Illusions of Familiarity

Bruce W. A. Whittlesea

Feelings of familiarity are not direct products of memory. Although prior experience of a stimulus can produce a feeling of familiarity, that feeling can also be aroused in the absence of prior experience if perceptual processing of the stimulus is fluent (e.g., Whittlesea, Jacoby, & Girard, 1990). This suggests that feelings of familiarity arise through an unconscious inference about the source of processing fluency. The present experiments extend that conclusion. First, they show that a wide variety of feelings about the past are controlled by a fluency heuristic, including feelings about the meaning, pleasantness, duration, and recency of past events. Second, they demonstrate that the attribution process does not rely only on perceptual fluency, but can be influenced even more by the fluency of conceptual processing. Third, they show that although the fluency heuristic itself is simple, people’s use of it is highly sophisticated and makes them robustly sensitive to the actual historical status of current events.

A feeling of familiarity is the sine qua non of remembering. Judgments about one’s personal past that are not accompanied by a feeling of familiarity do not feel like remembering, but instead feel like guessing or problem solving. In contrast, a feeling of familiarity is usually sufficient to make one feel one is remembering, whether or not the feeling is accompanied by recall of the detail of a prior experience.

The experience of familiarity has a primitive and immediate quality, as though it were simply the reflection in consciousness of mental representations of prior events resonating to a reoccurrence of those events. This intuition suggests that the relationship between memory and feelings of familiarity is direct: That the feeling is the immediate consequence of, or even the perception of, the engagement of memory traces by a stimulus, and that the possession and activation of a memory trace related to a stimulus is a precondition for a feeling of familiarity about the stimulus.

Recent work, primarily by Jacoby and his associates (see Jacoby, Kelley, & Dywan, 1989, for a review), has shown that a feeling of familiarity is not a direct consequence of having or using a memory trace, but instead may be mediated by an unconscious attributional process. The idea is that people rely on the fluency of processing an event as a heuristic in making judgments about their prior experience of that event. Performance is enhanced when a stimulus matches representations of prior experience; people perceive the relative fluency of their performance as they perceive objects and events in the world. Like the perception of any stimulus quality, the fluency of performance is interpreted within its context and attributed to some source. When this unconscious attribution is to a source in the past, one experiences a feeling of familiarity, just as, when interpreting convergence of lines toward the horizon, one experiences a sense of depth.

Interpreting fluent performance as an effect of prior experience is a practical heuristic, because one of the primary effects of experiencing an object is to facilitate later interactions with the object. However, use of this heuristic leaves one open to the possibility of illusions of familiarity. Just as painter’s cues lead to an illusion of depth in a two-dimensional representation, fluent performance caused by some factor other than past experience can lead to a false sense of familiarity. Such illusions of familiarity are probably fairly uncommon in the ordinary course of events, but their occurrence, like the illusory perception of depth, provides valuable evidence about the ordinary source of feelings of familiarity.

Attributions of Perceptual Fluency to Past and Present

Investigation of the attributive basis of familiarity initially focused on perception as a source of performance variations that could be differentially attributed. Jacoby and Dallas (1981) observed that words read during study were identified more readily in test than were “new” words, and suggested that the fluency of perceiving “old” words at test could serve as the basis for feelings of familiarity, and hence as the basis of recognition judgments. Numerous subsequent studies have provided further evidence of a correlation between the fluency of perception and the use of familiarity in performing recognition judgments (e.g., Jacoby & Witherspoon, 1982; Johnston, Dark, & Jacoby, 1985; Kelley, Jacoby, & Hollingshead, 1989). More recently, direct experimental evidence has also become available. Whittlesea, Jacoby, and Girard (1990) manipulated the fluency of perceiving target words independent of their prior presentation by masking target words at test with greater or lesser amounts of visual noise. They demonstrated that words made relatively easy to
perceive were more likely to be judged repeated, even when
they had not been presented previously. This illusion of fa-
miliarity demonstrates that feelings of familiarity can be the
product of an unconscious attributional process and can re-
sult from making heuristic use of the fluency of perception.

The relationship between perceptual fluency and famil-
riety is complicated by the fact that fluency of performance
can result from, and can sensibly be attributed to, sources in
either the past or the present. Just as prior experience of an
object facilitates current processing, so do many factors in
the present, including visual clarity, absence of distraction,
and coherent organization of the stimuli. Thus, normatively,
the fluency of processing is at best an ambiguous indicator
of the source of current performance. In consequence, use of
the "fluency heuristic" can result in erroneous attributions of
an influence of present factors to an influence of the past, or
of past influence to present factors. In parallel to the illusory
familiarity felt when the fluency of present perception is
artificially enhanced, illusions about factors in the present
can be induced when prior experience is manipulated. For
example, prior experience of stimuli can increase subjects' belief
that they comprehend a text passage, without increasing
comprehension (Carroll & Masson, 1992); lengthen the
judged duration of presented items (Witherspoon & Allan,
1985); reduce the apparent loudness of a background noise
(Jacoby, Allan, Collins, & Larwill, 1988); increase belief in
the truth of a statement (Begg & Armour, 1991; Hasher,
Goldstein, & Toppino, 1977); increase the apparent visual
clarity of a stimulus (Whittlesea et al., 1990); lead to judg-
ments of brightness or darkness, independent of stimulus
intensity (Mandler, Nakamura, & Van Zandt, 1987); influ-
cence feelings about the pleasantness of stimuli (Zajonc,
1980); lead to errors in the prediction of the performance of
others (Jacoby & Kelley, 1987); and make nonfamous names
seem famous (Jacoby, Woloshyn, & Kelley, 1989). All of
these effects demonstrate illusions based on misattributing
fluency processing to a cause in the present rather than to the
actual influence of past experience.

Thus a major problem is to determine under what circum-
stances fluent processing will be attributed to the past, and
cause feelings of familiarity, or will alternatively be attribut-
ted to characteristics of present circumstances, and cause
feelings of present clarity, duration, brightness, and so forth.
Part of the answer, at least, appears to be that whether current
fluency is attributed to causes in the past or the present de-
PENDS on the subject's awareness of the actual source of flu-
cy. For example, Jacoby and Whitehouse (1989) found that
showing a word too briefly for conscious perception imme-
 diately prior to its presentation for a recognition jur-
gment, based on consideration of whatever potential sources of
fluency are known or currently attended. However, a great
many questions about this process remain unanswered.

First, direct experimental investigations of the attributional
basis of familiarity have so far been limited to the effects of
variations in the fluency of perceptual processing. However,
not all stimulus processing is perceptual. Numerous studies
have demonstrated that variation in conceptual processing
can be particularly important in determining the success of
er later recognition (e.g., Jacoby, 1983; Roediger, Weldon, &
Challis, 1989). Experiments 1–4 investigate the relative ef-
effects of variations in conceptual and perceptual processing
on illusions of familiarity.

Second, the attribution of fluency has only been studied
with respect to feelings of specific familiarity—feelings of
having encountered exactly that object before—in judgments
of exact repetition. Experiments 1, 2, and 4 also investigate
the source of feelings that the meanings of events, rather than
the events themselves, are familiar, in judgments of the se-
manic relatedness between current and prior events. Ex-
periment 5 investigates the "mere exposure" effect, exam-
in the source of feelings about the pleasantness of events
and the relationship between those feelings and feelings of
repetition.

Feelings about present sources of experience are not lim-
ited to a single sensation of "presentness," and feelings about
past sources are similarly not limited to the simple feeling of
familiarity. However, as indicated by the research cited ear-
lier, the various feelings that people have about the present
experience of stimuli are all subject to attributional biases.
Thus a third issue is whether feelings about the past that are
more discriminating than the simple feeling of repetition
from past to present are also the result of a heuristic process.
Experiments 6 and 7 investigate the source of feelings about

A related factor influencing whether current perceptual
fluency is attributed to the present or the past appears to be
whether the subject is focused on the past or present as a
potential source of effects of current performance when en-
countering the stimuli. Whittlesea et al. (1990) demonstrated
symmetrical illusions of familiarity and present clarity, based
on manipulation of current processing fluency by both prior
exposure and current clarity of the stimulus. Subjects know-
ing that stimuli could be repeated, but not realizing that the
clarity of the stimulus was manipulated at test, felt increased
familiarity when the stimulus was clearly presented. In con-
trast, other subjects knowing that the stimuli varied in clarity
at time of test, but not realizing that the stimuli could be
repeated, experienced the opposite illusion from the same
manipulations and felt that repeated stimuli were physically
clearer.

Current Questions

It has become clear that feelings of familiarity can be the
product of an unconscious attributional process; that such
feelings are only a special case of a more general heuristic
approach to making decisions about the nature of our ex-
perience; and that the process consists of making an inter-
pretation of the likely causes of current fluency of process-
ing, based on consideration of whatever potential sources of
fluency are known or currently attended. However, a great
many questions about this process remain unanswered.
the duration of events in the past and feelings of recency in the past.

All of the experiments in this article attempt to induce some illusion of familiarity, on the basis of some manipulation of processing fluency and in the context of some question about the past. To assist the reader in making comparisons among the conditions, the major results of all experiments are summarized in Table 1. All of the experiments use variations on the procedure used by Whittlesea et al. (1990, Experiment 1) and extend and modify the conclusions reported in that article. For that reason, the procedures of that research are summarized here as the General Method. Departures from that method are reported with each experiment. The major conclusions of that research, which are critical for evaluating the present experiments, are also summarized briefly.

General Method

Whittlesea et al. (1990, Experiment 1) showed subjects lists of briefly presented words, followed by a target word. Subjects were to pronounce the target word and then judge whether that word had been shown during the list, responding "yes" only if they were certain. The stimuli consisted of 975 of the highest frequency four-letter words from the Thorndike and Lorge (1944) count and were presented in uppercase in all conditions. All word displays were 4 cm wide and 0.5 cm high.

The experiment was conducted on an Apple Ile computer. The stimuli consisted of 975 of the highest frequency four-letter words from the Thorndike and Lorge (1944) count and were presented in uppercase in all conditions. All word displays were 4 cm wide and 0.5 cm high.

On every trial, a series of seven words was presented in rapid succession, followed by an eighth word that was presented as a recognition test item. Subjects were instructed to scan the list, then pronounce the eighth word, and then judge whether that word had been shown during the list, responding "yes" only if they were certain.

On any trial, on a keypress by the subject, a fixation stimulus (++++) was displayed for 320 ms in the center of the monitor, after which the screen briefly went blank (160 ms). The series of seven words was then presented, each word for 67 ms, and each in the same location as the last. Following the seventh word, the screen remained blank for 100 ms, and then the recognition test word was presented, again in the

Procedure

Table 1

<table>
<thead>
<tr>
<th>Experimental Conditions and Results for All Experiments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exp.</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>WJG</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
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<tr>
<td>3</td>
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<td>6</td>
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<tr>
<td>7</td>
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</tbody>
</table>

Note. Exp. = experiment. All experiments required subjects to pronounce test items on each trial prior to any other judgment.

The illusions reported are the effects of the covert manipulation when the property to be judged was absent. Refers to results obtained by Whittlesea, Jacoby, and Girard (1990, Experiment 1). Pleasantness was judged but not manipulated. The discrimination of pleasantness was calculated as the difference in probability of claiming repeated and nonrepeated items to be pleasant. See text for the calculation of the discrimination and illusion in this case.

Table 2

<table>
<thead>
<tr>
<th>Results From Whittlesea et al. (1990, Experiment 1): Pronunciation Latencies (in Milliseconds) and Probabilities of Judging Test Items to be Repeated, as a Function of Level of Masking and Actual Repetition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mask</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>20%</td>
</tr>
<tr>
<td>40%</td>
</tr>
</tbody>
</table>

center of the screen. The test word was presented within a rectangular mask of dynamic visual noise, 7.5 cm wide and 1 cm high. The density of this mask (the absolute percentage of dots turned on at any time) could be manipulated and could thus be used to manipulate the perceptual clarity of the test word.

The test word and its mask remained on the screen only until the onset of pronunciation. Naming latency was computed using a voice key. Immediately after pronunciation, the question “Did you see that word in the list?” appeared on the screen. Subjects responded by striking a “yes” or “no” key. The total time from the first presentation of a list item until the recognition decision, including the subject’s latency of pronouncing the test word, was about 1 s.

On half the trials, the test word was a repetition of a word in the list. Words to be repeated as the test stimulus were presented with equal frequency in the second to the sixth position of the list, but never in the first or last position. Subject to those conditions, the list position in which a target word was presented was randomized across trials. In consequence, words to be repeated as targets were pre- and post-masked by at least one word, and the subject would not know which position in the list to concentrate on. Neither test words nor words in the list were repeated between trials.

Crossed with the repetition factor, the dynamic mask covering the eighth word was light on half the trials (20% of the rectangle occluded by dots) and heavy on the remainder (40% occlusion). Subjects were informed that the probability that a target word was repeated was 50%, but were not informed that the dynamic mask would change. Each of the four combinations of repeated/unrepeated test word and light/heavy noise was presented on 30 trials, randomly intermixed. The order of trials, and the assignment of words to conditions, was randomized for each subject.

Before the experimental trials, subjects received 10 practice trials involving words not used in the succeeding 120 trials. During these trials, dynamic noise on the test word was held constant at 20%, although the repetition status of the test word was manipulated.

Following the experimental trials, subjects were interviewed to investigate their perceptions of how they had performed the task of identifying repetitions, and, more critically, to determine whether they were aware of the manipulation of the level of dynamic noise on the test word. A series of questions of graded directness was asked, from questions like “How did you decide whether an item was repeated?” through “Was it more difficult to report some words than others? (If so: On what proportion of trials was it difficult? What caused it? Did it influence your decision?)” and “Did it seem as if the amount of dots on the test word was changing from trial to trial?” and finally “We were actually changing the amount of dots on the test word from trial to trial. Do you think that affected your performance?” Additional questions were asked at each level until it was clear what the subject thought about his or her performance. Subjects who in any way indicated that they had been aware that the mask varied in density or who indicated that they had based their decisions on anything but feelings of remembering were excluded from the main analysis.

Median latencies for pronouncing test words and probabilities of responding yes when asked if the test word was repeated were computed for each condition within subjects and analyzed by means of analysis of variance (ANOVA).

Rationale

There were three basic strategies that subjects could use to judge whether the target word was a repetition of a word in the preceding list. One was to code as many list words as possible, rehearse them until the test item occurred, and then compare the target word to the rehearsed words. A second strategy was to watch all the items and then use the target word as a cue for recalling or reconstructing the prior occurrence of a semantically related word. This strategy is similar to one basis of recognition outlined by Mandler (1980, 1989), namely recognition by retrieval of prior episodes. The third strategy was to use familiarity, to judge the test word to be a repetition if it felt familiar. This strategy is similar to the other basis of recognition suggested by Mandler (1980, 1989). It is this basis of judgment, and its source, that is at issue in all of the experiments in this article.

When a test word was repeated from the list, any or all of these bases could be responsible for subjects’ claims of recognizing the test word. To isolate the familiarity basis, and to examine the impact of fluency on familiarity independent of its effects on recall and retrieval-based recognition, Whittlesea et al. (1990) focused on the effects of manipulating the fluency of the test word when that word had not been presented earlier. On those trials, memory of a prior exposure could not have any effect on the recognition judgment, either through recall or through facilitating identification of the target. However, on those trials, manipulation of the density of the mask would still affect the ease of identifying the target word. If the feeling of familiarity is a product of fluency, then the increased fluency of identification under the lighter mask should cause subjects to experience a feeling of familiarity, and to judge, incorrectly, that the item was repeated.

On those trials when the target word was not repeated, subjects identified the target word 74 ms faster when the mask was light rather than heavy (see Table 2). They were also 4% more likely to claim that the target was repeated when the mask was light. Whittlesea et al. (1990) concluded that their subjects experienced a feeling of familiarity when their processing was made relatively fluent by the light mask. Because the word was not repeated on those trials, this feeling of familiarity is an illusion. The occurrence of this illusion of remembering demonstrates that the feeling of familiarity is not a direct product of memory, but instead is the product of attributing fluent processing to a source in the past. Similar conclusions are drawn after most of the experiments in this article.

The claim that subjects experienced an illusion of remembrance is valid only if the subjects were unaware that their fluency in identifying target items was systematically manipulated by a covert source and if they actually based their decisions about the target word on feelings of remembrance. To ensure that these conditions were met, the extent of the subjects’ awareness was evaluated both through structured
interviews and through experimental control procedures. The interviews revealed a few subjects who thought they might have been aware of the covert manipulation; those subjects were excluded from further analysis. Of the remaining subjects, most were aware of some variation in their ease of identifying the target word. However, they attributed such variation to internal causes, such as fatigue and eyestrain, rather than to any systematic stimulus variation, and consequently ignored it in making the required decision about the target item. Thus, according to their own subjective reports, the subjects whose data are reported were unaware of the covert manipulation of fluency and based their decisions only on feelings of remembrance. This conclusion is supported by control studies conducted by Whittlesea et al. (1990) and by internal evidence from Experiment 5 of the current series. That evidence is summarized in the General Discussion.

Part 1: Illusions of Word and Meaning Repetition

The first four experiments examined whether feelings of familiar meaning can be aroused by manipulating processing fluency through factors in the present, as feelings of familiar identity are. The results demonstrate that feelings of familiar meaning are also the product of an interpretive process, but a curiously crude and sophisticated one, that is sensitive to the type of processing that is fluent, but not its source.

Experiment 1: Perceptual Fluency and Familiarity of Meanings

The object of Experiment 1 was to determine whether arbitrary variation of perceptual fluency would influence judgments about the semantic relatedness of current events to past events as it influences decisions about exact repetitions of items.

Method

Subjects. Twenty-seven Simon Fraser University students participated for course credit. Two subjects who may have noticed the manipulation of fluency were excluded from the analysis.

Procedure. Experiment 1 was identical to the General Procedure, except that the target was semantically related to one of the words in the list on half the trials rather than being repeated. For example, if ship had been presented in the list on a semantically-related trial, boat could be presented as a target; on an unrelated trial, the target would not be particularly related to any word in the list. Subjects were required to pronounce the target item, then judge whether it was meaningfully related to any word in the list.

One hundred thirty pairs of semantically related words were created by searching the stock of 975 four-letter words. Association norms were not used; however, the pairs consisted of obvious associates, such as bird-nest, chin-face, and foot-shoe. For each subject, 60 pairs were selected, at random, to be used in semantically related test trials, and 5 were selected for practice trials.

Pronunciation latencies were measured by requiring subjects to hit a key as they said the word, rather than by voice key. Use of a voice key can cause response latencies to be recorded prematurely, for example, when the subject says “uh” prior to response. Use of a hand key avoided these errors. This procedure was adopted in all experiments reported in this article.

Results and Discussion

Effects on pronunciation latency. Test words were pronounced with about equal speed following a list containing a semantically related word (557 ms) and following a list of unrelated words (561 ms), F(1, 24) < 1 (see Table 3). This lack of effect of semantic relatedness on pronunciation latency was expected, because “semantic priming” does not in general survive an intervening word (cf. Masson, 1991, 1992; but see Joordens & Besner, 1992, for an exception), and in this procedure at least one word, and on average three words, intervened between the “prime” in the list and the target word.

However, subjects pronounced the test word faster when the mask was light (538 ms) than when it was heavy (580 ms), F(1, 24) = 32.665, p < .001, MS_e = 1377.19, indicating that the masking manipulation was sufficient to affect perceptual ease. Whittlesea et al. (1990) demonstrated that this manipulation affects subjects’ feelings about the familiarity of specific items. If perceptual fluency also creates a feeling of familiarity for the meanings of items, then the masking manipulation should influence subjects’ relatedness decisions.

Effects on relatedness judgments. Subjects were more likely to report that a word was related to a word in the previous list if it truly was (p = .50) than if it was not (p = .29), F(1, 24) = 70.73, p < .001, MS_e = .015. This means that subjects could discriminate cases in which the target word really was related to a word in the list, on the basis of either recalling some words from the list (either by continued rehearsal or through recall cued by the target word) or on the basis of a feeling of familiarity for the meaning of the target word. This discrimination could not have depended on differences in fluency of perception, because, as documented in the last section, fluency was unaffected by the semantic relatedness of the list and target.

In answer to the major question of the experiment, subjects were no more likely to claim a word to be semantically related to an earlier word when the mask was light (p = .39) than when the mask was heavy (p = .39), F(1, 24) < 1. Although subjects did experience greater fluency in perceiving lightly masked stimuli, as indexed by response latency, this greater fluency did not translate into feelings that the meaning of the target was familiar and therefore related to a word in the list.

Table 3
Experiment 1: Pronunciation Latencies (in Milliseconds) and Probabilities of Judging Test Items to Be Related to an Earlier Word, as a Function of Level of Masking and Actual Semantic Relationship of Target to List

<table>
<thead>
<tr>
<th>Level of masking</th>
<th>Pronunciation latencies</th>
<th>Probability judged related</th>
</tr>
</thead>
<tbody>
<tr>
<td>Related</td>
<td>Not related</td>
<td>Related</td>
</tr>
<tr>
<td>20%</td>
<td>535</td>
<td>541</td>
</tr>
<tr>
<td>40%</td>
<td>580</td>
<td>581</td>
</tr>
</tbody>
</table>
Thus in this case, when perceptual fluency of the target was manipulated without the subjects' knowledge, variations in fluency were not mistakenly attributed to a source in the past and did not create differential feelings of familiarity. Two conclusions might be possible. One is that the illusions of familiarity based on fluency observed by Whittlesea et al. (1990) are specific to judgments of exact repetition, and only recognition judgments based on physical identity of present and past stimuli are influenced by unconscious attribution of the source of performance fluency. The other is that decisions about different aspects of familiarity are based on different aspects of processing: Decisions about formal identity may be based on physical properties and on the fluency of perceptual processing, whereas decisions about semantic relatedness may be based on identity of meaning and on the fluency of conceptual processing. Experiment 2 was conducted to evaluate these alternatives.

**Experiment 2: A Conceptually Driven Illusion of Familiar Meaning**

In this study, as in the previous one, a list of briefly presented words was shown to the subject, and the subject was then required to judge whether a target word was semantically related to any word in the list. However, in this case the fluency of processing was manipulated through the conceptual, rather than the physical, context of the target word. Instead of presenting targets in light or heavy visual masking, targets were presented in sentences that either led the subject to expect a general concept or led to no particular expectations. Examples are, respectively, "The stormy seas tossed the boat" and "He saved up his money and bought a boat." It could be expected that the former context might make the target word easier to identify, but on conceptual rather than physical grounds. If feelings of semantic relatedness are based on an attribution of processing fluency, as feelings of repetition apparently are, but are based on an attribution of the fluency of conceptually driven processing rather than the fluency of data-driven processing, then subjects in this experiment should erroneously claim target words to be semantically related to earlier words when the target word's conceptual properties are made to be more fluently processed by the test context.

**Method**

**Subjects.** Thirty Simon Fraser University students participated for course credit.

**Procedure.** The design and procedure of this experiment were identical to those of Experiment 1, except that instead of presenting target words in a rectangle of dynamic noise, they were presented as the last word of a sentence. Sentences of two kinds were used: those creating a general expectation of a particular concept, of which the target word would be an example, such as "The anxious student wrote . . ."

The screen then cleared, and the target word (e.g., TEST) was exposed, to be pronounced as rapidly as possible. Response latency was measured from the onset of the stimulus to the keypress accompanying the subject's pronunciation of the word.

Predictive and neutral contexts were made up for 130 words (120 experimental trials plus 10 practice trials). For each subject, 60 of each were selected, at random, to be used in test trials, and 5 were selected for practice trials.

Following the experiment, each subject was interviewed using questions similar to those given in the General Method, except that questions about masking were replaced with questions about variation in the semantic context. No subject in this experiment indicated awareness of that manipulation, or of guessing the relatedness of the target based on a perception of fluency.

**Results and Discussion**

**Effects on pronunciation latency.** Identification of a target word following a list containing a semantically related word (632 ms) was reliably faster than following a list of unrelated words (764 ms), \( F(1, 29) = 34.106, p < .001, M_{SE} = 15,518.63 \). This is a surprising finding, seeming to indicate "semantic priming" extending over several intervening words. However, there are several reasons to believe the effect is not the same as the one called "semantic priming." First, at 132 ms, this effect is far larger than those observed in standard "semantic priming" paradigms (cf. Neely, 1977). Second, pronunciation latencies, at an average of 698 ms, are much longer than those observed in the same paradigms. Instead, the effect probably reflects deliberate and time-consuming attempts to retrieve or rehearse words from the previous list prior to making a judgment (see Table 4).

If such deliberate retrieval strategies were used primarily in predictive contexts, then it would not be possible later to argue that the contexts influenced decisions through affecting feelings of familiarity. However, there was no evidence that predictive contexts selectively engaged deliberate retrieval processes: Not only was the effect of relatedness on response latencies independent of the type of context at test, interaction \( F(1, 29) = 1.175, \) but the direction of the differences was in the other direction, the numerical value of the "priming effect" being greater in the nonpredictive contexts (152 ms) than in the predictive contexts (113 ms). Thus the occurrence of this effect, although interesting, does not affect the interpretation to be offered of the effects of semantic test context on judgments of semantic relatedness.

More important for present purposes, subjects pronounced the test word faster when the context predicted the concept of which the word was an example (661 ms) than when the

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1. Many investigators (e.g., Fischler & Bloom, 1979; Schuberth & Eimas, 1977) have demonstrated that the last word of a sentence is identified or judged more quickly if it is congruous with the meaning of the foregoing sentence stem. The precise mechanism of this effect is subject to debate (cf. Fischler & Bloom, 1985) but is not at issue in the current experiments. For present purposes, it is only important that this effect results from variation of the semantic relationship between the target word and its context, rather than from variation in the physical clarity of the stimulus, as in Experiment 1.
Table 4

Experiment 2: Pronunciation Latencies (in Milliseconds) and Probabilities of Judging Test Items to Be Related to an Earlier Word, as a Function of Type of Semantic Test Context and Actual Semantic Relationship of Target to List

<table>
<thead>
<tr>
<th>Context</th>
<th>Pronunciation latencies</th>
<th>Probability judged related</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Related</td>
<td>Not related</td>
</tr>
<tr>
<td>Predictive</td>
<td>604</td>
<td>717</td>
</tr>
<tr>
<td>Nonpredictive</td>
<td>659</td>
<td>811</td>
</tr>
</tbody>
</table>

context was neutral (735 ms), $F(1, 29) = 24.115, p < .001, MS_e = 69.15.46$, indicating that the manipulation of semantic context affected the ease of identifying the item. Like the effect of masking on response latency in the last experiment, this is a source of variation in fluency of performance that subjects might or might not use in judging the familiarity of the meaning of a word. However, unlike the masking effect, this was due to a conceptual, rather than a perceptual, manipulation.

Effects on relatedness judgments. Subjects were more likely to report that a word was related to a word in the previous list if it truly was ($p = .34$) than if it was not ($p = .28$), $F(1, 29) = 17.485, p < .001, MS_e = .006$. As in Experiment 1, it must be concluded that subjects could actually discriminate cases in which the target word really was related to a word in the list, probably on the basis of coding one or two words from the list and recalling them at test.

However, in addition to this veridical discrimination, subjects claimed target words to be related to a word in the list with higher probability when the context predicted a particular concept ($p = .35$) than when the context was neutral ($p = .26$), $F(1, 29) = 26.201, p < .001, MS_e = .010$. That this effect was not based on facilitation of recall or retrieval of earlier words cued by the predictive context is demonstrated by the fact that the effect was about as large when the test item was not related to the list (8%) as when it was related (10%). Instead, the effect must result from the greater fluency of conceptually driven processing given by the predictive context, indexed by the facilitation of pronunciation. Because the fluency of processing in this case is created by a variable that is irrelevant to the historical relatedness of the target word to the list, use of the fluency heuristic to make decisions is normatively wrong. However, its use in this case demonstrates (a) that subjects do interpret the fluency of their performance to make decisions about semantic relations as well as exact repetition, (b) that they distinguish fluent conceptually driven processing from fluent perceptual processing and rely on the former in making decisions about semantic relatedness, but (c) that they do not distinguish between fluency given by appropriate sources (the semantic relatedness of current and past events) and that given by inappropriate sources (the current semantic context). Given that subjects were unaware of the differences between contexts, it means that use of the fluency given by the predictive context was unconscious rather than strategic. Fundamentally, subjects were influenced by the semantic contexts through a differential feeling of familiarity, an illusory feeling given by unconscious attribution of conceptually driven fluency of processing to a source in the past.

Experiment 3: A Conceptually Driven Illusion of Repetition

Experiment 2, like the experiments of Whittlesea et al. (1990), demonstrates that feelings of familiarity can result from attributions of fluency. However, the results reported by Whittle sea et al., showing feelings of exact repetition resulting from an arbitrary manipulation of perceptual fluency at the time of test, taken together with the results of Experiments 1 and 2, indicating that feelings of semantic familiarity result only from variation of conceptual fluency, suggest a strong specificity of feelings of familiarity to the type of processing that is fluent and to the type of judgment to be made. That is, they suggest that perceptual fluency leads to
an attribution of exact repetition of a word, and conceptual fluency leads to an attribution of previous experience of a semantically related word.

However, there is reason to doubt such strong specificity. Although semantically related items share only meaning, and might therefore be expected to be judged related only when conceptually based fluency is great, exact repetitions of an item share both meaning and form, and might therefore be judged related when either conceptually based or perceptually based fluency is great. Experiment 3 was conducted to discover whether judgments of exact repetition might also be influenced by conceptual fluency. In this experiment, the fluency of processing the target item was manipulated through its semantic context, as in Experiment 2, but the subject was required to decide whether the target word was identical to a previous word, as in the experiments conducted by Whittlesea et al. (1990).

Method

Subjects. Thirty Simon Fraser University students participated for course credit.

Procedure. The procedure of this experiment was nearly identical to the General Procedure (including the use of repeated rather than related test items). The exception was that target words were presented as the last word in a sentence, as in Experiment 2. However, unlike that experiment, the target word was presented along with the rest of the sentence, rather than being revealed subsequently. This procedure gave a greater semblance of normal reading than the procedure of Experiment 2, but prevented the gathering of pronunciation latencies. The latter information is useful, but not essential in this case: Because the sentences and target words were identical to those of Experiments 2 and 5 (in which response latencies were collected), the effect of the types of context on the fluency of identifying targets was already known.

Results and Discussion

Effects on recognition judgments. Repetition of a word in the list and as the target item had a reliable effect on judgments of repetition, repeated words being claimed old with greater probability \((p = .59)\) than nonrepeated words \((p = .16)\), \(F(1, 29) = 211.638, p < .001, MS_e = 0.027\) (see Table 5). This 43% discriminability of repeated and nonrepeated words is similar to the 40% effect reported by Whittlesea et al. (1990). However, subjects were also reliably biased in their judgments by the semantic context in which target words were presented, words presented in predictive contexts being judged old with greater probability \((p = .40)\) than words presented in neutral contexts \((p = .35)\), \(F(1, 29) = 8.435, p = .007, MS_e = 0.007\).

Thus the manipulation of semantic context had an effect on repetition decisions similar to that which it had on relatedness decisions in the last experiment. As in that experiment, the manipulation of fluency through semantic test context must have affected familiarity, rather than selectively engaging recall or retrieval processes, because the effect was about as large when target items were not repeated \(4\%\) as when they were \(5\%). Instead, the effect again demonstrates a heuristic use of conceptual fluency, unconsciously attributed to a source in the past, and experienced as a feeling of familiarity.

The overall 5% effect of manipulating conceptual context on recognition judgments is comparable to the 4% effect of manipulating visual clarity observed by Whittlesea et al. (1990). It demonstrates that decisions about exact repetition of words can be influenced by conceptual as well as perceptual manipulation of the fluency of identifying a word.

This finding leads to a puzzle. As discussed previously, repetition of a word reinstates both its formal and conceptual properties, whereas provision of a related word reinstates only the semantic properties of the original experience. The subjects were therefore discriminating quite effectively, if not consciously, in accepting either perceptual or conceptual fluency as an indication of specific-item familiarity but requiring conceptual fluency and rejecting perceptual fluency as a basis of semantic familiarity. The puzzle is how the subjects distinguish between these sources of fluency, given that they have the common outcome of enhanced efficiency of performance, as demonstrated by facilitated speed of pronunciation.

One possibility is that the subjects are sensitive to subtle variations in processing resulting from perceptual or conceptual resources, and are thus able to discriminate the source of fluency. Another possibility is that the subjects are totally insensitive to such variations, and that attribution of fluency to a conceptual or perceptual source relies on a crude impression of the type of task in which fluency is engendered, as an indicator of the type of fluency experienced.

Experiment 4: An Illusion of Familiar Meaning Caused by Illusory Conceptual Processing

To assess the merits of these alternatives, Experiment 4 was conducted as an exact replication of Experiment 1, with one exception. Experiment 1 required subjects to make semantic relatedness decisions about targets and list words, and attempted to bias those decisions by manipulating the perceptual fluency of the targets. Experiment 4 provided exactly the same judgments and manipulations of perceptual fluency, but additionally attempted to present the variations in perceptual fluency as though they had been given by a conceptual source, and were thus effectively variations in conceptual fluency.

To accomplish this, Experiment 1 (which used the perceptual manipulation of density of masking at test) was replicated in complete detail, with the exception that, in advance of each trial, the subject was given a general concept that was
predictive of the target word. For example, the cue given in advance might be a kind of dwelling. The target word in that case might be nest, a word related to the concept. Subjects were told that they could use the cue to scan the list for words meaningfully related to the concept and could thus prepare themselves to judge the semantic relatedness of the target word to a word in the list. However, the category cue was actually useless for detecting the word in the list that would be related to the target word. For example, for the case of dwelling and nest, the word in the list related to the target word nest would be bird. Although strongly related to the target word, the list word was unrelated to the advance categorical cue, so the cue could not be used to isolate that word during list presentation. Furthermore, the categorical cue was always related to the target word, so there were no differences between conditions in the preparedness of subjects to process the meaning of the target. However, the fact that subjects had advance warning, however vague, of the meaning of the target might cause them to treat variations in fluency of processing the target as variations in the fluency of conceptual processing, even though the major variation in processing fluency was due to perceptual factors, through manipulation of the density of masking.

**Method**

**Subjects.** Thirty Simon Fraser University students participated for course credit.

**Procedure.** The procedure was identical to that of Experiment 1, except that in advance of each trial, subjects were given a cue to the general category of the target item that would appear at the end of the trial. These cues were valid on every trial but rather vague: For example, the cue a kind of mammal predicted the target word bear, and the cue a kind of human predicted the target word baby. On trials in which the target word was not related to a list word, the cue was of course not predictive of any of the words in the preceding list. However, it was equally unpredictable on the 50% of trials in which the target word was related to a word in the list. For example, when the cue a kind of mammal was presented in advance, the word in the list related to the target word bear was cave, and when the cue a kind of human was presented, predicting the target word baby, the related list word was womb. (Other examples are given in Appendix B.) Consequently, the categorical cue added no useful information in deciding whether the target word was related to a word in the list.

**Results and Discussion**

**Effects on pronunciation latency.** Subjects identified target words related to list words faster (922 ms) than target words unrelated to list words (960 ms), $F(1, 29) = 13.571, p = .001, M_{SE} = 0.003$ (see Table 6). As in Experiment 2, this effect of semantic relatedness of earlier words is ascribed to subjects' strategies of retrieval, rather than to "semantic priming," and for the same reasons. More important for present purposes, subjects identified words that were lightly masked (879 ms) faster than words heavily masked (1,003 ms), $F(1, 29) = 84.664, p < .001, M_{SE} = 0.005$. Thus, as in Experiment 1, subjects' fluency of identifying the target word was influenced by the visual masking manipulation. It remained to be seen whether this perceptual source of differences in fluency would have any effect on judgments of relatedness.

**Effects on judgments of relatedness.** Subjects were sensitive to the actual relatedness of the target word to a list word, claiming words to be related when they actually were ($p = .49$) more frequently than when they were not ($p = .30$), $F(1, 29) = 106.028, p < .001, M_{SE} = 0.011$. However, subjects were also more likely to claim that a target word was related to a word in the list when the target was lightly masked ($p = .43$) than when it was heavily masked ($p = .35$), $F(1, 29) = 30.596, p < .001, M_{SE} = 0.006$. This 8% effect of perceptual test context on relatedness decisions is comparable in magnitude to the 9% effect of semantic test context on the same decisions in Experiment 2, and considerably larger than the 0% effect of the same manipulation of perceptual test context on the same decisions in Experiment 1. When target words were not semantically related to list words, so that recall from the list was impossible and only feelings of familiarity could affect decisions, the effect of the perceptual manipulation was 9%.

Comparing Experiments 1 and 4, it is clear that a difference in processing fluency resulting from perceptual factors can influence decisions about the familiarity of the meaning of an item, but only if it is interpreted as being a difference in the fluency of processing the meaning of the events. The fallacy of this interpretation is documented by the fact that the conceptual cue in Experiment 4 adds nothing to the subject's ability to detect a word in the list that might be related to the target and, if anything, slows the subject's identification of the target (response latencies in Experiment 4 were almost double those in Experiment 1). It is therefore concluded that decisions about the semantic relatedness of present and past events can be (a) influenced by current processing, as suggested by an attributional account of the relationship between memory and consciousness; (b) influenced by either perceptual or conceptual aspects of current processing; but (c) influenced by perceptual processing only to the extent that differences in fluency are interpreted to be differences in the fluency of conceptual processing. Simply stated, semantic familiarity is felt only when processing is fluent and is apparently conceptual, but perceptual fluency feels like conceptual fluency in the context of a semantic search.

More generally, to summarize Experiments 1–4, one will feel that the meaning of an event is familiar if its meaning is easily arrived at, regardless of the source of the ease, and one will feel that the event itself is familiar if either its mean-

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<tr>
<th>Level of masking</th>
<th>Pronunciation latencies</th>
<th>Probability judged related</th>
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</thead>
<tbody>
<tr>
<td>Related</td>
<td>Not related</td>
<td>Related</td>
</tr>
<tr>
<td>20%</td>
<td>868</td>
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<td>40%</td>
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</tr>
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</table>
ing or its formal properties are easily processed. Feelings of familiarity for both the event and its meaning can result from fluency of processing given by either perceptual or conceptual sources; which one the subject feels ("I've seen that before" or "I've seen something of that class before") apparently depends only on what question the subject is predisposed to answer when encountering the item. To sponsor a feeling of familiarity, the fluency of current processing need not be due to a normatively appropriate source, but it must feel as though it is.

The mechanism of familiarity revealed through these experiments is amazing. It is in some ways crude, operating on the basis of the simple heuristic "attribute fluent performance to any plausible factor." The crudity of this heuristic leads the mechanism into systematic errors, as in all the aforementioned cases in which performance variation due to a covert source in the present was misattributed to an overt factor in the past. Similarly, as described in the introduction, the mechanism can be tricked in the opposite direction, treating performance variations due to a source in the past as due to a source in the present. It is insensitive to the source of the fluency, unable to discriminate between fluency of performance due to conceptual factors and fluency resulting from perceptual factors but occurring under the cover of a semantic search. Yet it is also highly sophisticated, requiring that the fluency of performance feel as though it is due to a source that normatively would be appropriate for the decision to be made. It is willing to accept fluency apparently due to either perceptual or conceptual factors as evidence of repetition, but requires that the fluency should appear to result from conceptually driven processing to accept it as evidence of a semantically related prior experience.

It is also likely to be a highly efficient mechanism, making very few errors in the normal course of events. In general, prior experience does cause current fluency; prior experience of semantically related events will not promote current perceptual processing (except perhaps in the special case of "semantic priming"), and influences of prior events will not ordinarily be perfectly confounded with influences of current events.

Furthermore, there are likely to be some major differences between fluent processing conducted under the control of sources in the present and the past. A standard joke among academics interested in misattribution is that an unusually clear and cogent lecture is likely to invoke the response "It was O.K., but I've heard it all before." However, people are unlikely to make that kind of error, because prior conceptual processing is likely to make the concept available as a whole package, whereas current processing of the same concept, however fluent, is likely to take time, building up the concept in steps. The qualitative differences in flow between these two experiences of a concept are likely to disambiguate the source.

This sensitivity to differences in the fluency of performance to be expected from various sources is illustrated by all of the aforementioned experiments. Although subjects made systematic errors based on false feelings of familiarity, the influence of the covert source of fluency in the present was not in general nearly so great as that of the overt source in the past, as can be seen in Table 1. This suggests that fluent perception resulting from a light mask is not the same as fluent perception resulting from prior exposure; that fluent cognition resulting from a predictive context is not the same as fluent conceptual processing driven by prior semantic processing; and that the system only partially confuses the two, leading to a relatively low rate of errors. In turn, this suggests that the system is less insensitive to differences in processing than was first apparent: Although it is a heuristic processor, the system is fairly finely tuned to differences in the type of processing resulting from different sources. The experiments in the next sections investigate the sensitivity of this tuning and the range of sources of processing fluency to which it may be applied.

Part 2: Other Relationships Between Present and Past: Pleasantness, Repetition, Duration, Remoteness, and Recency

Experiment 5: A "Mere Exposure" Effect Without Prior Exposure

Numerous investigators have observed that mere exposure to a set of geometric shapes can affect later judgments about their pleasantness, despite the subject's being unable to discriminate repeated from novel shapes (e.g., Mandler et al., 1987; Zajonc, 1980). Experiment 5 was conducted to determine whether similar effects occur with natural words, and if so, whether both the positive effect on pleasantness ratings and lack of effect on recognition might be due to attributions of increased fluency of perception resulting from a previous encounter with the stimulus.

Method

Subjects. Twenty-one Simon Fraser University students participated for course credit.

Procedure. This experiment departed from the General Procedure in two ways. First, subjects were asked to judge target words as pleasant or neutral, after pronouncing them but before judging whether they were repeated. Second, in place of the masking manipulation, the neutral ("The evening gown was missing a . . . bead") and semantically predictive ("The bored student opened her mouth to . . . yawn") contexts from Experiment 2 were used to manipulate the fluency of processing. This experiment was thus identical to Experiment 3, except for the insertion of the pleasantness judgment between the pronunciation requirement and the repetition decision.

Results and Discussion

Effects on pronunciation latency. Response latencies were reliably smaller following the semantically biased test context (521 ms) than the neutral context (648 ms), F(1, 20) = 20.800, p < .001, MSe = 0.016, and smaller when the target was repeated (539 ms) than when it was not (630 ms), F(1, 20) = 37.715, p < .001, MSe = 0.005. (see Table 7). There was also a small but reliable interaction, F(1, 20) = 5.929, p = .023, MSe = 0.002, occurring because the effect of context was larger when the target was repeated.
Effects on pleasantness ratings. Pleasantness ratings were reliably influenced by a single, brief (67 ms), prior exposure, repeated words being judged pleasant \( (p = .61) \) more frequently than nonrepeated words \( (p = .53) \), \( F(1, 20) = 57.438, p < .001, M_S = 0.003 \). This replicates the illusion of pleasantness caused by repetition observed by Zajonc (1980) and Mandler et al. (1987). However, pleasantness judgments were also reliably influenced by the semantic context manipulation. Words presented in predictive contexts were rated as more pleasant \( (p = .65) \) than words presented in meaningful but nonpredictive contexts \( (p = .49) \). \( F(1, 20) = 30.102, p < .001, M_S = 0.017 \). Even when the word had not been previously exposed, the predictiveness of current context had a large effect (12%) on pleasantness ratings. This illustrates that the "mere exposure" effect, like the feeling of familiarity, is not a direct result of prior exposure. Instead, it is also due to an interpretation of the fluency of perception (indexed by response latency), given by either current factors or past experience.

Thus, when perception of words is made fluent either by previous exposure or by a semantically predictive context, the words are rated as being more pleasant than less fluently processed words. These factors were interactive, the pleasantness ratings given when words were repeated and predicted by context being greater than those predicted by either factor alone, \( F(1, 20) = 5.770, p = .024, M_S = 0.006 \), indicating that fluency from multiple sources has greater impact on the pleasantness decision than fluency from one source.

Effects on repetition decisions. Subjects’ judgments about repetition were also influenced by both factors. Repeated words were judged repeated \( (p = .47) \) more frequently than were nonrepeated words \( (p = .31) \), \( F(1, 20) = 18.659, p < .001, M_S = 0.027 \). More important, words presented in predictive contexts were judged repeated \( (p = .46) \) more frequently than words presented in nonpredictive contexts \( (p = .31) \), \( F(1, 20) = 64.146, p < .001, M_S = 0.007 \). Manipulation of the test context exercised a large influence on repetition decisions (18%) even when the word was not repeated, indicating again that its effects were mediated through the fluency of processing, rather than through assisting recall or retrieval processes. This again demonstrates feelings of familiarity based on an interpretation of processing fluency.

Recognition failure. This experiment was identical to Experiment 3 in every way except for the insertion of the pleasantness judgment between the pronunciation and repetition judgments. However, the subjects’ ability to discriminate repeated from nonrepeated words in this experiment was considerably less (16% ability) than that of subjects in Experiment 3 (43%). Although this decline in recognition is not as dramatic as the total inability to recognize repeated geometric figures that are also judged affectively (reported by Zajonc, 1980, and Mandler et al., 1987), it is certainly in the same direction.

One appealing hypothesis to explain this loss of discriminability is that because both pleasantness and repetition judgments rely on fluency, they are in a trading relationship, such that fluency attributed to pleasantness is not available to be attributed to repetition. (The idea here is similar to that of “misguided parsimony,” the hypothetical unwillingness to ascribe an outcome to multiple causes; cf. Nisbett & Ross, 1980.) In that case, pleasantness and repetition judgments should be negatively correlated within trials. In contradiction of that hypothesis, there was a slight but reliable positive association between pleasantness ratings and recognition judgments, \( \chi^2(1, N = 2,520) = 22.16, p < .001, r = .10 \).

A further hypothesis is that the interpolated task of rating pleasantness interrupted the subjects’ attempts to rehearse whatever aspects of the list they had managed to code. In that case, the subjects might simply become less willing to judge that any items were repeated. If they became very unwilling to do so, the effective discrimination of repeated and unrepeated items would be reduced by floor effects. Against that possibility, the mean probabilities of claiming to recognize items in Experiment 5 \( (p = .39) \) and Experiment 3 \( (p = .38) \) are quite comparable; it is only discriminability that declined.

The most likely explanation for the loss of discriminability is that the interpolated task of rating pleasantness interrupted conscious and deliberate strategies for recognizing items, such as rehearsal. However, rather than giving up, subjects became more reliant on pure familiarity as a basis for making the decision. In support of this explanation, the effect of fluency given by the context at test increased from 5% in Experiment 3 to 15% in Experiment 5 (and the effect on trials in which words were not repeated increased from 4% to 18%), indicating that at the same time the subjects were having increased difficulty in discriminating repeated from nonrepeated words, they were also becoming more reliant on the fluency of processing the test words as a heuristic for recognizing them.

An implication of this explanation is that most of the illusory effects discussed in this article are probably underestimates of the potential effects of fluency in generating feelings of familiarity. Given that in most experiments the subjects had other bases on which to perform the demanded judgments, such as recall and retrieval-based recognition, they may have relied relatively little on pure feelings of fa-

<table>
<thead>
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<th>Context</th>
<th>Pronunciation latencies</th>
<th>Probability judged pleasant</th>
<th>Probability judged repeated</th>
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<tbody>
<tr>
<td>Repeated</td>
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<td>.59</td>
</tr>
<tr>
<td>Not repeated</td>
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<td>Not repeated</td>
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Table 7: Experiment 5: Pronunciation Latencies (in Milliseconds) and Probabilities of Judging Test Items to Be Pleasant and Repeated, as a Function of Type of Semantic Test Context and Actual Repetition
miliarity. This suggests that in situations in which recall of distinctive episodes is not effective, reliance on familiarity, and consequently on processing fluency, will be more critical, particularly in studies of long-term remembering and studies of concept attainment, in which large numbers of barely distinguishable events are presented to subjects for classification. (The idea of fluent reprocessing as a basis of classification is explored by, e.g., Whittlesea, Brooks, & Westcott, in press, and Whittlesea & Dorken, 1993.)

Affective and repetition judgments. Turning to the relationship between pleasantness and recognition ratings, it is clear that they were influenced by the same factors, and to about the same degree. Both were influenced by prior presentation of the word (9% and 16% for pleasantness and repetition, respectively); the greater effect on repetition judgments may stem from some residual ability to use strategies other than familiarity. More critical, the test context, which exerts its influence purely through fluency of perception, had nearly identical effects on the two tasks, 16% and 15%, respectively. This finding strongly suggests that both feelings of pleasantness and the portion of recognition dependent on feelings of familiarity result from an unconscious attribution of processing fluency.

The original interest in the “mere exposure” effect was that it seemed to show that affective judgments can arise out of experience without cognitive mediation, independent of the type of processing leading to recognition judgments (Zajonc, 1980), although that conclusion is debatable (Mandler et al., 1987). The present data cannot directly address that issue, because the stimuli were meaningful words. However, they demonstrate that preferences are not necessarily aroused by the coding and retrieval of a stimulus (i.e., not by “mere exposure”), but instead can be created by efficient processing at test, whether due to prior exposure or to current but covert factors. Instead, they demonstrate that the illusory pleasantness of previously exposed objects has the same basis as the illusory familiarity of easily processed objects, namely an attribution of processing fluency.

Experiment 6: An Illusion of Duration in the Past

The experiments so far asked subjects whether an item had occurred in their recent past or was meaningfully related to an item in their immediate past. However, people have many other types of feelings about the past, including relative duration (this went on a longer time than that did) and relative recency (this occurred before that). The next two experiments examined whether these feelings about complex relations among events in the past are also the result of an unconscious attributional process.

Subjects in Experiment 6 were shown lists of briefly presented words, followed by a target item that was guaranteed to be a repetition of one of them. However, the word that was eventually presented as a target had been presented either as long as the other words during the list presentation or for twice as long; the subject was to decide which. As in Experiment 1 of Whittlesea et al. (1990), the subject was required to identify the target through visual noise before responding, and, as in that experiment, the visual noise was manipulated between trials without the subject’s knowledge.

Method

Subjects. Thirty Simon Fraser University students participated for course credit.

Procedure. The procedure was similar to that of the General Procedure, except that the target word was always a repetition of one of the seven items presented in the list, an item that had randomly occurred in positions two through six of the list. As well, on one-half of the trials, the earlier (list) presentation of the target item endured for 134 ms rather than the 67 ms for which all other items were presented. Subjects did not know in advance whether a word, or which word, would be presented for a longer interval. This manipulation was crossed with the covert manipulation of mask density, which was between 20% and 40% occlusion of the target word. The subjects were told not to claim that an item had been presented for a longer period unless they were sure.

Results and Discussion

Effects on pronunciation latency. Subjects identified target words faster when they had been presented longer (656 ms) than when they were presented for the standard period (672 ms), $F(1, 29) = 9.355, p = .004, MS_e = 0.001$ (see Table 8). They also identified words faster when the masking was light (629 ms) than when it was heavy (699 ms), $F(1, 29) = 79.200, p < .001, MS_e = 0.002$.

Effects on duration decisions. Subjects were able to discriminate longer from shorter earlier presentations of the target word, claiming target words to have been presented for longer when they were ($p = .54$) than when they were not ($p = .34$), $F(1, 29) = 71.330, p < .001, MS_e = 0.016$. As with recognition, there are a number of possible ways in which subjects could discriminate these cases, including noticing and coding a word that stood out during the list presentation. However, they were also more likely to claim that lightly masked test words had been presented for a long interval ($p = .46$) than that heavily masked words were ($p = .42$), $F(1, 29) = 6.483, p = .015, MS_e = 0.009$. Furthermore, the mask had an effect (6%) even when the prior occurrence of the word was short and would not have been picked out during the list presentation. The subjects thus seemed to be using the heuristic that longer exposure on the first presentation would result in more fluent identification during the test. This is a reasonable heuristic, and is justified by the pronunciation latency results. However, its application when

Table 8

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<th>Level of masking</th>
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<th>Probability judged long</th>
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<tbody>
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<td>Short</td>
<td>Long</td>
<td>Probability judged long</td>
</tr>
<tr>
<td>20%</td>
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</tr>
<tr>
<td>40%</td>
<td>708</td>
<td>689</td>
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</table>
fluency was given by the test context rather than by prior experience led subjects into error. It also demonstrates that they did not discriminate between feelings based on fluency given by the prior experience and feelings based on fluency given by the context at test. Thus the feeling of duration in the past, like the feeling of repetition from the past, can result from unconscious attribution of the perceptual fluency of current processing to a source in the past.

Experiment 7: Illusions of Primacy and Recency

People can clearly discriminate between events that happened in the remote versus the recent past. Experiment 7 was conducted to evaluate the degree to which they can discriminate earlier and later events that happened in the immediate past and the basis on which the discrimination is made. Subjects were shown lists of words, as in previous experiments, and then asked to indicate where in the list a target item had been presented. As in Experiments 1, 4, and 6, the visual clarity of the target word was manipulated through the density of a dynamic mask.

Method

Subjects. Forty-three Simon Fraser University students participated for course credit.

Procedure. As in previous experiments, each trial commenced with the presentation of a list of words, shown for 67 ms each, with no interstimulus interval. In this case, only six words were presented in the list. As usual, the screen went blank for 100 ms after the list, after which a target word was presented to be pronounced. Again as usual, the word disappeared as soon as pronunciation began. Subjects were then required to guess in which of the six serial positions of the list the word had occurred previously. The target word was always a repetition of one of the words presented in the list, taken at random from positions one through six, subject to the constraint that all positions were sampled equally often. Each subject served in 12 conditions (six serial positions by two levels of mask), and each trial required six words. To keep the number of trials per condition fairly high (26 trials per condition were actually used), the stock of words was increased to 1,950 by the addition of the 975 highest frequency five-letter words from the Thorndike and Lorge (1944) count. On any trial, only four-letter or only five-letter words were used.

All analyses were computed using the raw reaction latencies and ratings given by subjects. Separately, two indices were computed to represent the subjects' overall ability to discriminate the list positions of words and their bias in rating positions, in parallel to the percentage effects reported for other experiments. Given that this is a six-alternative forced-choice task, the subjects' ability to discriminate the list positions of target words can be indexed in several ways. The index used here is parallel to hits minus false alarms for the two-alternative forced-choice task, and consists of the difference in rated position of targets in two positions, divided by the difference in actual positions, averaged across all possible combinations of positions. The computation of the size of illusory effects is more vexed. In practice, it was computed as the difference between rated position, under low and high masking, of targets presented in a particular serial position, divided by the full range of possible serial positions.

Results and Discussion

Effects on pronunciation latency. As can be seen in Figure 1, the actual serial position of the earlier presentation of a word in the list influenced the latency of pronouncing the word after the list. As serial position increased from first to last, pronunciation latencies first increased and then decreased, the quadratic trend being reliable, $F(1, 42) = 12.62, p < .001, MS_e = 1.662.66$. The recency effect was more pronounced than the primacy effect, resulting in a reliable linear trend, $F(1, 42) = 10.09, p = .003, MS_e = 1.882.37$.

The masking manipulation also influenced pronunciation latencies, all items that were lightly masked being identified faster than any items that were more heavily masked, $F(1, 42) = 59.96, p < .001, MS_e = 3.298.42$. The interaction between serial position and masking was not reliable, $F(5, 210) < 1$.

Effects on serial position judgments. It is worth reminding the reader that subjects in this experiment were attempting to discriminate the serial positions of six items presented within a span of 400 ms. Subjects were generally able to discriminate the serial positions of various items, at least ordinal. As can be seen in Figure 2, increasing serial position of the tested item was accompanied by increasing rated serial position (in all cases but one), the linear trend being reliable, $F(1, 42) = 132.11, p < .001, MS_e = 0.758$. As can also be seen in the figure, the rated positions of items originally presented in the first and last positions were more extreme than those presented in interior positions, resulting in a sinusoidal plot, the cubic trend being reliable, $F(1, 42) = 37.93, p < .001, MS_e = 0.356$. This sinusoidal relationship between estimated and actual serial positions sug-
The results of Experiment 5 suggest that the estimation process was governed by perceptual fluency, because the plateau in estimating positions of interior words of the list corresponds to the plateau in response latencies for those items, whereas the more extreme ratings of words presented in the first and last positions correspond to the sharper tails of the distribution of response latencies (see Figures 1 and 2). However, that is only correlational evidence. Overall, subjects' success in discriminating the serial positions of targets was about 29% of the actual variation in serial position.

The arbitrary masking manipulation also had an effect on rated serial position. The remarkable aspect of these data is that subjects did not adopt a simple "more fluent, more recent" or "more fluent, more remote" strategy; the main effect of masking was in fact not reliable, $F(1, 42) = 2.04, p = .161$, $MS_e = 0.145$. Instead, they used perceptual fluency in a discriminating fashion, responding that a recent item was particularly recent if it was lightly masked (and hence pronounced faster), but also that a remote item was particularly remote if it was lightly masked (see Figure 2). Words presented in positions one through four were rated as having occurred earlier in the list when lightly masked (mean rated position = 2.93) than when more heavily masked (mean rated position = 3.03), $F(1, 42) = 5.97, p = .019$, $MS_e = 0.128$. In contrast, words presented in positions five and six were rated as having occurred later in the list when lightly masked (mean rated position = 3.84) than when more heavily masked (mean rated position = 3.51), $F(1, 42) = 23.40, p < .001$, $MS_e = 0.203$. The resulting overall interaction of masking and serial position was reliable, $F(5, 210) = 6.03, p < .001$, $MS_e = 0.184$, although those factors did not interact within positions one through four, $F(3, 126) < 1$, or within positions five and six, $F(1, 46) < 1$, indicating that masking really did have two separate effects at two different portions of the list.

The illusory effects of the mask were greatest for items presented in the last two positions, and particularly in the last position. Lighter masking caused remoteness illusions of 3%, 1%, 1%, and 3% for targets presented in positions one through four of the list, respectively, and recency illusions of 5% and 8% for items in positions five and six, respectively. Thus the effect of the lighter masking on position ratings was greatest for those items receiving maximal advantage in response latency from their serial positions (see Figures 1 and 2). This finding again suggests that subjects were not only using fluency as the basis of serial position judgments, but were unable to distinguish between fluency given by the actual serial position and fluency given by the masking manipulation.

Of course, fluency would not be sufficient to explain these subjects' ability to discriminate between recency and remoteness, because both more recent and more remote targets were associated with greater fluency. The subjects must have gotten a rough impression of the relative list position of the target from some other source. It seems likely that they were able to retrieve enough of the list to locate the target item with some accuracy. However, their feelings of recency or remoteness were modified and exaggerated by the fluency of pronunciation. Thus feelings of recency and remoteness also appear to result from a heuristic strategy based on interpreting perceptual fluency, but the strategy is a rather sophisticated one.

**General Discussion**

Jacoby and his associates (e.g., Jacoby, Kelley, & Dywan, 1989) argued that feelings of familiarity are attributions of current processing fluency to some source that seems likely. That is, when the past appears to be a likely source of current ease of processing, a feeling of familiarity will emerge. When the present is regarded as a more likely source of the same fluency, a feeling of some present quality will emerge.

The experiments of Part 1 of this article substantiate and generalize this proposition. They show that feelings of both exact repetition and semantic relatedness are susceptible to illusions of familiarity, induced by manipulating the fluency of current processing without the subject's knowledge. They further demonstrate that such illusions can be induced by manipulating either the perceptual or conceptual aspects of current processing. The occurrence of these illusions demonstrates that feelings of familiarity are the product of an unconscious interpretive process that attributes fluent processing to a plausible source. This heuristic process appears not to have access either to the contents of memory or to the stimulus processing that is driven by memory. It cannot reliably distinguish between processing facilitated by memory versus external sources, or between facilitation of perceptual versus conceptual processing, and can only infer these factors from the context in which fluent processing occurs.
However, this inferential process is highly sophisticated, taking into account the specific demands of the judgment to be made, the type of experience provided by the task, and the likely effects of various kinds of earlier experience on later processing. Consequently, the heuristic is applied selectively, under circumstances in which it is normatively appropriate to expect an influence of past experience on current processing fluency, rather than simply in an "if fluent, then old" fashion.

The experiments of Part 2 suggest that a wide variety of feelings about the past may come about in the same way as feelings of exact and conceptual repetition, through evaluating current performance and attributing success in particular tasks to specific aspects of experience. Thus feelings that present events are pleasant, as well as feelings that a prior event was repeated, enduring, remote, or recent, can all be induced as illusions by manipulating the ease of current processing. These experiments also add to the impression that use of the fluency heuristic is both crude and sophisticated. The decision strategy that a previous encounter with an item was long if it is easy to identify now (Experiment 6) vastly oversimplifies the impact of the world on the perceptual system. In contrast, interpreting fluent performance to mean that the item was distinctive (occurring at either end of the list), rather than interpreting it simply to mean that the item was recent (Experiment 7), demonstrates an intuitive appreciation of the complex ways in which experience actually affects current processing.

More generally, these experiments substantiate the idea that feelings of familiarity are the product of interpreting the source of the fluency of current processing under the influence of expectations aroused by the required judgment. Thus, in Experiment 5, subjects treated fluency of identification given by the masking manipulation to mean both that the stimulus was pleasant and that it was familiar. This suggests that feelings of familiarity are not a direct consequence of having a memory trace of the prior event. Instead, they suggest that the direct effect of prior experience of a stimulus is only to facilitate current processing, and that feelings of familiarity will result only if that fluency is interpreted to be a consequence of prior experience rather than current circumstances, under the influence of expectations aroused by current context.

The Issue of Unconsciousness

As indicated in the introduction, the conclusion that feelings of remembrance result from an unconscious interpretive process requires that subjects in these experiments must have been unaware of two separate aspects of their experience. First, they must have been unaware that differences in the fluency of their performance were caused by the test-time manipulation of the mask or semantic context, in addition to the influence of encountering words during the list. Second, they must also have been unaware of drawing an inference from the fluency of their performance on the target item.

The decision about an item must be based on a feeling of remembrance, rather than on a deliberate, conscious heuristic such as "If a word feels easy to identify, guess that it must be repeated." The subjects need not have been unaware of their fluency, only of its covert source and their use of it in judging items. As indicated earlier, any subject who reported thinking that task factors might have influenced their ease of identification, or that their ease of identification might have influenced their judgments, was eliminated from the experiment. This screening grants some confidence that the experimental manipulation of fluency influenced subjects unconsciously and was experienced as a feeling of familiarity.

However, subjects' reports of their own subjective states are imperfect measures of those states. Merikle and Reingold (1991) proposed a strong criterion to judge that subjects are using knowledge unconsciously, which requires that subjects who are not made aware of the basis of the decision are more influenced by that basis than are subjects who are made aware of it. The logic of this criterion is sound: If subjects cannot use the information deliberately, in a test directly requiring its use, then their success in another test indirectly requiring use of that knowledge is unlikely to be due to conscious use of the knowledge. This criterion is extremely useful in memory paradigms like those investigated by Merikle and Reingold, in which all study trials are conducted before any test trials, and subjects are informed about the basis of decision before the test trials but after study trials are completed. Consequently, the subjects can only use that basis of decision deliberately if they have already learned about it consciously during the study session. In contrast, the procedure of the present experiments combines study and test on each trial. If subjects were made aware of the covert source of information at the outset, they could scan the stimuli online, seeking variation in that stimulus property. Finding that subjects can detect and learn about a source of variation when they are warned about it in advance would not mean that other subjects, not informed of the covert source, are likely to become aware of it.

Whittlesea et al. (1990, Experiment 4) conducted such a control condition, making subjects aware of the masking manipulation in advance and asking them to judge the level of masking on each trial. However, these subjects were not informed that the target word would be repeated from the list on half the trials. Thus the conditions of this experiment were the exact reverse of their Experiment 1 (described earlier as the General Method). In Merikle and Reingold's (1991) terms, this is a direct test of the subjects' ability to use the source that had been covert for subjects in Experiment 1, but an indirect test of the source that had been overt for subjects in Experiment 1. Subjects in Experiment 4 were quite able to discriminate the levels of the mask, meaning that it was not so subtle a variation that subjects could not become aware of it. However, those subjects committed the opposite error, judging that the mask was light with greater probability when the word was repeated. That finding suggests that the subjects had become aware of the masking manipulation through being told about it, but were now making unconscious use of the other basis of decision, the fluency given by repetition. Rather than providing evidence that the subjects in Experiment 1 were aware of the covert manipulation, Experiment 4 suggested that subjects in both conditions were aware of
whichever source they were told about, and made unconscious use of fluency generated by the other source.

Thus, Merikle and Reingold's (1991) criterion is not applicable when study and test are intermixed. However, a related criterion can be imagined, based on the fact that use of the fluency given by the covert source (e.g., the mask) is actually inappropriate for the required decision, which was about a different property of the target word (e.g., whether it was repeated). This criterion reverses the onus of the control test: Rather than requiring that subjects cannot use the information when made aware of it, it requires that subjects can avoid using the information when made aware of it. That is, in the case of an inappropriate basis for making decisions, unconscious use would be illustrated if subjects are influenced by the source of information when not informed of it, but reject that basis and remain uninfluenced by it when made aware of it.

By this criterion, subjects not informed of the manipulation of fluency through masking the target word were almost certainly unaware of it. Whittlesea et al. (1990) told some subjects, in advance of the experiment, that the mask on the target word would be manipulated (Experiment 3), whereas other subjects were not told until after the experiment (Experiment 1). All subjects were to judge the repetition status of the target words. Whereas subjects not made aware of the manipulation made false claims of recognition when the mask was light, subjects made aware of the masking manipulation were unaffected by it in judging repetition. Thus, when made aware of the covert masking manipulation, the subjects behaved normatively. The failure of other subjects to ignore the influence of that manipulation argues that they were unaware of it. Although it has not been explicitly tested, the same logic applies to the covert manipulation of semantic test context used in some experiments in this article: Because fluency resulting from that context is an inappropriate basis for making any of the required decisions, subjects who were aware of that manipulation should have refused to use that basis for making decisions. Their extensive use of the fluency resulting from that manipulation (e.g., the 18% effect on repetition decisions in Experiment 5 of the current series) strongly suggests that they were unaware of its source.

Moreover, the subjects in Whittlesea et al.'s (1990) Experiment 3 made a different and revealing type of error. Compared with subjects not told about the masking manipulation, they were 8% less able to discriminate words that actually were repeated from those that were not. This finding suggests that those subjects were unable to discriminate fluency given by the mask from fluency given by repetition, and had simply refused to use fluency as a basis of decision. When made aware of the inappropriate source of influence, they were no longer able to use the appropriate source. This corresponds to the logic behind Merikle and Reingold's (1991) criterion for unconscious use of knowledge, that subjects not informed of a source of information make use of it, but that subjects informed about it cannot make discriminative use of it, indicating that the former subjects were unlikely to be using that information with awareness.

The second issue, whether subjects were aware of the fluency of their identification performance (although not its covert source), and deliberately used that knowledge to guess how the item was related to previous words in the list, is more difficult to assess. Again, the mixture of study and test within trials means that a subject who is told that his or her fluency will vary between trials can seek that information and use it deliberately to judge target items, whereas a subject not informed of it may never become aware of that variation but may use it unconsciously. The criterion that subjects not be able to use a source of information deliberately is too strong for assessing their consciousness of the basis of behaviors yet to come. However, there is another source of evidence suggesting that subjects in the present experiments were not aware of performing an attributive judgment. In Experiment 5, subjects were asked to judge the pleasantness of words as well as whether the words were repeated from the list. The latter judgment could be made as a conscious inference from the fluency of identification, if subjects were aware that repetition makes words easier to identify. However, it makes no sense to decide, with full consciousness, that one likes a word on the grounds that it is easy to identify. Instead, the only rational basis for liking a word is that the word is pleasant. Given that subjects in that experiment were 8% more likely to judge target words pleasant when they were repeated, and 16% more likely to judge target words pleasant when they were predicted by their semantic context, it seems very likely that those effects were due to an unconscious inference process, mediated by the fluency of identifying the word. Given also that the subjects claimed to make their pleasantness judgments purely on the basis of a feeling of liking, it seems plausible that their claims of making other judgments only on a feeling of remembrance are an accurate reflection of their subjective knowledge about the basis of those decisions.

Further Questions

There remain a number of unanswered questions. The manipulations of perceptual and conceptual fluency at the time of test apparently simulated the normal consequences of prior experience well enough to cause illusions of familiarity. However, the size of these illusory effects was in general much smaller than the subject's ability to discriminate real differences in past experience; but the latter ability reflects actual recall as well as familiarity. Thus it is not clear whether the feeling of familiarity induced by test-time manipulations is as great as that caused by prior experience, or whether prior experience causes additional unconscious influences on processing that are not simulated by the perceptual and conceptual manipulations.

The degree to which feelings of familiarity rely on the fluency of conceptual versus perceptual processing is also unclear. The effect of manipulating conceptual aspects of processing in Experiment 2 was larger (8%) than the effect of manipulating perceptual processing in the Whittlesea et al. (1990) Experiment 1 and in my Experiments 6 and 7 (4%, 6%, and 4%, respectively; see Table 1). This seems to suggest that conceptual processing is more salient or important for subjects in making familiarity decisions. However, that large
effect occurred only when the test required a decision about semantic aspects of the past. In Experiment 3, the same conceptual manipulation had only a 4% effect when the decision was about the exact repetition of test items. Moreover, in Experiment 4, manipulation of perceptual aspects of processing had a 9% effect on decisions about conceptual relationships when the perceptual variation was presented as due to conceptual variation. This finding seems to suggest that the size of the effect, and perhaps the amount of familiarity felt, is not caused either by the type of processing conducted or the type of decision to be made. Instead, familiarity is maximal when one's thinking about the meaning of an event is fluent in a context that suggests that one had thought about such a meaning previously.

This suggests that meaning does have special status for judgments of familiarity. Even that conclusion, however, must be treated carefully. The greatest effect on illusory feelings of familiarity (18%) was observed in Experiment 5, which used a conceptual manipulation but a repetition decision, a combination that had produced a 4% effect in Experiment 3. Because the increased effect was due to the insertion of the pleasantness rating prior to the repetition decision, it suggests that feelings of familiarity do not depend only on the type of processing that is fluent or the type of decision currently being made, but also on the relative availability of other sources of deciding, such as recall.

All of the experiments asked subjects to judge events that had occurred within 500 ms prior to the test, on the assumption that if people could ever be sensitive to actual traces of prior events in memory without being influenced by test-time processing characteristics, this would be the time. It is clear that even when the events in question have occurred in the immediate past, subjects are reliant on processing heuristics rather than directly on memory traces. Other studies have shown that subjects are reliant on fluency in judging repetition after half an hour (e.g., Jacoby & Whitehouse, 1989) and after 24 hr (e.g., Jacoby, Kelley, Brown, & Jaschenko, 1989), even when the events have occurred in the remote past are governed by the same process of interpreting current fluency under the expectations aroused by present context.

Finally, although some of the factors controlling what type of feeling results from interpreting the source of fluent performance have been identified, it is unclear whether some strong feeling always accompanies especially fluent processing. A special puzzle is why one has no pressing sense of familiarity in encountering well-known people in well-known places. The factual familiarity of the person and context presumably facilitate perceptual and conceptual processing to an extreme degree, yet one feels no rush of familiarity, for example, in encountering one's spouse in one's own kitchen. Instead, the maximal cases for arousing feelings of familiarity seem to be when a well-known person is encountered in an unexpected place or when a marginal acquaintance is unexpectedly encountered in a well-known place. It seems likely from these examples that the process of interpreting fluency, which results in the feeling of familiarity, is undertaken only when the fluency is surprising in the context.

References


**Appendix A**

Examples of Sentence Contexts Used in Experiments 2 and 3

<table>
<thead>
<tr>
<th>Expected Context</th>
<th>Unexpected Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>The impatient driver blew his (horn)</td>
<td>The boy in the classroom could not (draw)</td>
</tr>
<tr>
<td>The lemon made her pucker her (lips)</td>
<td>The man in the restaurant ordered (port)</td>
</tr>
<tr>
<td>The pregnant budgie built a (nest)</td>
<td>The tall skinny man always used to (brag)</td>
</tr>
<tr>
<td>The mother gently rocked her (baby)</td>
<td>The one he finally picked was the (best)</td>
</tr>
<tr>
<td>The dirty child was in need of a (bath)</td>
<td>The color of the carpet made her (gasp)</td>
</tr>
<tr>
<td>The dentist cured the tooth (ache)</td>
<td>The first thing he learned was to (kick)</td>
</tr>
<tr>
<td>The smoke caused the fire alarm to (ring)</td>
<td>The soft pillow under her head was (pink)</td>
</tr>
<tr>
<td>The evening sun sets in the (west)</td>
<td>She decided it was time to put away the (wool)</td>
</tr>
<tr>
<td>The bored student opened her mouth to (yawn)</td>
<td>He stared for a long time at the (body)</td>
</tr>
<tr>
<td>The chicken was roasted in the (oven)</td>
<td>The worker was told to move the (soil)</td>
</tr>
</tbody>
</table>
## Appendix B

Examples of Category Cues, Target Words, and Related List Words Used in Experiment 4

<table>
<thead>
<tr>
<th>Category cue</th>
<th>Target word</th>
<th>Related list word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body part</td>
<td>Lips</td>
<td>Kiss</td>
</tr>
<tr>
<td>Heater</td>
<td>Oven</td>
<td>Bake</td>
</tr>
<tr>
<td>State of health</td>
<td>Dead</td>
<td>Kill</td>
</tr>
<tr>
<td>Pastime</td>
<td>Game</td>
<td>Card</td>
</tr>
<tr>
<td>Stopper</td>
<td>Plug</td>
<td>Cord</td>
</tr>
<tr>
<td>Accident</td>
<td>Drop</td>
<td>Lift</td>
</tr>
<tr>
<td>Substance</td>
<td>Body</td>
<td>Soul</td>
</tr>
<tr>
<td>Beverage</td>
<td>Beer</td>
<td>Pint</td>
</tr>
<tr>
<td>Exercise</td>
<td>Swim</td>
<td>Sink</td>
</tr>
<tr>
<td>Covering</td>
<td>Hair</td>
<td>Head</td>
</tr>
<tr>
<td>Dimension</td>
<td>Time</td>
<td>Hour</td>
</tr>
<tr>
<td>Test</td>
<td>Quiz</td>
<td>Mark</td>
</tr>
<tr>
<td>Copy</td>
<td>Fake</td>
<td>Real</td>
</tr>
<tr>
<td>Discovery</td>
<td>Find</td>
<td>Lose</td>
</tr>
<tr>
<td>Clumsiness</td>
<td>Fall</td>
<td>Rise</td>
</tr>
<tr>
<td>Entertainment</td>
<td>Play</td>
<td>Work</td>
</tr>
<tr>
<td>Numerical</td>
<td>Zero</td>
<td>None</td>
</tr>
<tr>
<td>Weapon</td>
<td>Whip</td>
<td>Beat</td>
</tr>
<tr>
<td>Transportation</td>
<td>Sled</td>
<td>Snow</td>
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<tr>
<td>Group</td>
<td>Army</td>
<td>Tank</td>
</tr>
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</table>

Received November 19, 1992  
Revision received March 8, 1993  
Accepted March 15, 1993

## 1994 APA Convention “Call for Programs”

The “Call for Programs” for the 1994 APA annual convention appears in the September issue of the *APA Monitor*. The 1994 convention will be held in Los Angeles, California, from August 12 through August 16. The deadline for submission of program and presentation proposals is December 3, 1993. Additional copies of the “Call” are available from the APA Convention Office, effective in September. As a reminder, agreement to participate in the APA convention is now presumed to convey permission for the presentation to be audiotaped if selected for taping. Any speaker or participant who does not wish his or her presentation to be audiotaped must notify the person submitting the program either at the time the invitation is extended or before the December 3 deadline for proposal submission.