

***Scratching your tête* over code-switched idioms: Evidence from eye movement measures of reading**

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Idioms (*scratch your head*, *kick the bucket*) are ubiquitous, complex multiword phrases that have conventional but often non-compositional figurative meanings.^{1,2} Recent work using cross-modal priming³ and eye movement measures of reading⁴⁻⁶ supports a hybrid, multidetermined model of comprehension.⁷ Within this view, early stages of figurative comprehension are more affected by factors impacting direct retrieval of idiomatic forms (how familiar is an idiom), whereas late stages are more affected by factors impacting compositional processing (whether an idiom's component words relate to its overall figurative interpretation). Here, we investigate an aspect of idiom processing that is less well understood. How does disrupting an idiom's form representation (and thus, its direct retrieval) impact the time-course of its figurative comprehension?⁸

We pursue this question by capitalizing on a common property of bilingual language -- code-switching. For example, when one knows English and French, code-switching the idiom-final word of *scratch your head*, as in *scratch your tête*, disrupts the common idiomatic form while preserving its word meaning. Consistent with hybrid/multidetermined models, data from a sentence sensibility judgement task⁹ suggest that code-switch costs for idioms are greater than for comparable literal word sequences, however, unclear from that work is whether and how figurative comprehension was impacted using naturalistic reading methods.

Accordingly, 41 English-French bilingual adults read English sentences that contained 42 idioms while we monitored their eye movements. Crucially, these sentences had post-idiom disambiguating regions that enabled us to assess how they were ultimately interpreted (Table 1). To the extent that early direct retrieval of idiomatic forms is crucial for their figurative comprehension, we would expect code-switch costs for idioms to be greater than that for literal strings, and also that code switches would impede figuratively interpreting idioms, consistent with prior work using standard cognitive tasks.⁹

Linear mixed effects models of eye-movement data showed that code-switches on phrase-final nouns slowed processing at both early (noun gaze duration: $p < .001$; idiom gaze duration: $p < .001$), and late stages (idiom total reading time: $p < .001$), while a two-way interaction (Fig. 1) between condition and switch in noun gaze duration ($p < .05$) revealed that code-switched nouns were read more slowly when embedded in idioms vs. literal control phrases. In follow-up models that focused on item-level differences, early processing of code-switched idioms was facilitated by factors impacting the ease of direct retrieval (both idiom familiarity [noun go-past time: $p < .05$, Fig. 2] and degree of cross-language overlap [phrase gaze duration: $p < .01$, Fig. 3; noun go-past time: $p < .05$]). Interestingly, factors impacting the ease of compositional analyses (increased global decomposability) *slowed* the early processing of code-switched idioms (phrase gaze duration: $p < .01$, Fig. 4).

These data suggest that direct retrieval of idiomatic forms is crucial for figuratively interpreting idioms, consistent with past work.⁹ They also suggest that increased decomposability impedes idiom processing, possibly by generating competition between figurative and literal interpretations.⁵ Interestingly, the inhibitory role of increased decomposability emerged here at an earlier stage than past work,^{3,6} perhaps because the presence of a code switch promoted a compositional processing of the sentences right from the first pass. These conclusions are consistent with other work on idioms, for example, the processing of lexically modified idioms,⁸ and the benefit of cross-language overlap for bilingual idiom processing.¹⁰ Collectively, these data suggest the intriguing possibility that the bilingual lexicon is at least partly integrated beyond the single-word level at an abstract, multiword level.¹¹⁻¹²

Table 1. Example stimuli in the six experimental conditions.

Id-Id-En	Niles <i>scratched his head</i> when he could not determine where his dog was hiding.
Id-Lit-En	Niles <i>scratched his head</i> when he returned from camp covered in mosquito bites.
Lit-Lit-En	Niles <i>examined his head</i> when he returned from camp covered in mosquito bites.
Id-Id-Fr	Niles <i>scratched his tête</i> when he could not determine where his dog was hiding.
Id-Lit-Fr	Niles <i>scratched his tête</i> when he returned from camp covered in mosquito bites.
Lit-Lit-Fr	Niles <i>examined his tête</i> when he returned from camp covered in mosquito bites.

Figure 1

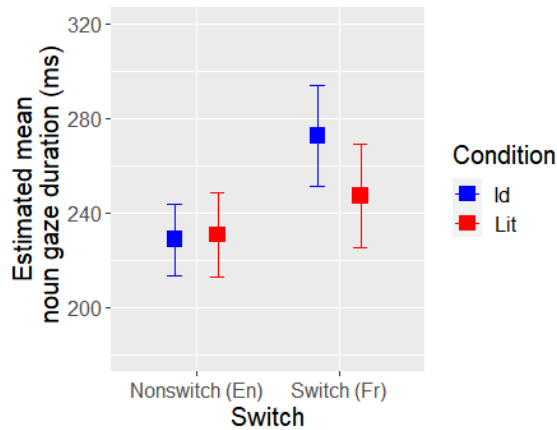


Figure 2

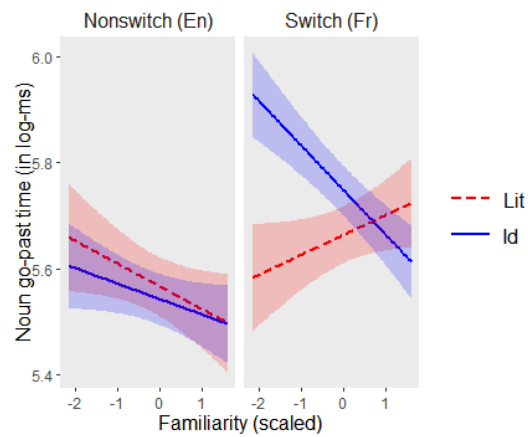


Figure 3

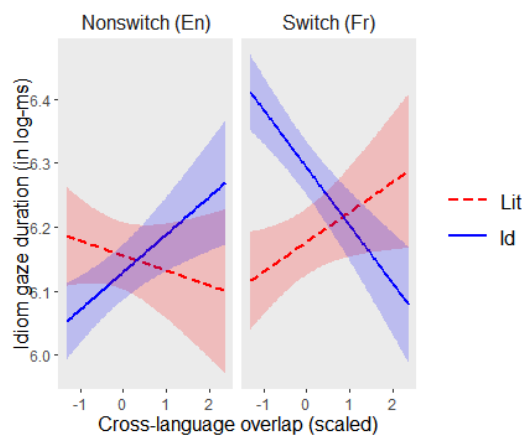
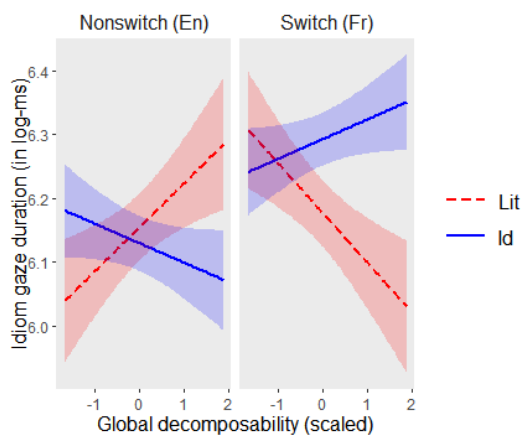


Figure 4



References

1. Cacciari, C., & Glucksberg, S., *Adv Psychol*, 1991
2. Gibbs et al., *J Mem Lang*, 1989
3. Titone, D., & Libben, M., *Ment Lex*, 2014
4. Siyanova-Chanturia et al., *Second Lang Res*, 2011
5. Carrol, G., & Conklin, K., *Lang Speech*, 2019
6. Titone et al., *Can J Exp Psychol*, 2019
7. Libben, M., & Titone, D., *Mem Cognition*, 2008
8. Geeraert et al., *MWE 2017*, 2017
9. Titone, D., Columbus, G., Whitford, V., Mercier, J., & Libben, M., *Contrasting bilingual and monolingual idiom processing*, in R. R. Heredia & A. B. Cieřlicka (Eds.), *Bilingual figurative language processing* (p. 171–207), 2015
10. Wolter, B., & Gyllstad, H., *Stud Second Lang Acq*, 2013
11. Carrol, G., & Conklin, K., *Biling-Lang Cogn*, 2017
12. Zeng et al., *J Neurolinguist*, 2020