Contextual and Lexical effects on Idiom Processing

Much of the early research into idioms (e.g. *kick the bucket*) treated them as unanalyzed 'large words', unconnected to the individual words that compose them [1,2]. More recent approaches place more emphasis on their structural properties [3,4,5]. According to *hybrid models* – focused primarily on the production of idioms – access to idiomatic meaning is mediated by the literal components of the expression. However, it is not clear whether such models extend straightforwardly to *language comprehension*, where the listener does not (initially) know whether the string of words is idiomatic or not. To test the validity of hybrid representations for comprehension, we looked for evidence of *compositionally-mediated idiom activation*: Does activation of semantically related, compositional (non-idiomatic) strings (e.g. *kick the pail*) result in partial idiom activation?

In addition to exploring how the activation of idiomatic vs. compositional meaning is modulated by bottom-up connections between lexical items, we looked at how top-down contextual information guides the activation of idiomatic vs. compositional meaning. Our aim was to examine the time-course and interaction of these processes.

Experiment: In a text-based visual-world eyetracking study [6,7,8], participants (n=12) heard sentences (24 targets, 60 fillers) containing word-strings ambiguous between literal and idiomatic meanings (e.g. *kick the bucket*) and semantically related non-idiomatic strings (e.g. *kick the pail*). Preceding context biased the literal (ex 1a,b) or idiomatic interpretation (ex 1c,d). To probe activation of idiomatic/literal interpretation, the display (Fig.1) showed four words (i) IDIOM_ASSOCIATE, related to idiomatic meaning, (ii) LITERAL_ASSOCIATE, related to literal meaning and (iii) two unrelated DISTRCTORS.

Results: Eye-movements after the onset of critical noun (*bucket/pail*) show an effect of contextual bias: More looks to LITERAL_ASSOCIATEs when biased literally and IDIOM_ASSOCIATEs when biased idiomatically, relative to DISTRACTORS (p's<.05). This indicates that the parser is rapidly utilizing top-down expectations to guide interpretation.

In literally-biased conditions, the contextual expectations boost the literal interpretation of both *kick the bucket* and *kick the pail*. For the latter, contextual bias is enough to suppress consideration of the idiomatic target: Although we find early competition between IDIOM_ASSOCIATE and LITERAL_ASSOCIATE in the *bucket* condition, looks to LITERAL_ASSOCIATE trump looks to IDIOM_ASSOCIATE in the *pail* condition (p's<.05).

Contextual effects are also found in *idiom-biased conditions*, where we see significant boosting of the idiomatic interpretation: Fixations reveal a long-lasting strong preference for IDIOM_ASSOCIATEs for both *kick the bucket* and *kick the pail* (p's<.05). In *bucket* cases, this persists throughout the trial; in *pail* cases, participants settle on the correct LITERAL_ASSOCIATE very late (800-1000ms post-noun-onset).

As a whole, we find initial competition between idiomatic and literal interpretations when the string is ambiguous between an idiomatic and literal meaning, but not with semantically related strings. However, the processing of semantically-related, unidiomatic strings (e.g. *kick the pail*) differs depending on contextual bias: On literally-biased trials, participants strongly prefer the literal over the idiomatic meaning, but on idiom-biased trials, the (incorrect) idiomatic meaning is temporarily preferred over the literal interpretation, suggesting compositionally-mediated idiom activation.

Word Count: 492

(1a) (Literal-Bias, *Bucket*) John spent all day filling things with cement as a nasty prank. Several people broke their toes when they **kicked the bucket** last Thursday evening and may sue.

(1b) (Literal-Bias, *Pail*) John spent all day filling things with cement as a nasty prank. Several people broke their toes when they **kicked the pail** last Thursday evening and may sue.

(1c) (Idiom-Bias, *Bucket*) Swimming with sharks is a dangerous and unpredictable profession. As a result of the shark attack several oceanographers **kicked the bucket** last Thursday evening.

(1d) (Idiom-Bias, *Pail*) Swimming with sharks is a dangerous and unpredictable profession. As a result of the shark attack several oceanographers **kicked the pail** last Thursday evening.
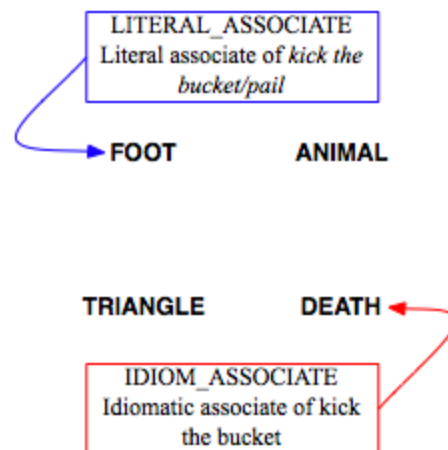

Figure 1 – A typical display (arrows & explanatory text added)

[1]   Swinney, D. A., & Cutler, A. (1979). The access and processing of idiomatic expressions. Journal of verbal learning and verbal behavior, 18:5, 523-534.

[2]   Bobrow, S. & Bell, S. (1973). On catching on to idiomatic expressions. Memory and cognition, 1:3, 343-346.

[3]   Sprenger , S. A., Levelt, W. J. M., Kempen, G. (2006). Lexical access during the production of idiomatic phrases. Journal of Memory and Language, 54:2, 161-184

[4]   Cutting , J. C., Bock, K. (1997). That's the way the cookie bounces: Syntactic and semantic components of experimentally elicited idiom blends. Memory and cognition, 25, 57-71

[5]   Cacciari C., Tabossi, P. (1988). The comprehension of idioms. Journal of Memory and Language, 27:6, 668-683

[6]   Meyer, A.M. (2005) Eye-tracking investigations of lexical ambiguity. Columbia, MO: University of Missouri Dissertation.

[7]   McQueen, J.M., Viebahn. (2007) Tracking recognition of spoken words by tracking looks to printed words. The Quarterly Journal of Experimental Psychology, 60:5, 661-71

[8]   Huettig, F. & McQueen, J.M. (2007). The tug of war between phonological, semantic and shape information in language-mediated visual search. Journal of Memory and Language, 57:4, 460-482