The false-friend effect in three profoundly deaf learners of French: disentangling morphology, phonology and orthography.

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Abstract

Three profoundly deaf individuals undertook a low-frequency backward lexical translation task (French/English), where morphological structure was manipulated and orthographic distance between test items was measured. Conditions included monomorphemic items (simplex), polymorphemic items (complex), items whose French morphological structure exceeded their English counterpart (mismatch), and a control. Order of translation success was uniform: control > mismatch > simplex > complex, as was order for false-cognate errors: complex > simplex > mismatch, patterning precisely with hearing participants (Janke and Kolokonte (2014)). We discuss how these results highlight a route for future studies to further disentangle phonology and orthography from morphology in L1-interference.

Keywords

False cognates, morphology, orthographic distance, profoundly deaf individuals

Introduction

In tasks that investigate the extent of L1 interference on L2 caused by false cognates, there remains an on-going issue as to how one can separate morphological, orthographic and phonological effects from each other (Berthele (2011); Browne (1982); Dijkstra, Grainger and van Heuven (1999); Dijkstra, Timmermans, et al. (2000); Haastrup (1989); Lemhöfer and Dijkstra (2004)). Dijkstra, Grainger and van Heuven (1999), for example, classify only orthographically identical items as true false cognates. But keeping orthography constant can still not guarantee phonological identity between two items, for example cave (/kav/) in French and English (/keɪv/). Equally, orthographic dissimilarity can be accompanied by phonological identity, as, for example, the Dutch soep (/su:p/) and the English soup (/su:p/ ((Dijkstra, Grainger and van Heuven 1999: 515). There is a difficulty then in separating orthographic from phonological variables in a visual task, making it hard to discern if one of these formal resemblances plays a more decisive role in negative transfer than the other. There is also growing evidence that the role of morphology, independently of orthography and phonology, is an important contributory factor in the false-friend effect. The influence of morphology in monolingual processing is amply documented. There is much on-line experimental evidence demonstrating the role that morphological information plays during word processing (see Marslen-Wilson and Keith (2006) and McQueen and Cutler (1998) for a review). 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. In regard to second-language processing, Cristoffanini, Kirsner and Milech (1986) showed that polymorphemic words triggered false-cognate errors, whilst Smith and Tsimpli (1995) found polymorphemic words to lead to more false-cognate errors than monomorphemic words. Since polymorphemic false-cognate word pairs depart further from each other in terms of their orthography and phonology than do monomorphemic pairs (e.g. cyniquement/cynically vs. livide/livid), these results go some way in support of a role for morphology on interference effects, independently of formal resemblances. To isolate the role of morphology further, Janke and Kolokonte (2014) created a low-frequency backward translation task (French L2; English L1) in which morphological complexity was manipulated. Three experimental conditions were included, where false-cognate word pairs were morphologically simplex (1a), morphologically complex (1b), or morphologically mismatched (1c). In this mismatch condition, the L2 word was morphologically complex, whereas its L1 false-cognate counterpart was simplex.[1] A control condition (1d), comprising words with no false-cognate counterparts, was also included.

		French Word	English false cognate
(1)	a.	félon	felon

[1] The criteria for these classifications can be found in Janke and Kolokonte (2014), who build their classifications upon Siegel (1977), Kiparsky (1982) and Gordon (1989).

b.	formelle#ment	formal#ly
c.	sauc#ière	saucer
d.	rossignol	---

L1 interference is made possible when a learner is presented with L2 material that exceeds their knowledge of L2 (see Kellerman 1979). Use of low-frequency items created this possibility, whilst morphological complexity was chosen as an example of a structural condition which might promote the occurrence of transfer (see Kellerman 1979; Meisel 1986). The first aim, therefore, was to test whether participants would make a greater number of errors in the critical conditions than in the control condition. This was predicted to be so if the false-cognate effect were truly an interference phenomenon. The second was to test whether morphologically complex pairs would lead to more false-cognate errors than morphologically simplex pairs. If morphology were an example of a structural condition that acted as a domain of transfer, then this second prediction should also prove true because the morphological mapping between affixes would exacerbate the false-cognate effect. The last aim was to test whether the mismatch condition resulted in fewer false-cognate errors than complex false cognates. Creation of a morphological mismatch between L2/L1 false-cognate pairs provided us with a condition in which interference should be reduced because the condition removed the stimulus argued to be the cause of the exacerbation of the interference, namely the morphological mapping between the two affixes. All of these expectations were borne out.

These results buttress the role of morphology in negative transfer, independently of orthography and phonology. But a question we explore here is how one might isolate the role of morphology from orthography and phonology still further. One way of examining the effects of orthographic similarity would be to measure the words used in each condition according to their orthographic distance, using the distance algorithm first proposed by Levenshtein (1966). The Levenshtein distance algorithm calculates the smallest number of insertion and deletion operations needed to transform one orthographic string into another (see especially Berthele (2011)). If the condition that induced the greatest number of false-cognate errors had the highest level of orthographic distance, or if the critical conditions showed no significant difference in this respect, one could rule out orthography as the deciding factor, thereby strengthening the conclusions drawn in Janke and Kolokonte (2014).

In addition to factoring out orthographic effects, we also wanted to find a way of reducing phonological interference. A population whose spoken-language phonological representations are severely diminished is that of prelingually, profoundly deaf individuals (see Goldin-Meadow and Mayberry 2001). In fact, recent literature has questioned whether or not prelingually profoundly deaf individuals make use of phonological codes when processing the written word (see especially Bélanger et al

2012; McQuarrie and Parrila 2009; Miller and Clark 2011). It would be very interesting then to explore how these individuals fare on this task, as a reduced access to phonology could take us a step further towards isolating morphologically motivated decomposition of written stimuli from phonologically mediated cues.

The present study explores this possibility by testing whether the effects found in Janke and Kolokonte (2014) for hearing participants occur in congenitally deaf learners of French. We searched for prelingually profoundly deaf adults (<90dB)[2], whose proficiency in written English was clearly demonstrable, and whose age of first language acquisition had not been delayed (see especially Mayberry, 2007). Their proficiency in French would need to be above A-Level in order to test them on the same low-frequency items. French for these individuals would be their third rather than their second language, having been exposed to Sign and spoken English from birth or early infancy. If these individuals' performance on the same translation task patterned with hearing participants', the role of morphology in negative transfer might be further supported. Before turning to the current study, we review some of the most recent literature on deaf people's spoken-word phonological representations.

[2] A person is diagnosed as profoundly deaf if the threshold at which they can detect sound exceeds 90 decibels.

Deaf people's spoken-word phonological representations

The question of the extent to which we can assume substantially reduced phonological coding in profoundly deaf proficient readers has received considerable attention (see especially Bélanger et al (2012); Clark, Gilbert and Anderson (2012); Izzo (2002), Mayberry et al (2011); McQuarrie and Parrila (2009), Miller and Clark (2011), Miller et al (2012); Piñar, Dussias and Morford (2011). It is well known that deaf children are biased towards a reliance on orthographic information when asked to make phonological judgements, a bias that increases with visually presented words (see Sterne and Goswami 2000). But further to children perhaps not utilising phonological representations when other cues, such as orthography, are available, there is new evidence that challenges the view that there is a positive relation between phonological coding ability and deaf individuals' developing and ultimate reading ability (for a clear and current review, see Piñar, Dussias and Morford, 2011). Mayberry, del Giudice and Lieberman (2011), for example, concluded that phonological coding skills could be associated with only 11% of the variance in their deaf participants' reading proficiency, and the authors stress that the direction of this association could not be established (p179). The best predictor was language ability, which was linked to 35% of the variance. There is also some doubt as to the validity of previous tests of phonological coding abilities in deaf individuals. McQuarrie and Parrila (2009) sought to distinguish between orthographically and visually motivated judgements from phonologically motivated ones on tasks designed to tap into underlying phonological representations. Upon a careful review of previous experiments, they questioned whether deaf participants were actually using phonological cues on phonological coding tasks. Their own off-line study, based upon a design that incorporated three levels of phonological awareness (rhyme, syllable, and crucially, phoneme), as well as controlling for orthographic and phonetic interference, revealed that for those conditions in which phonological awareness was essential to participants' responses, performance fell below chance. This was true regardless of reading ability, which ranged from poor to very good. This line of argumentation has been taken substantially further by more recent studies. Bélanger et al (2012) provide evidence of deaf individuals, at both pre- and post-lexical levels of access, not activating phonological codes. The authors conclude that "even skilled deaf readers did not activate phonological codes during word recognition or word recall" (p17). Still more relevant to our present study is that very poor phoneme discrimination ability has been found in a set of highly-skilled deaf readers (Miller and Clark (2011). The authors cite this as definitive evidence against theories in which phonological representations are considered a pre-requisite for reading development, although this is a controversial issue and one we cannot do justice to here. Finally, we remark that an absence of a correlation between reading ability and phonemic awareness has also been found in primary-school-aged deaf children completing a story retelling task: Phonemic awareness did not contribute to any of the variance in reading ability (Izzo 2002). This steadily growing body of contemporary studies taps into both earlier and later stages of deaf children's and adults' reading. Collectively, they question the link between development of phonological representations and that of reading, and some go as far to argue against the view that phonological codes are operative when processing the written word. It is beyond the scope of the present research note to assess this argument further. This brief review, however, enables us to demonstrate how current thinking on this topic underpinned our decision to include profoundly deaf individuals as an alternative means of, at the very least, reducing the effects of phonological variables. Any results we gained in this regard should be interpreted with caution, however, exposing more questions for future considerations that should inform a large-scale study.

Our study

With the above cautions in mind, we tested how three profoundly deaf Signers, exposed to both Sign and spoken English from birth (Participants 1 and 2) or infancy (Participant 3), fared on the same translation task administered to 58 hearing learners of French in Janke and Kolokonte (2014). Our aim was to explore this as a potential avenue for providing further support for the role of morphology in false-cognate driven translation errors. Our predictions with respect to our participants' translation success rate were the following:

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

Method

Participants. Three profoundly deaf participants took part, one male (Participant 1) and two female (Participants 2 and 3), with chronological ages of 24.10 yrs, 24.03 yrs and 34.11 years, respectively. All participants were congenitally deaf and used BSL as their only or preferred method of communication. Participants 1 and 2 had access to Sign and spoken English from birth, participant 3 had access to Sign from birth and to spoken

English from 18 months. They had all been exposed to written English from the onset of school and had no neurocognitive impairments. Participant 1 wore a hearing aid in one ear, enabling him to detect some very low frequencies, whereas the other participants wore no hearing aids. All described themselves as profoundly Deaf with a native command of British Sign Language (BSL) and English. They had attended oral deaf secondary schools, where they studied French, our first participant for seven years, our second and third participants for five years. Participant 1 took GCSE and A Level French,[3] and attained a Grade A at both of these levels. He travels to France frequently. Participant 2 took GCSE French, gaining a Grade B, had lived in France for one year, and still travels to France frequently. Participant 3 gained a Grade A in GCSE French. She had lived in France for five years. All participants had also completed a GCSE in English Language.

Materials. Test items were four to twelve letters long**.** A set of twelve high-frequency words were also included. This further distributed the false cognates and ensured that participants could perform equally well on an aspect of the task not dependent upon proficiency (performance on these was at ceiling). False cognates classified in Kirk-Greene (1990) were included as test items, in all totalling a set of 68 words[4]. Four equal

[3] The GCSE (General Certificate of Secondary Education) is the standard five-year course in England and Wales, taken by 11 to 16-year-olds in order proceed to A-Level or leave school. The A-Level (Advanced Level) is the standard two-year course in England and Wales, completed by 16 to 18-year-olds in order to gain university entry.

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

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 and English was simplex). The 12 high-frequency items were excluded from the final analysis (see Appendix for full lists of words, translations and syntactic categories). The word length and frequency of items were calculated, and the means compared across the four lists, all of which are in Table 1. Due to participants' level of French being substantially lower than their English, we calculated English frequency using the Subtlex$_{US}$ database. This is compiled from subtitles, which are increasingly relied upon as providing a more accurate representation of spoken language (Brysbaert and New 2009). A one-way anova conducted across all four conditions revealed no significant differences. 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. Lastly, we also calculated the critical words' orthographic distance, using the Levensthein algorithm (see Levenshtein (1966) and Berthele (2011)). A one-way anova was significant ($p<.01$) and inspection of the means pointed once again to the complex category as the source. Post-hoc testing (Tukey B) revealed no significant difference between the simplex and mismatch condition.

Table 1. Mean length, frequency and orthographic distance of data pool.

	Simplex (n = 17)	Complex (n = 17)	Mismatch (n = 17)	Control[5] (n = 17)
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
Orthographic Distance (Levensthein)	1.35	4.17	2.47	N/A

Procedure. A self-paced backward lexical translation task was used. Participants were seated individually in front of a computer screen on which was written instructions explaining the task. They were told that for each trial, a French word would appear on the screen and that they should write down the English translation on the sheet of paper provided. They controlled the speed at which they progressed. A practice set was given prior to 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 written 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

[5] This list included a mixture of both morphologically simplex (e.g. rossignol, huître, dotation) and complex (e.g. lutteur, ivresse, soigneux) items.

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 a language history questionnaire. They were each paid £30 for their participation.

Results

All three participants scored at ceiling on the high-frequency distractor items. We first assessed whether all participants achieved a higher number of correct translations in the control condition than in any of the critical conditions. This was so. Translation success also followed a uniform order: control condition > mismatch condition > simplex condition > complex condition. Participants also opted for the false cognate in the complex condition more often than the simplex condition, and least of all in the mismatch condition: complex > simplex > mismatch. Note that this did not result in a greater number of correct responses in the mismatch condition; rather the participants avoided the false-friend trap by providing an incorrect answer, or declining to offer any translation at all. The table below displays their scores across the four conditions. Responses are recorded as '✓' (correct), 'X' (incorrect[6]/don't know) and 'FC' (false cognate response).

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

Table 2. Participants' scores across all conditions.

	CONTROL (n =17)		SIMPLEX (n=17)			COMPLEX (n =17)			MISMATCH (n = 17)		
	✓	X	✓	X	FC	✓	X	FC	✓	X	FC
Participant 1	9	8	3	3	**11**	0	2	**15**	2	9	**6**
Participant 2	6	11	1	4	**12**	1	2	**14**	2	7	**8**
Participant 3	12	5	3	3	**11**	1	1	**15**	1	10	**6**
Means	9	8	3.5	3.3	**12**	0.7	1.7	**14.7**	1.7	8.7	**6.7**

Discussion

Across all conditions, our profoundly deaf participants patterned in the same direction as the hearing participants in Janke and Kolokonte (2014), according to the three predictions made within. Firstly, the fact that the control condition achieved a greater number of correct translations than any of the critical conditions lends support to the false-cognate effect being a robust phenomenon occurring in tasks which tap into different levels of processing. Secondly, the complex condition, which induced a higher number of false-cognate errors than the simplex condition, is also important. This condition tested the extent to which the extra layer of structure created by an affix on both word pairs could exacerbate the interference. These affixes, which share no orthography and minimal phonological features, demonstrate that morphology, independently of formal resemblances, acts as a domain of transfer. The literature on interference induced by false cognates has proven orthography to be an important factor in L1 transfer (e.g. Dijkstra, Grainger and van Heuven 1999). Note, however, that the Levensthein measure of orthographic distance was highest in the complex condition, namely that which induced the greatest number of false-cognate errors (and not significantly different in the simplex and mismatch condition), a result which is at odds with orthographic similarity being the most important contributory factor in this example of negative transfer. Lastly, the mismatch condition did result in the fewest number of false-cognate responses. This was the condition that removed the extra layer of structure in the L1 word hypothesised to promote negative transfer. With these results then, morphology as an example of a structural condition that can induce negative transfer is further corroborated.

The data from our current participants provide us with an alternative means of further isolating the role of morphology from that of phonology. These were three profoundly deaf individuals, who categorised themselves as bilingual between English and BSL yet used BSL as their sole or preferred method of communication. They had been schooled according to the national curriculum to GCSE and/or A-Level standard. Profoundly deaf people have severely diminished spoken-language phonological representations

(Goldin-Meadow and Mayberry 2011), and hence offer a means of reducing the effects of phonological variables on a visual task. The visual processing of profoundly deaf people is known to operate differently from that of hearing, an issue we cannot pursue further here, but we nevertheless suggest that these first results offer a credible avenue for how one might further disentangle phonological, orthographic and morphological factors in this phenomenon.

To conclude, by expanding our original task to include profoundly deaf native Signers with a high command of written French, we hope to have signalled a new and interesting route for a future full-length project. Such a study could build on the current work by seeking a population of profoundly deaf proficient readers, who have a high knowledge of French yet poor spoken-language phoneme discrimination ability (Miller and Clark 2011), and test these participants on mid-frequency items so as to ensure a larger data pool. If these items' orthographic distance were also taken into account, as proposed here, this would strengthen the case for the strongest factor in this task being morphology considerably.

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Appendix

Table 3. Control Items.

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

Table 4. Simplex Items.

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	N	disbeliever	miscreant	ADJ
carnation	N	flesh tint/complexion	carnation	N
replet	ADJ	plump	replete	ADJ
félon	ADJ	disloyal	felon	ADJ

Table 5. Complex Items.

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 6. Mismatch Items.

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	N	Delegate/MP	deputy	N
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 7. High-Frequency Control Items

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

gênant	ADJ	embarrassing
follement	ADV	incredibly
poupée	N	doll
malheureux	ADJ	unhappy