The representation of “false cognates” in the bilingual lexicon

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The results of repetition priming studies with homographs such as *BANK* suggest that semantic constraints restrict priming to the specific meaning invoked during the study phase. Cross-language priming studies with “false cognates” (words with similar form but unrelated meanings) suggest that form similarity may be sufficient to support repetition priming, and they do not therefore support this claim. The relevant studies have used language cues (e.g., seeing the word *ESTATE* in the context of other Italian words) as distinct from semantic cues (e.g., *INVERNO-ESTATE*) to constrain meaning, however, so that interpretation is correspondingly uncertain. The experiment described in this paper was designed to answer this question: Does sequential exposure to the English word pair *MANOR-ESTATE* during the study phase facilitate lexical decision to the second of these words during sequential exposure to the Italian word pair *INVERNO-ESTATE* (i.e., winter-summer) during the test phase of the experiment? In the experiment reported below, interpretation of false cognates was constrained by meaning rather than language, and cross-language repetition priming was eliminated for false cognates. The results suggest that lexical representation in bilinguals is organized along morphological lines rather than by language.

The relationship between the representations of translations is a critical issue in bilingual research. According to one point of view, the lexicon is partitioned by language in bilinguals with independent, language-specific lexical systems connected to a single, language-independent conceptual system (e.g., Potter, So, von Eckardt, & Feldman, 1984). According to an alternative point of view, however, morphology is the critical variable, and the bilingual account will be consistent with the monolingual account in many important respects (see, e.g., Bybee, 1985; Kirsner, 1986). The latter argument suggests that words similar in form and meaning, such as those descended from a single morphological root, share representation *at the lexical level* even though they may also have common conceptual links. If morphology is critical, it follows that language does not define a boundary condition for representation, and that words which share meaning *and* form will be lexically represented in closely linked structures regardless of language. The prevalence of such structures will of course depend on the extent to which the languages of a bilingual involve intersection among lexical items, but language as such will be irrelevant.

Bybee (1985) described the monolingual lexicon as consisting of a series of lexical paradigms. A lexical par-

adigm is defined as a cluster of words consisting of a base word and its morphological relatives. Relationships between words in lexical paradigms are determined by their morphological similarity. Thus, when two words are identical or similar in meaning and form, they share the same lexical representation or cluster. However, words similar only in meaning or in form will involve separate lexical representations or clusters. It is possible to describe the morphological theories of the bilingual lexicon in similar terms if cognates (words similar in form and meaning) are likened to morphologically related words within a language and noncognates are likened to words similar in meaning but different in form. In this case, cognates would be stored in the same lexical paradigm, whereas translations that are not cognates would require separate representations.

A critical issue in lexical research involves the representation of homographs and “false cognates”—that is, words that involve completely different meanings and referents although they involve identical or similar surface forms. False cognates such as *ESTATE* can be contrasted with “true cognates” such as *DEPRESSION/DEPRESSIONE*, words that to a large extent share form and meaning. This contrast is also present within languages too, as is illustrated by a word such as *BANK*, a term that has several unrelated interpretations. Now, if meaning and form together define lexical representation as Bybee (1985) and Kirsner (1986) have argued, recognition of false cognates should involve reference to separate lexical representations.

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Research into the role of meaning and surface form in lexical representation has spawned a variety of paradigms. The development of multiple paradigms reflects two issues: first, the desire to establish and exploit paradigms that selectively sample a single process or representation, and second, a growing suspicion that this objective is, while desirable, unobtainable. Much of the early work investigating lexical organization involved what we will refer to as *standard repetition priming*. Standard repetition priming typically comprises the presentation and repetition of stimuli during separate study and test phases of an experiment, in which the critical comparison involves lexical decision for *new* words, stimuli not presented during the study phase, and *old* words, stimuli that have been presented during the study phase. It should be noted, furthermore, that the study and test phases are usually separated by minutes or even hours, without compromising the advantage typically observed for old words, and that stimulus interpretation is unconstrained by either a mask, to reduce contributions from conscious processes, or the context, to constrain interpretation.

Research involving the standard repetition priming paradigm has generally demonstrated that lexical decision is facilitated when words are repeated in the same form and language (e.g., Scarborough, Cortese, & Scarborough, 1977), but that facilitation is abolished when noncognate translations are used (e.g., Kirsner, Brown, Abrol, Chadha, & Sharma, 1980; Kirsner, Smith, Lockhart, King, & Jain, 1984; Scarborough, Gerard, & Cortese, 1984). The major exception to this pattern involves true cognates, translations that share semantic and orthographic and/or phonemic features (Cristoffanini, Kirsner, & Milech, 1986), where the authors have assumed that facilitation reflects reference to a language-independent representation, involving a stem or root morpheme for example.

Questions about the relationship between lexical representations of translations involve the use of a third type of word, in addition to cognates and noncognates. Consider a word such as *ESTATE*. The English *ESTATE* and the Italian *ESTATE* are not translations of each other. The two readings involve completely independent meanings and referents, yet they are orthographically identical. Does representation of *ESTATE* in English facilitate lexical decision when *ESTATE* is subsequently presented in Italian, or vice versa? The answers to questions about the representation of *ESTATE* are important theoretically, and for second language instruction generally. Where theory is concerned, the pattern of cross-language facilitation is important. Evidence that exposure to *ESTATE* in English facilitates performance when *FIN* is subsequently presented in French, or vice versa, would falsify the claim that morphology is critical, for morphology involves meaning as well as form.

Bilingual studies of false cognates indicate that each reading may be available under certain conditions. Beauvillain and Grainger (1987), for example, explored semantic priming at short stimulus onset asynchronies and found that false cognates or "interlexical homographs" prime associated words in the alternative language, even

when facilitation depends on access to the unintended reading of the prime. For example, presentation of *COIN* as a French word (for which the translation is *CORNER*) actually reduced reaction time to *MONEY* in an English lexical decision task for a stimulus onset asynchrony of 150 msec but not 750 msec (Beauvillain & Grainger, 1987, Experiment 1). Beauvillain and Grainger (Experiment 2) found, furthermore, that this effect was stronger when leakage between languages depended on access to the high- as distinct from the low-frequency reading of the false cognate. These results are of course consistent with monolingual studies that show that both meanings of English homographs are activated for a brief period immediately after stimulus presentation (Simpson & Burgess, 1985).

How should we interpret these results? Two issues justify caution. First, because their experiments required subjects to switch rapidly between languages, between presentation of the prime and test stimuli at short stimulus onset asynchronies, Beauvillain and Grainger (1987) may have inadvertently encouraged their subjects to adopt a flexible, language-independent strategy. The second point involves the fact that they did not provide a semantic context for their primes apart from the uncertain role of language. It is possible that language constrains semantic interpretation, but this is uncertain, particularly under the rapid language shifting conditions used by Beauvillain and Grainger. In summary, the results would carry greater weight in regard to the processing of false cognates if the researchers had applied semantic as well as language constraints to their primes.

Additional evidence that priming effects for false cognates are not restricted to one reading or language when language is used to provide the constraint was reported by Gerard and Scarborough (1989). Their paper actually includes two findings that are relevant to the debate. The first of these involved standard repetition priming. Gerard and Scarborough found substantial transfer for false cognates as well as cognates under standard repetition priming conditions, a pattern that was not observed for noncognates. This outcome is consistent with the inference that each reading of the false cognate was activated during encoding. Gerard and Scarborough did not adopt this interpretation, however, and used in evidence the second of their findings. This second finding involved evidence that access to false cognates was restricted to the designated language during the study phase of the experiment. Gerard and Scarborough found that frequency in the target language determined reaction time during the study phase, when priming was irrelevant. Thus, when a high-frequency English word such as *RED* was presented for classification as a "word" or "nonword" under Spanish target conditions, lexical decision reflected the low-frequency count for that word in Spanish, not the high-frequency count associated with the English reading of that word. Furthermore, when the same word was presented for classification as a "word" or "nonword" under English target conditions, lexical decision reflected the high-frequency count for that word in

English, not the low-frequency count associated with the Spanish reading. Thus Gerard and Scarborough found facilitation for false cognates under standard repetition priming conditions, but instead of assuming that this reflected activation of both readings, they assumed that the language manipulation used by them had effectively controlled interpretation, and that facilitation reflected another "artefact," involving an encoding effect based on surface form. This argument is of course similar to that advanced by Forster and Davis (1984), that standard repetition priming involves episodic as distinct from lexical effects.

How secure is Gerard and Scarborough's (1989) claim? It is our contention that a simpler and more cautious interpretation of their data is available. It is that their subjects followed the instructions literally and classified stimuli as words or nonwords *for the target language*, a task that they could complete only following access to representations in the designated language, whether English or Spanish. It is possible to argue, therefore, that their experiment tapped decision processes rather than lexical access. According to this view, then, access to the low-frequency reading of false cognates actually *followed* access to the high-frequency reading, although subjects rejected the low-frequency reading because it did not meet the relevant decision criterion as a "word" in the designated language. It is possible to argue, furthermore, that a similar procedure operated when the frequency counts were reversed, the difference being that the low-frequency reading of the false cognate was accessed *after* the high-frequency reading in the designated language. In summary, then, it is our contention that their subjects actually accessed both readings during the study phase of their experiment, and that it was this step that supported repetition priming for false cognates during the test phase.

Where multiple readings are possible, the critical manipulation involves context. Studies of monolinguals are consistent with the claim that all of the meanings of ambiguous words are activated during initial processing, and that inappropriate meanings are inhibited only at a later stage (Tanenhaus, Leiman, & Seidenberg, 1979). Furthermore, several recent studies have demonstrated that it is possible to deny access to the multiple meanings of homographs by using context to constrain meaning. The use of context to constrain meaning results in the removal of the priming effects between homographs that involve unrelated readings (Bainbridge, Lewandowsky, & Kirsner, 1993; Jones, 1991; Masson & Freedman, 1990).

Masson and Freedman (1990) preceded ambiguous words with a context word that was semantically related to one meaning of the homograph. Priming was observed only when the homograph was presented with the same meaning in the second phase of a standard repetition priming experiment. No priming was observed when the homograph was presented in the second phase with the context word defining a different meaning. For example, sequential presentation of the word pair MONEY–BANK during the study phase primed BANK when it was repeated following ROBBER during the test phase (i.e., ROBBER–

BANK), but facilitation was not observed for BANK in the ROBBER–BANK sequence during the test phase if the study pair consisted of RIVER–BANK. Similar results were found by Bainbridge et al. (1993) and Jones (1991), although these researchers used sentences rather than individual words to control interpretation. Bainbridge et al. proposed that priming was absent between inappropriate meanings of the same word form because there are separate representations for each reading or interpretation, an argument that is essentially the same as that advanced by Bybee (1985), although for rather different reasons.

The critical experimental procedure therefore involves an analysis of standard repetition priming for false cognates when a semantic context is used to constrain interpretation. Is repetition priming observed under cross-language language conditions when processing is directed toward the language-specific meanings of false cognates under both study and test conditions, or does contextual constraint restrict facilitation to true cognates. On the basis of monolingual studies involving contextual constraint, it is anticipated that facilitation will be restricted to circumstances in which the study and test manipulations involve the same meaning. The experiment described below was implemented to test this proposition.

METHOD

Subjects

Twenty-four English/Italian bilinguals from Perth and Melbourne, Australia, participated in the experiment. All subjects considered themselves to be fluent bilinguals whose first language was English and rated themselves as 5 or over on a scale of 1 to 7 in both languages. Subjects were using both languages on a daily basis either at home or at work. All subjects had normal or corrected-to-normal vision. The mean ages, mean number of years of education, mean number of years of using their second language, and mean proficiency rating in their second language were 37, 17, 26 and 5.3, respectively.

Apparatus and Stimuli

The stimuli were presented on a Macintosh Powerbook 170. A HyperCard program ran the experiment, controlling the presentation of the stimuli and recording naming latencies.

The test stimuli consisted of 228 words and nonwords. There were 36 cognates, 36 noncognates, 36 false cognates, 33 noncognate fillers, and 87 nonwords. Stimuli were selected using Garzanti's (1969) Italian–English dictionary. Word frequency was determined by reference to Kučera and Francis (1967) for the English words and Juilland and Traversa (1973) for the Italian words. The word pairs from sets of cognates and noncognates were reviewed and classified as "semantically similar" by seven fluent Italian–English speakers prior to the experiment. The same procedure demonstrated that the noncognates were "highly different" in form. The false cognates were selected if they were either identical in form or different in form by only one or two letters, provided that they were semantically unrelated. Application of the constraints outlined above restricted the extent to which the word sets could be balanced for word frequency. This restriction was nonetheless accepted, because the critical prediction involved an interaction between cognate type and repetition status. The mean word frequency values are shown in Table 1. The stimuli were divided into three groups. In Phase 1, one stimulus group was presented in English, one was presented in Italian, and one was not presented. All of the stimuli were presented in Italian in Phase 2.

Table 1
Word Frequency (WF) as a Function
of Language and Treatment

Language	Cognates	Noncognates	False Cognates
Italian	8	3	45
English	18	12	25
Italian + English	26	15	70

The context words were selected in the following manner. The false cognates in Italian were listed with their English meanings. Five English monolinguals were provided with the lists of the English meanings of the Italian and English stimuli in a word association task. The two most common responses were used as context words and were translated into Italian. The context words for the Italian and English stimuli in Phase 1 were translations, except in the case of false cognates, which did not have the same meaning and could therefore not have the same context words. The Italian stimuli in Phase 2 had different context words from those for the Italian stimuli in Phase 1. However, the same meaning was primed by the Italian context words in each phase. Examples of the words from the critical treatments are presented in Table 2.

Instructions and Procedure

The subjects were given the following instructions:

You are going to see a series of English/Italian words presented on the computer screen. The words will be in pairs. The first word in each pair will be in uppercase letters. The second word will be in lowercase letters. You need to make a decision about the second word, the one in lowercase letters. Sometimes this will be a real word. Sometimes it will be a nonword; that is, a made-up word which does not exist. When you see a real word press the up-arrow key. When you see a nonword press the control key. You need to make this decision as quickly but as accurately as you can. The first word in each pair, the one in uppercase letters, will give you a clue about the meaning of the second word. It is there to help you make your decision.

A practice session was included.

The experiment included two phases. Phase 1 consisted of two parts. For all subjects, the first part was in English and the second part was in Italian. There was a short break between the two parts of Phase 1, during which subjects were instructed to continue with the same task but were told that the words would now be in Italian.

Following the completion of Phase 1, there was a 5-min break, during which biographical questions were asked. Subjects were then asked to continue with the task and were told that the words would again be in Italian. Subjects were counterbalanced across the six conditions so that all stimuli were seen in each condition.

The context–test stimulus pairs were presented randomly, at the center of the screen. The context word was presented in uppercase letters for 1,000 msec. There was a 250-msec interstimulus interval between the context and test stimuli. The test word was presented in lowercase letters, and it remained on the screen until a response was made. There was a 1,000-msec lag between keypress and presentation of the following trial. Response times and error rates were recorded by the computer using a HyperCard program.

RESULTS

Reaction Time

A 3×3 repeated measures analysis of variance (ANOVA) was conducted following removal of errors and outliers. Responses were treated as outliers when reaction time was more than 2 standard deviations from the mean in a treatment by treatment procedure. The variables were cognate type (i.e., cognates, noncognates, and false cognates) and repetition status (i.e., same language, different language, and new). A mixed ANOVA was used for the item analysis, with repetition status as a within-subjects variable and cognate type as a between-subjects variable. The main effects of cognate type [$F_1(2,46) = 15.67, p < .05$; $F_2(2,104) = 16.83, p < .05$] and repetition status [$F_1(2,46) = 20.98, p < .05$; $F_2(2,208) = 34.47, p < .05$] were significant, as was the interaction between these factors [$F_1(4,92) = 2.56, p < .05$; $F_2(4,208) = 3.34, p < .05$]. The results are summarized in Table 2.

A series of planned contrasts was used to test a priori hypotheses. There was a significant difference between cognates in the same-language and new condition [$F_1(1,23) = 5.80, p < .05$; $F_2(1,104) = 6.41, p < .05$] and between cognates in the different-language and new con-

Table 2
Examples of Context and Test Words for Phases 1 and 2 for the Intralanguage,
Cross-Language, and New Treatments for Cognates, Noncognates, and False Cognates

		Study Phase		Test Phase	
	Condition	Context	Test	Context	Test
Cognates					
Intralanguage	I–I	TRISTE	depressione	INFELICE	depressione
Cross-language	E–I	SAD	depression	INFELICE	depressione
New	#I			INFELICE	depressione
Translations		<i>sad</i>	<i>depression</i>	<i>unhappy</i>	<i>depression</i>
Noncognates					
Intralanguage	I–I	VEGETALE	pisello	FAVA	pisello
Cross-language	E–I	VEGETABLE	pea	FAVA	pisello
New	#I			FAVA	pisello
Translations		<i>vegetable</i>	<i>pea</i>	<i>bean</i>	<i>pea</i>
False Cognates					
Intralanguage	I–I	SPIAGGIA	estate	INVERNO	estate
Cross-language	E–I	MANOR	estate	INVERNO	estate
New	#I			INVERNO	estate
Translations		<i>beach</i>	<i>summer</i>	<i>winter</i>	<i>summer</i>

Note—The first and second letters in the condition column identify the study and test languages, respectively: I, Italian; E, English; #, “does not apply.” Thus, E–I indicates that the languages of presentation for the study and test phases were English and Italian, respectively.

Table 3
Mean Reaction Time and Percent Error (PE) for Cognates, Noncognates, and False Cognates for the Intralanguage Priming, Cross-Language Priming, and New Treatments

	Cognates		Noncognates		False Cognates	
	RT	PE	RT	PE	RT	PE
Intralanguage	616	5	674	14	581	9
Cross-language	618	6	794	18	678	11
New	660	10	827	17	676	16
Repetition priming	44		153		95	
Relative priming	0.95		0.22		-0.02	

Note—Repetition priming = lexical decision for the new treatment (RT_{new}) – lexical decision for the intralanguage treatment, or RT_{new} – RT_{intra}. Relative priming = (RT_{new} – RT_{cross})/(RT_{new} – RT_{intra}).

dition for subjects [$F_1(1,23) = 6.35, p < .05$] but not for items [$F_2(1,104) = 3.73, p > .05$]. There was no significant difference between cognates in the same- and different-language conditions [$F_1(1,23) = 0.01, p > .05$; $F_2(1,104) = 0.36, p > .05$].

A different pattern was observed for false cognates and noncognates. For false cognates there was no significant difference between different language and new conditions [$F_1(1,23) = 0.013, p > .05$; $F_2(1,104) = 0.60, p > .05$]. But there was a significant difference between the same-language and different-language conditions [$F_1(1,23) = 11.98, p < .05$; $F_2(1,104) = 18.41, p < .05$] and the same-language and new conditions [$F_1(1,23) = 18.93, p < .05$; $F_2(1,104) = 25.628, p < .05$].

Similarly, for the noncognates, there was no significant difference between the new and different-language conditions [$F_1(1,23) = 0.53, p > .05$; $F_2(1,104) = 1.77, p > .05$], though there were significant differences between the same-language and different-language conditions [$F_1(1,23) = 8.30, p < .05$; $F_2(1,104) = 25.63, p < .05$] and the same-language and new conditions [$F_1(1,23) = 11.79, p < .05$; $F_2(1,104) = 40.86, p < .05$].

Accuracy

Error rates were converted to percentages for each stimulus group and analyzed using a 3×3 repeated measures ANOVA. Cognate type and repetition status were the independent factors; percent error rate was the dependent variable. The analysis revealed a significant effect of cognate type [$F(2,46) = 15.72, p < .05$] and repetition status [$F(2,46) = 9.50, p < .05$]. There was no significant interaction between cognate type and repetition status [$F(4,92) = 0.65, p > .05$]. The means are shown in Table 3.

Frequency effects

As described above, word frequency was greater for the words in the cognate set than for those in the noncognate set. The word frequency differences between the cognate and noncognate sets shown in Table 1 are reflected in three predictable performance measures: mean reaction time for the new treatments, at 660 and 827 msec for the cognate and noncognate treatments, respectively; accuracy

for the new treatments, at 90 and 83 percent correct for the cognate and noncognate treatments, respectively; and repetition priming, at 44 and 153 msec for the cognate and noncognate treatments, respectively. These patterns can be predicted on the basis of established relationships between word frequency and the performance measures; they have been observed in many studies (e.g., Kirsner, Milech, & Standen, 1983; Kirsner & Speelman, 1996; Scarborough et al., 1977).

The observed pattern of performance for false cognates does not fit the picture outlined above. Even if consideration is restricted to the Italian word frequency data for the false cognates, it is evident that the observed word frequency count is higher for these words than it is for the cognates, yet the performance indices suggest that, functionally, they belong to a lower word frequency band, with less accuracy (84% vs. 90%), longer lexical decision (676 vs. 660 msec), and more repetition priming (95 vs. 42 msec). It should be noted that these differences do not, however, compromise our central claim that repetition priming is restricted to conditions in which form and meaning are maintained. One way to characterize this claim is to specify the relative priming (RP) values for the critical treatments. RP can be used to assess the extent of transfer when performance is known for "new" treatment and for "old-identical" repetition treatment. Thus, $RP = (RT_{new} - RT_{old-different}) / (RT_{new} - RT_{old-identical}) = 0.95, 0.22$, and -0.02 for the cognate $(660-618)/(660-616)$, noncognate $(827-794)/(827-674)$, and false cognate $(676-678)/(676-581)$ treatments, respectively. This pattern is consistent with the claim that repetition priming is eliminated in the false cognate treatment.

DISCUSSION

The results show that false cognates conform to the pattern observed for noncognates, provided that interpretation of the words is contextually constrained. The results demonstrate that the conjunction between meaning and surface form is critical. The presence of semantic correspondence is not alone sufficient, or repetition priming would have been observed for noncognates, and the presence of physical similarity is not alone sufficient, or repetition priming would have been observed for the false cognates. It is only when physical and semantic similarity co-occur that standard repetition priming is observed.

The results complement monolingual studies in English, where standard repetition priming is eliminated when contextual constraints invoke different readings of homographs (Bainbridge et al., 1993; Jones, 1991; Masson & Freedman, 1990). Facilitation is observed when the contextual constraint involves the same reading of the homograph (Bainbridge et al., 1993). This pattern was also observed in our experiment, where different prime words were always used even when the language and intended interpretation were identical. More generally, facilitation will be observed for decontextualized homographs, because each subject will invoke his or her citation

sense, and the same pattern can be expected for decontextualized false cognates, as individuals opt for their preferred interpretation.

Reading, listening, writing, and talking almost invariably occur in a specific context, and measurement of performance under contextualized conditions is therefore critical to model development. The results described in the present paper demonstrate that when context is controlled experimentally, facilitation is restricted to words that share both meaning and form, and that each of these variables is alone insufficient to sustain repetition priming. The results complement those observed under similar conditions in monolingual research.

The critical result in the present study is that repetition priming is absent for false cognates, a finding that is secure despite frequency differences between the word sets. The frequency differences are of interest, however. The observation of interest is that performance for new cognates is equal or superior to that for new false cognates on all performance measures despite the fact that Italian word frequency counts for the noncognates is alone greater than the sum of the English and Italian word frequency counts for the cognates. This pattern could, if significant, be explained by assuming that either (1) functional word frequency for the cognate set is actually higher than observed word frequency, as if these words played a prominent role in second language learning for example, or (2) functional word frequency for the false cognate set is actually lower than observed word frequency, as would be the case if these words had been selectively neglected in second language learning, for example. We cannot adjudicate between these options.

One challenge to our assumption that the results reflect lexical processes involves the counterclaim that the standard repetition priming paradigm reflects episodic as well as lexical processes. This claim can be advanced in either of two forms, involving conscious and unconscious processes, respectively. In its unconscious form, the claim is little different from models which assume that lexical performance depends directly on the records or traces of old events (Kirsner & Dunn, 1985; Logan, 1988). The general argument developed by Logan and by Kirsner and Dunn is that records or traces function as a resource, a resource that can be used to answer a variety of questions, involving lexical decision and recognition memory, for example.

In its conscious form, the claim implies that participants use "oldness" information in preference to "lexicality" information to make lexical decisions, even when the latter is readily available. This proposition appears to draw support from evidence that repetition priming under stem completion conditions depends on both automatic and intentional memory processes (Jacoby, 1991). However, it should be noted that typical "reaction times" in the stem completion task, the conventional procedure for separating automatic and intentional uses of memory, are approximately 10 times longer than those involved in lexical decision, a difference that compromises generalization between the paradigms.

A second argument concerns the type of episodic information being used to guide lexical decision. It cannot be that participants use "oldness" information in preference to "lexicality" because the test phase included old nonwords as well as new nonwords. It must therefore involve a conditional decision based on oldness *and* the response used during the study phase. But is this task easier than lexical decision? How hard are old/new and word/nonword decisions, relatively? Ratcliff, Hockley, and McKoon (1985) for example, used parallel procedures to measure performance on these tasks and found that performance on lexical decision was both faster and more accurate than performance on recognition memory. Thus they reported reaction time and accuracy values of approximately 930 msec and 99% correct, respectively, for lexical decision and approximately 1,050 msec and 90% correct, respectively, for recognition memory. Moreover, performance on the recognition memory task declined steadily as a function of lag, whereas the repetition effects in lexical decision were indifferent to lag, except at very short intervals. We have no quarrel with the claim that recognition memory and lexical decision enjoy access to at least one shared resource. But the stronger claim that performance in lexical decision tasks actually depends on conscious episodic information involving old/new judgments has not been sustained. Furthermore, in the present context, oldness is not a sufficient criterion; subjects would need to retrieve response information as well, a conjunction that poses a significant challenge to the episodic account.

A third argument against the episodic account of standard repetition priming effects in lexical decision is that it requires an additional and expensive assumption to explain the overall pattern of results. The critical feature involves the *absence* of repetition priming effects in noncognates. When people are tested under recognition memory (i.e., old/new) as distinct from lexical decision (i.e., word/nonword) conditions, performance for noncognate translations is reduced only slightly by a language change (see, e.g., Kintsch, 1970), an outcome that stands in sharp contrast to the observed pattern of results for noncognates in standard repetition priming. Similarly, in free recall, the effect of repeating translations during list presentation is virtually identical to the effect of re-presenting words in the same form (Kollers & Gonzalez, 1980). Thus, when we turn to the traditional episodic tasks, we find that language is virtually transparent; people recall and classify stimuli regardless of language change. The claim that the standard repetition priming effects reflect episodic processes requires an additional argument, to explain the *absence* of facilitation effects for noncognates.

A second possible challenge to our results and interpretation involves the contrast between standard and masked repetition priming paradigms (see, e.g., Forster & Davis, 1984). The two repetition priming paradigms involve quite different priming procedures. In the masked priming procedure, stimulus onset asynchrony ranges from 30 to 60 msec, whereas the critical interval can be measured in hours or weeks in the standard paradigm. In

addition, of course, the priming stimulus in the masked repetition priming is masked to reduce or preclude conscious processes. It should be noted, furthermore, that experiments involving the masked repetition priming procedure have generally resulted in facilitation effects for noncognates as well as cognates (e.g., de Groot & Nas, 1991; Gollan, Forster, & Frost, 1998), an outcome that challenges our claim that lexical representation depends on meaning *and* form. Although the claim that standard repetition priming is influenced by conscious episodic processes cannot be ignored, masked repetition priming is also open to extralexical interpretation, on the basis of evidence that, first, form priming may be observed for nonwords (Masson & Isaak, 1999) and, second, semantic priming may be observed in the absence of stimulus identification when degraded displays are used (Marcel, 1983). Our argument is, then, that performance on these tasks reflects different sets of processes. It is of course possible that each task is influenced by a single lexical source, involving an influence that may be masked by contributions from other sources in each task.

One other problem for the challenge posed by masked repetition priming is that, contrary to the original claim that performance on this task is insensitive to word frequency (Forster & Davis, 1984), recent evidence suggests that facilitation in masked repetition priming is sensitive to practice effects, involving the contrast between first and second language performance in particular (Gollan et al., 1998). In summary, it is our assumption that the standard and masked repetition priming procedures sample different aspects of lexical function, and that the delineation of characteristics of the relevant processes will depend on further research.

It is our claim that the basic units of representation in the mental lexicon are defined by morphology (Bybee, 1985; Kirsner, 1986), and that this principle of organization transcends language (Cristoffanini et al., 1986; Kirsner, Lalor, & Hird, 1993). The evidence presented in this paper extends the claim that both surface and semantic similarity are critical; when either of these is absent, standard repetition priming is eliminated under inter- as well as intralanguage conditions. The term "surface similarity" is misleading, however, and "structural similarity" might be more appropriate. The critical study involved standard repetition priming between Hindi and Urdu cognates, using words that are indistinguishable in their spoken form, but utterly different in their printed forms.¹ Thus, evidence involving both (1) *orthographic* cognates, words that are similar in regard to orthography and meaning (where phonology usually follows orthography to some extent), and (2) *phonological* cognates, words that are similar in regard to phonology and meaning but not orthography (Brown, Sharma, & Kirsner, 1984), supports a more abstract account involving structural as distinct from surface similarity. We propose, therefore, that the contingency between structural similarity (a term that encompasses orthographic and phonological effects) *and* semantic similarity determines the organization of the mental lexicon, a claim that mimics ar-

gument about the role of inflections and derivations in intralanguage research (e.g., Laudanna, Badecker, & Caramazza, 1989).

Our argument is similar to that developed by Bybee (1985), who described the lexical system as consisting of many lexical paradigms. In her account, each paradigm contains a stem and its morphological derivatives. Her central argument is that lexical representation is dominated by the lexical paradigm, and that performance data may be interpreted with reference to the experiences that establish and modify specific paradigms. The critical question addressed in the present paper concerns the hypothesis that morphology transcends language, and that lexical paradigms that straddle the boundaries between languages reflect the same principles as do paradigms that are language specific. This issue is addressed at two points. The first point involves the relative magnitude of repetition priming under intra- and cross-language conditions for cognates. Because most of the word pairs in the relevant set differed in regard to both orthography and phonology, it was expected that repetition priming would be slightly less under cross-language than intralanguage conditions. The observed difference was only 2 msec, however, a result which suggests that the orthographic and phonological differences involved were discarded prior to lexical access. This result is similar to that reported by Scarborough et al. (1977) for case. The second point concerns the absence of transfer between false cognates. This result is critical. If representation is determined by the lexical paradigm, or, more narrowly, the co-occurrence of words that share both structural and semantic elements, the presence of transfer between word pairs that share only one of these attributes would be problematic. The present result brings the bilingual account into line with the monolingual account; when interpretation is constrained by a semantic cue rather than language, and standard repetition priming is abolished for homographs.

Evidence that contextual manipulation creates a lexical environment in which false cognates do not pose a threat to bilingual performance has important implications for second language learning. It suggests, for example, that instruction in second language vocabulary should avoid the use of decontextualized procedures where both genuine and false cognates are concerned. For genuine cognates, the use of context will encourage the establishment of lexical representations that are language independent, thereby enabling users to exploit existing lexical knowledge. For false cognates, the use of context should ensure that new representations are formed for words that might otherwise pose an interpretative challenge.

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NOTE

1. Hindi and Urdu use the Devanagari and Arabic scripts, respectively, and they are written from left-to-right and right-to-left, respectively.