False cognates: The effect of mismatch in morphological complexity on a backward lexical translation task.

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Abstract

In this article we focus on *false cognates*, lexical items which have overlapping orthographic/phonological properties but little or no semantic overlap. False-cognate pairs were created from French (L2) and English (L1) items by manipulating the levels of morphological correspondence between them. Our aim was to test whether mismatches in morphological structure affected success on a low-frequency backward lexical translation task. 58 participants, divided into four groups (A Level; Degree Level; Adult Learners; Bilinguals) were tested on monomorphemic items (simplex), polymorphemic items (complex), items whose morphological structure in French exceeded that of their English counterpart (mismatch), and control items. Translation success rate followed a uniform pattern: control > mismatch > simplex > complex. With respect to the false-friend effect, participant responses were also uniform: complex > simplex > mismatch. It is argued that an independent level of morphology explains these results.

Keywords

L2 processing, false cognates, morphology, mental lexicon

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Introduction

The extent to which processes and structures that underlie language comprehension and production are specific to each of the individual languages of the bilingual speaker or whether language-general mechanisms are operative is an ongoing question. Central to its development has been work on *cognates*, cognates being defined in Carroll (1992: 104) as 'any pair of words which are treated by the learner as belonging to distinct linguistic systems but are also treated as 'the same thing' within those systems'. Perceived similarity is based primarily upon formal properties, i.e. orthography and phonology, for example, *tourist* in English and *touriste* in French (see Carroll 1992: 95). When these formal properties are accompanied by a semantic overlap, cognate pairing has a facilitating effect on lexical processing; this effect has been shown to be robust not only in typical populations (Browne 1982; Carroll 1992; Costa, Caramazza et al. 2000; Costa, Miozzo et al. 1999; Costa, Santestebana et al. 2005; Cristoffanini, Kirsner et al.

1986; de Groot and Nas 1991), but also in atypical ones, such as those suffering from aphasia (see Kohnert 2004; Roberts and Deslauriers 1999). An example of a facilitating effect would be that found in lexical decision tasks, where reaction times are faster and fewer errors are made for cognate words than for noncognate words (Costa, Caramazza et al. 2000; Sánchez-Casas, García-Albea et al. 1992). In the absence of a semantic overlap, cognate pairing has a negative effect, leading to classical 'false friends' errors, such as the French *actuel* being translated incorrectly into English as *actual* instead of the correct 'present'. Studies on false cognates demonstrate varying degrees of L1 interference. Browne (1982) was a study on the aural and visual recognition of cognates rather than false cognates yet a surprising effect was found for certain pairs. Within the aural condition, when English participants were asked to translate the French *passion* into English (the correct answer being the orthographically identical *passion*), they incorrectly translated the word as *patient.* It seemed that the phonological similarity between the two items caused this interference. A similar effect was found for Danish learners of English by Haastrup (1989), also in a lexical translation task. Concentrating purely on monosyllabic items, Dijkstra et al (1999; 2000) recorded a greater number of errors made with false-cognate items than with control items and slower reaction times for false cognates than for cognates on visual lexical decision and language decision tasks. Thus, we see a robust false-cognate effect across a number of different tasks.

Within translation, the trap set by the false cognate is at its most potent with the language learner whose exposure to L2 is more limited, where the success of translation is seen to increase with L2 proficiency (Haastrup 1989). But translation errors triggered by words which share similar formal, but not semantic, properties have been witnessed in those who have gained near native proficiency (Smith and Tsimpli 1995). The persistence of this phenomenon renders it of continued significance to second language teachers and researchers, who have a keen interest in equipping students with a means of avoiding these traps. But it is also of interest to psycholinguists, as the very propensity for learners to be fooled by the form of these words, at the expense of their differing semantics, opens up some interesting questions as regards their representation within the lexicon; a clearer identification of which elements cause most problems within this group of words can contribute to a better understanding of the structure of their lexical representations (Carroll 1992; Clahsen, Felser et al. 2010; Dijkstra, Grainger et al. 1999; Gordon 1989; Kroll, Michael et al. 2002; Smith and Tsimpli 1995).

In the present article, we investigate their negative impact further, by focusing on the morphological properties of false-cognate pairs in L1 (English) and L2 (French). Specifically, we test whether tampering with the degree to which these pairs match in terms of their morphological structure can anticipate the success rate on a backward (L2 → L1) lexical translation task. This task has proved an effective means of exposing those factors that impact upon second language learning (de Groot 1992; de Groot and Keijzer 2000; Sánchez-Casas, García-Albea et al. 1992)**.**

Very little work on false cognates has focused on morphology as a potential interference factor, preferring instead to narrow the data pool to items with optimal orthographic/phonological correspondence (see Dijkstra et al 1999), thereby restricting the focus of study to monomorphemic items. In the literature on monolingual processing, the influence of morphology is widely accepted. On-line experimental evidence shows that morphological information does play a role during word processing (for a useful review see McQueen and Cutler 1998). Longtin and Meunier (2005), for example, have found priming effects with polymorphemic pseudowords in French (e.g. *rapidifier*) in the absence of orthographic and semantic effects.

With the current study's focus on L2 words, the question is whether one can draw a comparison between native and non-native morphological processing. Cristoffanini, Kirsner et al (1986) and Smith & Tsimpli (1995) focused on L2 processing and included polymorphemic items in their data pool. Both studies reported a strong cognate effect for polymorphemic items. Smith and Tsimpli's (1995) interpretation of their results is that they reflect L1 interference on L2 and that this interference is caused not only by the form of the stem but also by the morphological features of the affix. The current study builds upon theirs, by testing for L1 interference in the first instance and also by seeking to expose the role of morphological factors further. It is intended that our results will contribute to further identification of those representations that are accessed during cross-linguistic processing.

Background to current study

Smith and Tsimpli (1995) was an investigation into the linguistic capabilities of the much cited linguistic savant Cristopher, an individual with extraordinary morphological abilities in second language acquisition. In one of the many experiments that Christopher participated in, the researchers compared Christopher's susceptibility to translation errors of cognate words with that of typical L2 learners. Our current interest lies with the part of their experiment that focused on these typical controls. Using cognates in a backward lexical translation task, they found that L2-French learners, even those with degree-level French and beyond, made classical false-cognate errors, such as incorrectly translating *actuellement* as *actually* instead of the correct, *presently*. Fourteen participants tested on a battery of individual lexical items generated a uniform pattern of results in their responses, by performing best on control items, and worst on false cognates. An indicative example is given in Table 1 below, where words such as in (a), which have no English false-cognate cousin to mislead the participant, resulted in a better translation rate than a word such as (b), which does. This pattern represented all participants, and their results were taken to indicate an L1 interference due to formal similarity, which corroborated results from previous studies (Browne 1982;

Cristoffanini, Kirsner et al. 1986; Dijkstra, Grainger et al. 1999; Dijkstra, Timmermans et al. 2000; Haastrup 1989).

Table 1. False cognates vs. control items.

	French Word	***English False Cognate***	***English Translation***
(a)	chien	--	dog
(b)	enfant	infant	child

A further division was clear within the group of words formed of false cognates, however. All participants performed worse - by opting for the false cognate more often - on polymorphemic items than they did on monomorphemic items. Table 2 provides a representative example of each, where performance was generally worse on type (a), than type (b), examples.

Table 2. Polymorphemic false cognates vs. monomorphemic false cognates.

	Morphological Complexity	**French Word**	**English False Cognate**	**English Translation**
(a)	Polymorphemic	actuellement	actually	presently
(b)	Monomorphemic	actuel	actual	present

Smith and Tsimpli argue that these results demonstrate L1 interference stemming from the affix, and were thus taken as indicative of distinguishable structural processes operative at different levels in the lexicon.

It is this latter result which is of particular interest to us in that it supports a view of language processing in which lexical activation of an L1 candidate is triggered not only by the formal features of the L2 stem in the input (Costa, Santestebana et al. 2005; Cristoffanini, Kirsner et al. 1986), but also, in the case of polymorphemic items, by the morphological features of the affix; the affixes *–ment* (in the French *actuellement*) and *–ly* (in the English *actually*) in the example above share no orthography at all, and the sharing of phonological features is minimal[1], suggesting an additional level of morphological processing is operative with polymorphemic items. Indeed, the differential results remain unexplained in a theory which makes no distinction between processing rules operative within the word and those which operate at the level of the word boundary.

Current study

Our first aim is to establish that L1 interference – in the sense of lexical activation of an L1 candidate triggered by the formal features of an L2 stimulus – occurs. In order to test

[1] The term 'phonological similarity' is used in the paper in accordance with Carroll (1992) and Dijkstra et al (1999, 2000). According to a 'non-atomic' approach to phonology, the pair shares the feature +sonorant, a fact which could have repercussions for lexical storage/retrieval. This is an important point but one that we cannot pursue here as it would take us too far afield for current purposes. We thank an anonymous reviewer for this comment.

this, we use a backwards lexical translation task which includes false-cognate items, along the lines of Smith and Tsimpli, whilst controlling for frequency and L2 proficiency. If the formal properties of the L2 item can activate an L1 candidate, we expect that participants will make more translation errors with false cognates than with control items, since the formal similarity will lead them to a formally compatible yet semantically incongruous L1 translation.

To test further for an independent level of morphological processing, we create conditions with monomorphemic and polymorphemic items, as exemplified in Table 2 (a&b) above. If L1 interference extends to morphology, we expect an increased false-cognate error rate for the polymorphemic items. This is because monomorphemic items are similar only in their form, whereas polymorphemic items introduce morphology as a potential factor in virtue of their affixes. In (1a) below, for example, L1 influence on the learner's lexical decision is limited to the English stem. This is not so for (1b), where the learner, when presented with the word *formellement*, has two potential mis-mappings, that between the stem, and that between the affix. Based on the L2 learner's knowledge of the affix[2], this extra mapping of the affixes is claimed to induce a greater amount of errors on the part of the language learner.

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[2] There are a number of paths through which L2 acquisition proceeds (for a detailed review of both explicit and implicit learning, see Williams 2009). In the case of #*ment*, the L2 learner encounters examples of these affixes' productivity as s/he gathers vocabulary (e.g. *seulement* 'only', *extraordinairement* 'extraordinarily', *facilement* 'easily'), but might be exposed to the adverbial function of the affix via teaching. Knowing and understanding the concept of a grammatical phenomenon, however, cannot be collapsed with acquisition of that phenomenon, as Carroll (2002) points out.

1.	French Stimulus:	(a) livide	(b) formelle #ment
		|	| |
	False Cognate:	livid	formal # ly

The third condition we introduce is a 'mismatch' condition. This condition enables us to test the extent to which success rate is affected when a word in a participant's L2 differs in morphological structure from its L1 false-cognate counterpart. L1 interference is promoted under certain structural conditions (see Kellerman 1979; Meisel 1983). The structural condition that we employ is morphological complexity. Creation of a morphological mismatch between L2/L1 false-cognate pairs provides us with a condition in which interference should be reduced because this condition removes the stimulus that is argued to be the cause of the exacerbation of the interference, namely the morphological mapping between the two affixes. Our expectation then is that this condition should result in fewer false-cognate errors. If borne out, we have stronger support for this truly being an interference effect and we will have succeeded in further exposing the influence of morphology in the absence of purely formal factors. To illustrate, a comparison of (2b) and (2c) below, shows that the mapping at the morphological level is disrupted, *saucière* being a polymorphemic item in French, unlike its English false cognate counterpart, *saucer*, which we classify as monomorphemic[3].

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[3]Mismatching in complexity of form could in principle arise in two ways; where the L2 word is complex, and its false-cognate counterpart simplex, or where the L2 word is simplex, and its false-cognate counterpart complex. In practice, the former mismatch far exceeds the latter (Kirk-Greene 1990), and it is this type on which we concentrate.

2. French Stimulus: (a) livide (b) formelle #ment (c) sauc#ière

	(a)	(b)	(c)
French Stimulus:	livide	formelle #ment	sauc#ière
False Cognate:	livid	formal # ly	saucer ?

Summarising this section, the predictions with respect to participants' translation success rate are the following:

1. Participants will make more translation errors with critical items (complex, simplex and mismatch) than with control items.
2. Complex cognates will trigger more false-cognate errors than simplex cognates.
3. Mismatched cognates will inhibit interference, thereby triggering fewer false-cognate errors than complex cognates.

We also consider the following question with regard to proficiency:

4. Does level of French proficiency (A Level, Degree, Bilingual) interact with any of the predictions made above, as previous studies have suggested (Haastrup 1989)?

Deciding on cross-linguistic criteria that can provide a valid distinction between polymorphemic and monomorphemic items is theory-driven, and in the next section, we set out those considerations which have informed our classification.

Classification of items

A number of considerations need to be taken on board when classifying the morphological structure of lexical items. Here our aim is to distinguish between items that are likely to be processed as unanalysed whole forms in the lexicon and those whose structure points to a further process of decomposition with regards to lexical operations. We will refer to the former type as morphologically 'simplex' and the latter type as morphologically 'complex'.

A false-cognate pair in L2 and L1 may be obviously monomorphemic, with varying degrees of orthographic and phonological overlap (Fr. *cane* 'duck'- Eng. *cane*, Fr. *faire* 'to do'- Eng. *fair*). And as discussed above, false-cognate pairs can also be polymorphemic words, where the words overlap in form in terms of their stem, but also have a productive affix that shares morphological features (Fr. *candide#ment* Eng. *candid#ly*). This carves a clear simplex/complex division, where simplexes are formed of one word (consisting of a free morpheme/stem), and complexes, where the number of morphemes they comprise is a function of the number of productive affixes they have. But there is another class of words of particular interest with regard to their lexical representation. Examples in English include *petulant*, *trivial* and *carnation* which etymologically originated from a stem and an affix, but synchronically, the evidence points to their being stored as monomorphemic lexical entries (see especially Anshen and Aronoff 1988; Carroll 1992; Fromkin 1987; Gordon 1989). Despite their etymological roots, then, the transparency of which fluctuates according to an individual's encyclopaedic knowledge, this derivational history is hidden from the on-line language processor (see Marslen-Wilson 2007). Harder to classify are words which have a greater compositional transparency and have affixes that are not entirely unproductive (*fatality*), but the phonological effects that these affixes undergo and trigger on their stems (see examples below), suggests that they, too, are stored as whole forms. We place such English words into our simplex category, and turn now to further motivations for this classification.

An approach to lexical theory in which affixes are classified according to those which are productive and form their own lexical entries, and those which are stored attached to their stem, is Level Ordering Theory. This began with Siegel (1977), was developed in Kiparsky (1982), and linked explicitly to productivity in Gordon (1989). An essential assumption running through these works is that lexical word-formation rules operate at different levels, and that rule-applications which apply at these levels do so in one direction. Level 1 processes apply before Level 2 processes, which apply before Level 3 processes, where each level corresponds to phonological, morphological, and morpho-syntactic processes respectively. Criteria for categorising affixes according to these levels varies slightly in each work, but each refer to semantic transparency, whether or not affixation to a stem results in a phonological change in that stem, and whether or not a form can undergo further changes.

If we take the words *opacity* and *happiness*, for example, the question arises as to how their affixes, namely *–ity* and *–ness* are to be classified. In the absence of etymological knowledge, *opacity* is less semantically transparent than *happiness*. And –*ity* causes a vowel change in stems it attaches to, yet *–ness* does not (e.g. *op[ei]que* → *op[æ]city*; *[əʊpən]* → *[əʊpən]ness).* On a level-ordering approach, then, these affixes are classified as level I and II respectively, and because of the ordering that these levels are subject to, the theory predicts that those affixes classed as level I affixes should not attach to level II affixes. This correctly rules out a derivation such as *upp-ness-ity*, where a Level I affix is attached subsequent to a Level II one, but rules in *uppity-ness* (the state or instance of being uppity) where the order of attachment is reversed.

Of course, level-ordering theory as originally conceived has been shown to exhibit a number of exceptions to these ordering restrictions (see Spencer 1991) for a review), but the fundamental distinction between the ordering of phonological, morphological, and phrasal processes for the purposes of on-line comprehension and production is well motivated and receives much empirical support for L1 (see Vannest and Boland 1999). Measuring level-ordering effects in first language acquisition against productivity for example, Gordon (1989) found that in a lexical decision task, children's willingness to accept novel forms as words was dependent on their familiarity with the stem for words with Level II and III affixes, but not so for those which had Level I affixes. The reasoning was that for Level I, the word is stored as a whole entry, but for

Level II and III, the stem can be stored separately from its affix, so familiarity of the stem impacts upon whether the whole word is accepted by the child. Hannahs and Stotko (1997), who also drew a distinction between non-neutral (corresponding with Level 1) and neutral (corresponding with Level 2) affixes, found support for the psychological reality of these distinctions from the visible differential effects in acquisition. Children were more likely to recognise neutral suffixes than non-neutral suffixes.

We turn now to the criteria for our classification of affixes, which has been informed by the above considerations.

Table 3. Criteria for classification.

Criteria	***Complexes***	***Simplexes***
A stem and affix must be compositionally transparent	Yes	Not applicable
Affix must be currently used in the derivation of new words	Yes	Not applicable
Affix causes sound changes to the stem	No	Yes

Note that categorisation of a word as either complex or simplex will not be identical across languages, but will depend upon whether a word meets the criteria set in the above table in that particular language, French and English for present purposes.

Returning to our example in (2), the French *saucière* (gravy boat) would be classified as complex, as the word has been derived from attaching a productive affix to its transparent, and still used stem, *sauce*-. The English *saucer*, however, is classified synchronically as simplex on the basis of there being no separable stem from which it has been derived. Our final categorisation is presented in Table 4.

Table 4.Relatedness conditions.

Conditions	***Examples***	
	French	***English***
1. Control words	ivresse	drunkenness
2. Simplex FCs	livide	livid
3. Complex FCs	formelle#ment	formal#ly
4. Structurally Mismatched FCs	sauc#ière	saucer

Method

Participants. This experiment included fifty-eight participants, who were divided into four groups. The *School Group* consisted of thirteen A2-Level students[4] (9 females and 4 males) from two grammar schools, in the final month of their A-Level course (Mean Age: 219 mths (18.25 yrs) SD: 4.6). All had completed five years of GCSE study, plus

[4] The A-Level (Advanced Level) is the standard two-year course, taken by English 16 to 18-year-olds in order to gain university entry. A2 denotes the second year of that course.

two years at A level, totalling seven years of study. In the *University Group*, we tested fifteen university students of French (11 females and 4 males), who were in the last stages of their second year (Mean Age: 271 mths (22.6 yrs) SD: 49.4). Prior to their two years of French at university, they had all completed five years of GCSE study and two years at A level, totalling nine years of study. Our *Bilingual Group* included fifteen participants, all of whom had English as their L1 and recorded a minimum of 20 years of constant exposure to French (Mean Age: 461 mths (38.3 years) SD: 161.5). In addition to this exposure, all of them had minimally completed five years of O level/GCSE study, two years at A level and four years at University, totalling eleven years of study. These three groups gave us three levels of proficiency. Our final group, the *Adult Learners Group*, consisted of a heterogeneous set of fifteen participants (8 females and 7 males), who were part of a French discussion group that met on a weekly basis to practise their language skills. Every member had been attending this group for a minimum of three years (Mean Age: 690 mths (57.5 yrs) SD: 133.0). Twelve had not studied French formally beyond the age of sixteen, but three had taken a degree in French in their youth, and all reported that they travelled to France regularly. Information regarding participants' additional languages was collected from a language history questionnaire administered at the end of the experiment. 44 out of the 58 participants had knowledge of a third language (see Appendix Figure 1), where knowledge was classified as at least two years of exposure to that language. Of the 44, 36 reported knowledge of a Romance language. All participants had normal or corrected-to-normal vision, none had any neurocognitive impairments and they were paid £5 for their participation.

Materials. Test items were four to twelve letters long**.** In addition to the experimental items, we included a set of twelve high-frequency words to further distribute the false cognates and to increase the participants' opportunity of providing correct answers, thereby minimising any anxiety that might accompany testing of this kind. This also served to ensure that participants could perform equally well on an aspect of the task that was not dependent upon proficiency (performance was at ceiling for all participants). Of the false cognates, only those classified as such in Kirk-Greene (1990) were included as test items, in all totalling a set of 68 words[5]. Four equal lists, representing each of our conditions, were compiled from this total: 17 control words, 17 simplex false cognates, 17 complex false cognates, 17 mismatch false cognates (where the French was complex but its English false cognate was simplex). The 12 high-frequency items were excluded from the final analysis (see Appendix for full lists of words, their translations and syntactic categories). Both the word-length and frequency of each of these words were calculated, and the means were compared across the four lists, all of which are recorded in Table 5. Due to our participants' level of French in three of our groups being substantially lower than their English, we feel that English

[55] All translations were further checked with four native French speakers, all of whom corresponded with each other and the dictionary.

rather than French frequency is a more reliable estimate for them but for the sake of completeness, we have calculated both. For English frequency, we have departed from the Francis and Kučera (1982) corpora, opting for the Subtlex$_{US}$ database which avoids the pitfalls that have been noted for this particular corpus (Brysbaert and New 2009), two of which are that it is only on written data and is limited to 1.014 million words. For French, we have used the Lexique database (New, Pallier et al. 2001). Both of these databases are compiled from subtitles, which are increasingly relied upon as providing a more accurate representation of spoken language. One-way analyses of variance of both French and English frequency measures across all four conditions revealed no significant differences (all p values > 0.2). The same test conducted for word length was significant ($p < .01$) and an inspection of the means pointed to the complex category as the source of this difference, which was confirmed by post-hoc testing. This was expected given the additional level of affixation required to create this condition. The remaining three conditions showed no difference.

Table 5. Mean length and frequency of data pool.

	Simplex (n = 17)	**Complex (n = 17)**	**Mismatch (n = 17)**	**Control (n = 17)**
French Word Frequency per Million (Lexique)	1.53	0.6	0.5	1.33
English Word Frequency per Million (Subtlex)	1.42	1.2	1.48	1.32

French Word Length (no of letters)	7.24	9.88	8.71	8
English Word Length (no of letters)	7.06	9.18	8.06	7.82

Procedure. We used a self-paced backward lexical translation task. Participants were seated individually in front of a computer screen in a quiet room. On the screen, they read written instructions explaining the task. Participants were told that for each trial, a French word would appear on the screen and that they should provide the English translation as quickly as possible. They could control the speed at which they progressed by clicking on the space bar after each response they gave. A practice set was given to all participants prior to the start of the experiment proper to familiarise them with the procedure. For each trial, the target appeared in the middle of the screen and participants gave a verbal response before pressing a button to continue to the next trial. Each target was displayed in Nimbus Sans 36 font in black on a white background. The experiment was run on a PC running Windows, using the FLXLAB 2.4 open source software (http://flxlab.sourceforge.net.) which incorporated on-line randomisation of trial order. After the experiment, the participants filled in the aforementioned language history questionnaire.

Results

We looked first at participants' accuracy. Mean responses for the group as a whole, in addition to those for each individual group, are shown in Table 6 for all conditions, namely control, mismatch, simplex and complex. Responses for the experimental conditions are categorised as '✓' (correct), 'X' (incorrect[6]/don't know) and 'FC' (false cognate response), whereas for the control condition only '✓' (correct), 'X' (incorrect/don't know) are possible answers. The table indicates that all groups fared better, i.e. offered a correct translation more often, in the control condition than in any of the false cognate conditions. In the final row of Table 6 one can see that the mean total correct responses in the control condition was 9.9, compared with 4 in the mismatch condition, 1.9 in the simplex condition and 0.9 in the complex condition. A Friedman test confirmed the different scores between these conditions to be significant ($p<0.001$), and Wilcoxon Signed Rank tests (Bonferroni adjusted) comparing the control with the mismatch condition, the mismatch with the simplex condition, and lastly the simplex with the complex condition, confirmed the predicted order of correct translations (control > mismatch > simplex > complex), each with a significance value of $p<0.001$. Median values were: complex (.00), simplex (1.00), mismatch (3.00) and control (9.50).

We then examined the degree to which participants fell for the false cognate across the three critical conditions. All participants fell for the false cognate more often

[6] 'Incorrect' classifies an answer that is wrong yet uninfluenced by the false cognate (for example, translating *candidement* as *pineapple*).

in the complex condition (M: 14.7; SD: 1.8) than in the simplex condition (M: 11.6; SD: 2.7), and least of all in the mismatch condition (M: 8.8; SD: 2.9). A Friedman test gave significance at p<0.001, and a Wilcoxon Signed Rank tests (Bonferroni adjusted) comparing the complex with the simplex condition and the simplex with the mismatch confirmed the predicted order of false-cognate error (complex > simplex > mismatch). Median values were: complex (15.00), simplex (12.00) and mismatch (9.00).

We also monitored the speed at which participants produced the translations. All participants took longest to respond to the mismatch condition than the complex and the simplex condition. The mean reaction times for the simplex, complex, mismatch and control condition were 4806, 4750, 6301, 5927 ms respectively. A Friedman test confirmed the different scores between these conditions to be significant (p<0.001).

In terms of proficiency, we analysed the responses of the School, Degree and Bilingual Group, excluding the Adult Group whose proficiency could not be categorised reliably. Between group mean scores for correct translations revealed that in the control condition, the Bilingual Group achieved the highest number of correct responses (16), followed by the School Group (7.2) and then the University Group (6.3) and a Kruskal-Wallis test was significant (p<0.001). Between group scores in the complex condition, the simplex condition and the mismatch condition were all significant at p<0.001.

Table 6. Mean scores across all conditions.

GROUPS	CONTROL (n =17)		MISMATCH (n = 17)			SIMPLEX (n=17)			COMPLEX (n =17)		
	✓	***X***	✓	***X***	***FC***	✓	***X***	***FC***	✓	***X***	***FC***
School (n = 13) means (SD)	7.2 (2.2)	9.7 (2.1)	1.7 (1.4)	4.8 (2.3)	**10.5** (2.1)	0.5 (0.7)	4.2 (2.5)	**12.2** (2.4)	0 (0)	1.4 (1.8)	**15.6** (1.8)
University (n = 15) means (SD)	6.3 (3.6)	10.7 (3.6)	1.9 (1.4)	4.7 (2.4)	**10.4** (2.2)	0.3 (0.5)	4.5 (2)	**12.2** (1.8)	0.3 (0.6)	2 (1.2)	**14.7** (1.2)
Adult Learner (n = 15) means (SD)	9.7 (3.5)	7.3 (3.5)	3.9 (1.6)	3.8 (1.8)	**9.3** (1.8)	1.9 (1.3)	2.5 (1.5)	**12.8** (1.9)	0.3 (0.5)	1.2 (0.9)	**15.4** (0.9)
Bilingual (n = 15) means (SD)	16 (0.9)	1.1 (0.9)	8.2 (2.7)	3.3 (2.7)	**5.3** **(1.8)**	4.8 (2.8)	3.1 (1.4)	**9.1** **(3.1)**	2.7 (2)	1 (1.1)	**13.3** **(2.1)**
All Groups (n = 58) means (SD)	9.9 (4.7)	7.1 (4.7)	4 (3.2)	4.1 (2.3)	**8.8** (2.9)	1.9 (2.4)	3.5 (2)	**11.6** (2.7)	0.9 (1.5)	1.4 (1.3)	**14.7** (1.8)

In terms of the false cognate error rate, the scores in the table above suggest that the effect of proficiency was minimal. However, an initial Kruskal-Wallis incorporating all three groups was significant in the simplex condition at p<0.005, the complex condition at $p<0.004$, and in the mismatch at $p<0.001$. A subsequent Mann-Whitney in which the School and Degree Groups were merged and compared with the Bilingual Group revealed the latter to be the source of this difference (all at $p<.001$), which is supported by the Bilingual Group’s highest rate of correct responses across all conditions. Each group’s mean false-cognate response fell in the following order: complex > simplex > mismatch.

In order to see whether participants who had exposure to a Romance language (Spanish, Italian, Latin) performed differently in terms of their false cognate responses from those without a Romance language, we conducted an analysis where knowledge of Romance was the IV. The results showed no significant difference. We also compared the false cognate responses of those participants who had no third language with those who had a third language. Again, these results were not significant.

Discussion

The false-cognate effect has been shown to be a robust phenomenon that occurs cross-linguistically and in tasks which tap into different levels of processing. Previous studies demonstrate that L2 learners are often misled by the formal (orthography/phonology) overlapping of translation pairs at the expense of their differing semantics (Dijkstra 1999; 2000; Smith and Tsimpli 1995). Smith and Tsimpli (1995) demonstrated an across-the-board false-cognate effect, which was independent of participants’ level of

French; they interpreted this as an L1 interference effect. The results of the first part of our experiment, where we found that all participants attained a significantly higher number of correct translations in the control condition than in any of the three critical conditions corroborate theirs. By controlling for frequency, the present study strengthens this finding.

To investigate the role of morphology, we included a condition with morphologically complex items, to see whether this additional level of structure would increase participants' number of false-cognate errors. Our prediction was that the morphological properties of the affix would have an effect over and above purely formal factors. This expectation was borne out, as we found that participants did produce more false-cognate responses in the complex condition than in the simplex. According to previous studies conducted on false cognates, the false-friend effect operates on the basis of orthographic and phonological properties (Dijkstra, Grainger et al. 1999; Lemhöfer and Dijkstra 2004). These studies have strived for strict orthographic identity between corresponding items, thus focusing necessarily on monomorphemic, and in most cases also monosyllabic, items. A further explanation is required for the difference in performance between our simplex and complex conditions. If orthography were the only factor, we should not have found participants to perform significantly worse on the complex condition than on the simplex one. The fact that our participants were essentially blind to the orthographic difference between the affixes supports a level of morphological processing that operates independently of this factor. This finding is in line with the aforementioned literature that L1 interference extends to morphology (Cristoffanini, Kirsner et al 1986, Smith and Tsimpli 1995), morphology being an example of a structural condition that promotes interference (Kellerman 1979).[7]

Of further import is that the above results lend empirical support to the original theoretical divide of Level I and II affixes, as originally conceived in Siegel (1977) and Kiparsky (1982). An important criterion for our classification of items in the three conditions was semantic transparency, namely that in the complex condition we only included items where compositionality held between the stem and affix. Evidence from the literature on monolingual morphological processing also emphasises the importance of semantic transparency. For example, Longtin et al. (2003) found similar priming effects between semantically opaque and semantically transparent words (e.g. opaque pair *fauvette/fauve* 'warbler/wildcat' vs. transparent pair *gaufrette/gaufre* 'wafer/waffle'). This prohibits any categorisation of words on the basis of a distinction between semantic opacity and transparency. Our own results, which find a robust

[7] A way in which the effects of morphological variables could be isolated further from formal (orthographic/phonological) ones would be to test participants whose spoken-language phonological representations were severely diminished. This would further isolate morphologically motivated decomposition of written stimuli from phonologically mediated cues. This possibility is explored in Janke and Kolokonte (in prep). Three pre-lingually profoundly deaf (<90dB) learners of French, exposed to Sign and spoken English from birth and with L1, L2 and L3 (French) proficiency demonstrated, undertook the same backward lexical translation task. The deaf participants' responses patterned precisely with those of the hearing participants reported on here.

distinction between simplex (i.e. semantically opaque) and complex (i.e. semantically transparent) words, where the latter cause significantly more problems than the former, resist an explanation along these lines at the level of translation. Indeed, in the same study, Longtin et al. (2003) also employed a cross-modal paradigm, where they found significant facilitation for semantically transparent words but not opaque ones. This second part of Longtin et al.'s study and ours both tap into later levels of processing, where the prime in the former case and the stimuli in the latter are consciously identifiable. On the basis of our off-line results, we suggest that processes operating on polysyllabic items which we have categorised as simplex identify the word as an unanalysed lexical whole, whereas truly polymorphemic items employ a further level of processing, which recognises a divide between the stem and affix. At this point, then, our results find a more natural explanation within theoretical models that can distinguish between processing rules operative within the word and those which operate at the level of the word boundary (Marslen-Wilson, Tyler et al. 1994; Pinker 1998; Smith and Tsimpli 1995). Marslen-Wilson's model (1994), for example, draws a distinction between semantically opaque and semantically transparent items, the former being stored lexically as wholes, the latter involving further lexical decomposition between the stem and affix. Participants' performance on the current task appears to corroborate the validity of this demarcation, and on the whole, that of neutral versus non-neutral affix classification in the spirit of Level Ordering Theory.

A question introduced, but not investigated in Smith and Tsimpli (1995), was whether disturbing the balance of morphological complexity between French and English words would impact upon participants' translation choice. The innovation of this study was the creation of a mismatch condition, drawing upon Level Ordering Theory (Gordon 1989; Kiparsky 1982; Siegel 1977) as a starting point. In this mismatch condition, French words were morphologically complex, yet their false-cognate counterparts were simplex. We expected the false-cognate error rate to be lowest in this condition due to our having removed the extra level of mapping predicted to cause an exacerbated interference. In this condition, all participants demonstrated uniformly a better translation rate, as well as significantly slower reaction times. It is also this condition that provides confirmation that the false-cognate effects we have been examining is an interference phenomenon, since removing the level of structure predicted to promote interference, resulted in a significantly lower false-cognate error rate (see Meisel 1983).

The final main issue we wanted to investigate was whether there would be a relation between proficiency and translation success rate. We classified proficiency according to how many years our groups had been exposed to French, which allowed us to categorise three of our four groups and gave us the following order: School Group < University Group < Bilingual Group. In the control condition, the Bilingual Group scored a mean of 94% correct responses, while the two remaining groups (School and

University), when they avoided the false cognate, generally gave an ‘incorrect/don’t know’ response. The criteria of length of exposure to French did not predict translation success rate in the control condition, as our School Group marginally out-performed our University Group. In terms of the false-cognate error rate, an interesting observation was that all groups followed a uniform pattern, suggesting that increased proficiency cannot suppress interference entirely. L1 interference is made possible when a learner is presented with L2 material that exceeds their knowledge of L2 (see Kellerman 1979). Our use of low-frequency items opened up this possibility for all of our groups. A subsequent test using higher-frequency items might find proficiency to correlate negatively with interference-driven errors after all.

A potential factor that needed to be addressed was whether knowledge of a further Romance language would have any effect on participants’ responses. There has been some debate as to whether or not bilinguals activate the non-dominant language (i.e. one not required) during tasks (Dijkstra, Grainger et al. 1999; Dijkstra, Timmermans et al. 2000; Elston-Güttler, Gunter et al. 2005). If participants with a Romance language (see Appendix Figure 1 for the distribution) had displayed a different pattern of performance from those without one, this would have suggested a role played by this non-dominant language. However, analyses we conducted comparing the performance of those participants with knowledge of Romance versus those with none, as well as the performance of those participants with knowledge of any third language versus those with none, yielded non-significant results.

Summary

Our principal interest in this experiment was to investigate whether L1 influence on L2 processing is dependent not only on surface similarities but also on morphological properties, taking forward an idea mooted in Smith and Tsimpli (1995). Also key was that the main thrust of affix classification as conceived in Level Ordering Theory was on the right track. Our results revealed not only a robust false-cognate effect but also an intensified effect with morphologically complex items. We maintain that this latter effect cannot be attributed purely to orthographic or phonological influence as the overlap of these properties on the French and English affixes in the complex condition was minimal. The role of morphology is thus corroborated. Our mismatch condition exposed this morphological level further, as it disturbed the morphological correspondence between the L1 and L2 items, thereby predicting a reduced false-cognate effect. The amount of interference was indeed the lowest in this condition, a result which makes sense within frameworks that draw a theoretical distinction between complex and simplex items as proposed here (Carroll 1992; Giraudo and Grainger 2001; Gordon 1989; Marslen-Wilson, Tyler et al. 1994).

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Appendix

Table 7. List of French Words (control condition).

French Word	Category	Translation
ivresse	NOM	drunkenness
effroyable	ADJ	appalling
lourdement	ADV	heavily
maigreur	NOM	thinness
soigneux	ADJ	meticulous
neigeux	ADJ	snowy
crevaison	NOM	puncture
luisante	ADJ	gleaming
dotation	NOM	endowment
inavouable	ADJ	shameful
lutteur	NOM	wrestler
rêveur	NOM	dreamy
osseux	ADJ	bony
huître	NOM	oyster
rossignol	NOM	nightingale
couturière	NOM	dressmaker/seamstress
craintif	ADJ	timid/fearful

Table 8. List of French Words (simplex condition).

French Word	Category	Translation	Eng False Cognate	Category
gendre	N	son-in-law	gender	N
labour	N	ploughing/tilling	labour	N
casserole	N	saucepan	casserole	N
officieux	ADJ	unofficial/informal	officious /official	ADJ
adéquat	ADJ	appropriate/suitable	adequate	ADJ
parcelle	N	particle/fragment	parcel	N
trivial	ADJ	course/vulgar	trivial	ADJ
pétulant	ADJ	lively/exuberant	petulant	ADJ
impotent	ADJ	helpless	impotent	ADJ
livide	ADJ	referring to colour	livid	ADJ
séculaire	ADJ	centennial/old	secular	ADJ
séquelle	N	aftereffects of illness	sequel	N
abbé	N	abbot, priest	abbey	N
mécréant	ADJ	disbeliever	miscreant	ADJ
carnation	N	flesh tint/complexion	carnation	N
replet	ADJ	plump	replete	ADJ
félon	ADJ	disloyal	felon	ADJ

Table 9. List of French Words (complex condition).

French Word	Category	Translation	Eng False Cognate	Category
abusif	ADJ	misconceived	abusive	ADJ
agonisant	ADJ	dying	agonizing	ADJ
cyniquement	ADV	brazenly	cynically	ADV

disgracieux	ADJ	awkward/unattractive	disgraceful	ADJ
fatalement	ADV	inevitably	fatally	ADV
mystifiant	ADJ	deceptive/ misleading	mystifying	ADJ
nervosité	N	agitation/irritability	nervousness	N
rudesse	N	roughness/ severity	rudeness	N
partialement	ADV	unfairly	partially	ADV
exténuant	ADJ	exhausting	extenuating	ADJ
harassante	ADJ	exhausting	harassing	ADJ
inconvenante	ADJ	unseemly/improper	inconvenient	ADJ
désagrément	N	displeasure	disagreement	N
formellement	ADV	categorically	formally	ADV
candidement	ADV	ingenuously	candidly	ADV
inusable	ADJ	hard-wearing	unusable	ADJ
déshonnête	ADJ	unseemly/indecent	dishonest	ADJ

Table 10. List of French Words (mismatch condition).

French Word	Category	Translation	Eng False Cognate	Category
liquoriste	N	wine/spirit merchant	liquorice	N
versatilité	N	fickleness	versatility	N
fatalité	N	inevitability	fatality	N
solliciteur	N	petitioner/supplicant	solicitor	N
repli	N	fold/bend	reply	N
saucière	N	sauceboat	saucer	N

député	ADJ	Delegate/MP	deputy	ADJ
libellé	N-V	wording	to libel	N-V
caissette	N	small box	cassette	N
dépositaire	N	trustee/agent	depository	N
remembrement	N	consolidation/regrouping (of land)	remembrance	N
ingénuité	N	ingenuousness/naïvity	ingenuity	N
dégustation	N	sampling	disgust	N
tenante	N	holder	tenant	N
errante	Adj	wandering	errant	Adj
débauchage	N	dismissal/enticement from	debauchery	N
sinistré	ADJ-N	disaster victim	sinister	ADJ

Table 11. List of High-Frequency Control Items.

French Word	Category	Eng Translation
chaleur	NOM	heat
feuille	NOM	leaf
jeunesse	NOM	youth
légèrement	ADV	lightly
haine	NOM	hate
poubelle	NOM	dustbin
renard	NOM	fox
oeuf	NOM	egg
gênant	ADJ	embarrassing

follement	ADV	incredibly
poupée	NOM	doll
malheureux	ADJ	unhappy

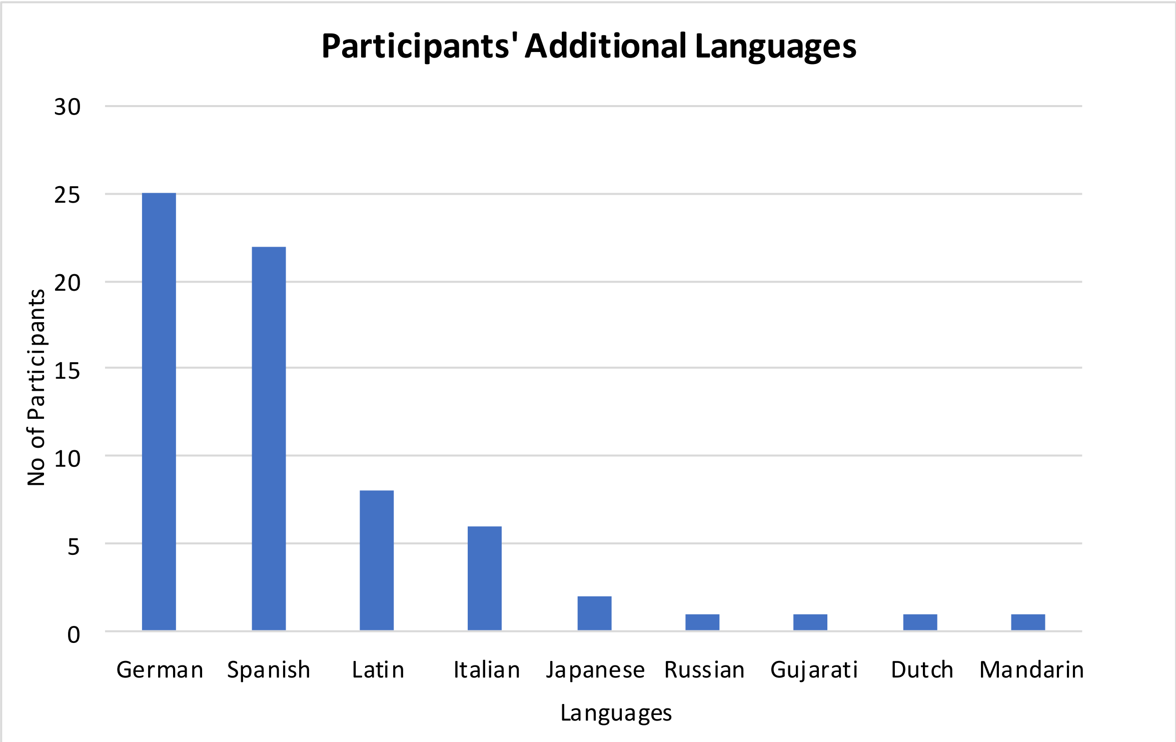

Figure 1. Participants' knowledge of additional languages.