

A database of 256 natural stories to investigate processing of figurative and literal emotional language

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Figurative expressions are pervasive in everyday communication. Recent neurophysiological research suggests that figurative expressions are more emotionally engaging than their literal counterparts (Bohrn, Altmann, & Jacobs, 2012; Citron & Goldberg, 2014; Rojo, Ramos, & Valenzuela, 2014); hence, figurative language may play a key role in expressing emotional states, seeking empathy, and communicating effectively (e.g., Horton, 2013). This study aims to extend the current available materials on figurative language (e.g., Bambini, Resta, & Grimaldi, 2014) by providing the first database of idiomatic expressions embedded in naturalistic stories. Our database comprises 128 pairs of English stories that include an idiomatic and a closely-matched literal expression, along with norms for emotional valence and arousal (to what extent is an expression negative, neutral or positive; and to what extent it evokes physiological activation), familiarity (how often one comes across it in reading, listening or speaking), imageability (how easy it is to imagine), predictability (the likelihood of the idiomatic vs. literal ending to be expected by participants), semantic transparency (to what extent to which the idiomatic meaning can be inferred from the meaning of the individual words that compose it), and length and complexity indices.

Stories describe everyday events that happen to common people to maximise readers or listeners' engagement and empathic reactions to them, and to elicit natural reading processes. A context is first set, then something happens and a final reaction or conclusion, expressed either through an idiomatic expression or its literal rendering, is reached. The two versions of each expression are as similar as possible, and are followed by a sentence or a few words, to avoid "wrapping-up" reading processes to take place at the key idiomatic vs-literal expression (see Rayner, Kambe, & Duffy, 2000). This is particularly helpful for event-related potential (ERP) or eye-tracking experiments in which the time course of cognitive processes is tracked in detail. Two example stories:

Stephen had been at work on a long 12-hour shift and pulled into the driveway of his home. When he walked through the door his wife asked if he would like a bath running for him while he ate his evening meal. Stephen said "no thank you, I'm feeling tired, I think I will **just hit the sack**" and fell asleep straight away when he got into bed. [Literal: **just go to bed**]

Jeff had been thinking about quitting his job at the post office for a few weeks now. He was not happy at how he was being treated; he was expected to work long hours without being paid any overtime. When he opened his latest wage slip, it was over £40 short, **this was the final straw!** He handed his formal notice in the very next day. [Literal: **this was enough!**]

Rating study. Participants were presented with the full story and the key expression (either idiomatic or literal) underlined, but with the text immediately following the expression omitted (e.g., they did not see 'He handed in his formal notice in the very next

day.’ in the final example above. They were asked to read the whole story and rate (on 7-point Likert scales) the underlined expression for the extent to which it is positive or negative in valence, their level of emotional arousal (from not at all to extremely arousing), familiarity, imageability, semantic transparency (the latter was only rated in response to idiomatic expressions). This allowed validation of the specific expression after having taken the story context into account. For predictability, stories were presented without the key expressions and participants had to write down a possible continuation. Each story and variable was rated by at least 20 participants.

The ratings for valence, arousal, familiarity, imageability, semantic transparency and scores for predictability were calculated and correlations between each computed to investigate their relationships. As predicted, we found the classic quadratic relationship between valence and arousal, whereby increasingly positive and negative expressions were rated at higher in emotional arousal (Bradley & Lang, 1999). In addition, preliminary findings show an interesting positive correlation between predictability and valence, as well as between predictability and familiarity, suggesting that the more predictable an expression, the more positive and familiar it is perceived. This database will be useful for the design of future experimental studies that address questions about the neural basis of figurative and literal language processing in natural contexts, combining ecological validity with the control over potentially confounding emotional and psycholinguistic factors. The results will be discussed along with provided examples of possible experimental studies that can be conducted.

Keywords: idioms, stories, emotion, natural reading, database

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