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Hall, Christopher J (2002) The automatic cognate form assumption: evidence for the parasitic model of vocabulary development. *IRAL - International Review of Applied Linguistics in Language Teaching*, 40 (2). pp. 69-87.

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# The automatic cognate form assumption: Evidence for the parasitic model of vocabulary development

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## *Abstract*

*The Parasitic Hypothesis, formulated to account for early stages of vocabulary development in second language learners, claims that on initial exposure to a word, learners automatically exploit existing lexical material in the L1 or L2 in order to establish an initial memory representation. At the level of phonological and orthographic form, it is claimed that significant overlaps with existing forms, i.e. cognates, are automatically detected and new forms are subordinately connected to them in the mental lexicon. In the study reported here, English nonwords overlapping with real words in Spanish (pseudocognates), together with noncognate nonwords, were presented to Spanish-speaking learners of English in a word familiarity task. Participants reported significantly higher levels of familiarity with the pseudocognates and showed greater consistency in providing translations for them. These results, together with measures of the degree of overlap between nonword stimuli and translations, were interpreted as evidence for the automatic use of cognates in early word learning.*

## **1. Introduction<sup>1</sup>**

### *1.1. The role of cognates in vocabulary development*

The facilitating role of cognates in the L2 vocabulary learning process has long been recognized (cf. Sweet 1972 [1899]). Cognates are words in two or more languages which share phonological and/or orthographic form, and normally (but not necessarily) are also related semantically. Ringbom (1987: 41) makes the commonsense observation that “[w]hen both phonological and semantic similarity work together, the effect is like that of a magnet attracting a new word to be stored in the learner’s mental lexicon when he meets it for the first time”. In this way, cognates have been recognized as significant sources of positive transfer (Ringbom 1987; Odlin 1989; Nation 1990). Not surprisingly, the same authors have pointed out that phonological similarity *without* (suffi-

cient) semantic overlap, in the familiar cases of false cognates (*faux amis*), will lead to negative transfer (or *interference*).

Very little experimental work has been conducted by applied linguists on the effects of cognates in vocabulary learning (although cf. Ard and Homburg 1983). There have been relatively more data from naturalistic studies (e.g., Ringbom 1987; Holmes and Ramos 1993; also studies discussed in Hatch and Brown 1995 and Singleton 1999), as well as from word association tasks (e.g., Meara 1984), all demonstrating the significant role of formal similarity in the development and organization of the L2 mental lexicon. General research on orthographic and phonological aspects of foreign language vocabulary development and processing remains, however, sparse, while work on top-down strategies has dominated the literature (Koda 1997).

In research by experimental psycholinguists on the mental lexicons of bilinguals, on the other hand, an impressive amount of data has been gathered (cf. Chen and Leung 1989; Jin 1990; Sánchez Casas et al. 1992; de Groot and Nas 1991; de Groot 1992, 1993; Kroll and Stewart 1994). These data suggest that phonological and semantic cognates are more closely associated than noncognate translation equivalents, but that purely phonological cognates (*false cognates*) appear to behave like noncognates on a number of psycholinguistic tasks, such as cued translation, word and picture naming, and priming using translation, repetition and semantic associates.

More recent research on the effects of phonological and conceptual aspects of words in bilingual processing has found that purely formal similarity between word competitors can influence performance on lexical decision and translation recognition tasks (e.g., Dijkstra et al. 1998; Talamas et al. 1999). Talamas et al. (1999), following Kroll and Stewart's (1994) asymmetric model of lexical representation and processing in bilinguals, confirm that less fluent bilinguals are more affected by formal similarity than more balanced bilinguals: "For less fluent individuals, who are likely to have greater uncertainty about their L2 knowledge than more fluent individuals, any significant activation of shared [formal] features may present sufficient evidence to respond positively that the pair of words are translation equivalents, regardless of whether or not that is so" (1999: 56). Dijkstra et al. (1998) show that fully fluent bilinguals also demonstrate false cognate interference effects (from interlingual homographs such as *room*, Eng. 'room', Dutch 'cream') when performing the lexical decision task in bilingual mode (i.e., when language input is mixed between L1 and L2).

Dijkstra and his colleagues have also shown that the neighbourhood density of a word, i.e. the number of lexical neighbours differing minimally from it in orthography in either L1 or L2, will affect recognition and translation latencies (Grainger and Dijkstra 1992; Van Heuven et al. 1998). *Traitors* (L1 words with more neighbours in L2 than in L1) are slower to recognize, and provoke

more errors, than *patriots* (L1 words with more neighbours in L1 than L2). Van Heuven et al. (1998: 474) conclude that “[s]timulus items automatically activate orthographically similar words in both the target language and the other language of the bilingual participant”.

In addition, studies on lexical production and comprehension errors in a foreign language consistently reveal patterns of formal organization in and between the native and foreign language lexicons. Ecke’s work on tip-of-the-tongue recall stages in second and third language learners (Ecke 1996, 1997; Ecke and Garrett 1998) shows clearly that interlexical influence at the level of phonological and orthographic form plays a crucial role in learners’ extended word searches. In a study of cognate reliance in reading comprehension by Brazilian learners of English, Holmes and Ramos (1993) report lexical misidentification on the basis of formal similarity with other words in the L1 and L2 (e.g., L2 *poll* interpreted as L1 *polo* ‘city, central point’ and L2 *swing* taken as L2 *swim*).

Laufer (1989, 1997) discusses the issue in terms of the phenomenon of *deceptive transparency*, in which readers misidentify a word on the basis of its formal similarity with existing words in the L1 and L2, listing false cognates (such as Eng. *tramp* taken as Hebrew *trempe* ‘lift’) and identifying a class of error which she calls *synforms*, which, according to her studies, are the largest category of deceptively transparent words. Synforms (*malapropisms* in the monolingual literature) are lexical mis-hits selected due to formal resemblance with other L2 forms (such as *price* for *prize* and *cute* for *acute*). Laufer argues that synforms are identified because of insecure knowledge of the target form or of both target and error forms. In a study of French EFL learners’ errors, Granger (cited in James 1998: 149) found that over 34 % of lexical errors were due to the use of false cognates, i.e., L2 words with partial form and meaning overlap with L1 translation equivalents.

The evidence summarized here, much of it collected in studies which tap automatic, non-attentional processes, strongly suggests that similar form features in the L1 and L2 are automatically detected and exploited in the establishment of memory traces for new L2 words. The following section sketches a model of vocabulary development that takes such similarity detection and exploitation as the principal motor which drives early word learning.

### 1.2. *The Parasitic Strategy of vocabulary development*

On the basis of a series of studies on foreign language errors in L2 and L3, Hall (1992, 1996, 1997; Hall and Schultz 1994) and Ecke and Hall (1998, 2000) have argued that vocabulary development may usefully be viewed as a problem of pattern-matching and assimilation with current lexical knowledge, at least at the onset of the word learning process. This psycholinguistic approach has

motivated the postulation of a *Parasitic Strategy* of vocabulary development: a series of automatic, unconscious cognitive stages that an emerging lexical entry is hypothesized to undergo after the learner first encounters an unknown word.

According to the Parasitic Strategy, the key to learning the word is first to establish a form representation, i.e., construct a memory trace of the pronunciation and/or spelling, and then to make the right connections with existing lexical and conceptual knowledge. The strategy claims that after registering the form, learners will immediately identify a translation equivalent, should one be available, through overt translation into L1, by an L1 or L2 definition, by some icon (e.g., a picture or mime), contextual cues, or by whatever other medium. This is because when language input is received, it is the immediate and inevitable responsibility of the language faculty in the mind/brain to deal with it, whether it is from the L1 or the L2. The central purpose of the language faculty is, I assume, to assign forms to meanings, and meanings to forms, using any and all linguistic resources available.

We witness this assumption of translation equivalence in learner errors, for example where an L2 form is used erroneously in the syntactic frame of a semantically equivalent L1 lexical entry. Hall and Schultz (1994) collected lexical errors from 125 compositions written by Mexican learners of English at the beginner level, in which the majority of examples of incorrect syntactic deployment could be traced to the grammatical behaviour of translation equivalents (74 % of the 104 errors detected). Examples include (1a), on the basis of (1b):

- (1) a. *It would like you.* (produced)  
 b. *Te gustaría*  
 you-object it-would-please  
 ‘You would like it.’ (intended meaning)

Here, the English verb *like* is rightly taken as the most appropriate translation equivalent of the Spanish verb *gustar*. The problem is that the two verbs behave differently with regard to their syntactic deployment. Both verbs select the same thematic roles as arguments, but (simplifying slightly), *like* places the experiencer in subject (preverbal) position and the theme in object (postverbal) position, whereas Spanish *gustar* does the opposite (following the pattern of Eng. *please*).<sup>2</sup>

We can represent this phenomenon schematically using diagrams that follow the conventions of Hall’s (1992) “Triad Model”, according to which entries in the mental lexicon are built from pairs of linguistic representations (phonological/orthographic form and syntactic frame) connected with nonlinguistic conceptual representations (cf. the lexeme/lemma/concept distinction of Levelt (e.g., Levelt 1989; Levelt et al. 1999) and Kroll’s distributed lexical/conceptual

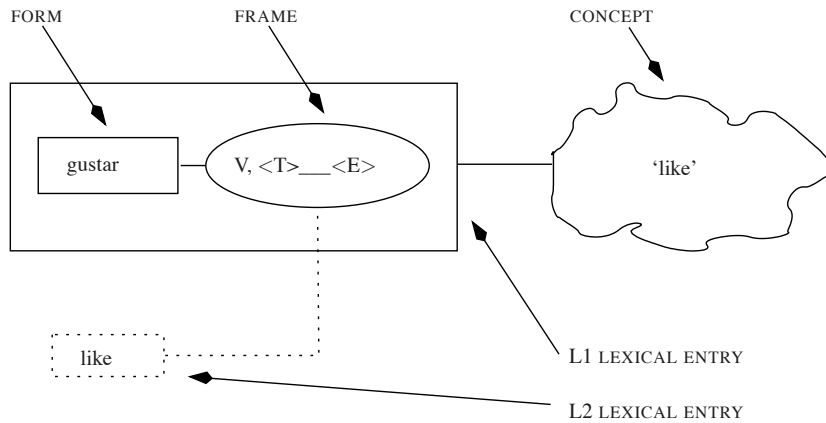


Figure 1. *Noncognate translation equivalent*

feature model of the bilingual lexicon (Kroll and de Groot 1997). Hence, in Figure 1, the L2 form *like* is connected in subordinate fashion to the frame representation of the L1 lexical entry (where <T> \_\_\_ <E> represents the appropriate thematic grid):<sup>3</sup>

According to the Parasitic Strategy, the normal pattern for learners in the early stages of acquisition will be to connect novel L2 words to the frame representation (lemma) of a translation equivalent (leading to errors such as [1a]).

Formal cognates, however, as items sharing some criterial amount of phonological and/or orthographic form, might lead automatically to even more economical representation-building and retention, whether the concept identified is the correct one or not (or even if no concept is identified at all). The identification of cognates, both true and false, constitutes a form of cross-linguistic influence (Ringbom 1987; Hatch and Brown 1995). True cognates (for example Eng. *rose* and Sp. *rosa*) are lexical items which are common to L1 and L2, despite superficial phonological or orthographic differences, as a result of either shared lexical inheritance from a common ancestor language, or through inter-language borrowing. In true cognates, a form's meaning equivalence has been maintained, historically, between L1 and L2, whereas in false cognates either the meanings have diverged (e.g., Sp. *actual* 'current' and Eng. *actual*, from Lat. *actualis* 'active, practical') or the items are actually unconnected historically (e.g., Sp. *tuna* 'prickly pear' and Eng. *tuna*).

The learner's identification of a cognate (which may turn out to be true or false), is represented in the model as a direct connection at the form representation level, as diagrammed in the example of the true cognate in Figure 2, where

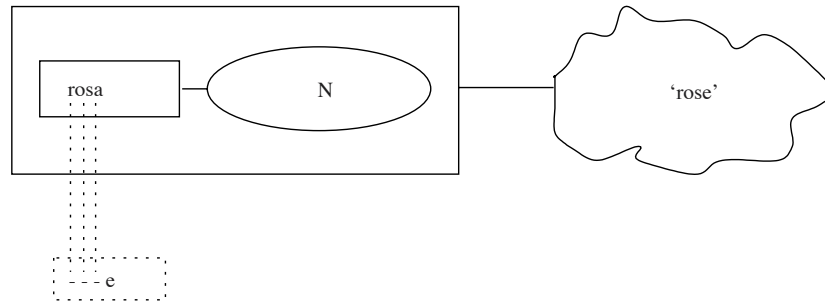


Figure 2. Cognate translation equivalent

(ignoring minor details such as vowel quality) the L1 word *rosa* differs only in the addition of a final vowel from the L2 form *rose*.

Given this interlexical connection (shown in Figure 2 as dotted lines representing redundancy connections from the L2 form to the L1 orthographic representation), retention of the L2 form (i.e., the representation's achievement of permanence in lexical memory) should require less effort, since much of the form is already in place in the (robust) L1 lexicon.

A logical consequence of this process is, however, the student's construction of false cognates. We distinguish here between two types of false cognate: (i) true false cognates, and (ii) indirect cognates, representing points on a continuum rather than poles. (Holmes and Ramos (1993) identify a "cline of 'cognateness'" and Granger (1996, cited in James 1998: 148) makes a similar distinction between "totally deceptive" and "partially deceptive" cognates). A true false cognate would be Eng. *tuna* for Sp. *tuna* 'prickly pear' (the Spanish translation of Eng. *tuna* is 'atún'). An indirect cognate, on the other hand, shares some criterial amount of salient features in conceptual memory, of which the learner may be consciously aware, for example Eng. *library* used for Sp. *librería* 'bookshop', instead of for Sp. *biblioteca*. Here the semantic overlap is clear: both concepts involve a building containing shelves from which clients take away one or more books (in the second case, they leave money and do not bring the books back). In Figure 3 and Figure 4 these examples are schematized, showing both the learner error (via the dotted line redundancy connections) and the target configuration (from L2 form to L1 syntactic frame representation, via the subordinate connection represented here by a dashed line).

In essence, learners create such non-target configurations because they are trying to maximize the use of already established language structure, i.e., entries in the L1 mental lexicon. In other words, they are exploiting the L1 lexicon in parasitic fashion. We should not be surprised that L2 learners execute

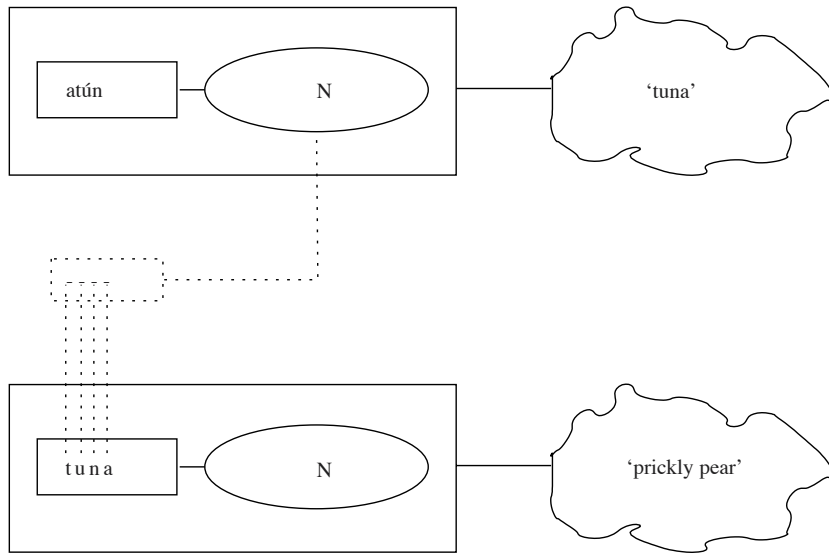


Figure 3. True false cognate

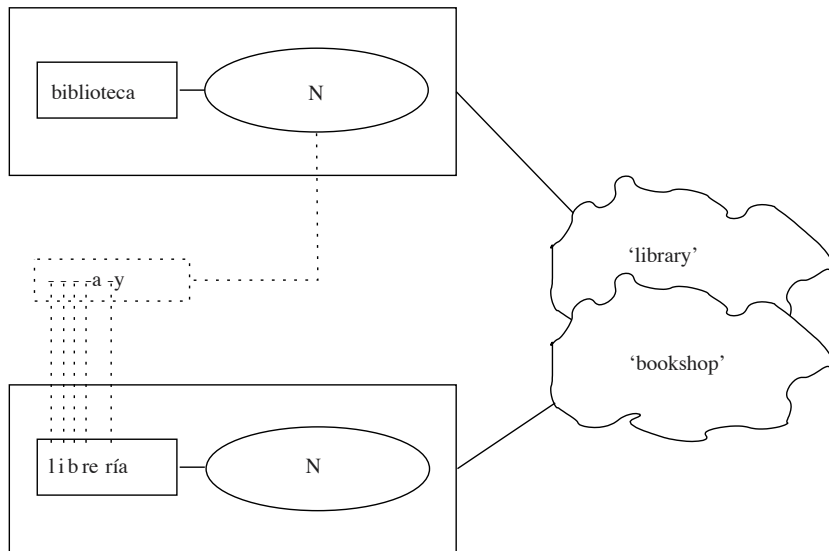


Figure 4. Indirect cognate



the most economical strategy in their acquisition of vocabulary. The parasitic nature of L2 vocabulary learning and representation is in full accord with general principles governing the nature of mental representation and processing, such as economy (Martinet 1964; Lightfoot 1979; Haiman 1983), least effort (Zipf 1949; Slobin 1977; Chomsky 1991) and accommodation (Piaget and Inhelder 1969). Instead of constructing an entirely new knowledge store for the L2, learners utilize the store they have already in place. Instead of duplicating information, at the form level with cognates and at the frame level with grammatical equivalents, they list it only once and attach new L2 forms to existing representations.

Naturally, the account of the vocabulary development process given by the Parasitic Strategy can only be partial, since, as Singleton (1999) and others have pointed out, there is much more to learning words than registering their form and connecting them with representations in the L1 mental lexicon. Clearly, forms which remain unconnected with appropriate syntactic, semantic, collocational and sociocultural features for the L2 will fossilize as interlanguage phenomena. Nevertheless, even though the process is not uniquely form-driven, even at the beginning stages (cf. Talamas et al. 1999), patently all learners must establish some memory representation of a phonological and/or orthographic form to which the other characteristics of wordship may be anchored. If the learner's native language affords storage and access cues for an L2 word form, in the shape of a cognate, then it seems probable that the language faculty will try to detect and exploit these cues.

## **2. The experiment**

In the study reported here, one aspect of the Parasitic Strategy was subjected to scrutiny: the automatic use of form cognates in the construction of a representation for a new L2 word, and the consequent assumption that they are true cognates, independently of whether evidence is available to suggest that they share semantic content. A simple experiment was conducted to confirm or disconfirm this prediction of the strategy.

### *2.1. Design and hypotheses*

Spanish-speaking learners of English as a foreign language participated in a word familiarity report task, where the word list presented included items which were formal cognates with word forms in the L1. In order to isolate form from confounding variables introduced by semantic and syntactic factors, the experimental stimuli were all nonwords, some overlapping in form with real L1 word forms (pseudocognates), others not (noncognates). For each item, participants were instructed to record whether they had seen it before, and to provide a word in the L1 which they judged might be closest to it in meaning.

Unlike nonword use in tasks such as lexical decision (where participants make speeded decisions as to whether a stimulus is an existing word in the language or not), here the nonword stimuli should have the same status as unknown real L2 words. This is because (a) participants have limited knowledge of English vocabulary and (b) they are required only to judge familiarity with the stimuli, rather than assess their status as words. Thus, they have no reason to believe that stimuli will be anything other than existing words of the language.

Following the predictions of the Parasitic Hypothesis, the following hypotheses were formulated:

1. The mean number of participants reporting having seen the word before will be higher for pseudocognates than for noncognates.
2. The mean number of possible L1 translations given across participants per item will be lower for pseudocognates than for noncognates.
3. The mean number of participants responding with the most favoured translation per item across participants will be higher for pseudocognates than for noncognates.
4. The degree of overlap between nonword and suggested translation will be greater for pseudocognates than for noncognates.

Hypothesis 1 reflects the assumption of the Parasitic Strategy that participants will automatically activate any stored form in the L1 which significantly overlaps with the L2 word, and thus will be more likely to report familiarity with it. Hypotheses 2 and 3 respond to the prediction of the Parasitic Strategy that similar form will be taken automatically as a token of similar meaning (as in the case of false cognates), and therefore that the pseudocognates will constrain participants' translation guesses more than the noncognates, both across responses (Hypothesis 2) and across participants (Hypothesis 3). Finally, Hypothesis 4 affirms the essential corollary that what constrains translation word selection is, precisely, overlap of form.

## 2.2. *Participants*

Ninety-five native Spanish-speaking university students participated in the experiment. All were enrolled in sections of an intermediate English for Academic Purposes course. They received extra course credit for their participation.

## 2.3. *Materials*

A set of English nonwords (orthographically and phonologically well-formed but non-occurring words) was constructed. To detect the role of form overlap with the L1 (Spanish), half of the nonwords were designed so that they had cognates in Spanish (henceforth called *pseudocognates*). For example, one of the English pseudocognates constructed was *\*strobe* (cognate with Spanish *es-*

*tribo* ‘stirrup’); another was \**campanary* (cognate with Spanish *campanario* ‘bell tower’). The other half of the nonword set were non-cognates, i.e., evincing no form overlap with Spanish words, such as \**plude* and \**thrimble* (see Appendix).

Fifteen pseudocognates and fifteen noncognates were designed and randomly distributed among 60 real English words, half of which were cognates and half not. The complete list of 90 items was controlled for the following variables:

- *Frequency*: The nonwords have zero frequency, so in order to provide a balanced list and avoid demoralizing participants, the majority of real words used were of high frequency, as were their translations in Spanish. Forty of the sixty real English words used, together with their Spanish equivalents, occurred in the first 1000 most frequent words in Eaton’s (1940) crosslinguistic frequency list. The other twenty English words and their Spanish equivalents were taken from the sixth or seventh thousand words in the Eaton list. Of the fifteen pseudocognates, six had Spanish cognates from the first thousand words in the list, while nine were taken from the sixth or seventh 1000 words.
- *Length*: An attempt was made to provide a fair spread of word lengths, reflecting the kind of distribution these students would have been exposed to, but erring on the side of simplicity (fewer syllables), in order not to make the list appear too offputting. Of the nonwords, five were monosyllabic, five bisyllabic and five polysyllabic. Of the sixty real words, thirty were monosyllabic, twenty bisyllabic, and ten polysyllabic.
- *Morphological complexity*: In order to reflect the reality of English and Spanish vocabulary, the polysyllabic pseudocognates and noncognates all used transparent suffixes which were cognate with their Spanish counterparts (e.g., Eng. pseudocognate \**sper-ance* versus Spanish *esper-anza* ‘hope’; and noncognate \**onter-ize* using cognate suffix *-ize*, Sp. *-izar*). Mono- and bisyllabic nonwords were morphologically simple (except for one prefixed form in both the pseudo- and noncognate bisyllables). Only five of the real words had a transparent affix.
- *Cognate status*: The principal criterion to determine cognate status for both real and nonwords was that the pair must share at least two-thirds of their form, in number of letters, without the substitution, epenthesis, metathesis or omission of any letter.<sup>4</sup> The only exceptions admitted, in accord with English-Spanish comparative norms, were the substitution of *s* for *z*, or *ñ* for *n*; the epenthesis of *e* before *s* at word onset; or the omission of repeated consonants in the case of English gemination. Exhaustive searches of the *Diccionario de la Lengua Española* (1984) and *The Shorter Oxford English Dictionary* (1973), and consultation with two panels of three native speakers, ensured that the noncognates were in fact such.

To avoid order effects, the ninety (randomized) stimuli were divided into four blocks, and the order of presentation of blocks differed for each of the participant groups.

#### 2.4. *Procedure*

The stimuli were presented visually to participants in seven intact classroom groups, averaging 13.6 in each group. Ten warm-up items, real English words reflecting a range of frequencies of occurrence, were added at the beginning of each session, but not revealed as such to participants. Participants saw the 100 items centred, in large lowercase typeface, on a video monitor. Each word appeared for a duration of twenty seconds, with a blank screen of five seconds between each word, and a twenty second delay between each of the five blocks. After the warm-up block, the experimenter clarified any doubts about the procedure.

Participants were asked to perform two tasks for each word they saw: (i) record whether or not they thought they had seen the word before: and (ii) write down what they thought could be the Spanish word closest in meaning to the English word presented, even if they had to guess. Participants recorded their responses on a simple answer sheet containing numbers and spaces for writing response words. They recorded familiarity with the word by circling the corresponding number, and unfamiliarity by placing a cross over it. They wrote down the Spanish word closest in meaning in the space next to the corresponding number.

#### 2.5. *Results*

Results were collected from a total of ninety-five participants. Due to experimenter error, data were lost for one item of the pseudocognate condition. The results were coded, per item per condition, according to five separate criteria designed to address the hypotheses presented above:

1. Number of participants reporting familiarity with each word.
2. Number of different Spanish words given as translations, per item.
3. Number of participants responding with the most frequent translation into Spanish, per item.
4. a. Number of participants responding with Spanish translations sharing the same initial letter with the English word.  
b. Number of participants responding with Spanish translations sharing the same first three consonants as the English word, in the same order.

The overlap criteria in (4), of shared initial letter and first three consonants, were used instead of the original cognate criteria, since, obviously, the noncognates had no L1 cognates by design.

Mean scores and percentages for each criterion are given in Tables 1–5.

Table 1. Mean number of participants reporting familiarity with stimulus, across items

	Pseudocognate condition	Noncognate condition
Participants [n = 95]	38.36 (40.37 %)	5.33 (06.01 %)

Table 2. Mean number of translations reported per item, across participants

	Pseudocognate condition	Noncognate condition
Translations	14.14	41.33

Table 3. Mean number of participants responding with the most frequent translation, across items

	Pseudocognate condition	Noncognate condition
Participants [n = 95]	54.5 (57.37 %)	12.6 (13.76 %)

Table 4. Mean number of participants responding with forms sharing initial letter with stimulus, across items

	Pseudocognate condition	Noncognate condition
Participants [n = 95]	77.57 (81.65 %)	46.33 (48.73 %)

Table 5. Mean number of participants responding with forms sharing first three consonants with stimulus, across items

	Pseudocognate condition	Noncognate condition
Participants [n = 95]	74.93 (78.87 %)	17.07 (19.02 %)

These five between-condition scores were subjected to a series of *t*-tests to verify whether the differences were significant. All *t*-tests showed that the differences were statistically significant at at least  $p \leq 0.001$  (Criterion 1:  $t(13) = 5.821$ ,  $p \leq 0.0001$ ; Criterion 2:  $t(13) = 7.796$ ,  $p \leq 0.0001$ ; Criterion 3:  $t(13) = 6.096$ ,  $p \leq 0.0001$ ; Criterion 4(a):  $t(13) = 4.284$ ,  $p \leq 0.001$ ; Criterion 4(b):  $t(13) = 8.945$ ,  $p \leq 0.0001$ ).

### 3. Discussion

Participants consistently reported that pseudocognates were more familiar than noncognates, even though neither group contained real words. In addition, a much narrower range of translations was provided for pseudocognates than for

noncognates, and the most frequent translation given was provided by a much larger group of participants in the former condition than in the latter. An analysis of the translations provided shows that the pseudocognate responses shared significantly more formal features than those of the noncognate condition, thus strongly suggesting that this difference is indeed due to form similarity and not other factors.

These results clearly show that, in line with the results for non-fluent bilinguals yielded in the study by Talamas et al. (1999), intermediate EFL students assume that shared form indicates shared meaning. In operational terms, this implies that learners are sensitive to form overlap, and not only that they automatically register it, but that this formal connection leads transitively to an assumption of semantic overlap, as shown by the higher rates of familiarity and translation conformity for pseudocognates as opposed to noncognates.

These results, though collected with artificial forms in an artificial environment, support a major claim of the Parasitic Hypothesis, by showing that learners, on encountering novel vocabulary items (in this case nonwords), initially use already existing form information from the words they know in order to confirm or create hypotheses about word meaning. Of course, in the task they were asked to perform here, independent semantic information (in the form of context sentences, texts, topics, pictures, or real situations of language use) was not provided. Earlier naturalistic studies, however, seem to confirm that form familiarity can override such cues, a phenomenon observed by Holmes and Ramos (1993: 92) in their study of cognate use in reading comprehension, and termed by them “reckless guessing”.

Laufer (1989) reports similar cases, where overlapping forms in the L2 (synforms) influence word recognition and subsequent semantic processing. For example, one participant understood sentence (2) below as (3), by confusing the words *nurturing* with *natural*, *fending* with *finding*, and *leaving* with *living*:

- (2) *This nurturing behaviour, this fending for females instead of leaving them to fend for themselves, may take many different forms.*
- (3) *Instead of living natural life, natural behaviour, females and children find many different forms of life.*

These synform confusion data are matched by some of the responses given in the present study. For example, the pseudocognate \**gan* yielded four instances of *pistola* ‘pistol’ and two of *arma* ‘weapon’, presumably due to its similarity (at least in American English pronunciation) with the word *gun*. Similarly, the pseudocognate \**tard* was translated as *duro* ‘hard’, by two participants, and the pseudocognate \**encendate* as *fecha* ‘date’, by four participants. Such data confirm Ecke and Hall’s (1999, 2000) claims that the Parasitic Strategy is essentially promiscuous with regard to the language source of potential form

associates accessed, i.e., that any form in L1 or L2 (or L3) can influence the processing of any other form in L1 or L2 (or L3) with which it overlaps.

The results of this experiment are consistent with connectionist, interactive activation models of the lexicon (cf. Rumelhart and McClelland 1986), an approach which has been extended to the bilingual lexicon (e.g., Dijkstra and Van Heuven 1998; Kroll and de Groot 1997) and to second language acquisition (e.g., MacWhinney 1997; Ellis 1998). Connectionism views the mind as a vast network of simple processing units, where complex mental states and behaviours are the result of different configurations of the network (in a style similar to the neurophysiological network of neurons in the brain). In a distributed network, maximal economy is envisaged. For example, instead of separate nodes to represent the word forms *bit*, *sit*, *fit*, *kit*, *lit*, etc., there would be activation in the areas of the network representing the syllable nucleus and coda *-it*, together with activation of mutually-inhibiting patterns representing the consonantal onsets *b-*, *s-*, *f-*, *k-*, *l-*, etc. Learning word forms then becomes a process of mapping new input across the existing network in a succession of cycles, through which connection weights and facilitatory or inhibitory effects become settled in different ways.

The present results and the Parasitic Strategy in general may be interpreted within such a parallel distributed framework: recall that parasitic vocabulary learning means establishing new form representations and connecting them with existing units (accommodating them into the existing network). With cognates, much of the “new” material is already represented, distributed across the network configured for L1 lexical knowledge, and so little new must be learnt at the form level (the redundancy connections used in Figures 2–4 can be taken as schematic oversimplifications of patterns of activation of shared form features, independent of particular lexical entries). Activation of an L1 form through overlap with the form features of a novel L2 word will automatically trigger activation of the meaning of the L1 word, via spreading activation from lexical to conceptual levels of the network. This much falls out from connectionist models such as Dijkstra and colleagues’ Bilingual Interactive Activation (BIA) model of word recognition (Dijkstra and Van Heuven 1998). The Parasitic Strategy takes this further by making explicit the fact that such transitory activation in the online recognition process can lead to more permanent connections, which influence the outcomes of vocabulary acquisition (for example, the fossilization of false cognates).

It appears, then, that in early word learning, form information is automatically and unconsciously exploited, via pattern-matching between the contents of working memory (the new form) and long-term lexical memory (the L1 and L2 mental lexicons). The connections thus generated lead to the establishment of lexical triads of a parasitic nature, where most of the L2 entry is made up of already existing L1 material. Such is the automaticity of this process that a

significant number of participants in the study described here report that they are familiar with nonwords, on the basis of the extent of their formal overlap with cognates in the L1.

In applied linguistics and language pedagogy, we often underestimate how much learners bring to the learning task. Matthei and Roeper (1983: 86), discussing the instinctual nature of human language processing, refer tangentially to the problem of second language learning:

The reader can ask himself . . . whether he thinks that the kind of knowledge [of language] we have and use every day could really be learned or if understanding language is like opening one's eyes and seeing. For language we must open our ears, make connections between words and things, and adjust our grammars in some slight ways. The rest may be all there. Making 'slight adjustments' and a few 'connections between words and things' can be taken to refer to the special characteristics of each language. Such operations seem monumental to those in language classes or to tourists trying to make themselves understood in a foreign country, but they may actually be quite minimal. It is like noticing that human beings all look quite different from each other; but, in many respects, we all look exactly the same.

Although it would be absurd to characterize second language learning as fundamentally instinctual in this way (given all that we know of maturational, environmental, affective, motivational and other factors which distinguish L1 from L2 development), we would do well to recognize that *parts* of the process must be the result of automatic cognitive procedures, and that psycholinguists can make important contributions to our understanding of language learning (and possibly to the development of more effective teaching practice) by exploring the conditions and scope of such procedures.

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**Appendix: Items used in the pseudocognate and noncognate conditions**

(Spanish cognates and English translations are provided in parentheses for the pseudocognates.)

Pseudocognates	Noncognates
stirbe ( <i>estribo</i> ‘stirrup’)	pirt
mirl ( <i>mirlo</i> ‘blackbird’)	jiss
pulge ( <i>pulga</i> ‘flea’)	tarm
gan ( <i>ganar</i> ‘win’)	plude
tard ( <i>tarde</i> ‘late’)	rause
recort ( <i>recortar</i> ‘cut’ (V))	belmer
halcone ( <i>halcón</i> ‘falcon’)	purtent
gemel ( <i>gemelo</i> ‘twin’)	extrow
entend ( <i>entender</i> ‘understand’)	elter
bastant ( <i>bastante</i> ‘enough’)	thrimble
campanary ( <i>campanario</i> ‘bell tower’)	muttlemment
menesterous ( <i>menesteroso</i> ‘needy’)	urninary
esperance ( <i>esperanza</i> ‘hope’ (N))	onterize
atraverse ( <i>atravesar</i> ‘cross’ (V))	chailerate
encendate ( <i>encender</i> ‘light’ (V))	astazance

**Notes**

1. This research was supported by a grant from the UDLA Institute of Research and Graduate Studies. I gratefully acknowledge the generous time and effort dedicated to this project by my research assistant Moya Schultz. I also thank Peter Ecke and two anonymous reviewers for their helpful comments on the manuscript.
2. In an earlier stage of English, *like* also shared this syntactic behaviour (e.g. *It likes us well* – meaning ‘We like it well’ – from Shakespeare’s *King John*, II.1.533).
3. <T> = theme and <E> = experiencer.
4. Neighbourhood density and frequency in the L1 and L2 (Grainger and Dijkstra 1992; Van Heuven et al. 1998) were not calculated. A future experiment might profitably manipulate such factors, to assess whether degree of formal overlap beyond a single form in the L1 might affect reported familiarity. To my knowledge, neighbourhood effects have so far been observed only in online word recognition tasks such as lexical decision.

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