processing or "lexical ambiguity resolution." It has recently been claimed (Tanenhaus, Leiman, & Seidenberg, 1979; Swinney, 1979) that the temporal asymmetry between two kinds of human information processing posited by the two-factor theory ("automatic" versus "controlled" or "attentional") can account for the apparently conflicting findings concerning the way in which semantic context affects the selection of the contextually relevant meaning of an ambiguous word. It is the purpose of the present research to examine this application of the two-factor theory by using a semantic priming paradigm. Before discussing research on homograph processing, some important aspects of the two-factor theory and its experimental application will be reviewed.

The Two-Factor Theory of Attention

Many studies using the priming paradigm have been formulated and/or interpreted in terms of the "two-factor" theory of attention (Posner & Snyder, 1975a, 1975b; Shiffrin & Schneider, 1977). This theory postulates two kinds of human information processing, automatic and controlled. Information processed "automatically" or "systemically" does not require the subject's conscious attention, nor is it subject to limited-capacity constraints (Posner & Warren, 1972). Information processed in a controlled, strategic fashion involves the use of a limited-capacity mechanism identified with attention.

In early studies using successive letter-matching tasks (e.g., Posner & Boies, 1971), these two kinds of processing were identified by the following kind of procedure. A trial consisted of the presentation of two letters, one sec apart, and the subject was required to indicate by a speeded response whether the two stimuli were the same or different (primary task). At various intervals throughout a trial, the subject was also required to make a speeded response to an auditory "probe" (secondary task). It was hypothesized that, as reaction time (RT) to the auditory probe increased, the primary task was placing heavier demands on limited-capacity, controlled processing. The general finding (e.g., Figure 1) was that RT to the probe was relatively unaffected immediately after first letter presentation (relative to probe RTs just prior to first letter presentation), presumably indicating automatic parallel processing of the probe and the first letter, but rose sharply 300 to 400 msec after first letter presentation, indicating controlled processing of the letter and the gradual exclusion of the auditory probe stimulus from the limited-capacity channel.

More recent studies using simultaneous letter-matching, word-classification (Posner & Snyder, 1975a), and lexical decision tasks (Neely, 1976, 1977) have not used the interference produced to a secondary task as the measure of the involvement of limited capacity processing in the primary task. Rather, controlled processing has been produced by using a priming stimulus to create a particular "expectancy" as to the identity of the target. For instance, if a word prime was followed on the majority of trials by a semantically related target, then the subject would develop an expectancy for a specific subset of all possible targets, namely those semantically related to the prime. The presence of controlled processing has typically been operationalized in this situation as increased latencies or "inhibition" for responses to a letter or word target that does not conform to the subject's expectancy, compared to a baseline condition using a neutral priming stimulus (e.g., XXXXX) upon which an expectancy cannot be based. It was postulated that this inhibition occurs because the unexpected target, in not receiving any attentional processing, now lies "outside" the limited-capacity channel, and the subject must compensate for his misplaced expectation by the time-consuming operation of switching attention to the actual target (Posner & Warren, 1972).

Automatic activation in this paradigm, on the other hand, has typically been operationalized as a reduced latency or "facilitation" for responses to a letter or word target that has been primed by an identical or semantically related stimulus, compared to the control condition using the neutral priming stimulus. It was postulated that facilitation occurs because the priming stimulus automatically activates its particular structural unit or "logogen" (Morton, 1969) in long-term memory prior to target presentation (see Collins & Loftus, 1975), resulting in speeded processing of the target itself when it is identical or semantically related (Posner & Warren, 1972).

In order to show that automatic processing occurs early, while attention takes some time to develop, the amount of processing on the prime has been controlled by, for example, varying the time from onset of the prime to onset of the target (stimulus onset asynchrony: SOA). It has been hypothesized (e.g., Neely, 1977) that when the SOA is brief, only the facilitative effects of automatic activation will be observed, whereas when the SOA is long, certain products of automatic processing will have been selected and received controlled processing, with inhibition resulting for unselected stimuli.

Neely's (1977) study provides a good example of the factorial manipulation of expectancy-based strategies, semantic relatedness, and prime SOA. He used a two-stimulus array where the first stimulus was a prime (a category name, e.g., BIRD), and the second stimulus was a target letter string (either a word that was a member of a category, e.g., ROBIN, or a non-word). Subjects were required to decide whether the target was a word or a non-word (lexical decision) and their RT was the dependent variable. Neely varied the relationship of the prime to the target (related or unrelated) and the subject's expectancy as to the identity of the target based on the identity of the prime. Expectancy was manipulated by instructing subjects on some trials (Non-Shift condition) that one category prime (e.g., BIRD) would be followed on most trials by targets that were members of the same category (e.g., ROBIN), and instructing subjects on other trials (Shift condition) that primes of a category label (e.g., BIRD) would be followed on most trials by targets that were members of a different category (e.g., DOOR:Building Parts). Only a portion (2/3) of the actual trials conformed to these relations, so the subject's expectancy was not always confirmed. Finally, Neely varied the SOA of the prime (250, 400, or 700 msec), hypothesizing that, at brief SOAs, the facilitative effects of automatic associative priming would occur only for related targets, while at longer SOAs, attentional effects would eventually produce inhibition for unexpected targets (either related or unrelated) and facilitation for expected targets (either related or unrelated). All facilitation and inhibition effects were computed relative to a "neutral" prime condition using a string of Xs.

Neely reported the following pattern of results (Figure 2). At brief SOAs (250 msec), RT to targets related to the prime was facilitated and RT to targets unrelated to the prime was (relatively) unaffected, regardless of the subject's expectancy as to the prime's identity. At longer SOAs (400 and 700 msec), targets that were both related and expected were facilitated, while targets that were unrelated and unexpected were inhibited. When the target was expected and unrelated, or unexpected and related, the effects of automatic and controlled processing could be seen to "play off" against one another: Unrelated targets that were expected eventually (i.e., at longer SOAs) showed facilitation, whereas related targets that were unexpected eventually showed inhibition. Given the two-factor theory, these results provide a consistent pattern of temporally dependent changes in facilitation and inhibition as a function of prime-target associative relation and subject expectancy: Automatic processing shows rapid onset and rise-time, facilitating related targets; controlled processing takes time to develop - about 300 to 400 msec after presentation of the prime, facilitating the processing of expected targets and inhibiting the processing of unexpected targets.

Two points can be drawn from this brief discussion of the two-factor theory. The first is methodological and relates to the usefulness of the priming paradigm for the study of context effects in lexical ambiguity resolution: The priming stimulus can be regarded as constituting a "context" in which the processing of the target information occurs. Second, the two-factor theory distinguishes two ways in which the contextual information can influence the processing of the target: automatic activation and controlled processing. The work of Posner and his colleagues has emphasized the temporal relationship between these two modes of processing, with automatic activation reflecting the rapid access to existing "structures" in memory and controlled processing reflecting the slower-acting "subject" component, including expectancies (predictions) or strategies. Recent work by Swinney (1979) and Tanenhaus et al. (1979) suggests that the temporal parameters of automatic and controlled processing can be profitably applied to the problem of "lexical access" to the meanings of homographs. However, Tanenhaus et al. have argued that ambiguity resolution takes place more rapidly than the attentional responses characteristic of "expectancy" as exemplified in Posner and Snyder's (1975a) and Neely's (1977) paradigm. These researchers have raised a number of other issues as well concerning application of the two-factor theory to ambiguity resolution. Before discussing their findings, some background research on the processing of homographs will be reviewed.

Processing of Homographs

In normal language contexts, homographs are usually processed quickly and effortlessly, typically without any immediate awareness of ambiguity. The mechanism of the "resolution" of lexical/semantic ambiguity has been widely researched (for reviews see Clark & Clark, 1977; Fodor, Bever, & Garrett, 1974; Foss & Hakes, 1978), but a clear account of the way in which a contextually relevant meaning of a homograph is selected has not emerged.

Two models have been dominant. The "multiple access" (Tanenhaus et al., 1979) or "exhaustive computation" (Conrad, 1974) model maintains that all meanings of a homograph are retrieved independently of context, and then contextual information is used to select the most appropriate meaning. The "selective access" or "prior decision" (Foss & Jenkins, 1973) model maintains that context constrains which meaning is retrieved, so that only one contextually appropriate meaning is normally processed by the system.[2] The debate centers primarily on the constraining effects of context. Most studies assessing meaning activation for isolated homographs have supported the multiple access view (e.g., Holley-Wilcox & Blank, 1980; Rubenstein, Garfield, & Millikan, 1970; Rubenstein, Lewis, & Rubenstein, 1971), but there are conflicting views on this issue (see Schvaneveldt, Meyer, & Becker, 1976). Although the case of isolated homographs will not be dealt with directly, the most recent theory and data (reviewed below) support the multiple access view.

Two trends in research on homographs will be discussed. One has relied primarily on a technique called "phoneme monitoring" and has employed sentences as contexts. The other trend has used the priming paradigm, based in large part on the work discussed above.

In the phoneme monitoring procedure (Foss, 1970; Foss & Jenkins, 1973), the subject is required to rapidly identify an initial target phoneme of a critical word. The critical word is embedded in a sentence and is immediately preceded by a homograph or non-homograph. It has been hypothesized that multiple access models predict longer RTs to detect the phoneme when preceded by homographs since all possible meanings of the homograph must be accessed, and this has been taken to produce a heavy "transient processing load" on the homograph (Foss, 1970). Identical times are predicted by selective access models because, like non-homographs, only a single meaning is processed, resulting in less transient processing load on the homograph.

The results of these studies (Cairns & Kamerman, 1975; Foss, 1970; Foss & Jenkins, 1973) have generally supported the multiple access view: Phoneme monitoring latencies were longer when preceded by homographs than by non-homographs (see Holmes, Arwas, & Garrett, 1977). However, Swinney and Hakes (1976) suggested that in these early studies the biasing context was not sufficiently strong to ensure that only one meaning of the ambiguous word was appropriate. With stronger, more predictive contexts, they found no difference between phoneme monitoring latencies for ambiguous and control words, concluding that the strong contexts resulted in the processing of only one meaning of the ambiguous words.

These early phoneme monitoring studies have also been questioned on methodological grounds. Newman and Dell (1978) argued that the ambiguity variable was often confounded with a phonological variable, so that a greater degree of phonological similarity existed between control words and the target phoneme than between ambiguous words and targets. This had the effect of producing interference which increased detection times for target phonemes after ambiguous words. Further, Mehler, Segui, and Carey (1978) demonstrated that phoneme monitoring times are dependent on the frequency and length of the word preceding the target phoneme. When they controlled these variables, no difference was found between RTs in the homograph and non-homograph conditions. However, as Tanenhaus et al. (1979) point out, this null result does not necessitate an interpretation in terms of selective access. Phoneme monitoring tasks, they argue, may not even be sensitive to an additional processing load due to multiple access since, among other possible reasons, multiple access, if automatic, would occur so rapidly that it would not be reflected in the phoneme monitoring task, at least as it was employed.

Phoneme monitoring studies have not successfully established the plausibility of either the selective or multiple access model of ambiguous word processing. Results of studies using priming techniques have not faired much better until recently. However, as will become clear, the theoretical developments related to the priming paradigm (i.e., the two-factor theory) suggested the mechanisms necessary for some progress on the problem. These studies will now be considered.

A seminal priming study by Schvaneveldt et al. (1976) offered some of the first interesting data on semantic context effects on homograph processing. This study arose from earlier work (Meyer & Schvaneveldt, 1971; Meyer, Schvaneveldt, & Ruddy, 1975) demonstrating basic associative priming effects. In these early studies, they required subjects to make a rapid decision as to whether each of two letter strings were words. They found that subjects were able to categorize the second stimulus as a word (e.g., Nurse) more rapidly when the first stimulus was a related word (e.g., Doctor) than when it was an unrelated word (e.g., Chair). The facilitation due to this associative relationship was interpreted in terms of an automatic spread of activation within a semantic network from the memory representation of the first word to that of the related word. Schvaneveldt et al. (1976) used the same basic sequential decision task to study lexical access in the case of homographs. Subjects were presented with letter string triplets and required to make a lexical decision to each stimulus before the next was presented. On the critical trials, the second letter string was a homograph and the first and third words varied in their relationship to it. They found that when the first and third words were related to the same meaning of the homograph (congruent trials: River-Bank-Water), lexical decision latencies to the final word were facilitated relative to a control condition where the final word was unrelated to the biased homograph (e.g., initial trials: River-Bank-Time). On the other hand, when the first and third words were related to different meanings of the homograph (incongruent trials: River-Bank-Money), comparable facilitation was not found. They argued that such a result was consistent with selective access to the homograph's meaning, since the biasing context eliminated facilitation (i.e., lexical access) to the alternative meaning of the homograph.

Conrad's (1974) study provided evidence apparently contrary to the selective access model. She employed a technique based on Warren's (1972) finding that interference to name the ink colour of a target word occurred when the target word was primed by a semantically related word. Conrad presented subjects with sentence contexts ending in either a homograph or a non-homograph. The task was to name the ink colour of a target word presented after the final homograph or non-homograph. On the critical trials, the target word was either related to the contextually biased or non-biased meaning of the homograph (e.g., "We made tea in the pot."; Biased target: UTENSIL; Unbiased target: MARIJUANA). Conrad hypothesized that if only one meaning of a homograph is accessed, colour naming interference would appear only for target words related to that accessed meaning. Her results showed that both meanings of a homograph produced some interference, albeit unequal, regardless of biasing context, so she concluded that context does not constrain lexical access. However, Conrad repeated the same homograph for each subject in five different conditions, raising the possibility that on each subsequent presentation the former meanings of the word were also accessed or that subjects developed unspecified strategies in response to the multiple presentations. Oden and Spira's

(Note 1) data were consistent with this possibility. They controlled the number of presentations in the same paradigm as Conrad (1974) and found greater colour-naming interference to targets when the context biased the homograph. They interpreted their findings as support for the selective access view.

Recently a critical variable relating to the discrepancy in these findings has been discovered by Tanenhaus et al. (1979) and Swinney (1979). Recall the distinction previously drawn between automatic and controlled processing, particularly with respect to temporal parameters. Automatic processing begins immediately upon stimulus presentation, while controlled processing takes time to develop (about 300 to 400 msec). Tanenhaus et al. have argued that the amount of processing of the "priming" homograph before presentation of the target is critical for whether one finds support for selective or multiple access. For instance, Conrad (1974) presented targets at offset of the homograph (0 msec delay) and her data were consistent with multiple access. Oden and Spira (Note 1), on the other hand, introduced a 500 msec delay between the homograph and the target, and Schvaneveldt et al. (1976) required a lexical decision between the homograph and the target. Each of these latter two studies was interpreted as supporting the selective access model.

To test the hypothesis that lexical selection occurs sometime after all meanings are initially activated, Tanenhaus et al. (1979) used a naming task and varied the delay between the homograph and the target. Auditory sentences biased either the noun or verb readings of a final homograph. Visual targets were either congruent or incongruent with the biased meaning of the homograph. For instance, "She held the rose - FLOWER" was a congruent trial, and "They all rose - FLOWER" was an incongruent trial. Facilitation and inhibition were calculated by subtracting naming latencies of congruent and incongruent trials from a control condition where the same targets were preceded by unrelated sentences and non-homographs (e.g., She held the post - FLOWER). They found that, regardless of biasing context, naming was facilitated with zero delay between offset of the homograph and onset of the target (Figure 3). However, when the target was delayed by 200 msec, only the contextually congruent meaning of the homograph was facilitated and the incongruent meaning was neither facilitated nor inhibited.

Tanenhaus et al. (1979) interpreted these findings as support for a two-stage model of ambiguity resolution in which all meanings of the homograph are first accessed automatically, followed by the "selection" of a contextually appropriate meaning. They argued that such a selection process might be characterized in terms of Shiffrin and

Schneider's (1977) notion of a controlled (i.e., attentional) process that takes place very quickly, is not accessible to introspection, and is not heavily consuming of limited-capacity resources. They contrasted this kind of "decision" process with controlled processes that more directly engage the subject's conscious attention, are more open to conscious control and introspective awareness, and result in heavier demands on the limited-capacity mechanism.

The purpose of the present research was to re-examine the "stages" hypothesis of ambiguity resolution using semantic (word) contexts rather than syntactic contexts, with particular attention to the temporal parameters associated with the stages and the role of attentional factors in these context effects. Since a large part of Tanenhaus et al.'s (1979) discussion involved comparing their work with Neely's (1977, reviewed above), the following discussion examines some of these comparisons and suggests difficulties with their design which make some of their inferences about temporal parameters and the role of attentional processes problematic.

Two specific considerations led Tanenhaus et al. to conclude that ambiguity resolution may involve an attentional process of a different sort than described by Neely (1977). First, the decline in facilitation to the incongruent meaning of the homograph purportedly occurred earlier (200 msec) than the decline in facilitation to

Neely's related, unexpected targets (400 msec). However, there are a number of procedural differences between their study and Neely's which make such comparisons theoretically questionable. One such difference is that Tanenhaus et al.'s delay from offset of the final auditory prime word to the onset of the target - which they refer to as an SOA - does not correspond to Neely's use of SOA as the interval from the onset of the visual prime to the onset of the target. Tanenhaus et al.'s "SOA" does not include the time necessary to speak the final priming word of the sentence, and hence is more technically an interstimulus interval (ISI). The actual processing time for the homograph at their 200 msec ISI may have been substantially longer than a nominally similar SOA value. Therefore, what they observed at 200 msec ISI may have been closer to Neely's 400 msec SOA, if we assume an additional 200 msec (conservatively) to speak the word. This interpretation is supported by the fact that their facilitation functions show no rise-time, as would be expected on the basis of previous research requiring a response between 0 and 200 msec after onset of the prime (e.g., Warren, 1972). This problem casts doubt on their notion that "speeded" attentional processing is occurring for the incongruent targets.

The other procedural problem limiting comparison between Tanenhaus et al's findings and Neely's is their use of sentence or syntactic contexts rather than single word

word contexts. The syntactic element of sentences, and most certainly the "amount" of context (Foss, Cirilo, & Blank, 1979; Underwood, 1977), may augment the effects of a single word prime and further speed a decision related to the relevant meaning of the homograph. In short, Tanenhaus et al. cannot impute a basic attentional processing difference between incongruent targets and Neely's (1977) unexpected, related targets, since the effect may be due to the specific type of priming used in each study.

In light of these procedural considerations, one question the present research will attempt to answer is whether, using single-word primes (like Schvaneveldt et al., 1976) with closely controlled visual exposure, the time-course of the stages can be more precisely estimated, and in particular, whether there is a decline in facilitation to incongruent targets comparable to Neely's unexpected, related targets.

The second comparison with Neely's study leading Tanenhaus et al. (1979) to posit a different kind of attentional processing for homographs was the apparent lack of inhibition for incongruent targets, once again in contrast to the inhibition produced to Neely's unexpected, related targets. The problem with this conclusion is that their baseline for calculating facilitation and inhibition was different from Neely's. Neely (see also Posner & Snyder, 1975a) used a neutral (XXXXX) prime as the baseline for calculating inhibition. Reaction times in this condition were subtracted from those in the condition where the prime either did not match the target (Posner & Synder, 1975a) or did not predict an expected target (Neely, 1977). Tanenhaus et al. used a "neutral sentence" (non-homograph as the final priming word) followed by an unrelated target as the control condition against which the critical experimental trials were compared. However, this baseline for calculating facilitation and/or inhibition cannot be equated with a baseline employing non-semantic (i.e., meaningless) primes. In fact, Neely has reported maximum inhibition at longer SOAs when the subject expects a related word and gets an unrelated word (nonshift-unexpected-unrelated condition). Other examples of the apparent difference between these critical baselines can be cited. Tulving and Gold (1963) demonstrated that when a sentence context is followed by an incongruent word target (e.g., "Three people were killed in a highway RASPBERRY"), the visual duration threshold for the target is increased relative to a control with no context. Likewise, Schuberth and Eimas (1977) found sentence contexts produced inhibition of a lexical decision to incongruent targets. Therefore, Tanenhaus et al.'s "neutral" sentence context followed by an unrelated target is not the appropriate baseline, at least for a comparison with Neely's work. In the present study, meaningless neutral primes (XXXXX) were used as the baseline for calculating inhibition. A condition analagous to Tanenhaus et al.'s baseline, where a biased homograph is followed by an unrelated word, was also included for a more direct comparison with their results.

A further point concerning inhibition relates to the role of expectancy in producing inhibition. Tanenhaus et al. argue that their subjects did not employ the same kind of conscious, "accessible" strategies as did Neely's. However, they could not know the actual role that spontaneous strategies played in their results. Although it is true that no explicit expectancy instructions were given, as Posner and Snyder (1975a) have shown, expectancy can produce inhibition without such instructions. The only apparent requirement to produce expectancy effects appears to tbe some "useful" probability of a certain kind of target (a minimum probability of .50 in Posner & Snyder, 1975a). Subjects need not even be explicity aware that they are adopting a particular processing strategy (see Shulman & Davison, 1978).

The role of expectancy as it pertains to ambiguity resolution is important for two reasons. First, expectancy has been shown to be a potent variable for the manipulation of inhibition (Posner & Snyder, 1975a; Neely, 1977). This inhibition, in turn, forms the basis for inferences about attentional processing, at least in the formulations of two-factor theory associated with the work of Posner and his associates. Inferences about the role of attention in ambiguity resolution might be made by examining the effects of strong and weak expectancy on, for example, incongruent targets, when other conditions are known to vary as a result of such manipulations (like the amount of inhibition for unrelated targets). Therefore, if the incongruent meaning of an ambiguous word is attentionally processed as are Neely's related, unexpected words, then we would predict that incongruent targets would show a delay in the decline of facilitation and inhibition similar to related, unexpected targets in Neely's (1977) study.

Expectancy is also important because, phenomenologically, resolution of ambiguity may take either a small or a large amount of time and effort, depending on such factors as the amount of context, difficulty of the material, and task parameters - particularly subject strategies to use contextual information. Of these variables, the effect of subject strategies is of primary interest in the present experiment, not only because this variable has been shown to be potent for manipulating facilitation and inhibition (Posner & Snyder, 1975a), but also because it will bear on whether ambiguity resolution can be influenced by more conscious, accessible strategies. If the time course can be shown to be influenced by expectancy strategies, this will constitute evidence that the resolution of lexical ambiguity is a "variable" strategy potentially under some strategic control, notwithstanding the speed of its execution.

To examine the role of expectancy in a preliminary way as it pertains to ambiguity resolution, a straightforward strategy manipulation was used. Some subjects (Active group) were instructed to use the word primes to predict related targets, thereby ostensibly improving their performance on the task. Other subjects (Passive group) were instructed to attend only to the target and treat the priming stimuli as warning signals for the target.

One final issue concerns the a priori dominance or frequency of the respective meanings of ambiguous words. Hogaboam and Perfetti (1975) have pointed out that much research in ambiguity resolution had (up to that point) ignored this variable. They responded by arguing for an "ordered search" model where the most frequent meaning is retrieved first, tested against the context, and so on through less frequent meanings until the contextually relevant meaning is located, at which point processing stops. Hogaboam and Perfetti's data lend support to the view that a priori dominance affects the likelihood of retrieval of a particular meaning. However, their view did not anticipate a two-stage model of processing (see particularly, Simpson, 1981). The present hypothesis is that all meanings are automatically activated independently of context, and only after initial exhaustive activation does context have an effect. In their view, despite the order of search (i.e., sequential lexical access) being independent of context, context does determine how many meanings will be accessed, since the search is terminated when the contextually relevant meaning is located. (Unfortunately, they do not address the issue of attentional versus automatic processing regarding this ordered search model.) This hypothesis may explain contextual effects after attention becomes a factor, but it would relate only to the second stage of processing under the present view. Nevertheless, their point regarding the importance of frequency of meanings is well taken, and this variable has been carefully controlled in the present research.

In the foregoing discussion, a number of questions have been raised. First, if ambiguity resolution can be characterized in terms of the two stages of automatic and attentional processing, what is the time-course of this processing? Second, what is the pattern of facilitation and inhibition using a semantically neutral baseline (Xs)? Third, what role do controlled, expectancy-related strategies play with regard to the speed and/or "duration" of the stages, and in particular, the inhibition of homograph meanings incongruent with a biasing context?

EXPERIMENT 1

To answer these questions, a three-stimulus priming paradigm similar to that of Schvaneveldt et al. (1976) was used. These researchers presented three successive letter-strings and required subjects to make lexical decisions to each. Each subsequent stimulus was presented when a vocal response was initiated to the former. However, because of these successive decisions, prime duration was (necessarily) left uncontrolled. In the present paradigm, the first two stimuli were presented at controlled durations and did not require an overt response. Rather, the subject was required to pronounce or name only the final word (Jacobson, 1973; Schvaneveldt & Ruddy, 1974; Warren, 1972, 1977) and an attempt was made to manipulate (via instructions) the use the subject made of the priming stimuli.

The basic three-stimulus experimental configuration involved the presentation of, first, a biasing context stimulus (Prime I), second, a homographic stimulus (Prime II), and third, a target word that was either congruent, incongruent, or unrelated to the two-stimulus context. A condition was also included involving three unrelated words, making a total of four experimental conditions. These conditions were compared to two control conditions. The first of these (Control 1) included two strings of Xs as primes. This represented the neutral control condition most similar to that employed by Neely (1977), except that two strings of Xs were presented instead of one. The second control condition (Control 2) included a string of Xs for Prime I. This condition was included to isolate the effects of context. It is similar to Schvaneveldt et al.'s (1976) "terminal" associates condition, except that their first stimulus was an unrelated word rather than a string of Xs.

Schvaneveldt et al. included another control condition in their study ("separated" condition) where only the first and third words were related (e.g., Money-Date-Coin). They included this condition to disentangle the priming effect of the first versus the second word on the final word (the target in the present study). However, in the present study, unlike Schvaneveldt et al., the duration of the homograph was manipulated, and an interaction of conditions (congruent and incongruent) with SOA was predicted; that is, facilitation was predicted for both congruent and incongruent targets at brief SOAs, only for congruent trials at longer SOAs, with facilitation for incongruent targets reduced to zero (relative to a baseline analagous to Tanenhaus et al.) or showing inhibition (relative to a neutral baseline). This interaction will not be made fundamentally more interpretable by the inclusion of a "separated" condition. In light of this, and also the problem of generating sufficient normed homographs for multiple conditions, no such control was included in the present experiment.

The SOA from Prime I to Prime II was always 500 msec in order to ensure that subjects were able to attentionally process the biasing context stimulus itself. The SOA from Prime II to the target was either 100, 200, or 500 msec SOA. At 100 msec SOA, only automatic effects were expected. The 200 msec value, nominally similar to Tanenhaus et al.'s 200 msec ISI, was chosen because no attentional effects have been reported at this brief duration and observing an attentional effect at this SOA would constitute a novel observation. The third SOA of 500 msec represented a value at which attentional effects (i.e., inhibition) would be predicted (Neely, 1977).

The following strategy manipulations were used. The Passive group was instructed to use the primes as neutral warning signals and attend primarily to naming the target. The Active group was instructed that the primes would sometimes be related to the targets and that their strategy should be to attend to these primes in order to improve their performance on the naming task. Posner and Snyder (1975a) have shown that both instructions to subjects about use of the primes and the probability that a prime predicts a target can influence the amount of facilitation and inhibition. The present study relied primarily on strategy instructions, while setting the prime/target associative probability (i.e., the probability that a prime was followed by a related target) at .50. Therefore, on half the trials where a word Prime II was used, it was related to the target. This .50 prime-target probability corresponds to the intermediate 50-50 condition in Posner and Snyder's (1975a) Animal Name experiment. They reported spontaneous inhibition using this probability in combination with neutral strategy instructions. In order to emphasize the legitimacy of the instructions, practice trials involved unrelated words for Passive subjects and primarily related words for Active subjects.

METHOD

Subjects. Twelve male and twelve female volunteer subjects were selected from the subject pool at Wilfrid Laurier University. Subjects were assigned to conditions on the basis of a predetermined block randomized schedule.

Apparatus. The experimental apparatus was situated in a sound attenuated and dimly-lit experimental room. All aspects of trial presentation, including timing of durations, RT measurement, and RT recording were controlled by a CBM PET (Series 2001-N) microcomputer. Stimulus presentation was on a remote TV video monitor (Electrohome EVM-910) situated approximately 50 cm in front of the subject. A micro-relay (Gerbrands G1341) interfaced the voice-operated microphone (Shure 575S) with the microcomputer. During the intertrial interval (ITI), RTs calculated by the microcomputer were recorded on a sound-attenuated Commodore Matrix Printer.

Materials and Lists. The majority of the required 270 homographs were chosen from two recently published homograph norms (Nelson, McEvoy, Walling, & Wheeler, 1980; Wollen, Cox, Coahran, Shea, & Kirby, 1980). Two recent studies using homographs (Holley-Wilcox & Blank, 1980; Tanenhaus et al., 1979) and one older source (Cramer, 1970) supplied the balance.

Extensive counterbalancing procedures were adopted to construct the lists (see Appendix A for procedures). A number of variables were counterbalanced on the critical homograph trials in order to eliminate the problem of a priori meaning dominance (Hogaboam & Perfetti, 1975). All homographs met the normative criteria that (1) the two primary meanings (i.e., total dominance) accounted for 70% of the responses in the norms and (2) the "dominance ratio" between these two meanings was at least .12. The dominance ratio was calculated by dividing the response probability associated with the less dominant meaning by the combined probabilities of the two principle meanings. For example, where the two meanings account for 80% of the total responses and each meaning accounts for 40% of the total responses, the dominance ratio would be 40/80, or .50. The following variables were counterbalanced across trial types: Total dominance, divided into six categories (.70-.74; .75-.79; .80-.84; .85-.89; .90-.94; .95-1.00), dominance ratio, grammatical class of the two meanings (noun-noun;

noun-verb; verb-verb), and direction of dominance in a trial (where either the higher or lower dominant meaning was the biasing Prime I).

All conditions were counterbalanced for frequency in the language (Kucera & Francis, 1967) and mean word length (per cell) for Prime I, Prime II, and most important, the target. No items were repeated in the experiment so as to avoid the problem of subjects' possibly detecting the homography (see earlier comments; Conrad, 1974), and having RT influenced on repeated targets (see Jacoby & Dallas, in press). Targets were also non-homographic, since it has recently been demonstrated that the number of meanings of a target word is more potent than freqency for influencing RT in a lexical decision task (Jastrezembski, 1981). Unrelated words were chosen from Kucera and Francis (1967) and were matched for frequency and mean word length with the corresponding primes (I and II) or targets in the experimental conditions.

After these counterbalancing procedures on List 1, a second list was constructed. List 2 was created by reversing the Experimental and Control 2 items in List 1, and creating a second order for Control 1 items (see Appendix B for List 1 and 2 with normative data).

Design. All trial types, with examples, are diagrammed in Table 1. The examples given are redundant so as to clarify trial types only. Three levels of Prime Condition, each representing 1/3 of the trials, were used: (1) Experimental (E) trials consisted of a word Prime I and word Prime II; (2) Control 1 (C1) consisted of two neutral (XXXXX) primes; (3) Control 2 (C2) consisted of a neutral Prime I and a word Prime II. Target relation was the second major trial variable with four levels. Congruent targets (CT) were related to the contextually biased meaning of a homograph (e.g., oar-row-PADDLE). Incongruent targets (IT) were related to the contextually unbiased meaning of a homograph (e.g., oar-row-COLUMN). Unrelated targets (UT) were of two kinds. The first (UT1) were unrelated to either meaning of a biased homograph (e.g., oar-row-GREEN). The second (UT2) were unrelated to primes that were themselves unrelated (e.g., oar-sky-GREEN). Subjects received an equal number of presentations of E, C2, and C1 trials. It should be noted that target relation was, therefore, only a nominal designation (dummy variable) for all levels of C1, since only a single target word was presented, and for two levels of C2, since no Prime I was presented to distinguish CT from IT (two related words), or UT1 from UT2 (two unrelated words).

Each of the 12 resulting trial types (3 Prime Conditions X 4 Prime-Target Relations) was presented at each of three prime II-to-target SOAs (100, 200, and 500 msec), yielding a total of 36 conditions. Each subject received 15 presentations of each kind of trial for a total of 540 trials, presented in three blocks of 180 trials each (one at each SOA). For each block, prime condition and prime-target relation were randomized within each of five sub-blocks. All possible orders of block presentation (6) were used (one order for each of two subjects, one male and one female, in each strategy group). Blocks and SOA were counterbalanced so that each block was presented an equal number of times at each SOA. Thirty practice trials preceded the first block and 10 practice trials preceded each subsequent block.

Procedure. The task involved the presentation of five individual stimulus events at one spatial location of the video screen. Stimuli were 4 mm high and a maximum of 35 mm long. A trial was initiated with a three sec ITI, using two "bar-markers" at the perimeter of the longest word stimulus, and was followed by a 500 msec central fixation point ("+"). The first word, Prime I, was presented for 50 msec, followed by a 450 msec blank interval, for a total SOA of 500 msec. The 50 msec on-time allowed clear readability of the prime. Prime II was also presented for 50 msec, and was followed by a blank interval of either 50, 150, or 450 msec, for a total SOA of 100, 200, and 500 msec, respectively. Finally, the target word remained present until the subject activated the voice-operated relay, at which point the 3 sec ITI was initiated.

Each subject was run in one 75 min session. Subjects were seated in front of the remote video screen and given instructions for the naming task and the use of the primes according to the strategy group to which they had been assigned. The Passive group was instructed to attend to the targets while treating the primes merely as warning signals. The Active group was told that sometimes the primes would be related to the target and therefore they should pay attention to the primes to improve their performance on the naming task (see Appendix C for the instructions). After a demonstration of the trial sequence, the practice trials were presented. In the practice trials, the Passive group received all unrelated words and the Active group received primarily (75%) related words. After five practice trials, subjects were asked if there were any difficulties with the task. The remaining practice trials and 180 test trials were continued uninterrupted, with one trial every 5.5 sec (approximately) for a total block presentation time of 18 min. The experimenter could interrupt the sequence if the subject required a pause for any reason, however, this occurred for only one subject. Blocks of trials were separated by 3-5 min rest periods.

RESULTS

Errors accounted for 1.87% of the total responses and were generally the result of mispronounciations, prematurely activating the voice-operated relay, or failing to activate it by not speaking loudly enough. All errors were eliminated from the analyses.

Analyses were performed on the cell median RTs and the median "difference" scores using the UT1 baseline (biased homograph followed by an unrelated word) and the C1 baseline (two neutral primes). Medians were used to eliminate the problem of outliers (particularly extremely long latencies) common with the use of means. Only the analysis of median difference scores will be reported below since this analysis was generally clearer and more interpretable in light of the hypotheses of facilitation and inhibition. The results of the median RT analysis (cell means and ANOVA summary table) can be found in Appendix D.

The following procedure was used to generate the difference scores. First, since the target relation variable was a nominal designation for C1 (all levels) and C2 (two of the four levels) and, in fact, these nominal designations were estimates of the same parameters, a single median RT was derived for these conditions. Therefore, all four nominal designations of target relation in C1 (CT, IT, UT1, UT2) were collapsed to produce a single C1 median RT. Likewise, the nominal target relations of CT and IT in Control 2 (two related words) were collapsed to produce a single median RT called Control 2-Related (C2-R), and the nominal designations of UT1 and UT2 (two unrelated words) were collapsed to produce a single median RT called Control 2-Unrelated (C2-U). This procedure resulted in seven median RT values, four for the experimental prime condition (CT, IT, UT1, and UT2), two for the Control 2 prime condition (C2-R and C2-U), and one for the Control 1 prime condition (C1). Two sets of difference scores were produced for the 24 subjects by either subtracting from the UT1 baseline RT the remaining six RTs to produce six UT1 "difference conditions" (CT, IT, UT2, C2-R, C2-U, and C1), or subtracting from the C1 baseline RT the remaining six RTs to produce six C1 difference conditions (CT, IT, UT1, UT2, C2-R, C2-U). A positive difference score thus indicated the amount of facilitation and a negative difference score the amount of inhibition, relative to the baseline employed.

Assumptions for the valid use of the F test in the fixed effects analysis of variance model require that the observations be mutually independent, normally distributed, and have equal variance. Since repeated observations on the same subject can result in correlated measures, an additional assumption is made in the mixed model concerning the symmetry of variance-covariance matrices (Kirk, 1968). All analyses thus included tests of the symmetry assumption (Dixon & Brown, 1979). For the analysis reported in Appendix D, the tail probability of the F statistic for these tests is included. For the difference analysis reported below, no significant deviation from symmetry was found, and therefore all F ratios can be considered unbiased in this regard. The region of rejection for all statistical tests was set at $p < .05$. Analyses of variance were conducted on both the UT1 and C1 difference conditions. The results of the UT1 baseline analysis will be reported first, since an analagous baseline was used by Tanenhaus et al. (1979) and some comparison can be made with their findings.

UT1 Baseline Analysis. Figure 4 shows the six difference conditions as a function of SOA for the combined strategy groups. Recall that, according to the two-stage view of ambiguity resolution, equal facilitation would be expected for CT and IT at brief SOAs, with a decline in facilitation at the longer SOAs for IT trials only. However, in the UT1 baseline analysis, UT1 is not included as an explicit condition for comparison because, of course, all difference scores are relative to it. A strong test of the hypothesis of Tanenhaus et al. (1977) would involve an actual comparison of CT and IT with UT1 in terms of the "absolute" amount of facilitation from this particular baseline. These comparisons can only be made in the C1 analysis (see below). In the present analysis, a somewhat weaker version of the hypothesis can be tested. This would involve testing differences between these conditions at each SOA, or the amount of facilitation within a difference condition across SOA. A priori tests on these comparisons did not produce a pattern of results different than the overall ANOVA with a posteriori comparisons. Therefore only the latter will be reported.

The ANOVA included SOA and all six difference conditions as within-subject factors, and list and strategy as between-subject factors. List (1 and 2) was included as a factor because items were not presented under all conditions (see Appendix A). The analysis indicated no main effects of list or strategy, both *F*s < 1. Strategy did not interact with any other factors, all *p*s $> .10$. List, however, did show a marginal interaction with SOA, $F(2, 40) = 2.77$, *MSe* = 1853.92, $p > .075$, indicating that speed of response as a function of SOA differed somewhat for the two list versions. However, list did not interact with any other factors, all *p*s $> .20$. The main effect of SOA was not significant, $F(2, 40) = .74$, *MSe* = 1859.92, but the main effect of difference condition and the SOA X Difference Condition interaction were both significant, $F(5, 100) = 10.12$, *MSe* = 333.99, and $F(10, 200) = 2.38$, *MSe* = 226.06, respectively.

All simple main effects and multiple comparisons employed the pooled mean square error and pooled degrees of freedom when the comparison included sources of variation with different error estimates. An analysis of the simple main effects of the SOA X Difference Condition interaction indicated that there were significant comparisons among conditions at 100 msec SOA, $F(5, 300) = 8.00$, *MSe* = 262.03, 200 msec SOA, $F(5, 300) = 4.80$, and 500 msec SOA, $F(5, 300) = 4.19$. *A posteriori* tests (Tukey's HSD = 13.41, $q' = 4.06$)

indicated that the following comparisons of difference conditions at each SOA were significant. At 100 msec SOA, C1 differed from C2-U (27.35 msec), C2-R (19.45 msec), UT2 (18.99 msec), and IT (18.25 msec). Also, C2-U differed from CT (16.36 msec). At 200 msec SOA, C1 differed from both C2-R (14.63 msec) and C2-U (16.71 msec). Also, CT differed from C2-U (14.10 msec), and IT differed from C2-U (13.6 msec). At 500 msec SOA, CT differed from C2-R (16.7 msec), C2-U (16.43 msec), and most important, from IT (16.20 msec). Simple main effects analysis on levels of SOA for each difference condition resulted in a significant SOA effect only for IT, $F(2, 240) = 3.18$, $MSe = 497.37$. Comparisons on IT (Tukey's HSD = 12.83, $q' = 2.83$) indicated a significant increase in facilitation from 100 to 200 msec SOA (13.75), and a significant decrease in facilitation from 200 to 500 msec SOA (14.35 msec).

These data offer support for the hypothesis that biasing context word (Prime I) does not reduce RT facilitation to incongruent targets (IT) at brief SOAs, but produces a marked reduction in facilitation at longer SOAs; that is, both CT and IT show equal facilitation at brief SOAs, and a marked divergence at the longer SOA. The hypothesis that these effects take place within the temporal parameters for automatic and attentional effects reported by Neely (1977), rather than Tanenhaus et al. (1979), was also supported. No inhibition was found for IT at 500 msec SOA relative to the UT1 baseline, a finding congruent with that reported by Tanenhaus et al., but as noted previously, this is not surprising if UT1 is a condition for which one would expect inhibition relative to a more neutral baseline. This is supported by the direction of the difference between UT1 and C1, although the effect was not significant.

A most surprising finding was the "inhibition" of the word prime trials (experimental and Control 2) relative to the C1 condition. There seems to be some kind of "load" or interference effect operating when words are used as primes, although the presence of two related primes, versus one, appears to antagonize the interference. Actually, the effect has been reported elsewhere in the literature using a naming task (Rossmeissl, Note 4; see Discussion), although not with the lexical decision task (see Figure 2). The C1 analysis will provide further data on this general inhibition, and the effect will be examined in the Discussion.

Another comparison of some interest involves C2-R and C2-U (difference in RT due to a single related, versus unrelated, prime). The non-significant difference at 100 msec SOA for these conditions is in the expected direction, but by 200 msec SOA this difference disappears. This may be due to the fact that priming effects using the naming task are typically small and appear to both rise and dissipate very rapidly. For instance, Warren (1977), using a naming task with single word primes and moderately associated targets, found no facilitation effects (relative to a control like C2-U) at 75 and 112.5 msec SOA (5 and 7 msec, respectively), significant facilitation at 150 msec SOA (14 msec), and no facilitation at 225 msec SOA (9 msec). Clearly, the single word priming effects are small and transient using the naming task, and it may be that in the C2-R condition activation was just beginning at 100 msec SOA, but had dissipated by 200 msec SOA, resulting in no observed facilitation.

The final trend to note in Figure 4 is the convergence of C1 and UT2 at 500 msec SOA. It is curious that UT2 is not inhibited relative to the C1 baseline; indeed, it shows a tendency to be facilitated relative to UT1. This is unexpected given the consistent finding (e.g., Neely, 1977) that unrelated words are inhibited relative to a neutral baseline at longer SOAs. An explanation of this effect will be offered in the Discussion.

C1 Baseline Analysis. Recall that the reason for employing the C1 baseline was to allow inferences about attentional processing. A prime had to be employed that did not provide information to the subject about where to "direct" attentional processing. In this way, the results were to be comparable to earlier literature dealing more specifically with automatic and attentional effects (Neely, 1977; Posner & Snyder, 1975a). The baseline employed by

Tanenhaus et al. (1979) did not allow these researchers to make inferences about attention because their baseline would itself be inhibited relative to a semantically neutral baseline using Xs.

Figure 5 plots the C1 baseline difference scores as a function of SOA for the combined strategy groups. Since _a priori_ hypotheses were advanced regarding the relationship of CT, IT, and UT1 as a function of SOA, non-orthogonal multiple comparisons using Dunn's procedure (see Kirk, 1968) were made on difference conditions at each SOA (d = 11.65, MSe = 276.08), and SOA at each difference condition (d = 13.81, MSe = 378.89). At 100 msec SOA, there were no differences between CT, IT and UT1, indicating that CT and IT have not been strongly primed by 100 msec SOA. At 200 msec SOA, both CT and IT showed significant facilitation relative to UT1 (16.96 and 16.46 msec, respectively), but did not themselves differ. At 500 msec SOA, CT was significantly facilitated relative to IT (16.20 msec) and UT1 (18.32 msec), and UT1 and IT did not themselves differ (2.12 msec). The comparisons across SOA for each difference condition showed that CT was significantly facilitated from 100 to 500 msec SOA (19.16 msec), that IT was facilitated only from 100 to 200 msec SOA (15.15 msec), but not from 200 msec to 500 msec SOA (-5.06 msec), and that no facilitation resulted for UT1. These results complement those of the UT1 analysis and offer support for the hypotheses tested in the experiment. The only real difference is in the significant main effect of SOA, an effect which results from making difference conditions relative to C1, a condition which shows short latencies, particularly at brief SOAs.

An ANOVA including all difference conditions was identical in design to the UT1 analysis of all difference conditions. The results showed no main effects of list or strategy, both Fs < 1. The main effects of SOA and difference condition were both significant, $F(2, 40) = 7.77$, $MSe = 1034$, and $F(5, 100) = 7.53$, $MSe = 323.76$, respectively. These latter two variables did not interact ($F < 1$), but the higher order interaction of Strategy X Lists X SOA was significant, $F(2, 40) = 4.88$, $MSe = 1034$. Plotting of this interaction (Figure 6) indicates that the Active group does not show an effect of SOA for List 1, but does for List 2, while the reverse situation occurs for the Passive group. The interaction seems be limited to 500 msec SOA. It would appear, then, that the general inhibition of word prime trials relative to the C1 baseline obtains for both lists and strategy at 100 and 200 msec SOA (i.e., it is only at 500 msec SOA that the interaction is evident). The fact that the list effect is particularly strong in this analysis (i.e., C1 baseline) suggests that the C1 difference condition was a major contributor to the effect; that is, when all difference conditions are made relative to it, the interaction is apparent. The fact that list interacted with strategy, particularly at 500 msec SOA, but did not interact with difference condition in any other analyses, suggests that, whatever the confounding effect of list, it may be linked to the strategic use of the neutral prime condition. Because of the confounding list effect, the interaction of SOA X Difference Conditions was not analyzed further.

However, this raised some question concerning the *a priori* tests; namely, were they biased by the list effect? An analysis of variance was conducted including list and strategy, with SOA and only the three relevant difference conditions (CT, IT, UT1) on which the *a priori* comparisons were conducted. The results indicated no main effect of list or strategy, both Fs < 1, and neither of these factors was involved in any interactions, all ps $> .20$. This suggests that the critical comparisons were not unduly influenced by the list variable.

A final issue concerns the strategy manipulation. The failure to produce significant differences may indicate that the instructions failed to elicit the requisite strategies. The majority of subjects reported attempting to follow the instructions, but the Passive subjects also said it was difficult to avoid anticipating related words when they realized they were present in the trials. It is nonetheless instructive to consider the more obvious similarities and differences between the groups. Figure 7 allows inspection of difference scores for all conditions, plotted for the separate groups for each baseline analysis. The overall trends indicate that the Passive group shows reduced facilitation and inhibition, particularly at 200 msec SOA.

DISCUSSION

The experiment was designed to answer a number of questions related to the stages view of ambiguity resolution. First, are there two stages and, if so, what are the temporal parameters of the resolution process? Second, what is the pattern of facilitation and inhibition relative to a semantically neutral baseline using Xs? And third, how do attentional strategies influence the time course of resolution and/or the degree of inhibition of incongruent targets? Each of these issues will be considered in turn.

Some evidence was found to support the two-stage view of ambiguity resolution in that CT and IT conditions were both equally facilitated at brief SOAs and showed marked statistical divergence at the longer SOA. This effect appears to occur well within the temporal parameters for automatic and controlled processing found by Neely (1977). For instance, he found that facilitation to targets that were related to the prime, but unexpected, declined to zero by 400 msec SOA (Figure 2). The present results, therefore, give no reason to suppose that the incongruent meaning of a homograph is different than a related word that is simply unexpected, at least in terms of when the reduction in facilitation occurs. They also support the earlier suggestion that Tanenhaus et al.'s 200 msec ISI may have involved longer functional processing time than the nominally similar 200 msec SOA used here. Indeed, the CT and IT functions at 200 and 500 msec SOA in Figure 4 are similar in form to the congruent and incongruent functions at 0 and 200 msec ISI in the Tanenhaus et al. results (see Figure 3). The fact that IT shows no inhibition relative to the UT1 baseline is, as suggested earlier, not unexpected if UT1 is itself inhibited relative to a neutral baseline (C1).

Related to the interpretation of the automatic activation hypothesis is the interesting, albeit inconclusive, trend for C2-R trials (e.g., XXXXX-row-PADDLE) to show less facilitation than CT (e.g., oar-row-PADDLE) at all SOAs and, in particular, IT (e.g., column-row-PADDLE) at 200 msec SOA. One might have expected that C2-R and IT would show equal facilitation at brief SOAs if all meanings of the homograph are activated <u>independently</u> of context. The difference between CT and C2-R might be explained in terms of a carry-over priming effect of the three related words in CT (see Schvaneveldt et al., 1976, "separated" condition). One might also argue that the same kind of carry-over priming is operating in the case of IT: The target receives additional activation from Prime I because of the common semantic relationship to Prime II, the homograph. Marcel (1980; see below) reported findings apparently at variance with this interpretation, although his data are inconclusive, as are the present results. This particular comparison needs to be examined more closely in future research. The lack of facilitation for C2-R at longer SOAs has already been mentioned, with a possible explanation (see UT1 baseline analysis). Another explanation for the lack of strategic priming effects at the longer SOA suggests that subjects were not actively attending to Prime II words in C2-R. This may have been due to Prime II's lack of predictive utility. For instance, when Prime I was a string of Xs (Control 2), the probability of Prime II being a word was only .50 (since it could also be followed on half the trials by another X prime, i.e., C1). In addition, when Prime II was a word, it was related to the target only half the time, making the probability of a related target, conditional upon an X Prime I, only .25. On the other hand, when Prime I was a word (experimental trials), it was always followed by a word Prime II. This word Prime II was, in turn, related to the target on half the trials, for a probability of a related word, conditional on a word prime, of .50. The low predictive utility of Prime II in C2 trials may have discouraged use of it as a cue.

Another purpose of the present study was to examine facilitation and inhibition relative to the semantically neutral (XXXXX) baseline. This was to make the design more comparable to Neely's (1977) and to facilitate inferences about the role of attention with regard to the incongruent targets. To repeat, a general pattern of results similar to Tanenhaus et al. (1979) was found when the UT1 baseline was used, although the time course of ambiguity resolution did not parallel that described by those authors. However, using a neutral baseline, the picture was rather more complicated than expected on the basis of previous studies using the lexical decision task (e.g., Neely, 1977). Not only were the priming effects very small, but the relationship of word prime trials to the neutral baseline was generally one of inhibition, particularly at brief SOAs. Both of these findings are in contrast to results using the lexical decision task (Fischler & Goodman, 1978; Neely, 1977) where prime-target relatedness produced substantial facilitation and inhibition effects that were roughly symmetrical around the X baseline condition.

Although the small priming effects and the inhibition effect may be regarded as independent issues, they can both be discussed relative to possible peculiarities of the naming task itself. The following discussion considers some of these possibilities.

Fischler and Bloom (1979) argue, on the basis of a recent review by Coltheart (1979), that the amount of semantic processing required for a lexical decision task may exceed that for a naming task because in a naming task it is the grapheme-phoneme analysis that is critical for performing the task and this results in a reduction of the "input level" of semantic information. Consistent with this, Allport (1980) outlines a model of word recognition in reading based on the existence of two distinct access routes to word recognition: phonological encoding (grapheme-to-phoneme conversion) and lexical morphology (i.e., related to word structure and comparable to 'syntax' for a grammar). Without reviewing in detail the evidence for this model, the basic idea Allport draws from the findings is that these two kinds of encoding constitute "access routes" that are capable of being totally dissociated, as in the acquired brain syndromes known as phonemic and surface dyslexia (Marshall & Newcombe, 1973). The phonemic dyslexic shows evidence of impairment of the grapheme-phoneme conversion process, while at the same time showing evidence of normal semantic encoding processes. This results in an inability to read pronounceable non-words, and the production of reading errors that are semantically related to the target word (see Marcel & Patterson, 1978). On the other hand, the surface dyslexic shows the reverse deficit. He or she shows impairment of semantic processing, relying on the grapheme-phoneme conversion analysis to pronounce words. Therefore, errors made by surface dyslexics typically take the form of mispronouncing words with irregular pronounciations (e.g., suite = "suit" and pint = pĭnt). Indeed, Coltheart (Note 3) has noted that this form of dyslexia can be diagnosed almost solely by the mispronounciation of the word "pint."

How do these considerations apply to reading in normal subjects, and more particularly, how do they relate to the small priming effects in the present experiment? One implication of grapheme-to-phoneme conversion and lexical morphology being distinct sub-systems is that, under certain experimental conditions with normal subjects, one might expect that each source of information could produce distinct effects if the other source were not available to the subject. Allport (1977) attempted to experimentally produce such a situation (see also Marcel & Patterson, 1978). He reported that subjects were able to use semantic attributes to select a category exemplar from a severely masked multi-word array, and that the grapheme-phoneme conversion errors and semantic errors were similar to the pattern found in phonemic dyslexia; that is, just such an dissociation was taken to be occurring for normal subjects (however, see Ellis & Marshall, 1978, for a criticism of the latter finding).

A second implication of these two access routes being distinct sub-systems is that subjects might be able to differentially use these processing systems according to task demands. For instance, Shulman and Davison's (1977) data suggest that subjects can spontaneously reduce the "input level" of semantic information for a particular task if the task does not require it. They reported that the semantic priming effect in a lexical decision task is significantly reduced for related word trials when the baseline is a meaningless consonant string rather than pronounceable non-words. They interpreted this to mean that subjects could pre-empt at least some of the semantic processing when the task could be efficiently performed by distinguishing words from non-words on the basis of orthographic and phonemic properties. (Caution is necessary in interpreting this result since latencies in the pronounceable non-word condition were longer than in the condition using meaningless consonant strings. This would provide more time for activation to exert an effect in the former condition; see Rossmeissl, Note 4.) James (1975) reported a similar finding.

The same kind of argument can be used to suggest that the processing "requirements" of pronounciation tasks may differ from those of the lexical decision task (where the response in the former case is articulatory and in the latter is typically manual). Allport (1977) argues that the phonological representation required for an articulatory or naming response to a word can be accomplished with less semantic analysis than a lexical decision task (see Navon & Shimron, 1981). In turn, lexical decision or classification tasks need not rely on phonological encoding, but can be performed through "whole word analysis" by direct access to the semantic lexicon. Therefore, one might argue that the semantic priming information would be less "influential" in the naming task than it would be in a lexical decision task. Rossmeissl (Note 4), for instance, found that semantic priming effects from flanker words were considerable when subjects were required to semantically classify a target word, but were small when subjects were required to name the same stimuli. (It can also be argued that longer RTs in a classification task allow more time for semantic priming to exert an effect. However, as will be clearer from the ensuing discussion of the interference effect at brief SOAs in the present study, other relevant differences may exist between naming and semantic classification tasks which make such an argument less general.)

If subjects are relying heavily on phonological encoding in the naming task, then it would be expected that their errors would be primarily phonologically-based, and words with irregular pronounciations would be particularly susceptible to mispronounciation. In the present study, pronounciation errors accounted for approximately 45% of all errors. A response was categorized as a pronounciation error if subjects (1) emitted a sound which was not a word (e.g., a hesitation involving saying "aah" or some syllable of a word), (2) substituted or deleted a letter of the target word to form another word (e.g., keel = "kneel" or shore = "sore"), or (3) mispronounced a phonologically irregular word to form either a word (e.g., suite = "suit" or comma = "coma") or a non-word (e.g., pint = "pǐnt" or aunt = "aw-nt"). Each of these types of errors accounted for approximately 18%, 49%, and 33% of the total pronounciation errors, respectively. Therefore, where errors in pronounciation occurred, they primarily involved either a grapheme-phoneme conversion error (letter substitution) or a phonologically correct but "semantically incorrect" pronounciation. In fact, half of the subjects in the present experiment mispronounced pint as "pǐnt." These results indicate the apparently heavy reliance of subjects on phonological information for pronouncing the words.

In short, there is some reason to believe that the processing requirements of a naming task substantially influence the amount of priming, not only in that naming latencies are typically shorter than for the lexical decision task, but also in the kind of information required to perform the task (the two are undoubtedly correlated). It is interesting in this regard that, if the naming task can be performed efficiently without extensive use of semantic information, it may be that instructing the Active subjects to attend to the semantic information in the primes was counterproductive: The advantage of anticipating related targets may have been neutralized by the disadvantage of trying to attend to meaning. This may be one factor in accounting for the lack of an effect of the strategy manipulation. Other possible reasons for the lack of an effect are discussed below.

The other issue related to the C1 baseline results is the tendency for word prime trials to be inhibited relative to C1. Recognizing that part of this effect may be a list artifact (despite C1 being counterbalanced with experimental and control 2 trials in terms of target word length and frequency), one simple explanation of this effect is that the rapid visual presentation of Prime II, followed by the target at the same location on the screen, resulted in visual confusion between a word Prime II and the target word, but not an X Prime II and the target word. That is, the target was possibly more discriminable from the string of Xs than from a word, resulting in a RT advantage for C1. Given the presentation procedure, it would be surprising if such an effect was not involved to some extent. However, semantic relatedness of primes to the target clearly antagonizes this effect, since CT shows less interference than either UT2 or UT1. Furthermore, the interference has been observed in other paradigms not employing single-location, sequential presentation. For example, Rossmeissl (Note 4) found that latencies to name a target word were inhibited when the target was simultaneously laterally flanked by words compared to Xs, with less inhibition for related words than unrelated words. He did not find comparable inhibition using the X flankers when the task involved semantic categorization of the same stimuli. Also, using a perceptual identification task, Allport (1977) required subjects to report the identity of single severely-masked words. He also presented masked parafoveal "flanker" words that were associated bidirectionally or unidirectionally, or were unrelated. Percent correct report for the control condition using no flanker words was as good as the condition using bidirectional flankers, with unrelated flankers causing the greatest disruption in performance. These results suggest that other dimensions, possibly featural or semantic incongruity, or the response requirements of the naming task, are also partially responsible for the effect.

In short, part of the explanation for the interference at 100 and 200 msec SOA may be formulated in terms of a Stroop-like interference from Prime II when it was a word, as opposed to Xs, and when it was presented in close temporal proximity to the target. There are two aspects to this possibility. The first involves identifying the naming response as being particularly vulnerable to Stroop interference when a word is the competing stimulus. (This can account for the lack of a comparable interference in the lexical decision task, Neely, 1977.) The second aspect involves identifying a temporal limit on the interference produced by the competing stimulus, because it seems to be primarily at very brief SOAs, or with simultaneous presentation, that the effect is strongest. Both of these aspects of the interference are well documented for the Stroop effect, and are now discussed.

Stroop interference is the inhibition of response latency to a target when it is accompanied (usually simultaneously) by a conflicting source of information (Dyer, 1973; Jensen & Rohwer, 1966; Stroop, 1935). For instance, a subject might be required to rapidly name the colour of colour patches. Latency to name the colour is longer when the colour is shaped into the form of a conflicting colour word than when the colour forms a neutral shape or a word unrelated to colours. Or, the task might be to read a colour word. If the colour of the ink in which the word is printed is incongruent with the name of the target word, interference to name the word is created. However, the effects in these two tasks are not symmetrical. The interference is greater from words when naming colours, than from colours when reading words, and may even be reduced to zero in the latter case (Dyer, 1973; Stroop, 1935).

One account of this asymmetric interference suggests that since the "look-up" rate for word names is more rapid than for colour names, the word name becomes available before the name of the ink colour, creating output interference with the attempt to name the colour (Keele, 1973; Cohen & Martin, 1975; Morton & Chambers, 1973). The interference is reduced when the target is a colour word and the conflicting stimulus is a colour because, hypothetically, the colour word becomes available for output before the name of the conflicting colour. The output interference interpretation is not the only one that can be used to explain interference in Stroop-like situations. Other researchers have argued that the locus of interference is at perceptual processing of structural features (Regan, 1981; Stirling & Coltheart, 1977) or conceptual (semantic) processing (Seymour, 1977). It may be that interference can be produced at a number of "levels" and be either "central," "peripheral," or some combination of these depending on the task and materials used.

One important aspect of the interference created by words is that it interacts with the kind of task: The effect is most potent in (but not limited to) situations where a reading response is required. If a physical match (i.e., non-articulatory response) is required between either colours or colour words, incongruent colours interfere <u>more</u> when attempting to match words, than incongruent colour words interfere when attempting to match colours (Dyer, 1973; Treisman & Fearnley, 1969). The same kind of reversal of Stroop interference occurs when scanning is required to locate the position of a target (Uleman & Reeves, 1971).

The importance of reading *per se* to the critical interference effect from words has also been demonstrated by the lack of interference from words when they are presented auditorily (Thackray & Jones, 1971).

The second issue relates to the temporal aspects of Stroop interference. Using a task requiring the matching of colour words with colour patches, Flowers (1975) demonstrated that the interference from the colour words could be attenuated if the delay between the target word and colour patch was increased beyond 100 msec. Gumenik and Glass (1970) found that if the reading response was delayed by perceptually degrading the conflicting words, the interference from words could be substantially reduced. Indeed, they found that the tendency for colour naming to be more inhibited by conflicting words, than word naming by conflicting colours, was reversed when the reading response was delayed. That is, degraded words interfered *less* with colour naming than did the colours with reading the degraded words. Dyer and Severance (1972) have shown that this effect was not simply due to differences in legibility, but rather was due to differences in the relative temporal parameters of the naming of the ink colours and the naming of the word. In another study, Dyer (1971) pre-exposed words in black ink for various intervals before colouration of the words. The rationale was to advance word processing relative to colour processing to find the point of maximum interference, and the point at which the interference was attenuated. Latencies to name the target colour were maximized with pre-exposures of 40 to 60 msec, declining dramatically after this point.

In light of these remarks on Stroop interference, a possible account of the interference in the present naming task is that subjects are showing a Stroop-like interference in word-prime conditions (Experimental and Control 2) from Prime II when it is presented at brief durations before onset of the target. Comparable interference does not exist with an X Prime II because it has no morphological structure and therefore does not "compete" with the subject's naming of the target. The interference may reflect the differences between Xs and words on either the structural, phonemic, or or semantic level. All these sources have been implicated in the Stroop effect, as noted above. Furthermore, Stroop findings concerning the importance of the response mode (naming) for interference to be produced from words may explain why these effects are not present with the lexical decision task (or other classification tasks, see Myers & Lorch, 1980). The finding that primes which are related in meaning to the target diminish the interference can be readily accounted for by a compensatory effect of semantic priming.

Application of this rationale to the present results must be tempered by considering the differences between the present task and the Stroop task involving the naming of colours. In the present study, subjects are not naming colours, but naming words. Therefore, both the interfering stimulus and the target are words, rather than the interfering stimulus being a word and the target a colour patch. As a result, the speed of processing for both the interfering stimulus and the target should be more alike than in the Stroop situation, where word processing is hypothesized to be more rapid than colour processing. Nevertheless, if one assumes that Stroop colour naming interference is produced when response information from the two information sources creates output interference (see Dyer, 1973), then, in principle, whether the target response involves a colour name or a word will be less critical than the "availability" conflict.

The use of the neutral prime 'X' baseline with the naming task has raised a number of interesting issues. The small priming effects and the inhibition for word trials might be partially explained in terms of the processing requirements and interference effects using the naming task. These requirements, both in terms of task encoding and response mode, can account for some of the differences between results using the naming task and those obtained by Neely (1977) using the lexical decision task. If Xs are inappropriate because they are not equated with words in terms of their susceptibility to a Stroop-like interference, regular (i.e., pronounceable) non-words might be a better "neutral" control, at least in terms of controlling certain structural and phonemic properties of words.

One final issue needs to be discussed: the expectancy manipulation. The purpose of this manipulation was twofold: First, to see whether explicit strategies to use contextual information could alter the characteristics of ambiguity resolution itself (e.g., the time-course); second, to create an explicit expectancy for related targets, and then to observe whether incongruent targets were correspondingly inhibited.

Two observations are relevant. First, ambiguity resolution appeared to take place for both groups (see Figure 7). Assuming subjects were following instructions, this provides evidence that ambiguity resolution occurs without any conscious attempt to "use" the priming information. Second, despite the similarity of the groups regarding eventual resolution, trends in the data suggested differences in the predicted directions, particularly at 200 msec SOA. This suggests that either a conscious strategy to use priming information has only a small effect (see Fischler & Bloom, 1979, Experiment 5), or the strategy manipulation was relatively ineffective in eliciting the requisite strategies. Although the former might be true, the following considerations suggest that the strategy manipulation was not as effective as it might have been.

First, as noted above, the potential conflict between instructing subjects to use semantic information in the naming task when they may perform as efficiently without attending to it, may have reduced attention to the primes for the Active subjects. Second, and possibly more important, the prime-target associative probability itself may have been too low to support conscious expectancies. It will be recalled that for conditions involving word primes (experimental: two word primes; control 2: one neutral prime, one word prime), the probability of a target related to Prime II was .50, and it was argued that since Posner and Synder (1975a) found inhibition using this probability, it could be considered a sufficiently high value. However, there are some relevant differences in the present study. First, Posner and Synder's (1975) targets were selected from one semantic category (animals), whereas targets in the present experiment were not selected from such a limited pool. The single target category would have supported more specific expectancies. Also, their primes and targets were physically identical on a proportion of the trials. Second, in the experimental trials at 500 msec SOA (i.e., when subjects could be expected to be attentionally processing the primes), the primes would appear to be unrelated to the targets in the IT trials if ambiguity resolution had taken place. Therefore, the effective probability of any prime-target relationship was reduced to .25 for

Experimental trials. Finally, there is an additional consideration in the Experimental trials, namely, the probability of a certain kind of target conditional upon the relationship of the primes. Primes were related on 75% and unrelated on 25% of the Experimental trials. Therefore, the probability of a related target conditional upon related primes was .33 (CT versus IT and UT1 trials), whereas the probability of an unrelated target conditional upon unrelated primes was 1.00 (UT2 trials). This would have the undesirable effect of making unrelated targets more predictable than related targets.

The perfect conditional probability of UT2 trials may explain the increasing facilitation (albeit non-significant) of these trials as SOA increased (see Figure 4). This may represent an attentional effect based solely on the high conditional probability of unrelated words. It is different than Neely's (1977) expected, unrelated trials in that his subjects were explicitly aware of the semantic category of the unrelated targets. In the present study, the only consistency was the non-relatedness of the target to the preceding primes, and subjects certainly did not report being aware of this regularity, even though it appeared to influence RTs.

In sum, the reduced prime-target associative probabilities may have attenuated the attentional commitments of Active subjects to the primes - an undesirable consequence considering the relative ease of the naming task (i.e., short latencies) and its possibly low semantic information requirements.

Before discussing some general theoretical issues, the relevant aspects of the present study will be compared with the findings of a recently published study by Marcel (1980). Generally, his findings are consistent with those reported here concerning the effect of context on ambiguous word processing. Marcel's study was designed to demonstrate that multiple meanings of "polysemous" or ambiguous words are automatically processed at brief prime durations (even when the subject is unable to report the identity of the masked context word), and that at longer unmasked durations - when the subject can focus attention on the context word - only the contextually relevant meaning continues to be processed.

Marcel's task involved the presentation of three successive letter strings (see Schvaneveldt et al., 1976), and required subjects to make a lexical decision to only the first (LS1) and third (LS3) letter strings, while varying the conditions under which the second letter string (LS2) was presented. On the critical trials, LS2 was an ambiguous word and LS3 was a word related to one of its meanings. On these trials, the first word was either "congruent" with LS2 and LS3 (e.g., HAND-palm-WRIST), "incongruent" (e.g., TREE-palm-WRIST), or unrelated (e.g., CLOCK-palm-WRIST, called the "unbiased" condition). The congruent and incongruent trials are the same as CT and IT in the present study. The unbiased trials were similar to C2-R, except that his unbiased trials involved an unrelated first word, whereas C2-R used a string of Xs as the first stimulus. Marcel used three other conditions, two of which were identical to conditions used in the present research. The "initial" condition was similar to UT1, where the first two words were related and the third was unrelated (e.g., SPEED-race-WRIST). The "unassociated" condition was similar to UT2 in that none of the words were related (e.g., CLOCK-race-WRIST). Finally, in the "separated" condition, the first and third words were associates, but unrelated to the second word (e.g., HAND-race-WRIST). This final condition was a control used by Schvaneveldt et al. (1976) and was discussed in the Introduction.

Marcel used three masking conditions for LS2: No masking, pattern masking, and energy masking. The energy masking condition is not strictly relevant to present concerns, so will not be discussed here. Each masking condition was used with both a 600 msec and a 1500 msec ISI from LS2 to LS3. In the no masking condition, LS2 was displayed for 500 msec. When this duration was combined with ISIs of 600 and 1500 msec, it produced a total SOA of 1100 msec and 2000 msec, respectively. In the pattern masking condition, LS2 was displayed for 10 msec, followed after an interval (determined for each subject individually so that subjects could not reliably report the occurrence of LS2, let alone its identity) by a 250 msec pattern mask composed of random letter fragments. The ISIs of 600 and 1500 msec were taken as the interval between letter strings, so the SOAs for this condition were 610 and 1510 msec for each ISI, respectively. The pattern masking condition was designed to allow only automatic processing of the ambiguous word. The no masking condition was to allow attentional processing of the ambiguous word. Therefore, although the task and procedure were different from the present methodology, Marcel was actually testing the same "stage" hypothesis of lexical ambiguity resolution. A critical prediction, therefore, was that facilitation would accrue to both congruent and incongruent targets in the pattern masking condition, but only to congruent targets in the no masking condition.

In the pattern masking condition, Marcel found that both congruent and incongruent conditions were significantly facilitated relative to initial and unassociated conditions (i.e., unrelated targets). This finding is comparable to that of the present research where CT and IT were facilitated relative to the UT1 baseline.

The pattern masking condition also provided further evidence related to selective and multiple access theories of ambiguity resolution. The selective theory predicts that facilitation to targets related to an unbiased ambiguous word (i.e., unbiased condition) would only occur on a proportion of trials since the appropriate homograph meaning would not be accessed on every trial. Therefore, evidence of facilitation would presumably favour a multiple access view. Marcel compared performance on separated trials at 1500 msec ISI with performance on unbiased trials at 600 msec ISI. (Comparing across ISI roughly equated these conditions for total LS2 processing time.) He found greater facilitation for the unbiased trials, a result predicted by the multiple access theory.

A final point related to the separated condition is that this control allowed Marcel to address the issue of the independent priming contribution of the initial word prime compared to the homograph. Although unbiased and incongruent conditions produced facilitation, they did not differ in the amount of facilitation and congruent trials consistently showed greater facilitation than both. One interpretation is that additional priming accrues to the target from the first associated word.

Turning to the no masking condition, the first significant result was that the congruent trials showed significantly greater facilitation than incongruent trials, and incongruent trials were actually inhibited relative to the initial and unassociated trials at 1500 msec ISI. This result confirms the finding of the present study that facilitation is maintained for CT trials at 500 msec, but drops to zero for IT trials (using the UT1 baseline). It also indicates that incongruent trials can show inhibition relative to a control involving a target unrelated to the primes (i.e., UT1 and UT2). (Recall that in the present results, IT and UT1 were equally - but non-significantly - inhibited relative to the C1 baseline.)

The second significant result of the no masking condition involved the separated and unbiased conditions. Whereas the unbiased condition was significantly facilitated relative to the separated condition with pattern masking, the unbiased condition showed (non-significant) inhibition relative to the separated condition in the no masking condition. This suggests that if the subject is aware of the ambiguous word, selective access can occur for isolated ambiguous words. This is supported by Simpson's (1981) research demonstrating that access to the meanings of an ambiguous word depends on their _a priori_ likelihood. However, it does not support Simpson's assumption that _only_ this kind of selective access occurs, since Simpson did not vary the amount of processing of the ambiguous word and in failing to do so apparently missed the critical early activation of all meanings.

In sum, Marcel's findings confirm those of the present study on ambiguity resolution. His data differ from the present results by suggesting that, even with isolated ambiguous words, all meanings appear to be initially accessed automatically (see also Holley-Wilcox & Blank, 1980), and second, that the contextually incongruent meanings of ambiguous words can be inhibited even more than targets unrelated in meaning to the primes. One interesting difference between Marcel's study and the present one is the conditions under which "automatic" processing was produced. Marcel used pattern-masking to limit the possibility of conscious report of the context information. This allowed him to use very long ISIs between the context and the target (600 and 1500 msec) without consciousness being a factor. In the present study, the amount of time for processing of the prime was manipulated, so that automatic effects were produced when a target response was required before consciousness became a factor. The fact that the results were similar suggests that it is not necessary to actually limit the amount of perceptual information the subject potentially has about the ambiguous word. It is only necessary to pre-empt processing before this information becomes a factor.

SOME THEORETICAL CONSIDERATIONS

The present study was formulated in light of work in the area of attention, particularly the two-factor theory (Posner & Snyder, 1975a, 1975b; Shiffrin & Schneider, 1977). Since the application of two-factor theory to lexical ambiguity resolution is relatively recent, there is little published on the theoretical implications of this work. As noted in the Introduction, Tanenhaus et al. (1979) argued that selection of the contextually-appropriate meaning of an ambiguous word might be characterized in terms of a rapid, non-conscious, attentional response, as opposed to the slower, more consciously controlled, attentional response (what Shiffrin & Schneider, 1977, call "veiled" and "accessible" controlled responses, respectively). Although the present data did not support two of their reasons for this suggestion (the early resolution time, and the lack of inhibition for incongruent targets), there is still merit in their suggestion simply because its plausibility may not be contingent on these two empirical outcomes. Despite resolution not occurring as early as 200 msec SOA, it is still necessary to account for the apparent automaticity of the process; that is, subjects do not appear to make a "conscious" decision about the ambiguous word's meaning. Also, it has been argued that inhibition occurs even with rapid attentional responses (see Shallice, 1978).

One account of rapid and effortless attentional responses is suggested by considering Shiffrin and Schneider's (1977) notion of an "automatic attention response" (AAR), considered in light of the late selection theory of attention.

Both early selection theories (Broadbent, 1971; Treisman, 1964a, 1964b; Neisser, 1967) and late selection theories (Allport, 1977; Deutsch & Deutsch, 1963; Duncan, 1980; Hoffman, 1978; Keele, 1973; Posner, 1978; Shiffrin & Schneider, 1977) postulate two systems of perceptual processing. The first system is a pre-attentive parallel processing system and the second is a limited capacity attentional system. The critical difference between early and late selection theories is the kind of perceptual processing that is imputed to each of these systems (Duncan, 1980). Early selection theory suggests that simple stimulus characteristics such as voice (hearing) and colour (vision) are extracted by the first system, and that the form and meaning of the stimulus are extracted by the second system. By contrast, late selection theory postulates that all these kinds of processing are carried out in parallel by the first system. The second system is left to select the products of pre-attentive processing for, say, consolidation in short-term memory (Shiffrin, 1975), or integration into a clear perceptual event (Allport, 1977) - in short, for conscious awareness and conscious processing.

For present purposes, the important aspect of late selection theory is that only certain products of the first system come to be processed attentively. Hence, the effects of limited capacity processing (decrements associated with competition for limited resources) are restricted to these selected products. The parameters of the selection process are not as yet well defined, particularly for complex tasks

(Duncan, 1980), but in certain kinds of visual search tasks where the relationship between the search set and distractors is consistent across trials ("consistent mapping" (CM) tasks, see Shiffrin & Schneider, 1977), it is the target search set which appears to be the only information that is selected for entry into the limited-capacity system. For instance, Duncan (1980), Hoffman (1978), Shiffrin and Schneider (1977), and Taylor (1978) have shown that subjects can detect a single digit target among letter non-targets (or vice versa) without being influenced by the size of the array. It is only when detection of multiple simultaneous targets is required that performance suffers, and this is presumably because the simultaneous targets are competing for limited capacity processing. There are numerous examples that can be given (e.g., Stroop, 1935, Experiment 2), but Shiffrin and Schneider (1977, Experiment 4) demonstrated the point nicely when they showed that subjects could not selectively eliminate the interference caused by two simultaneous targets even when required to ignore one target. To recapitulate their demonstration, subjects were trained in a CM character-search task where a trial consisted of 20 presentations of four 2x2 stimulus arrays or "frames" at either 30, 60, or 200 msec per frame. Each frame contained two characters, and two masking stimuli to complete the array. The dependent measure was RT to indicate the presence of a target in a frame. After the training trials, subjects were required to search only one "valid" diagonal of the arrays, and ignore the other "invalid" diagonal. When an item from the memory set appeared in an invalid diagonal, it was called a "target foil." A target foil appeared on every trial and a target on two-thirds of the trials. On trials where both a target and a target foil were presented, they appeared either in the same frame (n) or separated by one frame (n-1 or n+1).

Shiffrin and Schneider's (1977) results showed that when the target and target foil appeared in the same frame, detection of the targets was disrupted. However, if the target foil preceded the target by a 200 msec frame, the decrement was almost eliminated. Shiffrin and Schneider argued that the target foil draws an attention response automatically (i.e., an AAR) to the invalid diagonal, resulting in a loss of processing time (or a depletion of the limited capacity resources) and a disruption in the detection of the target in the same frame. Since the performance decrement disappeared when the interfering stimulus was separated from the target stimulus by a single 200 msec frame, the AAR to the target foil had apparently run its course by this point.

Automatic attention responses represent an interesting class of responses because they bridge the gap between the extremes of automatic and controlled processing. What is particularly noteworthy is that an AAR is characterized by Shiffrin and Schneider (1977) as a selection process. As a task is learned, responses, and hence decisions, can be executed more quickly and effortlessly without excessive demand on the limited-capacity resources. It is this characteristic which links AARs to the decision involved in the resolution of lexical ambiguity. The subject's attention is drawn, at least initially, only to the meaning of the ambiguous word which is a suitable "target" meaning, given the contextual constraints. This account has the advantage of explaining the selection as both an "attentional" process, broadly construed, but one for which it is possible to have a high degree of automaticity.

Marcel (1980) has also considered some theoretical implications of the two-stage model of ambiguity resolution. Although he does not explicitly interpret his findings in terms of late selection theory, his view is compatible with it - but with a different emphasis. He distinguishes, as does late selection theory, between two kinds of processing. On the one hand, "perceptual" processing is automatic and has unlimited capacity. The initial activation of all meanings of an ambiguous word is interpreted in terms of this kind of processing. On the other hand, conscious representation is of limited capacity because only one representation or interpretation of an event can be entertained at one time. Multiple competing products of perceptual processing cannot be presented to consciousness simultaneously without creating interference. Therefore, a process of selection occurs where the products of perceptual processing are compared with possible automatically produced hypotheses (see also Allport, 1977). The product of the comparison process becomes the consciously perceived event - in the case of ambiguous words, the contextually relevant meaning. Allport hypothesizes that the effect of pattern masking is to limit the input of perceptual analyses to this comparison process, therefore eliminating consciousness of the ambiguous word and inhibition associated with it, and resulting in facilitation for all meanings. As noted earlier, an alternative procedure which produces the same effect is to limit the processing time available.

An important distinction implicit in Marcel's (1980) account and the account in terms of automatic attention responses, is that between processes which lead to awareness *per se* of a perceptually coherent event (i.e., the automatic production of conscious experience), and the conscious strategies that influence the way in which automatically produced hypotheses are formulated. Marcel relies heavily on an automatic mechanism for producing hypotheses against which perceptual information is compared. On the other hand, the account in terms of automatic attention responses suggests a process whereby explicitly conscious information (e.g., target search sets in detection studies, Shiffrin &

Schneider, 1977) comes to determine perceptual experience or what our attention will be automatically drawn to. The two emphases are complementary in that the former stresses consciousness as an "output" of perceptual processing, and the latter stresses the explicit strategic, or "input", function of consciousness. Lexical ambiguity is an important domain for studying the interaction of these two factors.

SUMMARY

The study addressed a number of issues related to context effects in lexical ambiguity resolution: The time-course, inhibition of non-selected meanings, the appropriate baseline, and the effect of conscious strategies. The results were discussed in terms of the research hypotheses. Methodological criticisms of Tanenhaus et al. (1979) were supported, both with regard to the temporal parameters of ambiguity resolution and the appropriate baseline. Although the pattern of facilitation and inhibition for incongruent meanings of ambiguous words showed a pattern similar to Neely's (1977) related and unexpected targets (both in terms of the decline in automatic facilitation and eventual inhibition), data from the strategy manipulation indicated little effect of conscious expectancy on resolution. Despite suggestive differences between the groups at briefer SOAs, independent reasons were given for doubting the efficacy of the strategy manipulation. Some consideration was given to the processing requirements of the naming task (compared to lexical decision) in terms of the small semantic priming effects and a possible Stroop-like interference produced by word primes at brief SOAs. It was argued that the task may be less appropriate than a more semantically demanding task for studying lexical access, but that, if it were to be used, "neutral" primes involving pronounceable non-words would be a more appropriate baseline than strings of Xs. Finally, two complementary theoretical perspectives on lexical access in ambiguity resolution were discussed. It was suggested that both accounts implicitly raise the important matter of the interaction between perceptual processes producing awareness and the attentional processes which influence perception and awareness. It was concluded that an important question for future research will involve showing how attentional strategies influence the course of perceptual processing.

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Footnotes

[1] The terms "ambiguous word" and "homograph" will be used interchangeably, both denoting words with multiple meanings that are pronounced identically for all meanings (i.e., homophonic).

[2] A third possibility called the "one meaning" hypothesis (Foss, 1970), "garden path" hypothesis (Conrad, 1974), or "ordered search" model (Hogoboam & Perfetti, 1975) suggests that order-of-search of the respective meanings of ambiguous words is independent of context (proceeding from high to low frequency of meaning), but that the number of meanings accessed is dependent on context because the ordered search terminates when a match is found between the context and the relevant meaning. For instance, this model would predict that when a dominant meaning is the biasing context, no "lexical access" ensues for less dominant meanings. This model will be treated as a variant of the selective access model because the hypothesis relating to lexical access in the present study predicts automatic access to the respective meanings independent of context, after which a context dependent selection occurs, whereas the ordered search model predicts no access on some proportion of the trials (i.e., on trials where the dominant meaning biases the homograph and the less dominant meaning is the target).

Table I: Trial Types, Experiment I *

Experimental			Control 1			Control 2		
PRIME I	PRIME II	TARGET	PRIME I	PRIME II	TARGET	PRIME I	PRIME II	TARGET
C (oar)	H (row)	CT (paddle)	XXXXX	XXXXX	CT (paddle)	XXXXX	H (row)	CT (paddle)
C (oar)	H (row)	IT (column)	XXXXX	XXXXX	IT (column)	XXXXX	H (row)	IT (column)
C (oar)	H (row)	UT1 (green)	XXXXX	XXXXX	UT1 (green)	XXXXX	H (row)	UT1 (green)
U (say)	U (dog)	UT2 (green)	XXXXX	XXXXX	UT2 (green)	XXXXX	U (dog)	UT2 (green)

* C = Biasing context word related to one meaning of homograph (H)
H = Homograph
U = Unrelated word
CT = Congruent target
IT = Incongruent target
UT1 = Target unrelated to biased homograph context
UT2 = Target unrelated to non-homograph, non-biasing context
XXXXX= Neutral prime

Redundant examples are indicated for clarity of trial relationships only; no items were repeated in the experiment.

Figure 1. Auditory probe RTs compared for exposure duration of the first letters of 50 and 100 msec in a successive letter-matching task.

Note. From "Components of attention" by M. I. Posner and S. W. Boies, Psychological Review, 1971, 78, 391-408.

FIGURE 1

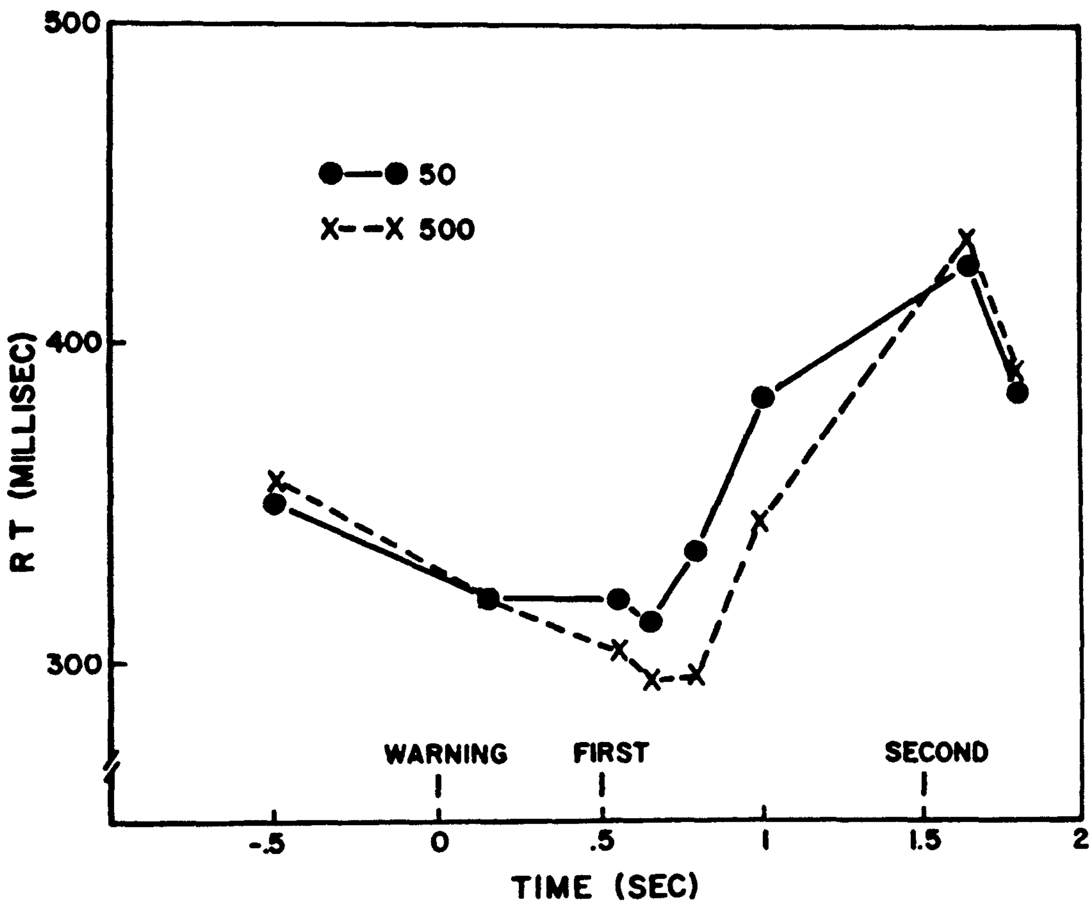
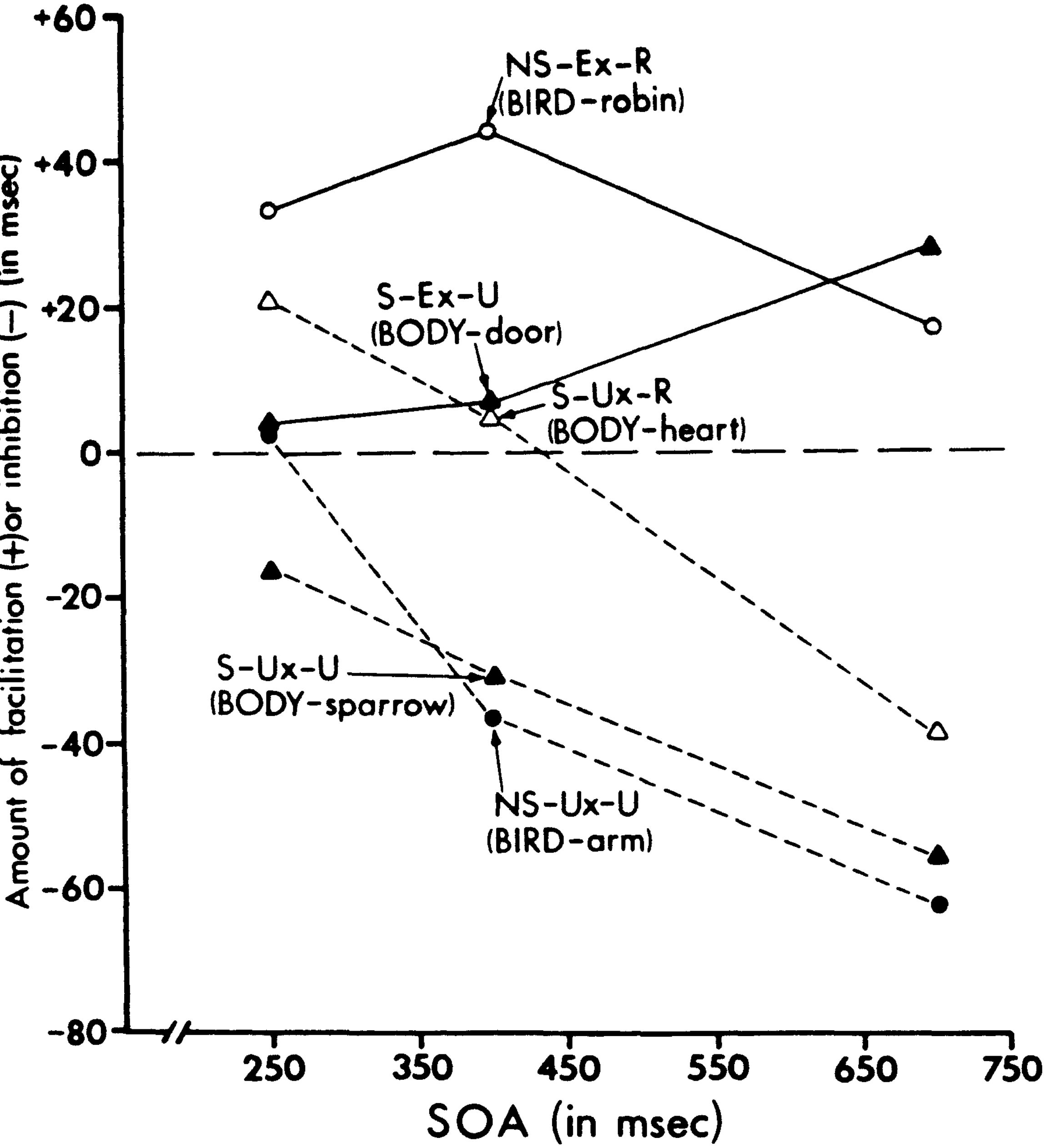

500
400
300
R T (MILLISEC)
50
500
WARNING
FIRST
SECOND
-.5
0
.5
1
1.5
2
TIME (SEC)

Figure 2. Amount of facilitation (+) or inhibition (-) in a lexical decision task for word targets in word-prime conditions as a function of stimulus onset asynchrony (SOA). (NS-Ex-R = Non-shift-Expected-Related; NS-Ux-U = Non-shift-Unexpected-Unrelated; S-Ex-U = Shift-Expected-Unrelated; S-Ux-R = Shift-Unexpected-Related; S-Ux-U = Shift-Unexpected-Unrelated.)

Note. From "Semantic priming and retrieval from lexical memory: The roles of inhibitionless spreading activation and limited-capacity processing" by J. H. Neely, Journal of Experimental Psychology: General, 1977, 106, 226-254.

FIGURE 2

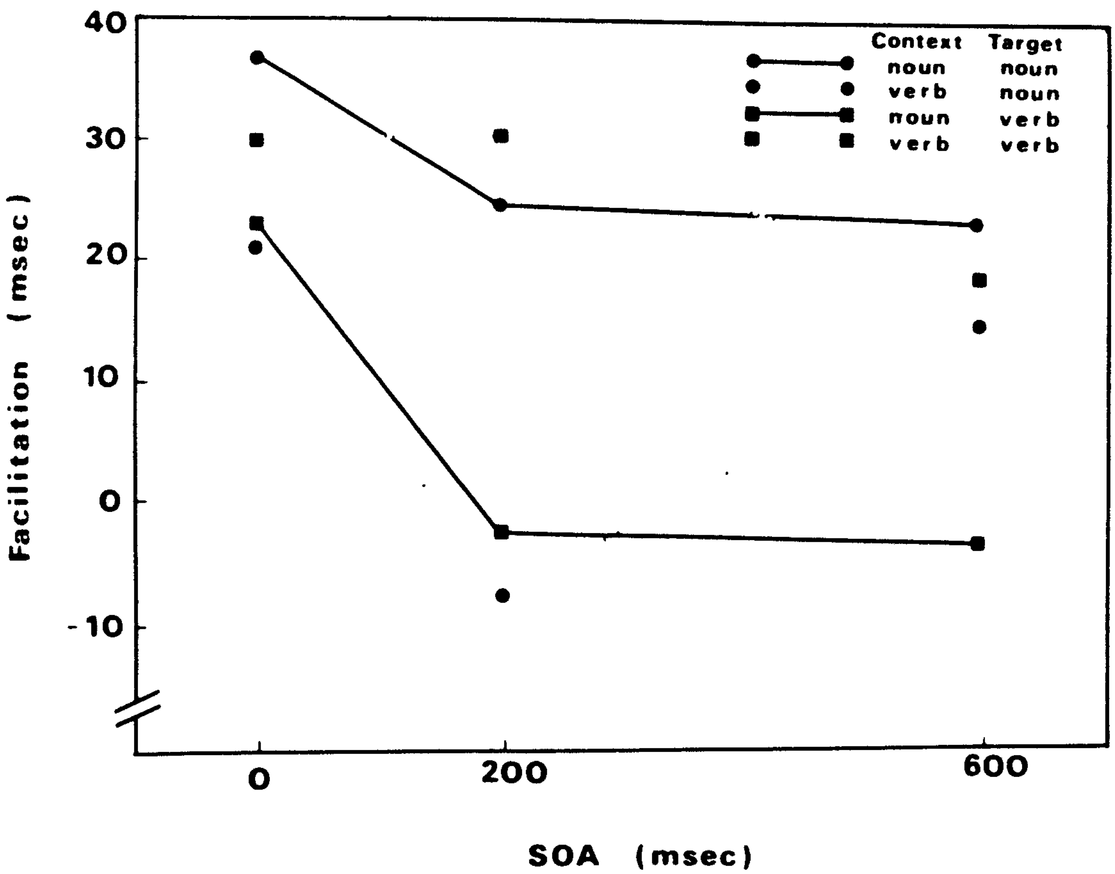


+60
+40
+20
0
-20
-40
-60
-80
Amount of facilitation (+) or inhibition (–) (in msec)
NS-Ex-R
(BIRD-robin)
S-Ex-U
(BODY-door)
S-Ux-R
(BODY-heart)
S-Ux-U
(BODY-sparrow)
NS-Ux-U
(BIRD-arm)
250
350
450
550
650
750
SOA (in msec)

Figure 3. Facilitation in naming latencies to noun and verb target words related to the contextually biased and unbiased reading of the preceding ambiguous word at 0, 200, and 600 msec interstimulus interval (ISI) between the end of the ambiguous word and the onset of the target.

Note. From "Evidence for multiple stages in the processing of ambiguous words in syntactic contexts" by M. K. Tanenhaus, J. M. Leiman, and M. S. Seidenberg, Journal of Verbal Learning and Verbal Behaviour, 1979, 18, 427-440.

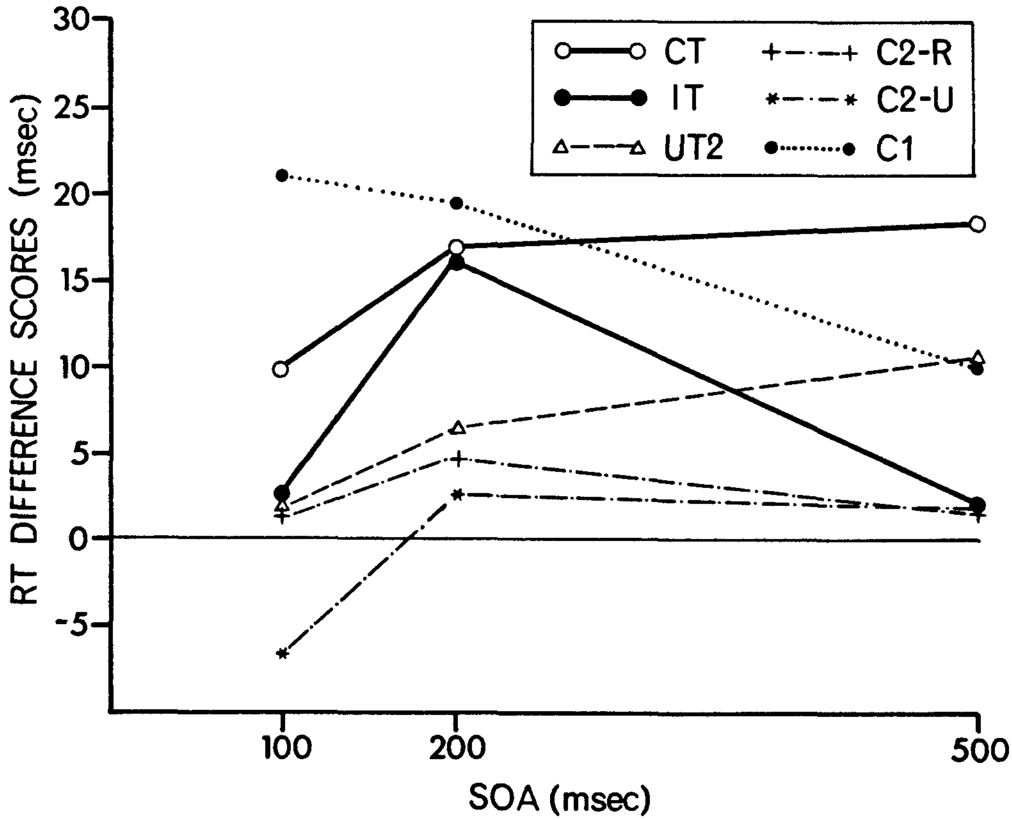
FIGURE 3



40
30
20
10
0
-10
Facilitation (msec)
Context Target
noun noun
verb noun
noun verb
verb verb
0
200
600
SOA (msec)

Figure 4. Experiment 1: UT1 baseline difference conditions as a function of stimulus onset asynchrony (SOA) from Prime II to the target, for combined strategy groups. A positive score (+) represents facilitation, and a negative score (-) represents inhibition, relative to the baseline.

FIGURE 4



CT
IT
UT2
C2-R
C2-U
C1
RT DIFFERENCE SCORES (msec)
30
25
20
15
10
5
0
-5
100
200
500
SOA (msec)

Figure 5. Experiment 1: C1 baseline difference conditions as a function of stimulus onset asynchrony (SOA) from Prime II to the target, for the combined strategy groups. A positive score (+) represents facilitation and a negative score (-) represents inhibition, relative to the baseline.

FIGURE 5

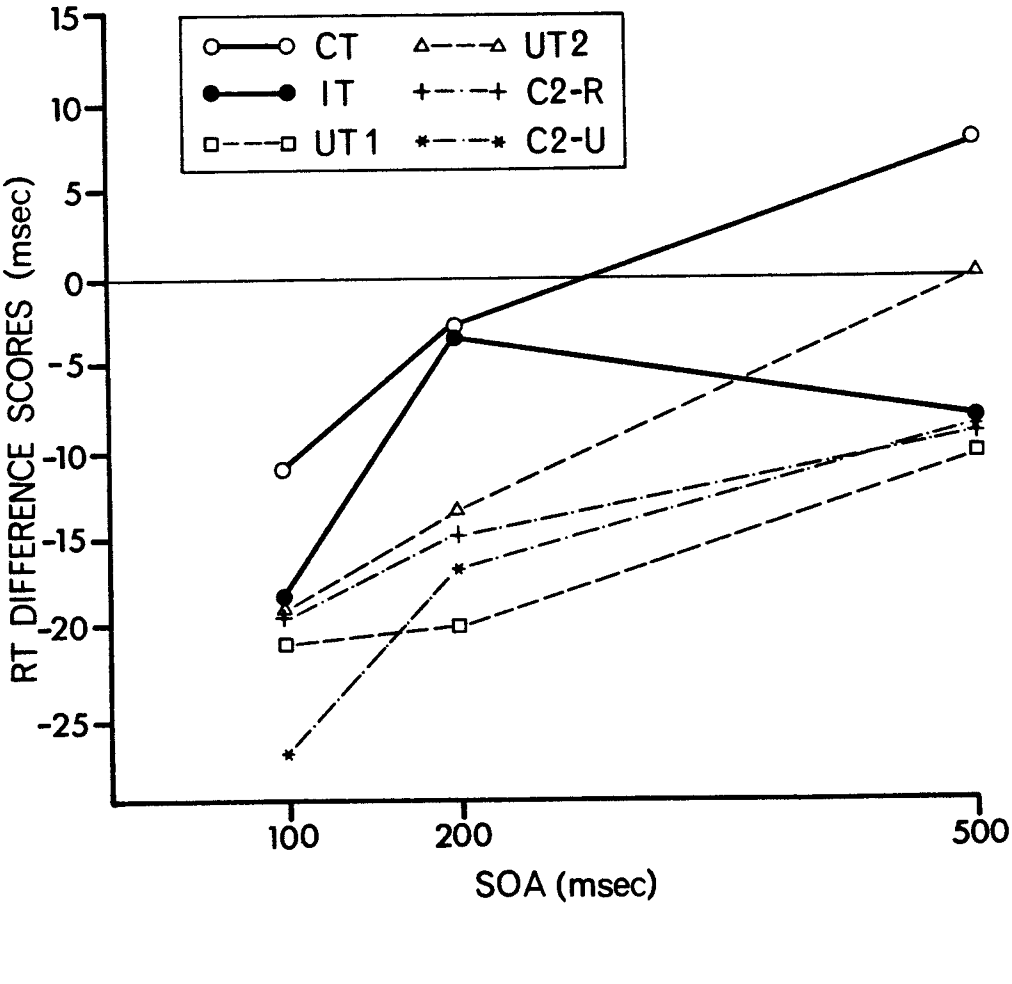
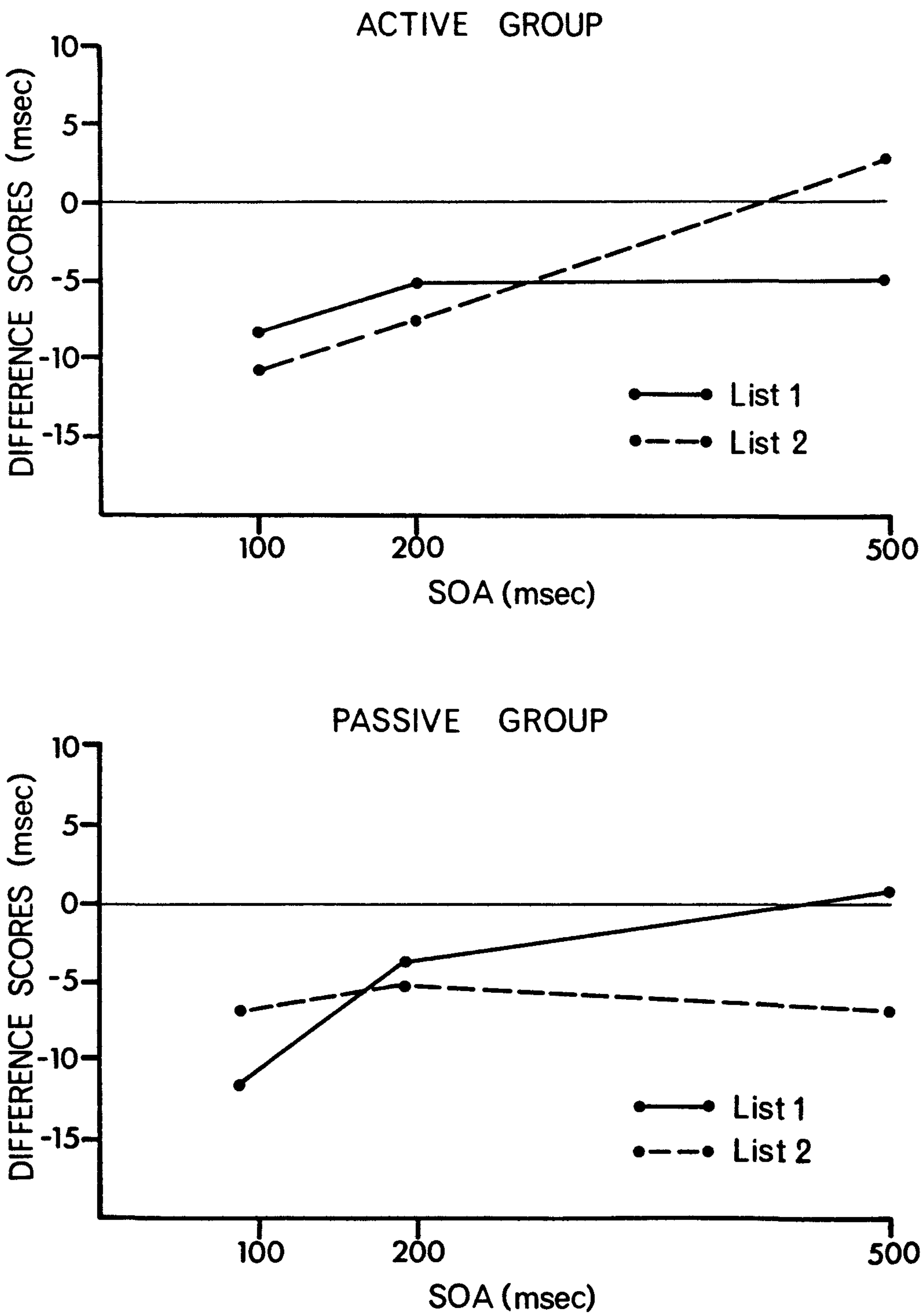

CT
IT
UT1
UT2
C2-R
C2-U
RT DIFFERENCE SCORES (msec)
15
10
5
0
-5
-10
-15
-20
-25
100
200
500
SOA (msec)

Figure 6. Experiment 1: The interaction of Lists X Strategy X SOA in the C1 baseline analysis.

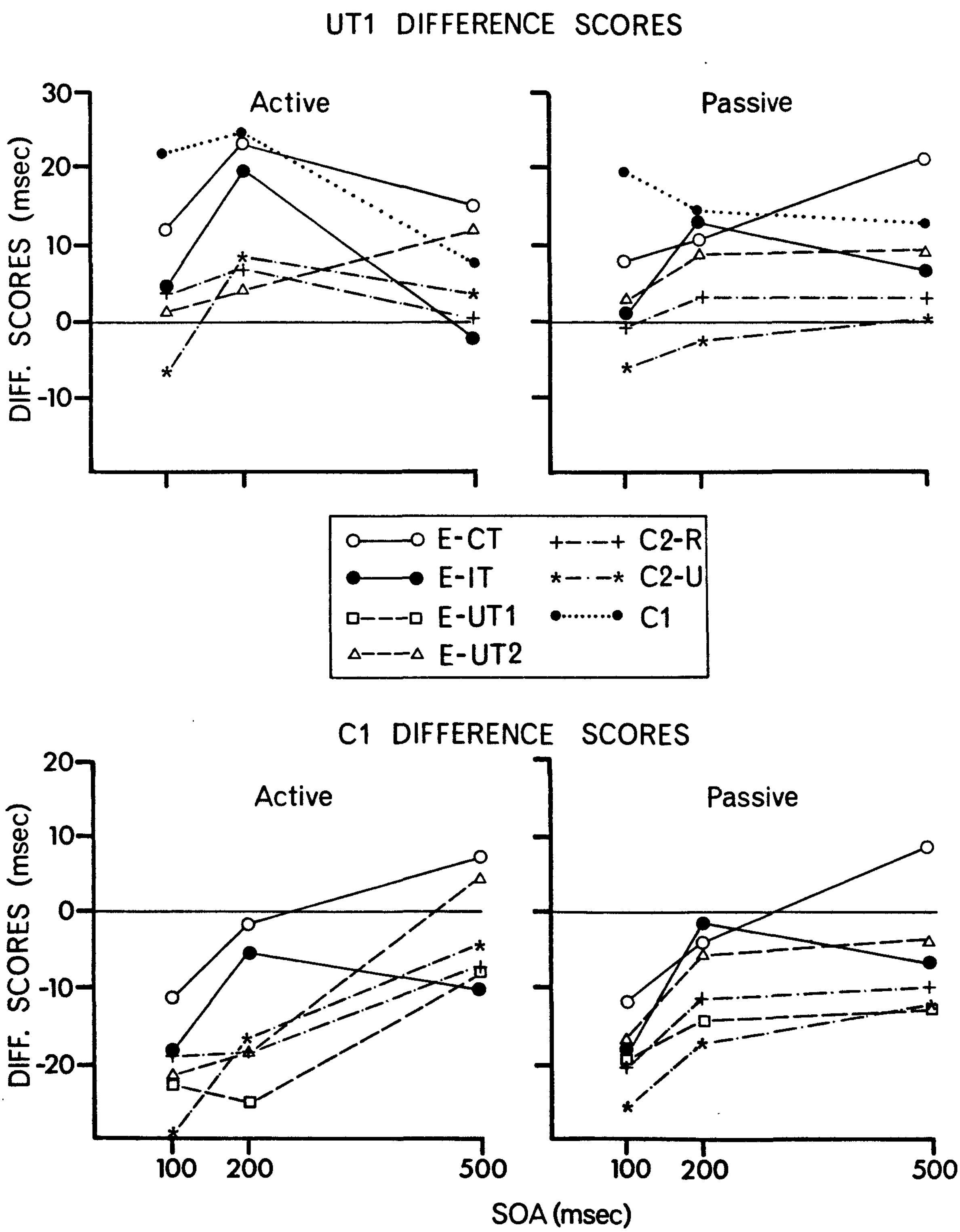
FIGURE 6



ACTIVE GROUP
DIFFERENCE SCORES (msec)
10
5
0
-5
-10
-15
100
200
500
SOA (msec)
List 1
List 2
PASSIVE GROUP
DIFFERENCE SCORES (msec)
10
5
0
-5
-10
-15
100
200
500
SOA (msec)
List 1
List 2

Figure 7. Experiment 1: UT1 and C1 baseline difference conditions as a function of SOA for each strategy group.

FIGURE 7



UT1 DIFFERENCE SCORES
Active
Passive
DIFF. SCORES (msec)
30
20
10
0
-10
E-CT
E-IT
E-UT1
E-UT2
C2-R
C2-U
C1
C1 DIFFERENCE SCORES
Active
Passive
DIFF. SCORES (msec)
20
10
0
-10
-20
100
200
500
SOA (msec)

APPENDIX A

List Counterbalancing

Counterbalancing Procedures for Word Lists

A. List 1

(1) Homograph Conditions: Homographs were employed in six of the twelve trial conditions: E-CT, E-IT, E-UT1, C2-CT C2-IT, C2-UT1. For each of these six homograph conditions, three equivalent blocks (A, B, C) were created, corresponding to the three SOAs at which items were to be presented. This made a total of 6 x 3 = 18 homograph "formats" with 15 homographs in each. This exhausted the 18 x 15 = 270 homographs used in the study.

Each of the 18 formats were counterbalanced on the following variables: 1. Total dominance: Each format contained an equal number of homographs from each of the six categories of total dominance (.70-.75, .76-.80, .81-.85, .86-.90, .91-.95, .96-1.00). 2. Dominance Ratio: Formats were equated for the mean dominance ratio, with an attempt to equate the distributional characteristics of dominance ratios across the formats. 3. Grammatical class of the homograph meanings: Each format contained an equal number of homographs with the two meanings that were either both nouns, both verbs, or one of each. 4. Direction of dominance: Each format contained equal numbers of presentations where the primary meaning biased the homograph ("High;" see Appendix B) and the secondary meaning biased the homograph ("Low;" see Appendix B). 5. Target word length and frequency: After counterbalancing on the above variables, mean frequency and word length were roughly equated for the respective formats.

(2) Unrelated targets (E-UT1, E-UT2, C2-UT1, C2-UT2): Targets for E-UT1 and E-UT2 were chosen from Kucera and Francis (1967) and equated with the mean frequency and word length of targets in E-CT and E-IT. The equation was done on a word-for-word basis for frequency and a cell mean basis for word length. The same procedure was followed for the C2-UT1 and C2-UT2 targets using C2-CT and C2-IT.

(3) Unrelated primes (E-UT2 and C2-UT2): Prime I of E-UT2 was chosen from Kucera and Francis (1967) and equated with the mean frequency and word length of Prime I for E-CT, E-IT, and E-UT1, on a word-for-word basis for frequency and a cell mean basis for word length. The same procedure was used to generate E-UT2 and C2-UT2 Prime II.

(4) Control 1: Targets in each target relation (CT, IT, UT1, UT2) were equated with the mean frequency and word length in the corresponding target relation in E and C2 trials. Again, the equation was done word-for-word for frequency and on a cell mean basis for word length.

B. List 2

To create List 2, the E-CT, E-IT, E-UT1 and E-UT2 trials of List 1 became C2-CT, C2-IT, C2-UT1, and C2-UT2 of List 2, respectively. This involved substituting the word Prime I in the E trials of List 1 for X's in the C2 trials of List 2.

Likewise, the C2-CT, C2-IT, C2-UT1, and C2-UT2 of List 1 became the E-CT, E-IT, E-UT1, and E-UT2 trials of List 2, respectively. This involved generating new Prime I words related to the homograph and substituting them for X's in the original List 1 C2 trials. For List 2 E-UT2 trials, new unrelated Prime I words were chosen from Kucera and Francis (1967) and equated for frequency and word length with the mean frequency and word length of Prime I for E-CT, E-IT, and E-UT1.

List 2 C1 trials were constructed by randomly re-ordering List 1 C1 items and making the necessary adjustments so as to equate each cell for mean frequency and word length.

APPENDIX B

Word Lists with Normative Data

LIST 1

SOA 1 EXPERIMENTAL CT

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
LOW	cave	9	1	N-N	bat	.454	18	dark	185
LOW	finger	40	1	N-N	digit	.200	1	hand	431
HIGH	pay	172	1	N-N	bill	.195	143	money	165
HIGH	oar	nn	1	N-V	row	.400	35	paddle	1
HIGH	cocktail	25	1	N-V	lounge	.247	9	room	383
HIGH	kernel	3	2	N-N	grain	.440	27	wheat	9
HIGH	church	348	2	N-N	temple	.333	38	worship	36
LOW	gaze	12	2	N-V	watch	.349	81	stare	14
LOW	look	399	2	N-V	saw	.279	352	observe	25
HIGH	yours	25	3	N-N	mine	.292	59	ours	27
LOW	abandon	17	3	N-V	maroon	.306	3	island	167
HIGH	harbour	37	4	N-N	port	.230	21	sailor	5
LOW	transfer	38	4	N-V	switch	.256	43	exchange	70
LOW	outline	12	4	V-V	trace	.500	23	copy	38
LOW	useless	17	6	N-N	vain	.176	10	futile	6

LIST 1

SOA 1 EXPERIMENTAL IT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
LOW	first	1360	1	N-N	second	.457	393	minute	53
HIGH	swim	15	1	N-N	pool	.288	111	cue	nn
HIGH	moon	60	1	N-N	star	.130	25	actor	24
HIGH	diamond	8	1	N-V	ring	.367	47	bell	18
LOW	delay	21	1	N-V	stall	.273	18	cattle	97
HIGH	word	274	1	N-V	spell	.178	19	witch	5
LOW	erode	4	1	V-V	wear	.133	760	jacket	33
HIGH	walking	54	2	N-N	cane	.500	12	sugar	34
LOW	gold	52	2	N-N	bar	.150	82	drunk	37
HIGH	cereal	nn	2	N-V	bowl	.465	23	pins	6
LOW	legal	72	3	N-N	case	.400	362	crate	15
HIGH	stein	18	3	N-V	mug	.175	1	assault	15
LOW	dinner	91	4	N-N	date	.368	103	calendar	28
LOW	circus	7	4	N-V	fair	.454	77	just	872
LOW	grill	12	5	N-V	grate	.280	3	grind	2

LIST 1

SOA 1 EXPERIMENTAL UT 1

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
HIGH	pebble	1	1	N-N	rock	.349	25	doubt	114
LOW	army	132	1	N-N	major	.340	247	land	217
LOW	condition	91	1	N-N	state	.159	808	hour	145
HIGH	boxing	nn	1	N-V	punch	.444	5	tan	9
HIGH	pickle	1	1	N-V	relish	.217	8	south	240
LOW	bed	127	2	N-N	spring	.357	127	lamb	7
HIGH	handle	53	2	N-N	crank	.305	1	golf	34
LOW	toys	11	2	N-V	play	.440	200	radar	23
LOW	commerce	58	2	N-V	trade	.214	143	oath	38
HIGH	care	162	2	V-V	tend	.330	43	absurd	17
LOW	goat	6	3	N-N	kid	.256	61	mark	83
HIGH	branch	33	3	N-V	stick	.268	39	ally	9
HIGH	unravel	1	4	N-V	fray	.189	1	luck	47
LOW	bird	31	5	N-N	crane	.314	5	fact	447
HIGH	obstruct	4	5	N-V	block	.416	66	proverb	5

LIST 1

SOA 1 EXPERIMENTAL UT2

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	say	456			terms		163	hotel	126
	save	62			daily		122	clear	219
	role	104			god		318	size	138
	tragic	33			treat		26	radius	9
	anchor	15			blond		11	close	234
	led	132			bay		57	ink	7
	list	133			tell		268	bus	34
	bore	25			share		98	tail	24
	ten	165			learn		84	folk	34
	minor	58			sake		41	creator	14
	drink	82			colour		142	lady	80
	era	30			mate		21	thunder	14
	nine	81			holy		49	wagon	55
	vicious	17			yard		35	high	497
	quaint	12			bearing		25	pretense	6

LIST 1

SOA 2 EXPERIMENTAL CT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
HIGH	shovel	5	1	N-N	spade	.500	10	dig	10
LOW	little	831	1	N-N	lot	.222	127	less	438
LOW	herd	22	1	N-N	pack	.177	25	wolf	6
HIGH	toss	9	1	N-V	fling	.295	2	propel	4
HIGH	bread	41	1	N-V	loaf	.233	4	bake	12
HIGH	bath	26	1	N-V	shower	.130	15	soap	22
LOW	drug	24	2	N-N	acid	.500	3	trip	81
HIGH	pig	8	2	N-V	sow	.442	3	pork	10
LOW	skirt	21	2	N-V	slip	.256	19	garment	6
LOW	rear	51	3	N-N	stern	.174	23	ship	83
HIGH	soar	9	3	N-V	fly	.421	33	glide	2
LOW	oriental	16	4	N-N	china	.421	69	country	324
HIGH	catch	43	4	N-V	pitch	.205	22	ball	110
LOW	trout	4	5	N-N	smelt	.396	3	salmon	3
HIGH	fall	147	5	N-V	drop	.242	59	down	895

LIST 1

SOA 2 EXPERIMENTAL IT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
LOW	drum	11	1	N-N	bass	.386	16	fish	35
HIGH	unique	58	1	N-N	rare	.326	47	steak	10
LOW	sleet	1	1	N-V	hail	.338	10	tribute	24
HIGH	baseball	57	1	N-V	strike	.227	50	union	182
HIGH	tracks	12	1	N-V	train	.159	16	teach	41
LOW	hunt	10	1	V-V	poach	.400	1	cook	47
LOW	writing	117	2	N-N	tablet	.440	3	pill	15
LOW	surface	200	2	N-N	plane	.210	114	sky	58
HIGH	click	2	2	N-V	tick	.441	3	flea	2
LOW	exercise	58	2	N-V	drill	.309	33	tool	40
HIGH	end	410	3	N-N	tip	.350	22	waiter	10
HIGH	clothes	89	3	N-V	fit	.230	3	seizure	6
HIGH	hay	19	4	N-N	straw	.189	15	sip	2
LOW	join	65	4	N-V	fuse	.329	5	circuit	23
LOW	spin	5	6	N-N	top	.281	204	bottom	88

LIST 1

SOA 2 EXPERIMENTAL UT 1

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
LOW	sharp	72	1	N-N	blunt	.403	9	aunt	22
HIGH	itch	5	1	N-N	rash	.257	1	center	224
LOW	servant	19	1	N-N	page	.194	66	road	197
LOW	basin	7	1	N-V	sink	.435	23	jazz	99
HIGH	dog	75	1	N-V	bark	.159	83	gear	26
HIGH	false	29	2	N-N	invalid	.388	7	height	35
HIGH	hobby	4	2	N-N	interest	.316	330	skin	47
LOW	number	472	2	N-V	figure	.395	209	phrase	34
HIGH	hair	148	2	N-V	strand	.204	7	scorn	4
LOW	blister	3	2	N-V	boil	.152	12	duty	61
HIGH	rude	6	3	N-N	gross	.429	66	comb	61
LOW	fight	98	3	N-V	box	.153	70	sort	164
LOW	cut	192	4	N-V	chop	.351	3	ideal	61
HIGH	narrow	63	5	N-V	taper	.360	3	gossip	13
LOW	wait	94	5	V-V	hold	.440	169	small	542

LIST 1

SOA 2 EXPERIMENTAL UT 2

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	dock	8			blade		13	jean	23
	system	416			concept		85	woman	224
	plow	12			logic		17	black	203
	tumour	17			beard		26	clay	100
	fiber	27			tide		10	mount	26
	loyal	18			dwell		8	myth	35
	sweet	70			monitor		3	author	46
	eight	104			leg		58	crime	34
	deaf	12			halt		10	rye	4
	current	104			prize		28	shore	61
	soon	200			sand		28	monster	6
	mouth	103			patent		135	son	166
	lane	30			canvas		19	baby	62
	sad	35			raft		4	patch	13
	frame	35			chance		131	course	465

LIST 1

SOA 3 EXPERIMENTAL CT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
HIGH	milk	49	1	N-N	pitcher	.466	21	glass	99
LOW	arm	94	1	N-N	sling	.244	1	broken	63
LOW	horses	68	1	N-N	stage	.136	174	coach	24
HIGH	heffer	1	1	N-V	steer	.434	9	beef	32
HIGH	print	18	1	N-V	type	.260	200	writer	73
HIGH	duct	1	2	N-N	pipe	.440	20	water	442
HIGH	butter	27	2	N-N	toast	.201	19	snack	6
LOW	cod	6	2	N-V	perch	.418	1	lake	54
LOW	verify	5	2	N-V	check	.285	88	correct	52
HIGH	animal	68	2	N-V	bear	.164	57	woods	25
LOW	cloak	3	3	N-N	cape	.266	20	coat	43
LOW	ocean	34	3	N-V	wake	.187	23	wave	46
LOW	guide	36	4	N-V	lead	.466	129	direct	129
HIGH	bulb	7	5	N-N	light	.486	333	socket	3
HIGH	metal	61	5	N-V	foil	.177	20	tin	12

LIST 1

SOA 3 EXPERIMENTAL IT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
LOW	sick	51	1	N-N	well	.435	897	oil	93
HIGH	window	119	1	N-N	screen	.260	48	movie	29
HIGH	fungus	2	1	N-V	mold	.315	45	jello	3
LOW	arrow	14	1	N-V	quiver	.282	9	shake	17
LOW	game	123	1	V-V	tag	.217	5	label	19
HIGH	stomach	31	2	N-N	colon	.440	nn	comma	2
LOW	name	294	2	N-N	pat	.325	35	touch	87
HIGH	rap	2	2	N-V	tap	.375	18	faucet	1
LOW	see	722	2	N-V	peer	.287	8	friend	133
HIGH	plant	125	3	N-N	root	.220	30	source	94
LOW	cabinet	17	3	N-V	console	.436	6	comfort	43
LOW	racquet	5	4	N-N	squash	.239	2	turnip	1
HIGH	earth	150	4	N-V	ground	.195	186	coffee	78
HIGH	waste	35	5	N-N	litter	.257	3	kitten	5
LOW	whip	19	5	N-V	lash	.322	6	brow	6

LIST 1

SOA 3 EXPERIMENTAL UT 1

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
HIGH	sound	204	1	N-N	quack	.400	9	worth	94
LOW	estate	51	1	N-N	will	.301	2244	salt	46
HIGH	new	1635	1	N-N	novel	.186	59	curb	13
LOW	alter	15	1	N-V	change	.457	240	fog	25
LOW	strength	136	1	N-V	might	.192	672	fiction	46
LOW	swift	32	1	N-V	fleet	.133	17	policy	222
LOW	messy	3	2	N-N	orderly	.440	20	shut	46
HIGH	worker	30	2	N-N	staff	.244	113	chin	27
HIGH	thin	92	2	N-V	lean	.488	20	civil	91
HIGH	wheel	56	2	N-V	tire	.166	22	garden	60
LOW	freckle	3	3	N-N	mole	.488	4	pace	43
HIGH	hat	56	4	N-N	cap	.297	6	noble	23
LOW	wipe	10	4	N-V	dry	.291	68	lack	110
HIGH	fasten	4	5	V-V	bolt	.200	10	genesis	4
LOW	snail	1	6	N-V	slug	.375	10	salad	9

LIST 1

SOA 3 EXPERIMENTAL UT 2

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
	hall	152			whole		309	marriage	95
	wrote	181			own		772	bond	46
	make	794			paid		145	cake	13
	lawn	15			aid		130	disk	25
	space	184			table		198	native	46
	alert	33			elbow		10	front	221
	move	171			angel		18	curve	45
	coal	32			inch		40	horizon	27
	head	424			tour		43	jack	92
	image	119			honey		25	circle	60
	duke	11			knot		8	dirt	43
	stuff	32			seek		69	lock	23
	bit	101			pale		58	nun	108
	giant	23			style		98	flint	4
	code	40			shelf		12	seam	9

LIST 1

SOA 1 CONTROL 2 CT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
HIGH	xxxxx		1	N-N	bridge	.363	98	river	165
LOW	xxxxx		1	N-N	mean	.288	199	average	130
HIGH	xxxxx		1	N-N	stand	.130	148	sit	67
LOW	xxxxx		1	N-V	shed	.448	11	barn	29
LOW	xxxxx		1	N-V	fan	.177	18	mail	47
LOW	xxxxx		2	N-N	park	.440	94	bench	35
HIGH	xxxxx		2	N-N	speaker	.349	49	lecture	16
HIGH	xxxxx		2	N-V	tear	.447	11	cry	48
LOW	xxxxx		2	N-V	dump	.200	4	truck	57
LOW	xxxxx		3	N-N	sole	.308	18	filet	1
HIGH	xxxxx		3	N-V	duck	.219	9	goose	4
LOW	xxxxx		4	N-N	post	.343	84	fence	30
HIGH	xxxxx		4	N-V	dove	.291	4	pigeon	3
HIGH	xxxxx		5	N-V	bow	.277	15	archer	1
LOW	xxxxx		6	N-N	chest	.323	53	treasure	4

LIST 1

SOA 1 CONTROL 2 IT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
LOW	xxxxx		1	N-N	pot	.454	28	pan	16
HIGH	xxxxx		1	N-N	kind	.284	313	nice	75
HIGH	xxxxx		1	N-N	dough	.159	13	flour	8
HIGH	xxxxx		1	N-V	being	.389	712	exists	59
LOW	xxxxx		1	N-V	jam	.227	6	wedge	4
LOW	xxxxx		1	V-V	break	.250	88	escape	65
HIGH	xxxxx		2	N-N	chick	.440	3	hen	22
LOW	xxxxx		2	N-V	smack	.417	4	slap	2
HIGH	xxxxx		2	N-V	hamper	.303	5	laundry	5
LOW	xxxxx		3	N-N	club	.439	145	weapon	42
LOW	xxxxx		3	N-V	prune	.155	45	trim	20
HIGH	xxxxx		4	N-N	nut	.216	15	shell	22
LOW	xxxxx		4	N-V	set	.297	414	group	390
HIGH	xxxxx		5	N-N	trunk	.250	8	luggage	10
LOW	xxxxx		5	N-V	lap	.326	19	lick	3

LIST 1

SOA 1 CONTROL 2 UT 1

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx		1	N-N	panel	.454	31	active	88
	xxxxx		1	N-N	plain	.222	48	lord	93
	xxxxx		1	N-N	ruler	.200	3	camera	36
	xxxxx		1	N-V	permit	.320	77	sum	45
	xxxxx		1	N-N	store	.282	74	vivid	25
	xxxxx		1	N-V	bug	.136	4	dozen	53
	xxxxx		2	N-N	beam	.395	21	toes	19
	xxxxx		2	N-N	flat	.305	67	drag	15
	xxxxx		2	N-V	gag	.418	4	crash	20
	xxxxx		2	N-V	race	.247	103	troop	16
	xxxxx		2	N-V	harp	.162	1	silk	12
	xxxxx		3	N-N	record	.200	137	widow	26
	xxxxx		3	N-V	hatch	.414	5	idea	195
	xxxxx		4	N-V	clip	.460	6	thrill	5
	xxxxx		5	N-N	present	.416	377	kettle	3

LIST 1

SOA 1 CONTROL 2 UT 2

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
	xxxxx				crowd		53	key	88
	xxxxx				late		179	fell	93
	xxxxx				theme		55	ratio	35
	xxxxx				period		266	prime	25
	xxxxx				scheme		38	rational	25
	xxxxx				soft		61	hero	52
	xxxxx				stadium		25	crown	19
	xxxxx				ranch		27	crude	15
	xxxxx				pecan		1	solve	20
	xxxxx				pain		88	rail	16
	xxxxx				bunk		18	array	11
	xxxxx				tone		78	card	26
	xxxxx				moral		141	third	190
	xxxxx				apple		9	balcony	5
	xxxxx				sat		150	groove	2

LIST 1

SOA 2 CONTROL 2 CT

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
HIGH	xxxxx		1	N-N	sense	.487	311	common	223
LOW	xxxxx		1	N-N	marble	.333	21	shoot	27
HIGH	xxxxx		1	N-N	gas	.130	3	fuel	17
LOW	xxxxx		1	N-V	strip	.434	30	bacon	10
HIGH	xxxxx		1	N-V	vault	.217	2	chamber	46
HIGH	xxxxx		2	N-N	tank	.440	12	septic	3
LOW	xxxxx		2	N-N	trust	.286	52	fund	62
HIGH	xxxxx		2	N-V	digest	.440	3	readers	37
LOW	xxxxx		2	N-V	toll	.133	16	tax	197
LOW	xxxxx		2	V-V	draw	.209	56	pull	51
HIGH	xxxxx		3	N-N	charm	.375	26	poise	6
LOW	xxxxx		4	N-V	seal	.378	17	letter	145
LOW	xxxxx		5	N-V	chuck	.314	14	throw	42
HIGH	xxxxx		5	V-V	count	.203	49	add	88
HIGH	xxxxx		6	N-N	force	.246	230	power	342

LIST 1

SOA 2 CONTROL 2 IT

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
HIGH	xxxxx		1	N-N	organ	.369	12	piano	38
LOW	xxxxx		1	N-N	hard	.244	202	easy	125
HIGH	xxxxx		1	N-N	grave	.189	33	bury	6
LOW	xxxxx		1	N-V	press	.434	127	news	1
HIGH	xxxxx		1	N-V	stalk	.295	9	pursue	20
LOW	xxxxx		1	N-V	slide	.196	20	film	96
LOW	xxxxx		2	N-N	afghan	.500	3	blanket	30
HIGH	xxxxx		2	N-N	cold	.177	171	hot	130
HIGH	xxxxx		2	N-V	broke	.467	72	shatter	2
LOW	xxxxx		2	N-V	produce	.284	82	farm	125
HIGH	xxxxx		3	N-N	file	.225	81	clerk	34
LOW	xxxxx		3	N-V	fix	.195	14	heroin	2
HIGH	xxxxx		4	N-N	board	.351	239	plank	7
LOW	xxxxx		4	N-V	shift	.211	41	crew	36
LOW	xxxxx		5	N-N	limp	.488	12	flaccid	nn

LIST 1

SOA 2 CONTROL 2 UT 1

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
	xxxxx		1	N-N	mint	.413	7	equal	90
	xxxxx		1	N-N	net	.222	34	simple	164
	xxxxx		1	N-N	fresh	.177	82	faith	111
	xxxxx		1	N-V	ram	.304	2	mercy	20
	xxxxx		1	N-V	wound	.230	28	carbon	30
	xxxxx		1	V-V	frisk	.133	nn	chair	66
	xxxxx		2	N-N	cell	.372	65	bride	33
	xxxxx		2	N-N	vessel	.333	16	expert	30
	xxxxx		2	N-V	march	.368	120	stem	29
	xxxxx		2	N-V	annual	.330	1	locker	9
	xxxxx		3	N-N	compact	.357	12	loom	6
	xxxxx		3	N-V	draft	.439	24	slow	60
	xxxxx		4	N-N	base	.282	91	flare	3
	xxxxx		4	N-V	pound	.342	28	meter	6
	xxxxx		5	N-V	roll	.343	35	eager	27

LIST 1

SOA 2 CONTROL 2 UT 2

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx				wet		53	balance	90
	xxxxx				view		186	central	164
	xxxxx				item		54	price	108
	xxxxx				air		257	boss	20
	xxxxx				debate		32	factory	32
	xxxxx				taste		60	relief	66
	xxxxx				patrol		25	merit	29
	xxxxx				youth		82	jet	29
	xxxxx				command		5	ear	29
	xxxxx				loss		86	tunnel	10
	xxxxx				twist		18	linen	6
	xxxxx				model		77	kill	63
	xxxxx				short		212	donor	5
	xxxxx				trick		15	keel	6
	xxxxx				wife		228	shade	28

LIST 1

SOA 3 CONTROL 2 CT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
LOW	xxxxx		1	N-N	pupil	.434	20	eye	122
HIGH	xxxxx		1	N-N	calf	.273	11	cow	29
HIGH	xxxxx		1	N-V	match	.488	41	pair	50
HIGH	xxxxx		1	N-V	stamp	.174	8	postage	1
LOW	xxxxx		1	V-V	lie	.195	59	recline	3
HIGH	xxxxx		2	N-N	deed	.440	8	act	283
LOW	xxxxx		2	N-N	rank	.140	24	smell	34
LOW	xxxxx		2	N-V	swallow	.484	10	throat	51
LOW	xxxxx		2	N-V	refrain	.314	10	chorus	18
HIGH	xxxxx		3	N-N	court	.195	230	law	299
HIGH	xxxxx		3	V-V	express	.317	40	rapid	43
LOW	xxxxx		4	N-N	note	.153	127	music	216
LOW	xxxxx		4	V-V	bound	.342	42	leap	14
HIGH	xxxxx		5	N-N	grace	.428	40	elegant	14
HIGH	xxxxx		6	N-V	shot	.212	112	rifle	63

LIST 1

SOA 3 CONTROL 2 IT

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
HIGH	xxxxx		1	N-N	right	.478	613	wrong	129
HIGH	xxxxx		1	N-N	deck	.340	23	boat	72
LOW	xxxxx		1	N-N	stable	.182	30	steady	41
LOW	xxxxx		1	N-V	sign	.370	94	endorse	6
LOW	xxxxx		1	N-V	bluff	.257	8	cliff	11
HIGH	xxxxx		1	N-V	sock	.133	4	shoe	14
LOW	xxxxx		2	N-N	mad	.440	39	angry	45
HIGH	xxxxx		2	N-N	still	.209	782	quiet	76
LOW	xxxxx		2	N-V	can	.336	1772	able	216
HIGH	xxxxx		2	N-V	strain	.285	31	stress	107
HIGH	xxxxx		3	N-N	staple	.292	1	paper	157
LOW	xxxxx		3	N-V	nag	.280	nn	pester	1
HIGH	xxxxx		4	N-V	iron	.500	43	steel	45
HIGH	xxxxx		5	N-N	fine	.305	161	good	807
LOW	xxxxx		5	N-V	dart	.201	6	dash	11

LIST 1

SOA 3 CONTROL 2 UT 1

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx		1	N-N	range	.400	160	truth	126
	xxxxx		1	N-N	yarn	.244	14	anger	48
	xxxxx		1	N-N	gin	.133	23	brush	44
	xxxxx		1	N-V	jerk	.355	2	decimal	3
	xxxxx		1	N-V	lobby	.244	20	maple	7
	xxxxx		1	N-V	jar	.130	16	due	142
	xxxxx		2	N-N	void	.440	10	dean	40
	xxxxx		2	N-N	field	.325	274	desk	65
	xxxxx		2	N-V	pelt	.426	9	test	119
	xxxxx		2	N-V	work	.186	760	north	206
	xxxxx		3	N-N	sage	.486	2	main	119
	xxxxx		3	N-N	firm	.150	109	hospital	110
	xxxxx		4	N-N	joint	.394	39	bare	29
	xxxxx		4	N-V	refuse	.201	16	night	411
	xxxxx		5	N-V	miss	.485	258	beat	68

LIST 1

SOA 3 CONTROL 2 UT 2

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
	xxxxx				keep		264	fear	127
	xxxxx				monk		16	depth	53
	xxxxx				maid		31	grant	15
	xxxxx				cotton		38	thorn	3
	xxxxx				gentle		27	elastic	7
	xxxxx				moss		9	deal	142
	xxxxx				zero		24	gate	37
	xxxxx				next		394	dream	64
	xxxxx				part		500	green	116
	xxxxx				thing		333	plan	204
	xxxxx				lend		14	blood	121
	xxxxx				chief		119	feed	123
	xxxxx				joy		40	precious	29
	xxxxx				wall		160	told	413
	xxxxx				wide		125	hung	65

LIST 1

SOA 1 CONTROL 1 CT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx				xxxxx			data	173
	xxxxx				xxxxx			rest	163
	xxxxx				xxxxx			quality	114
	xxxxx				xxxxx			nest	20
	xxxxx				xxxxx			trail	31
	xxxxx				xxxxx			site	64
	xxxxx				xxxxx			mayor	38
	xxxxx				xxxxx			clothing	20
	xxxxx				xxxxx			slave	30
	xxxxx				xxxxx			boycott	8
	xxxxx				xxxxx			sew	6
	xxxxx				xxxxx			safe	58
	xxxxx				xxxxx			blouse	1
	xxxxx				xxxxx			fold	7
	xxxxx				xxxxx			cure	28

LIST 1

SOA 1 CONTROL 1 IT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx				xxxxx			shadow	36
	xxxxx				xxxxx			focus	40
	xxxxx				xxxxx			prose	14
	xxxxx				xxxxx			sympathy	36
	xxxxx				xxxxx			chain	50
	xxxxx				xxxxx			axis	38
	xxxxx				xxxxx			suite	27
	xxxxx				xxxxx			interval	18
	xxxxx				xxxxx			pause	21
	xxxxx				xxxxx			cycle	24
	xxxxx				xxxxx			comic	9
	xxxxx				xxxxx			attic	16
	xxxxx				xxxxx			rate	209
	xxxxx				xxxxx			public	438
	xxxxx				xxxxx			nylon	1

LIST 1

SOA 1 CONTROL 1 UT 1

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
	xxxxx				xxxxx			unit	103
	xxxxx				xxxxx			cover	88
	xxxxx				xxxxx			cool	62
	xxxxx				xxxxx			shirt	27
	xxxxx				xxxxx			sacred	38
	xxxxx				xxxxx			percent	53
	xxxxx				xxxxx			cloud	28
	xxxxx				xxxxx			brick	18
	xxxxx				xxxxx			barrel	24
	xxxxx				xxxxx			jaw	16
	xxxxx				xxxxx			probe	6
	xxxxx				xxxxx			senior	34
	xxxxx				xxxxx			meant	100
	xxxxx				xxxxx			voice	226
	xxxxx				xxxxx			rope	15

LIST 1

SOA 1 CONTROL 1 UT 2

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
	xxxxx				xxxxx			deep	109
	xxxxx				xxxxx			carry	88
	xxxxx				xxxxx			minister	61
	xxxxx				xxxxx			victim	27
	xxxxx				xxxxx			core	37
	xxxxx				xxxxx			rural	54
	xxxxx				xxxxx			climate	55
	xxxxx				xxxxx			lamp	18
	xxxxx				xxxxx			motel	24
	xxxxx				xxxxx			chill	14
	xxxxx				xxxxx			nail	6
	xxxxx				xxxxx			magic	37
	xxxxx				xxxxx			spent	104
	xxxxx				xxxxx			feel	216
	xxxxx				xxxxx			oak	15

LIST 1

SOA 2 CONTROL 1 CT

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
	xxxxx				xxxxx			final	156
	xxxxx				xxxxx			open	319
	xxxxx				xxxxx			value	200
	xxxxx				xxxxx			junction	7
	xxxxx				xxxxx			belt	29
	xxxxx				xxxxx			tar	12
	xxxxx				xxxxx			danger	70
	xxxxx				xxxxx			bend	24
	xxxxx				xxxxx			doctor	100
	xxxxx				xxxxx			honour	66
	xxxxx				xxxxx			puddle	1
	xxxxx				xxxxx			west	235
	xxxxx				xxxxx			junior	75
	xxxxx				xxxxx			ice	45
	xxxxx				xxxxx			house	591

LIST 1

SOA 2 CONTROL 1 IT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx				xxxxx			fruit	35
	xxxxx				xxxxx			rain	70
	xxxxx				xxxxx			cubic	15
	xxxxx				xxxxx			dance	90
	xxxxx				xxxxx			gay	30
	xxxxx				xxxxx			dust	70
	xxxxx				xxxxx			palm	22
	xxxxx				xxxxx			happy	95
	xxxxx				xxxxx			fiddle	2
	xxxxx				xxxxx			offer	80
	xxxxx				xxxxx			gang	22
	xxxxx				xxxxx			ripple	5
	xxxxx				xxxxx			peck	5
	xxxxx				xxxxx			virtue	30
	xxxxx				xxxxx			warning	44

LIST 1

SOA 2 CONTROL 1 UT 1

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx				xxxxx			popular	98
	xxxxx				xxxxx			gone	195
	xxxxx				xxxxx			pretty	107
	xxxxx				xxxxx			pink	48
	xxxxx				xxxxx			rice	33
	xxxxx				xxxxx			knock	15
	xxxxx				xxxxx			cup	45
	xxxxx				xxxxx			goal	60
	xxxxx				xxxxx			angle	51
	xxxxx				xxxxx			camp	75
	xxxxx				xxxxx			purple	13
	xxxxx				xxxxx			stop	120
	xxxxx				xxxxx			sauce	20
	xxxxx				xxxxx			tough	36
	xxxxx				xxxxx			mind	325

LIST 1

SOA 2 CONTROL 1 UT 2

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
	xxxxx				xxxxx			rose	86
	xxxxx				xxxxx			red	197
	xxxxx				xxxxx			serve	107
	xxxxx				xxxxx			ride	49
	xxxxx				xxxxx			sentence	34
	xxxxx				xxxxx			bush	14
	xxxxx				xxxxx			agent	45
	xxxxx				xxxxx			budget	60
	xxxxx				xxxxx			raise	51
	xxxxx				xxxxx			knife	76
	xxxxx				xxxxx			compass	13
	xxxxx				xxxxx			ran	134
	xxxxx				xxxxx			disposal	20
	xxxxx				xxxxx			wash	37
	xxxxx				xxxxx			want	329

LIST 1

SOA 3 CONTROL 1 CT

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
	xxxxx				xxxxx			stay	113
	xxxxx				xxxxx			trend	46
	xxxxx				xxxxx			mood	37
	xxxxx				xxxxx			helium	16
	xxxxx				xxxxx			thank	36
	xxxxx				xxxxx			need	360
	xxxxx				xxxxx			crop	20
	xxxxx				xxxxx			fill	50
	xxxxx				xxxxx			grade	35
	xxxxx				xxxxx			congress	148
	xxxxx				xxxxx			text	60
	xxxxx				xxxxx			piece	129
	xxxxx				xxxxx			rule	73
	xxxxx				xxxxx			hostess	8
	xxxxx				xxxxx			sleep	65

LIST 1

SOA 3 CONTROL 1 IT

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
	xxxxx				xxxxx			born	113
	xxxxx				xxxxx			proud	50
	xxxxx				xxxxx			mess	22
	xxxxx				xxxxx			nominal	11
	xxxxx				xxxxx			tense	15
	xxxxx				xxxxx			lotion	8
	xxxxx				xxxxx			nose	60
	xxxxx				xxxxx			glad	38
	xxxxx				xxxxx			dead	174
	xxxxx				xxxxx			standard	110
	xxxxx				xxxxx			rise	102
	xxxxx				xxxxx			cripple	1
	xxxxx				xxxxx			vast	60
	xxxxx				xxxxx			point	395
	xxxxx				xxxxx			pop	8

LIST 1

SOA 3 CONTROL 1 UT 1

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx				xxxxx			wish	110
	xxxxx				xxxxx			mile	48
	xxxxx				xxxxx			scope	27
	xxxxx				xxxxx			computer	13
	xxxxx				xxxxx			hang	26
	xxxxx				xxxxx			fire	187
	xxxxx				xxxxx			raw	43
	xxxxx				xxxxx			path	44
	xxxxx				xxxxx			scene	106
	xxxxx				xxxxx			step	131
	xxxxx				xxxxx			apartment	81
	xxxxx				xxxxx			roof	59
	xxxxx				xxxxx			task	60
	xxxxx				xxxxx			leave	205
	xxxxx				xxxxx			classic	36

LIST 1

SOA 3 CONTROL 1 UT 2

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx				xxxxx			visit	109
	xxxxx				xxxxx			swing	48
	xxxxx				xxxxx			compare	28
	xxxxx				xxxxx			pint	13
	xxxxx				xxxxx			fist	26
	xxxxx				xxxxx			kept	186
	xxxxx				xxxxx			golden	42
	xxxxx				xxxxx			odd	44
	xxxxx				xxxxx			teeth	103
	xxxxx				xxxxx			charge	122
	xxxxx				xxxxx			twenty	80
	xxxxx				xxxxx			beach	61
	xxxxx				xxxxx			snow	59
	xxxxx				xxxxx			evidence	207
	xxxxx				xxxxx			bomb	36

LIST 2

SOA 1 EXPERIMENTAL CT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
HIGH	span	19	1	N-N	bridge	.363	98	river	165
LOW	median	1	1	N-N	mean	.288	199	average	130
HIGH	crouch	13	1	N-N	stand	.130	148	sit	67
LOW	storage	41	1	N-V	shed	.448	11	barn	29
LOW	football	36	1	N-V	fan	.177	18	mail	47
LOW	flowers	57	2	N-N	park	.440	94	bench	35
HIGH	speech	61	2	N-N	speaker	.349	49	lecture	16
HIGH	sorrow	9	2	N-V	tear	.447	11	cry	48
LOW	unload	7	2	N-V	dump	.200	4	truck	57
LOW	herring	2	3	N-N	sole	.308	18	filet	1
HIGH	swan	3	3	N-V	duck	.219	9	goose	4
LOW	pillar	2	4	N-N	post	.343	84	fence	30
HIGH	crow	2	4	N-V	dove	.291	4	pigeon	3
HIGH	target	45	5	N-V	bow	.277	15	archer	1
LOW	pirate	4	6	N-N	chest	.323	53	treasure	4

LIST 2

SOA 1 EXPERIMENTAL IT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
LOW	grass	53	1	N-N	pot	.454	28	pan	16
HIGH	genre	2	1	N-N	kind	.284	313	nice	75
HIGH	cash	36	1	N-N	dough	.159	13	flour	8
HIGH	human	299	1	N-V	being	.389	712	exists	59
LOW	jelly	3	1	N-V	jam	.227	6	wedge	4
LOW	crack	21	1	V-V	break	.250	88	escape	65
HIGH	girl	220	2	N-N	chick	.440	3	hen	22
LOW	kiss	17	2	N-V	smack	.417	4	slap	2
HIGH	hinder	1	2	N-V	hamper	.303	5	laundry	5
LOW	member	137	3	N-N	club	.439	145	weapon	42
LOW	juice	11	3	N-V	prune	.155	45	trim	20
HIGH	crazy	34	4	N-N	nut	.216	15	shell	22
LOW	place	571	4	N-V	set	.297	414	group	390
HIGH	tree	59	5	N-N	trunk	.250	8	luggage	10
LOW	knee	35	5	N-V	lap	.326	19	lick	3

LIST 2

SOA 1 EXPERIMENTAL UT1

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
HIGH	partition	6	1	N-N	panel	.454	31	active	88
LOW	prairie	21	1	N-N	plain	.222	48	lord	93
LOW	king	88	1	N-N	ruler	.200	3	camera	36
HIGH	licence	36	1	N-V	permit	.320	77	sum	45
HIGH	grocery	9	1	N-N	store	.282	74	vivid	25
LOW	bother	22	1	N-V	bug	.136	4	dozen	53
HIGH	wooden	50	2	N-N	beam	.395	21	toes	19
LOW	deflate	1	2	N-N	flat	.305	67	drag	15
LOW	prank	1	2	N-V	gag	.418	4	crash	20
HIGH	run	212	2	N-V	race	.247	103	troop	16
LOW	harangue	3	2	N-V	harp	.162	1	silk	12
HIGH	album	6	3	N-N	record	.200	137	widow	26
HIGH	egg	12	3	N-V	hatch	.414	5	idea	195
LOW	snip	1	4	N-V	clip	.460	6	thrill	5
HIGH	gift	33	5	N-N	present	.416	377	kettle	3

LIST 2

SOA 1 EXPERIMENTAL UT2

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	rigid	24			crowd		53	key	88
	visa	5			late		179	fell	93
	ease	42			theme		55	ratio	35
	couple	127			period		266	prime	25
	candy	16			scheme		38	rational	25
	cough	28			soft		61	hero	52
	none	108			stadium		25	crown	19
	opinion	96			ranch		27	crude	15
	dew	3			pecan		1	solve	20
	radio	120			pain		88	rail	16
	cocoa	1			bunk		18	array	11
	superb	14			tone		78	card	26
	call	188			moral		141	third	190
	curt	33			apple		9	balcony	5
	reveal	30			sat		150	groove	2

LIST 2

SOA 2 EXPERIMENTAL CT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
HIGH	wisdom	44	1	N-N	sense	.487	311	common	223
LOW	round	81	1	N-N	marble	.333	21	shoot	27
HIGH	mileage	15	1	N-N	gas	.130	3	fuel	17
LOW	slice	13	1	N-V	strip	.434	30	bacon	10
HIGH	tomb	11	1	N-V	vault	.217	2	chamber	46
HIGH	petrol	nn	2	N-N	tank	.440	12	septic	3
LOW	company	290	2	N-N	trust	.286	52	fund	62
HIGH	magazine	39	2	N-V	digest	.440	3	readers	37
LOW	fee	16	2	N-V	toll	.133	16	tax	197
LOW	haul	5	2	V-V	draw	.209	56	pull	51
HIGH	smile	58	3	N-N	charm	.375	26	poise	6
LOW	wax	14	4	N-V	seal	****	17	letter	145
LOW	discard	1	5	N-V	chuck	.314	14	throw	42
HIGH	substract	2	5	V-V	count	.203	49	add	88
HIGH	energy	100	6	N-N	force	.246	230	power	342

LIST 2

SOA 2 EXPERIMENTAL IT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
HIGH	heart	173	1	N-N	organ	.369	12	piano	38
LOW	soft	60	1	N-N	hard	.244	202	easy	125
HIGH	serious	116	1	N-N	grave	.189	33	bury	6
LOW	squeeze	11	1	N-V	press	.434	127	news	1
HIGH	corn	34	1	N-V	stalk	.295	9	pursue	20
LOW	skid	2	1	N-V	slide	.196	20	film	96
LOW	collie	2	2	N-N	afghan	.500	3	blanket	30
HIGH	sneeze	3	2	N-N	cold	.177	171	hot	130
HIGH	penniless	3	2	N-V	broke	.467	72	shatter	2
LOW	create	54	2	N-V	produce	.284	82	farm	125
HIGH	chisel	4	3	N-N	file	.225	81	clerk	34
LOW	repair	20	3	N-V	fix	.195	14	heroin	2
HIGH	chalk	3	4	N-N	board	.351	239	plank	7
LOW	drift	18	4	N-V	shift	.211	41	crew	36
LOW	crutch	1	5	N-N	limp	.488	12	flaccid	nn

LIST 2

SOA 2 EXPERIMENTAL UT1

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
LOW	currency	12	1	N-N	mint	.413	7	equal	90
HIGH	tennis	15	1	N-N	net	.222	34	simple	164
LOW	flirt	1	1	N-N	fresh	.177	82	faith	111
LOW	push	37	1	N-V	ram	.304	2	mercy	20
HIGH	injury	27	1	N-V	wound	.230	28	carbon	30
HIGH	search	66	1	V-V	frisk	.133	nn	chair	66
HIGH	jail	21	2	N-N	cell	.372	65	bride	33
LOW	vase	4	2	N-N	vessel	.333	16	expert	30
HIGH	month	130	2	N-V	march	.368	120	stem	29
LOW	book	193	2	N-V	annual	.330	1	locker	9
HIGH	auto	22	3	N-N	compact	.357	12	loom	6
LOW	beer	34	3	N-V	draft	.439	24	slow	60
LOW	concrete	48	4	N-N	base	.282	91	flare	3
HIGH	ounce	3	4	N-V	pound	.342	28	meter	6
LOW	dinner	37	5	N-V	roll	.343	35	eager	27

LIST 2

SOA 2 EXPERIMENTAL UT2

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
	gain	74			wet		53	balance	90
	ill	39			view		186	central	164
	enjoy	44			item		54	price	108
	nod	12			air		257	boss	20
	glory	21			debate		32	factory	32
	studio	31			taste		60	relief	66
	built	103			patrol		25	merit	29
	nurse	17			youth		82	jet	29
	arc	41			command		5	ear	29
	laid	77			loss		86	tunnel	10
	defeat	31			twist		18	linen	6
	pencil	34			model		77	kill	63
	gown	16			short		212	donor	5
	zest	5			trick		15	keel	6
	via	48			wife		228	shade	28

LIST 2

SOA 3 EXPERIMENTAL CT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
LOW	visual	40	1	N-N	pupil	.434	20	eye	122
HIGH	bull	14	1	N-N	calf	.273	11	cow	29
HIGH	mix	13	1	N-V	match	.488	41	pair	50
HIGH	collect	16	1	N-V	stamp	.174	8	postage	1
LOW	sofa	6	1	V-V	lie	.195	59	recline	3
HIGH	feat	6	2	N-N	deed	.440	8	act	283
LOW	stink	3	2	N-N	rank	.140	24	smell	34
LOW	gulp	2	2	N-V	swallow	.484	10	throat	51
LOW	song	70	2	N-V	refrain	.314	10	chorus	18
HIGH	judge	77	3	N-N	court	.195	230	law	299
HIGH	transport	18	3	V-V	express	.317	40	rapid	43
LOW	treble	2	4	N-N	note	.153	127	music	216
LOW	jump	24	4	V-V	bound	.342	42	leap	14
HIGH	beauty	71	5	N-N	grace	.428	40	elegant	14
HIGH	bullet	28	6	N-V	shot	.212	112	rifle	63

LIST 2

SOA 3 EXPERIMENTAL IT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
HIGH	left	480	1	N-N	right	.478	613	wrong	129
HIGH	poker	3	1	N-N	deck	.340	23	boat	72
LOW	riding	45	1	N-N	stable	.182	30	steady	41
LOW	symbol	54	1	N-V	sign	.370	94	endorse	6
LOW	fake	10	1	N-V	bluff	.257	8	cliff	11
HIGH	hit	115	1	N-V	sock	.133	4	shoe	14
LOW	insane	13	2	N-N	mad	.440	39	angry	45
HIGH	whiskey	17	2	N-N	still	.209	782	quiet	76
LOW	opener	6	2	N-V	can	.336	1772	able	216
HIGH	sift	4	2	N-V	strain	.285	31	stress	107
HIGH	goods	57	3	N-N	staple	.292	1	paper	157
LOW	mare	16	3	N-V	nag	.280	nn	pester	1
HIGH	wrinkle	2	4	N-V	iron	.500	43	steel	45
HIGH	penalty	14	5	N-N	fine	.305	161	good	807
LOW	spear	7	5	N-V	dart	.201	6	dash	11

LIST 2

SOA 3 EXPERIMENTAL UT1

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
HIGH	pasture	14	1	N-N	range	.400	160	truth	126
LOW	tale	21	1	N-N	yarn	.244	14	anger	48
HIGH	liquor	43	1	N-N	gin	.133	23	brush	44
LOW	stupid	24	1	N-V	jerk	.355	2	decimal	3
LOW	political	258	1	N-V	lobby	.244	20	maple	7
LOW	jolt	4	1	N-V	jar	.130	16	due	142
LOW	null	13	2	N-N	void	.440	10	dean	40
HIGH	meadow	17	2	N-N	field	.325	274	desk	65
HIGH	fur	13	2	N-V	pelt	.426	9	test	119
HIGH	toil	1	2	N-V	work	.186	760	north	206
LOW	spice	4	3	N-N	sage	.486	2	main	119
HIGH	solid	77	3	N-N	firm	.150	109	hospital	110
LOW	smoke	41	4	N-N	joint	.394	39	bare	29
HIGH	deny	47	4	N-V	refuse	.201	16	night	411
LOW	mister	10	5	N-V	miss	.485	258	beat	68

LIST 2

SOA 3 EXPERIMENTAL UT2

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
	lost	173			keep		264	fear	127
	sigh	11			monk		16	depth	53
	protect	34			maid		31	grant	15
	basement	31			cotton		38	thorn	3
	mike	91			gentle		27	elastic	7
	eleven	40			moss		9	deal	142
	gene	9			zero		24	gate	37
	mob	10			next		394	dream	64
	tea	28			part		500	green	116
	ward	25			thing		333	plan	204
	cabin	25			lend		14	blood	121
	tube	31			chief		119	feed	123
	bid	22			joy		40	precious	29
	noon	25			wall		160	told	413
	hire	15			wide		125	hung	65

LIST 2

SOA 1 CONTROL 2 CT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
LOW	xxxxx		1	N-N	bat	.454	18	dark	185
LOW	xxxxx		1	N-N	digit	.200	1	hand	431
HIGH	xxxxx		1	N-N	bill	.195	143	money	165
HIGH	xxxxx		1	N-V	row	.400	35	paddle	1
HIGH	xxxxx		1	N-V	lounge	.247	9	room	383
HIGH	xxxxx		2	N-N	grain	.440	27	wheat	9
HIGH	xxxxx		2	N-N	temple	.333	38	worship	36
LOW	xxxxx		2	N-V	watch	.349	81	stare	14
LOW	xxxxx		2	N-V	saw	.279	352	observe	25
HIGH	xxxxx		3	N-N	mine	.292	59	ours	27
LOW	xxxxx		3	N-V	maroon	.306	3	island	167
HIGH	xxxxx		4	N-N	port	.230	21	sailor	5
LOW	xxxxx		4	N-V	switch	.256	43	exchange	70
LOW	xxxxx		4	V-V	trace	.500	23	copy	38
LOW	xxxxx		6	N-N	vain	.176	10	futile	6

LIST 2

SOA 1 CONTROL 2 IT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
LOW	xxxxx		1	N-N	second	.457	393	minute	53
HIGH	xxxxx		1	N-N	pool	.288	111	cue	nn
HIGH	xxxxx		1	N-N	star	.130	25	actor	24
HIGH	xxxxx		1	N-V	ring	.367	47	bell	18
LOW	xxxxx		1	N-V	stall	.273	18	cattle	97
HIGH	xxxxx		1	N-V	spell	.178	19	witch	5
LOW	xxxxx		1	V-V	wear	.133	760	jacket	33
HIGH	xxxxx		2	N-N	cane	.500	12	sugar	34
LOW	xxxxx		2	N-N	bar	.150	82	drunk	37
HIGH	xxxxx		2	N-V	bowl	.465	23	pins	6
LOW	xxxxx		3	N-N	case	.400	362	crate	15
HIGH	xxxxx		3	N-V	mug	.175	1	assault	15
LOW	xxxxx		4	N-N	date	.368	103	calendar	28
LOW	xxxxx		4	N-V	fair	.454	77	just	872
LOW	xxxxx		5	N-V	grate	.280	3	grind	2

LIST 2

SOA 1 CONTROL 2 UT1

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx		1	N-N	rock	.349	25	doubt	114
	xxxxx		1	N-N	major	.340	247	land	217
	xxxxx		1	N-N	state	.159	808	hour	145
	xxxxx		1	N-V	punch	.444	5	tan	9
	xxxxx		1	N-V	relish	.217	8	south	240
	xxxxx		2	N-N	spring	.357	127	lamb	7
	xxxxx		2	N-N	crank	.305	1	golf	34
	xxxxx		2	N-V	play	.440	200	radar	23
	xxxxx		2	N-V	trade	.214	143	oath	38
	xxxxx		2	V-V	tend	.330	43	absurd	17
	xxxxx		3	N-N	kid	.256	61	mark	83
	xxxxx		3	N-V	stick	.268	39	ally	9
	xxxxx		4	N-V	fray	.189	1	luck	47
	xxxxx		5	N-N	crane	.314	5	fact	447
	xxxxx		5	N-V	block	.416	66	proverb	5

LIST 2

SOA 1   CONTROL 2   UT2

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx				terms		163	hotel	126
	xxxxx				daily		122	clear	219
	xxxxx				god		318	size	138
	xxxxx				treat		26	radius	9
	xxxxx				blond		11	close	234
	xxxxx				bay		57	ink	7
	xxxxx				tell		268	bus	34
	xxxxx				share		98	tail	24
	xxxxx				learn		84	folk	34
	xxxxx				sake		41	creator	14
	xxxxx				colour		142	lady	80
	xxxxx				mate		21	thunder	14
	xxxxx				holy		49	wagon	55
	xxxxx				yard		35	high	497
	xxxxx				bearing		25	pretense	6

LIST 2

SOA 2 CONTROL 2 CT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
HIGH	xxxxx		1	N-N	spade	.500	10	dig	10
LOW	xxxxx		1	N-N	lot	.222	127	less	438
LOW	xxxxx		1	N-N	pack	.177	25	wolf	6
HIGH	xxxxx		1	N-V	fling	.295	2	propel	4
HIGH	xxxxx		1	N-V	loaf	.233	4	bake	12
HIGH	xxxxx		1	N-V	shower	.130	15	soap	22
LOW	xxxxx		2	N-N	acid	.500	3	trip	81
HIGH	xxxxx		2	N-V	sow	.442	3	pork	10
LOW	xxxxx		2	N-V	slip	.256	19	garment	6
LOW	xxxxx		3	N-N	stern	.174	23	ship	83
HIGH	xxxxx		3	N-V	fly	.421	33	glide	2
LOW	xxxxx		4	N-N	china	.421	69	country	324
HIGH	xxxxx		4	N-V	pitch	.205	22	ball	110
LOW	xxxxx		5	N-N	smelt	.396	3	salmon	3
HIGH	xxxxx		5	N-V	drop	.242	59	down	895

LIST 2

SOA 2 CONTROL 2 IT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
LOW	xxxxx		1	N-N	bass	.386	16	fish	35
HIGH	xxxxx		1	N-N	rare	.326	47	steak	10
LOW	xxxxx		1	N-V	hail	.338	10	tribute	24
HIGH	xxxxx		1	N-V	strike	.227	50	union	182
HIGH	xxxxx		1	N-V	train	.159	16	teach	41
LOW	xxxxx		1	V-V	poach	.400	1	cook	47
LOW	xxxxx		2	N-N	tablet	.440	3	pill	15
LOW	xxxxx		2	N-N	plane	.210	114	sky	58
HIGH	xxxxx		2	N-V	tick	.441	3	flea	2
LOW	xxxxx		2	N-V	drill	.309	33	tool	40
HIGH	xxxxx		3	N-N	tip	.350	22	waiter	10
HIGH	xxxxx		3	N-V	fit	.230	3	seizure	6
HIGH	xxxxx		4	N-N	straw	.189	15	sip	2
LOW	xxxxx		4	N-V	fuse	.329	5	circuit	23
LOW	xxxxx		6	N-N	top	.281	204	bottom	88

LIST 2

SOA 2 CONTROL 2 UT1

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx		1	N-N	blunt	.403	9	aunt	22
	xxxxx		1	N-N	rash	.257	1	center	224
	xxxxx		1	N-N	page	.194	66	road	197
	xxxxx		1	N-V	sink	.435	23	jazz	99
	xxxxx		1	N-V	bark	.159	83	gear	26
	xxxxx		2	N-N	invalid	.388	7	height	35
	xxxxx		2	N-N	interest	.316	330	skin	47
	xxxxx		2	N-V	figure	.395	209	phrase	34
	xxxxx		2	N-V	strand	.204	7	scorn	4
	xxxxx		2	N-V	boil	.152	12	duty	61
	xxxxx		3	N-N	gross	.429	66	comb	61
	xxxxx		3	N-V	box	.153	70	sort	164
	xxxxx		4	N-V	chop	.351	3	ideal	61
	xxxxx		5	N-V	taper	.360	3	gossip	13
	xxxxx		5	V-V	hold	.440	169	small	542

LIST 2

SOA 2 CONTROL 2 UT2

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
	xxxxx				blade		13	jean	23
	xxxxx				concept		85	woman	224
	xxxxx				logic		17	black	203
	xxxxx				beard		26	clay	100
	xxxxx				tide		10	mount	26
	xxxxx				dwell		8	myth	35
	xxxxx				monitor		3	author	46
	xxxxx				leg		58	crime	34
	xxxxx				halt		10	rye	4
	xxxxx				prize		28	shore	61
	xxxxx				sand		28	monster	6
	xxxxx				patent		135	son	166
	xxxxx				canvas		19	baby	62
	xxxxx				raft		4	patch	13
	xxxxx				chance		131	course	465

LIST 2

SOA 3 CONTROL 2 CT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
HIGH	xxxxx		1	N-N	pitcher	.466	21	glass	99
LOW	xxxxx		1	N-N	sling	.244	1	broken	63
LOW	xxxxx		1	N-N	stage	.136	174	coach	24
HIGH	xxxxx		1	N-V	steer	.434	9	beef	32
HIGH	xxxxx		1	N-V	type	.260	200	writer	73
HIGH	xxxxx		2	N-N	pipe	.440	20	water	442
HIGH	xxxxx		2	N-N	toast	.201	19	snack	6
LOW	xxxxx		2	N-V	perch	.418	1	lake	54
LOW	xxxxx		2	N-V	check	.285	88	correct	52
HIGH	xxxxx		2	N-V	bear	.164	57	woods	25
LOW	xxxxx		3	N-N	cape	.266	20	coat	43
LOW	xxxxx		3	N-V	wake	.187	23	wave	46
LOW	xxxxx		4	N-V	lead	.466	129	direct	129
HIGH	xxxxx		5	N-N	light	.486	333	socket	3
HIGH	xxxxx		5	N-V	foil	.177	20	tin	12

LIST 2

SOA 3 CONTROL 2 IT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
LOW	xxxxx		1	N-N	well	.435	897	oil	93
HIGH	xxxxx		1	N-N	screen	.260	48	movie	29
HIGH	xxxxx		1	N-V	mold	.315	45	jello	3
LOW	xxxxx		1	N-V	quiver	.282	9	shake	17
LOW	xxxxx		1	V-V	tag	.217	5	label	19
HIGH	xxxxx		2	N-N	colon	.440	nn	comma	2
LOW	xxxxx		2	N-N	pat	.325	35	touch	87
HIGH	xxxxx		2	N-V	tap	.375	18	faucet	1
LOW	xxxxx		2	N-V	peer	.287	8	friend	133
HIGH	xxxxx		3	N-N	root	.220	30	source	94
LOW	xxxxx		3	N-V	console	.436	6	comfort	43
LOW	xxxxx		4	N-N	squash	.239	2	turnip	1
HIGH	xxxxx		4	N-V	ground	.195	186	coffee	78
HIGH	xxxxx		5	N-N	litter	.257	3	kitten	5
LOW	xxxxx		5	N-V	lash	.322	6	brow	6

LIST 2

SOA 3 CONTROL 2 UT1

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx		1	N-N	quack	.400	9	worth	94
	xxxxx		1	N-N	will	.301	2244	salt	46
	xxxxx		1	N-N	novel	.186	59	curb	13
	xxxxx		1	N-V	change	.457	240	fog	25
	xxxxx		1	N-V	might	.192	672	fiction	46
	xxxxx		1	N-V	fleet	.133	17	policy	222
	xxxxx		2	N-N	orderly	.440	20	shut	46
	xxxxx		2	N-N	staff	.244	113	chin	27
	xxxxx		2	N-V	lean	.488	20	civil	91
	xxxxx		2	N-V	tire	.166	22	garden	60
	xxxxx		3	N-N	mole	.488	4	pace	43
	xxxxx		4	N-N	cap	.297	6	noble	23
	xxxxx		4	N-V	dry	.291	68	lack	110
	xxxxx		5	V-V	bolt	.200	10	genesis	4
	xxxxx		6	N-V	slug	.375	10	salad	9

LIST 2

SOA 3 CONTROL 2 UT2

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx				whole		309	marriage	95
	xxxxx				own		772	bond	46
	xxxxx				paid		145	cake	13
	xxxxx				aid		130	disk	25
	xxxxx				table		198	native	46
	xxxxx				elbow		10	front	221
	xxxxx				angel		18	curve	45
	xxxxx				inch		40	horizon	27
	xxxxx				tour		43	jack	92
	xxxxx				honey		25	circle	60
	xxxxx				knot		8	dirt	43
	xxxxx				seek		69	lock	23
	xxxxx				pale		58	nun	108
	xxxxx				style		98	flint	4
	xxxxx				shelf		12	seam	9

LIST 2

SOA 1 CONTROL 1 CT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx				xxxxx			dead	174
	xxxxx				xxxxx			final	156
	xxxxx				xxxxx			stay	113
	xxxxx				xxxxx			bend	24
	xxxxx				xxxxx			gay	30
	xxxxx				xxxxx			minister	61
	xxxxx				xxxxx			tough	36
	xxxxx				xxxxx			palm	72
	xxxxx				xxxxx			classic	36
	xxxxx				xxxxx			nail	6
	xxxxx				xxxxx			peck	5
	xxxxx				xxxxx			task	60
	xxxxx				xxxxx			puddle	1
	xxxxx				xxxxx			lotion	8
	xxxxx				xxxxx			virtue	30

LIST 2

SOA 1 CONTROL 1 IT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx				xxxxx			thank	36
	xxxxx				xxxxx			core	37
	xxxxx				xxxxx			chill	14
	xxxxx				xxxxx			wash	37
	xxxxx				xxxxx			angle	51
	xxxxx				xxxxx			bomb	36
	xxxxx				xxxxx			scope	27
	xxxxx				xxxxx			source	20
	xxxxx				xxxxx			pause	21
	xxxxx				xxxxx			crop	20
	xxxxx				xxxxx			hostess	8
	xxxxx				xxxxx			brick	18
	xxxxx				xxxxx			fire	187
	xxxxx				xxxxx			house	591
	xxxxx				xxxxx			fiddle	2

LIST 2

SOA 1 CONTROL 1 UT1

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx				xxxxx			serve	107
	xxxxx				xxxxx			rose	86
	xxxxx				xxxxx			goal	60
	xxxxx				xxxxx			hang	26
	xxxxx				xxxxx			mood	37
	xxxxx				xxxxx			snow	59
	xxxxx				xxxxx			compare	28
	xxxxx				xxxxx			attic	16
	xxxxx				xxxxx			fist	26
	xxxxx				xxxxx			cubic	15
	xxxxx				xxxxx			junction	7
	xxxxx				xxxxx			fruit	35
	xxxxx				xxxxx			dance	9
	xxxxx				xxxxx			feel	216
	xxxxx				xxxxx			tar	12

LIST 2

SOA 1 CONTROL 1 UT2

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx				xxxxx			born	13
	xxxxx				xxxxx			offer	80
	xxxxx				xxxxx			site	64
	xxxxx				xxxxx			belt	29
	xxxxx				xxxxx			focus	40
	xxxxx				xxxxx			raise	51
	xxxxx				xxxxx			glad	38
	xxxxx				xxxxx			helium	16
	xxxxx				xxxxx			motel	24
	xxxxx				xxxxx			prose	14
	xxxxx				xxxxx			boycott	8
	xxxxx				xxxxx			grade	35
	xxxxx				xxxxx			doctor	100
	xxxxx				xxxxx			voice	226
	xxxxx				xxxxx			computer	13

LIST 2

SOA 2 CONTROL 1 CT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx				xxxxx			rest	163
	xxxxx				xxxxx			point	395
	xxxxx				xxxxx			gone	195
	xxxxx				xxxxx			probe	6
	xxxxx				xxxxx			victim	27
	xxxxx				xxxxx			rope	15
	xxxxx				xxxxx			dust	70
	xxxxx				xxxxx			nest	20
	xxxxx				xxxxx			spent	104
	xxxxx				xxxxx			beach	61
	xxxxx				xxxxx			blouse	1
	xxxxx				xxxxx			evidence	207
	xxxxx				xxxxx			knife	76
	xxxxx				xxxxx			pink	48
	xxxxx				xxxxx			public	438

LIST 2

SOA 2 CONTROL 1 IT

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
	xxxxx				xxxxx			senior	34
	xxxxx				xxxxx			rule	73
	xxxxx				xxxxx			jam	16
	xxxxx				xxxxx			meant	100
	xxxxx				xxxxx			trail	31
	xxxxx				xxxxx			danger	70
	xxxxx				xxxxx			clothing	20
	xxxxx				xxxxx			standard	110
	xxxxx				xxxxx			nylon	1
	xxxxx				xxxxx			carry	88
	xxxxx				xxxxx			mass	22
	xxxxx				xxxxx			pop	8
	xxxxx				xxxxx			sew	6
	xxxxx				xxxxx			cure	28
	xxxxx				xxxxx			odd	44

LIST 2

SOA 2 CONTROL 1 UT1

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
	xxxxx				xxxxx			wish	110
	xxxxx				xxxxx			value	200
	xxxxx				xxxxx			visit	109
	xxxxx				xxxxx			ice	45
	xxxxx				xxxxx			sentence	34
	xxxxx				xxxxx			tense	15
	xxxxx				xxxxx			fill	50
	xxxxx				xxxxx			cool	62
	xxxxx				xxxxx			chain	50
	xxxxx				xxxxx			camp	75
	xxxxx				xxxxx			nominal	11
	xxxxx				xxxxx			charge	122
	xxxxx				xxxxx			interval	18
	xxxxx				xxxxx			mayor	38
	xxxxx				xxxxx			mind	325

LIST 2

SOA 2 CONTROL 1 UT2

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx				xxxxx			cover	88
	xxxxx				xxxxx			leave	205
	xxxxx				xxxxx			unit	103
	xxxxx				xxxxx			swing	48
	xxxxx				xxxxx			rice	33
	xxxxx				xxxxx			pint	13
	xxxxx				xxxxx			agent	45
	xxxxx				xxxxx			text	60
	xxxxx				xxxxx			rural	54
	xxxxx				xxxxx			junior	75
	xxxxx				xxxxx			compass	13
	xxxxx				xxxxx			congress	148
	xxxxx				xxxxx			disposal	20
	xxxxx				xxxxx			sympathy	36
	xxxxx				xxxxx			need	360

LIST 2

SOA 3 CONTROL 1 CT

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx				xxxxx			quality	114
	xxxxx				xxxxx			path	44
	xxxxx				xxxxx			sacred	38
	xxxxx				xxxxx			lamp	18
	xxxxx				xxxxx			shadow	36
	xxxxx				xxxxx			want	329
	xxxxx				xxxxx			cycle	24
	xxxxx				xxxxx			cup	45
	xxxxx				xxxxx			magic	37
	xxxxx				xxxxx			ran	134
	xxxxx				xxxxx			budget	60
	xxxxx				xxxxx			step	131
	xxxxx				xxxxx			rain	70
	xxxxx				xxxxx			comic	9
	xxxxx				xxxxx			nose	60

LIST 2

SOA 3 CONTROL 1 IT

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
	xxxxx				xxxxx			deep	109
	xxxxx				xxxxx			mile	48
	xxxxx				xxxxx			gang	22
	xxxxx				xxxxx			purple	13
	xxxxx				xxxxx			knock	15
	xxxxx				xxxxx			fold	7
	xxxxx				xxxxx			sleep	65
	xxxxx				xxxxx			knee	35
	xxxxx				xxxxx			powder	173
	xxxxx				xxxxx			happy	95
	xxxxx				xxxxx			kept	186
	xxxxx				xxxxx			cripple	1
	xxxxx				xxxxx			roof	59
	xxxxx				xxxxx			open	319
	xxxxx				xxxxx			ripple	5

LIST 2

SOA 3 CONTROL 1 UT1

Direction of Dominance	PRIME I Item	PRIME I f	PRIME II Total Dominance	PRIME II Word Class	PRIME II Item	PRIME II Dominance Ratio	PRIME II f	TARGET Item	TARGET f
	xxxxx				xxxxx			popular	98
	xxxxx				xxxxx			proud	50
	xxxxx				xxxxx			suite	27
	xxxxx				xxxxx			oak	15
	xxxxx				xxxxx			shirt	27
	xxxxx				xxxxx			rate	209
	xxxxx				xxxxx			golden	42
	xxxxx				xxxxx			trend	46
	xxxxx				xxxxx			teeth	103
	xxxxx				xxxxx			piece	129
	xxxxx				xxxxx			twenty	80
	xxxxx				xxxxx			vast	60
	xxxxx				xxxxx			safe	58
	xxxxx				xxxxx			red	197
	xxxxx				xxxxx			slave	30

LIST 2

SOA 3 CONTROL 1 UT2

Direction of Dominance	PRIME I		PRIME II					TARGET	
	Item	f	Total Dominance	Word Class	Item	Dominance Ratio	f	Item	f
	xxxxx				xxxxx			pretty	107
	xxxxx				xxxxx			ride	49
	xxxxx				xxxxx			cloud	28
	xxxxx				xxxxx			bush	14
	xxxxx				xxxxx			barrel	24
	xxxxx				xxxxx			rise	102
	xxxxx				xxxxx			raw	43
	xxxxx				xxxxx			warning	44
	xxxxx				xxxxx			scene	106
	xxxxx				xxxxx			stop	120
	xxxxx				xxxxx			apartment	81
	xxxxx				xxxxx			honour	66
	xxxxx				xxxxx			percent	53
	xxxxx				xxxxx			west	235
	xxxxx				xxxxx			axis	38

APPENDIX C

Strategy Instructions

Strategy Instructions

Active Group

In this experiment we are interested in how people process common words. The task that I will describe to you will help us understand some aspects of this processing.

Before continuing, however, ensure that you are seated comfortably in front of the video screen with the microphone in position close to your chin, and that the word presently on the screen is clear and can be easily read.

The task that you will be required to perform is as follows. A sequence of stimuli will be presented on the video screen. First, two "bar markers" will appear at the centre of the screen, indicating the beginning of a trial (Demonstration). After two seconds the bar markers will be replaced by a single "cross" or fixation point (Demonstration). Fix your eyes on this point, for it will only appear for 1/2 second, and then will be followed immediately by three stimuli in rapid succession at the same location as the fixation point. The first two of these stimuli will be either both common words, both strings of X's (XXXXX), or one of each. The third stimulus will always be a common word which will be called the "target" word. Your task is simply to read aloud this final target word as rapidly and clearly as possible into the microphone. After you read the word, the printer will automatically record your reaction time.

As already mentioned, the first two stimuli will sometimes be words and sometimes X's. You will notice that when one or both of these two stimuli are words, they will sometimes be related in meaning to the target word that you are required to read aloud. This is important because you can actually improve your performance on the target word (that is, the speed that you can read it) if it is related to one or both of the first two stimuli. Therefore, to improve your performance on the task, attend closely to the words preceding the target word.

Some examples of these sequences will now be demonstrated so that you understand what will be presented, and then you will have an opportunity to practice with a succession of these trials until you feel confident of the task (Demonstration of sequence and administration of a proportion of the practice trials).

Now you will be presented with three groups of regular trials. Each group will continue uninterrupted for about 18 minutes and will be followed by a short break. If you wish to terminate the sequence of trials, please indicate to me immediately.

One final comment: When you are pronouncing the words, avoid hesitations that begin with "ahh" or similar noises. These may be registered as errors, so try and read the words accurately without sacrificing your speed of pronounciation.

Are there any further questions before we begin the regular trials? If not, I will give you the signal as to when we are about to begin.

Passive Group

In this experiment we are interested in how people process common words. The task that I will describe to you will help us understand some aspects of this processing.

Before continuing, however, ensure that you are seated comfortably in front of the video screen with the microphone in position close to your chin, and that the word presently on the screen is clear and can be easily read.

The task that you will be required to perform is as follows. A sequence of stimuli will be presented on the video screen. First, two "bar markers" will appear at the centre of the screen, indicating the beginning of a trial (Demonstration). After two seconds the bar markers will be replaced by a single "cross" or fixation point (Demonstration). Fix your eyes on this point, for it will only appear for 1/2 second, and then will be followed immediately by three stimuli in rapid succession at the same location as the fixation point. The first two of these stimuli will be either common words, strings of X's (XXXXX), or one of each. The third stimulus will always be a common word which will be called the "target" word. Your task is simply to read aloud this final target word as rapidly and clearly as possible into the microphone. After you read the word, the printer will automatically record your reaction time.

You may treat the first two stimuli as warning signals for the target word, but since your task does not otherwise involve these two stimuli, concentrate on reading the target word rapidly and accurately.

Some examples of these sequences will now be demonstrated so that you understand what will be presented, and then you will have an opportunity to practice with a succession of these trials until you feel confident of the task (Demonstration of sequence and administration of a proportion of the practice trials).

Now you will be presented with three groups of regular trials. Each group will continue uninterrupted for about 18 minutes and will be followed by a short break. If you wish to terminate the sequence of trials, please indicate to me immediately.

One final comment: When you are pronouncing the words, avoid hesitations that begin with "ahh" or similar noises. These may be registered as errors, so try and read the words accurately without sacrificing your speed of pronounciation.

Are there any further questions before we begin the regular trials? If not, I will give you the signal as to when we are about to begin.

APPENDIX D

Analysis of Variance

Median Reaction Times

Experiment 1

EXPERIMENT 1: CELL MEANS FOR MEDIAN RT ANALYSIS

WITHIN Ss CONDITIONS			BETWEEN Ss CONDITIONS				
			PASSIVE GROUP		ACTIVE GROUP		
SOA	PC*	TR*	LIST 1	LIST 2	LIST 1	LIST 2	MARG-INAL
		CT	587.33	546.00	534.00	576.16	560.87
	E	IT	605.50	541.33	554.50	571.16	568.12
		UT1	603.66	545.33	546.66	587.66	570.83
		UT2	606.50	536.83	532.33	599.83	568.87
		CT	604.66	532.50	543.50	575.83	564.12
100	C2	IT	622.16	546.33	547.50	581.50	574.37
		UT1	627.66	554.50	550.00	596.33	582.12
		UT2	606.16	543.50	557.50	595.83	575.75
		CT	569.66	525.50	530.83	563.00	547.25
	C1	IT	587.00	532.00	523.00	567.66	552.41
		UT1	573.00	538.66	525.50	576.00	553.29
		UT2	586.83	547.50	519.33	571.33	556.25
		CT	587.33	524.16	531.83	526.16	542.37
	E	IT	583.83	522.83	525.50	539.33	542.87
		UT1	596.00	536.83	539.33	565.16	559.33
		UT2	594.66	520.50	533.50	562.83	552.87
		CT	594.16	518.83	530.66	545.16	547.20
200	C2	IT	607.66	518.66	543.00	563.33	558.16
		UT1	607.00	536.66	527.50	563.16	558.58
		UT2	602.00	520.66	532.33	552.66	551.91
		CT	579.33	508.83	526.50	533.83	537.12
	C1	IT	575.83	516.66	506.16	529.33	532.00
		UT1	573.16	522.33	512.50	533.16	535.29
		UT2	593.16	524.83	524.66	540.50	545.79
		CT	532.00	466.66	494.00	497.16	497.45
	E	IT	542.16	486.83	506.83	518.83	513.66
		UT1	557.50	484.33	506.50	514.83	515.79
		UT2	538.50	485.33	487.16	509.83	505.20
		CT	542.66	486.00	507.83	501.16	509.41
500	C2	IT	557.50	486.16	504.83	524.16	518.16
		UT1	545.66	496.50	502.00	512.83	514.25
		UT2	554.50	488.16	502.16	510.50	513.83
		CT	543.66	473.50	499.50	508.00	506.16
	C1	IT	536.66	463.83	507.83	520.33	507.16
		UT1	547.33	477.66	489.16	524.16	509.58
		UT2	549.33	472.33	483.55	512.00	504.29

* PC = PRIME CONDITION TR = TARGET RELATION

ANALYSIS OF VARIANCE

EXPERIMENT I MEDIAN REACTION TIMES

SOURCE	SS	df	MS	F
STRATEGY GROUP(G)	33053.62	1	33053.62	.37
LIST(L)	82994.24	1	82994.24	.93
G X L	419761.50	1	419761.50	4.69*
ERROR	1791139.55	20	89556.97	
SOA(S)	453513.79	2	226756.89	43.07**
S X G	6476.55	2	3238.27	.62
S X L	14501.97	2	7250.98	1.38
S X G X L	3796.09	2	1898.04	.36
ERROR	210586.19	40	5264.65	
PRIME CONDITION(P)	33455.83	2	16727.91	30.61**
P X G	218.33	2	109.16	.20
P X L	2252.64	2	1126.32	2.06
P X G X L	699.38	2	349.69	.64
ERROR	21859.41	40	546.48	
S X P	6895.82	4	1723.95	5.69**
S X P X G	1277.43	4	319.35	1.05
S X P X L	1785.85	4	446.46	1.47
S X P X G X L	4639.02	4	1159.75	3.83**
ERROR	24255.41	80	303.19	
TARGET RELATION(T)	10820.12	3	3606.70	9.28**
T X G	413.50	3	137.83	.35

SOURCE	SS	df	MS	F
T X L	3143.37	3	1047.79	2.69
T X G X L	3071.26	3	1023.75	2.63
ERROR	23330.33	60	388.83	
S X T	2606.59	6	434.43	1.32
S X T X G	2662.83	6	443.80	1.35
S X T X L	2102.65	6	350.44	1.07
S X T X G X L	126.83	6	21.13	.06
ERROR	39364.47	120	328.03	
P X T	4277.21	6	712.86	2.16
P X T X G	2529.33	6	421.55	1.28
P X T X L	1319.54	6	219.92	.67
P X T X G X L	2137.26	6	356.21	1.08
ERROR	39603.69	120	330.03	
S X P X T	4518.06	12	376.50	1.16
S X P X T X G	3661.28	12	305.10	.94
S X P X T X L	2419.46	12	201.62	.62
S X P X T X G X L	3010.04	12	250.83	.77
ERROR	78129.58	240	325.32	

*$p < .05$
**$p < .01$

Tail Probabilities of Symmetry Tests

Error term 2: $p > .80$
3: $p < .05$
4: $p > .60$
5: $p > .40$
6: $p < .05$
7: $p > .10$
8: $p > .07$