



## *Inclusive* affective neurolinguistics

Jos J. A. van Berkum

To cite this article: Jos J. A. van Berkum (2019): *Inclusive* affective neurolinguistics, Language, Cognition and Neuroscience, DOI: [10.1080/23273798.2019.1665191](https://doi.org/10.1080/23273798.2019.1665191)

To link to this article: <https://doi.org/10.1080/23273798.2019.1665191>



© 2019 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



Published online: 18 Sep 2019.



Submit your article to this journal [↗](#)



Article views: 399



View related articles [↗](#)



View Crossmark data [↗](#)

## Inclusive affective neurolinguistics

Jos J. A. van Berkum

Utrecht Institute of Linguistics OTS, Utrecht University, Utrecht, Netherlands

**ARTICLE HISTORY** Received 26 July 2019; Accepted 9 August 2019

### Introduction

In a recent paper in *Language, Cognition and Neuroscience*, Hinojosa, Moreno and Ferré (2019) provide a thorough narrative review of empirical neuroscience research at the intersection of brain, language, and emotion. The authors, henceforth *HMF*, note that cognitive neuroscience models of language processing tend to ignore emotion, whereas affective neuroscience typically explores language only in so far as it is relevant to testing models of emotion (rather than of language processing). This leaves a gap in our understanding of the emotion-language interface. Starting from the notion that language comprehension is much less “feed-forward” and much more “interactive” than once believed, *HMF* call for an *affective neurolinguistics*, the neuroscientific study of the interaction between language processing and emotion.

I am very sympathetic to *HMF*’s plea to expand neurolinguistics so that it also includes the language-emotion interface – this is a timely and relevant call. I also think that this careful review of ERP and fMRI findings is going to be very helpful, to newcomers to the field, but also to those already working on language-emotion interactions. A lot of interesting work has already been done, and the systematic overview provided here can help others move forward. However, while agreeing with the general thrust of *HMF*’s plea, I do have a few comments that bear on which exact direction to move forward *in*.

### Are we focusing on the most important issues?

*HMF* focus their review on “the effects of emotional information on the comprehension of visually presented

single words, sentences and texts” (p. 2). For the practical purpose of reviewing, a restricted focus makes a lot of sense. The focus chosen by *HMF* also comes naturally. Many psycho- and neurolinguists study the processes involved in word recognition, sentence-level unification, and text comprehension, so exploring how emotional information “in” words, sentences and texts affects the processing of those bits of language – i.e. affects word recognition, or syntactic and semantic unification – is a straightforward extension of the standard language processing research programme. What is essentially added is emotion as a “top-down” context for component operations within the language processing system, in line with modern ideas of interactivity and feedback.

However practical and natural, though, one may well ask whether research on emotion as *an additional, contextual factor influencing regular comprehension processes as they unfold* is really the best place to start. Understanding how, say, morphosyntactic gender and number processing is affected by emotional content is relevant to understanding the details of the language processing machinery. However, as a focus for affective neurolinguistics, it does not seem to go to the heart of things. We *do* things with words, in ways that are principally dependent on conscious or unconscious emotion. We use language not just to dispassionately inform each other about facts of the world, but also to manipulate others, and to share feelings with them (Austin, 1962; Besnier, 1990; Bühler, 1934; Jakobson, 1960; Tomasello, 2008). For example, we use words to persuade, console, invite, encourage, praise, seduce, move, impress, insult, command, intimidate, threaten, joke with, and gossip over other people, as well as to express and share our own emotions. These everyday observations suggest at least two questions about the interplay between linguistic and

**CONTACT** Jos J. A. van Berkum  [j.vanberkum@uu.nl](mailto:j.vanberkum@uu.nl)

\*Commentary on Hinojosa, J.A., Moreno, E.M. & Ferré, P. (2019). Affective neurolinguistics: towards a framework for reconciling language and emotion, *Language, Cognition and Neuroscience*. doi:10.1080/23273798.2019.1620957

© 2019 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

affective processing that appear to be more fundamental than the one addressed by HMF:

- (1) How does emotion exert control over language production?
- (2) How does language lead to emotion during comprehension?

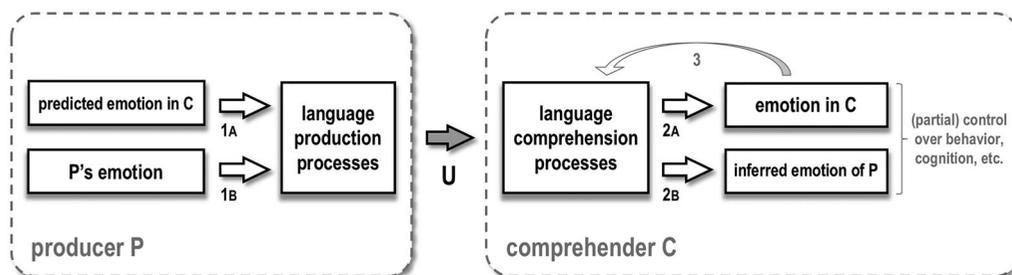
The first question asks about how aspects of language *production* are influenced by emotion, either the language producer's own current emotion, or his or her (possibly unconscious) predictions about emotion elicited by an utterance in the comprehender. How do speakers design and formulate their utterances such that they have the emotional effects that they do, and what role does their own emotion play in this? In what ways, for example, do these two aspects of the language producer's state (own emotion, predicted emotion in others) control affective prosody and turn timing, or the choice of words and constructions, in real time? The second question asks about how emotion is elicited by language during *comprehension*, i.e. as one of its "perlocutionary effects". How and why does a particular arrangement of incoming words and prosodic parameters elicit the emotional effects in the comprehender that it does, such that language can be used as a tool to affect other people? Also, how is it possible that people can sometimes achieve the same affective results by talking to themselves? These are all questions that psycho- and neurolinguists currently have very little to say on. And they are questions that affective neurolinguistics can and, in my opinion, should address.

In terms of the schematic in Figure 1, the research discussed by HMF primarily focuses on the interactive feedback denoted by arrow 3, the impact that "emotional content" in utterance U has on word recognition, syntactic parsing, and other ongoing language comprehension

processes. However, this is just *one* of the interfaces that we currently have very little knowledge of, and, importantly, it is most likely *not* an interface that makes language to do all the useful things mentioned above. What seems more basic is to try to understand the causality in interfaces 1 and 2, as part of the bigger chain that makes language use effective.

Is the latter exploration really psycho- and neurolinguistics? Well, traditionally not. But when you stop to think about it, exploring how one's emotions and one's predictions about other people's emotions influence language production is not so different from trying to understand how, say, conceptual messages and audience design considerations influence language production – and the latter are standard questions in the field. Also, exploring how incoming words elicit emotions as well as inferences about other people's emotions is not so different from trying to understand how incoming words elicit thoughts about the situation described, or inferences about what word meaning is intended by the speaker – with the latter again being standard questions in the field. For understandable historical reasons (see Van Berkum, 2018, 2019), "cognitive" questions such as the above are viewed as clearly belonging to the domain of psycho- and neurolinguistics proper, whereas their emotional counterparts are not. But now that we know a lot more about the brain, the role of conscious as well as unconscious emotion, and the cognition–emotion interface, I think this is a bias that the field should get rid of.

It should be noted that not *all* of the work discussed by HMF can be construed as studies of "feedback" interface 3. Furthermore, studying interface 3 (e.g. the impact that emotional contents has on gender and number processing) indirectly also studies interface 2A, at least on the reasonable assumption that emotional contents exerts its effect via emotional responses in the



**Figure 1.** Some relations between emotion and language during real-time language processing. P can be a speaker, writer, or signer. C can be a reader, listener, or sign comprehender (all in the role of addressee or overhearer). For simplicity, the figure focuses on a *verbal* utterance only (U) and does not depict the various non-verbal channels that will often also be available. Also, the schematic does *not* commit to discrete serial stages (e.g. in the sense that all emotion must wait for language comprehension to finish), and arrows 2A and 2B can stand for a causal as well as an entailment relationship (where emotion is a *part* of language comprehension). Interactions between one's own emotion and a predicted or inferred emotion in somebody else may occur, but are not explicitly marked in the figure.

comprehender. The point I'd like to make, however, is that framing one's work as studying interface 2 versus interface 3 does involve an important shift of focus, with different core questions, as well as a potentially rather different repertoire of methods.

To illustrate the latter, if the goal is to explore, in comprehension, the interaction between language and emotion expressed in "feedback" interface 3, then measures that have in the past proven to be particularly helpful in exploring components of language processing, such as EEG and fMRI, make a lot of sense. However, if we want to study how language *leads to emotion in the comprehender directly*, i.e. explore interface 2A without necessarily looking at subsequent interactions with language processing components, then *other* measures may become more relevant. Emotional episodes are stochastically synchronised bundles of motivational tendencies (e.g. wanting somebody to stop doing something), physiological responses (e.g. heart rate increase), cognitive responses (e.g. increased attention to particular things), and behavioural expressions (e.g. frowning, clenched fists), possibly accompanied by a subjective feeling (e.g. of being angry; see Van Berkum, *in press* for a linguist-oriented review of emotion theories). So, to examine emotion in response to language, we can measure *all of this*.

As usual, which measures are most appropriate depends on the specific question, as well as more practical concerns. For example, if you are interested in how a comprehender's emotional state varies continuously, as a function of every incoming word, probing subjective experience via a survey is not a good idea. In this case, other measures will be much more useful, such as facial electromyography (EMG), the recording of motor unit action potentials over muscles that are also used to express emotion (see, e.g. Foroni & Semin, 2009; t Hart, Struiksmā, Van Boxtel & Van Berkum, 2019). Of course, as part of this endeavour, we can also measure the *cognitive* aspects of an emotional episode, and we can use secondary *language* (e.g. cross-modal lexical probe) tasks for that, or even specific probe words later in the sentence or story. The latter could be construed as a case of emotion affecting aspects of language processing (cf. interface 3). But the framing is different, as the overall goal now is to study how emotion varies as a function of (and possibly as a constituent of) language comprehension, not how language comprehension varies as a function of emotion.

### What is emotional content?

As can be seen in Hinojosa, Moreno & Ferré (2019), their Figure 1, a lot of the brain lights up when we manipulate

the "emotional content" of language. One of the ways to move forward, therefore, is to start thinking about *different types of* emotional content. HMF make the same point: "An important question that needs to be addressed in future studies concerns the structure of the representation of the different attributes or dimensions that comprise the 'core' concept of emotional content." (p. 18).

In line with current psycho- and neurolinguistic models, HMF organise their review in terms of basic linguistic units: single words, and decontextualised sentences. This correlates with a first partitioning of emotional content: located in *lexico-semantic meaning* retrieved from long-term memory, and in *sentence-semantic meaning* computed by combining word meaning in accordance with the grammar. However, this organisation inherits a basic bias in the fields of psycho- and neurolinguistics, which is to primarily think of linguistic meaning as *coded* meaning, computed on the basis of stored knowledge in the mental lexicon, and (apart from sense ambiguity, e.g. "bank", "paper"), relatively independent of the context. Pragmatics researchers (e.g. Clark, 1996; Enfield, 2013; Grice, 1967; Scott-Phillips, 2015; Sperber & Wilson, 1995; Tomasello, 2008) have long argued, though, that in real language use, coded meaning is *just the beginning* of communicated meaning. An utterance like "I think your president is really competent!", uttered in context X at time T by producer P towards comprehender C, acquires its meaning not just as a function of the various memorised possible meanings of words like "your", "president", and "competent", and how these can be combined as a function of the grammar of English, but also as a function of what is being referred to *in this particular context* (e.g. which president?), how the utterance is produced (e.g. in an admiring or a sarcastic way), and what the social intention of P is (e.g. to flatter, share concern, make a joke, or simply engage in small talk).

The *Affective Language Comprehension* (Van Berkum, 2018, 2019) unpacks these various additional levels of communicated meaning precisely to explore what "emotional content" can mean during comprehension. According to the model, comprehenders can indeed have an unconscious or conscious emotional response to the relatively invariant "coded" meaning of particular signs and sign structures being uttered, largely *independent of what they stand for in the current context*. For example, readers and listeners can have mildly – possibly fully unconscious – brief positive responses to words like "competent", "holidays", or "happy", as well as to constructions like "we are go for launch" or "you may kiss the bride", even in the current bracketing as examples in a scientific paper. However, in everyday language

use, much of the emotional responding will occur to *contextualised* meaning. According to the *ALC*-model, this includes *C*'s representation of *P*'s current *referential intention*, e.g. ascribing competence to the current president of one's own country, of *P*'s current (and usually affective) *stance*, e.g. a sarcastic one, and of *P*'s current *social intention*, e.g. sharing genuine concern, as well as *additional inferences* that were not intended by *P*, e.g. that *P* is always so negative. These are levels of communicated meaning that an inclusive affective neurolinguistics should also embrace.

As might be expected, many other distinctions might also be relevant, including, say, (a) whether a word (in)directly refers to an emotion ("happy", "despair", "frown") or simply has an "emotional connotation" ("holidays", "cancer"), (b) whether the various representations being computed as part of contextualised language comprehension have a particular valence or are simply "arousing" (see HMF, p. 18), (c) whether the emotions are triggered by a full-blown multi-feature appraisal or result from simple associative conditioning, and (d) how those representations relate to specific appraisal dimensions (Scherer, 2005), core relational themes (Lazarus, 1991), and other aspects of specific emotions, such as the specific motivational tendency (Scarantino, 2014). However, according to the *ALC*-model, all those additional distinctions "ride on top of" at least five very different types of meaning being computed in language comprehension: sign meanings, referential intentions, stances, social intentions, and unintended "bonus meaning". The distinctions proposed in the *ALC*-model need not be the right ones, or the most fruitful ones – this is just a first stab at things. But if we do not unpack the complexity of linguistic (or otherwise communicated "non-natural") meaning in *some* way beyond coded word and sentence meaning, we are bound to overlook an important part of how actual language use leads to emotion.

Furthermore, apart from specifying various contextualised levels of communicated meaning beyond coded word and sentence meaning, frameworks such as the *ALC*-model also provide a handle on where the emotional aspects of coded meaning come from in the first place (see Van Berkum, 2018, for this). In terms of the model, for example, swear words can acquire their relatively context-insensitive affective power for a variety of reasons: because of what they typically refer to, because of the typical affective stance of people producing them, because of the typical social intentions realised when they are used, and/or because of the typical emotional effects that they elicit in addressees or overhearers (e.g. parents, Kindergarten staff). Although swear words are a useful example, the *ALC*-

model predicts that the same holds for how other words (and larger invariant constructions, e.g. the particular prosodic contour of sarcasm) get to have the stable "emotional contents" that they have. Again, the specific distinctions drawn by the *ALC*-model may in the end turn out not to be the most fruitful ones – there are many ways to carve up communicated meaning. But the general logic, that words and other atomic signs can have coded "emotional content" for a variety of reasons that principally relate to the many levels of meaning computed during contextualised language comprehension, seems like a reasonable one.

The relevance of making distinctions beyond coded meaning can also be illustrated by some of the research discussed by HMF, two fMRI studies that explored the role of valence and arousal in the processing of "emotional words" (HMF, p. 6). In one of these studies (Citron, Gray, Critchley, Weekes, & Ferstl, 2014) positive and negative single words were presented for lexical decision. In the other one (Lewis, Critchley, Rotshtein, & Dolan, 2007) such words were presented while asking participants to indicate whether each word could be used to describe themselves. These studies led to different sets of brain activations, which, according to HMF, can arise because of how different specific stimuli, data analysis, and task demands "influence several word processing stages" (HMF, p. 6). I agree that all those differences can matter, but one obvious place to look first is in how task demands focus participants on establishing coded versus contextualised meaning: whereas in the Citron et al. study, participants process decontextualised words only, task demands in the Lewis et al. study require participants to compute a more complex referential model in which the adjective meaning is momentarily applied *to the participant him- or herself*. The observed differences in brain activation might thus to some extent reflect emotion being triggered by retrieving coded sign meaning versus emotion triggered by constructing contextualised referential meaning *featuring oneself* (e.g. essentially asking oneself "Am I dumb?" or "Am I a nice person?"), as well as, incidentally, the very act of constructing a contextualised situation model. This can have a big impact on the nature and intensity of an emotional response.

Addressing the various levels of contextualised meaning suggested by pragmatic analyses of communication will make affective neurolinguistic research life more difficult, for sure, because presenting single words or fully decontextualised written sentences will often not be enough. However, context is a big thing. For example, one can use prosody to foreground the speaker's affective stance or speech act performed (e.g.

Aryani, Hsu & Jacobs, 2018; Hellbernd, & Sammler, 2018), embed sentences in a real-life evaluative context (e.g. Van Berkum et al., 2009), or set up a mock job interview in which participants are directly addressed and have something at stake (e.g. Bašnáková et al., 2015), to give just a few examples – the options are endless. Inclusive affective neurolinguistics will be difficult, but it'll also be fun.

## Conclusion

The call for affective neurolinguistics made by Hinojosa, Moreno and Ferré (2019) is a timely one – emotion is simply too central to sociality and cognition to be ignored in the study of language. I agree with HMF that studying how language-triggered emotion subsequently affects ongoing language comprehension is a relevant area of study. However, I think we should strive for a broader, inclusive affective neurolinguistics, in several different ways. First, the field should focus on how the emotional aspects of language use allow us to *do* things with words, a query that involves at least two questions: How does emotion influence language production in real time, and how does an utterance elicit emotion during language comprehension? Second, an inclusive affective neurolinguistics should boldly go beyond studying coded (semantic) meaning, and also explore the processing associated with contextualised (pragmatic) levels of meaning – after all, it is presumably at those levels where most of the “emotional language work” is done.

Although not the focus of my comments above, an inclusive affective neurolinguistics should also pay attention how emotion-relevant verbal communication relates to the various *other* channels that humans have at their disposal to communicate or elicit emotion, not just paralinguistic ones like affective prosody, but also fully independent channels, such as emotional expressions in the face and in body posture (see, e.g. Scarantino, 2017). And, last but not least, it seems wise to connect with other areas of the language sciences that speak to the language-emotion interface, such as affective semantics, language acquisition research, conversation-analytic research of natural emotional dialogue, and research on the evolution of language.

I do not think that HMF would necessarily disagree with the call for a broader research agenda and that they would like to deliberately restrict affective neurolinguistics to studying how language-triggered emotion subsequently affects ongoing language comprehension. But their review does reflect the current narrow focus of the field. What I suggest here is to expand affective

neurolinguistics well beyond that focus, and to include a number of core issues that have not received all that much attention.

The human mind is relatively ingroup-oriented, and time is short, so being inclusive is actually quite difficult. However, our job is to make comprehensive models of linguistic communication, not just study one historically foregrounded aspect of it. Also, we *can* be inclusive if we really want to. Language researchers have been welcoming and embracing cognition for decades – now it is time to embrace emotion, and everything that comes with it, as well.

## Disclosure statement

No potential conflict of interest was reported by the author.

## References

- Aryani, A., Hsu, C. T., & Jacobs, A. (2018). The sound of words evokes affective brain responses. *Brain Sciences*, 8(6), 94.
- Austin, J. L. (1962). *How to do things with words*. Cambridge, MA: Harvard University Press.
- Bašnáková, J., Van Berkum, J. J. A., Weber, K., & Hagoort, P. (2015). A job interview in the MRI scanner: How does indirectness affect addressees and overhearers? *Neuropsychologia*, 76, 79–91.
- Besnier, N. (1990). Language and affect. *Annual Review of Anthropology*, 19, 419–451.
- Bühler, K. (1934). *Sprachtheorie*. Jena: Gustav Fischer.
- Citron, F. M., Gray, M. A., Critchley, H. D., Weekes, B. S., & Ferstl, E. C. (2014). Emotional valence and arousal affect reading in an interactive way: Neuroimaging evidence for an approach-withdrawal framework. *Neuropsychologia*, 56, 79–89.
- Clark, H. H. (1996). *Using language*. Cambridge, MA: Cambridge University Press.
- Enfield, N. J. (2013). *Relationship thinking: Agency, enchrony, and human sociality*. New York: Oxford University Press.
- Feroni, F., & Semin, G. R. (2009). Language that puts you in touch with your bodily feelings: The multimodal responsiveness of affective expressions. *Psychological Science*, 20(8), 974–980.
- Grice, H. P. (1967). *Logic and conversation*. Unpublished manuscript of the William James Lectures. Cambridge, MA: Harvard University.
- Hellbernd, N., & Sammler, D. (2018). Neural bases of social communicative intentions in speech. *Social Cognitive and Affective Neuroscience*, 13(6), 604–615.
- Jakobson, R. (1960). *Style in language*. Cambridge, MA: MIT Press.
- Lazarus, R. S. (1991). *Emotion and adaptation*. Oxford: Oxford University Press.
- Lewis, P. A., Critchley, H. D., Rotshtein, P., & Dolan, R. J. (2007). Neural correlates of processing valence and arousal in affective words. *Cerebral Cortex*, 17(3), 742–748.
- Scarantino, A. (2014). *The motivational theory of emotions*. In D. Jacobson, & J. D'Arms (Eds.), *Moral psychology and human agency* (pp. 156–185). Oxford: Oxford University Press.

- Scarantino, A. (2017). How to do things with emotional expressions: The Theory of Affective Pragmatics. *Psychological Inquiry*, 28(2–3), 165–185.
- Scherer, K. R. (2005). What are emotions? And how can they be measured? *Social Science Information*, 44(4), 695–729.
- Scott-Phillips, T. (2015). *Speaking Our Minds: Why human communication is different, and how language evolved to make it special*. New York: Palgrave MacMillan.
- Sperber, D., & Wilson, D. (1995). *Relevance: Communication and cognition*. Oxford/Cambridge: Blackwell.
- 't Hart, B., Struiksma, M. E., van Boxtel, A., & van Berkum, J. J. A. (2019). Tracking affective language comprehension: Simulating and evaluating character affect in morally loaded narratives. *Frontiers in Psychology*. doi:10.3389/fpsyg.2019.00318
- Tomasello, M. (2008). *Origins of human communication*. Cambridge, MA: MIT Press.
- Van Berkum, J. J. A. (2018). *Language comprehension, emotion, and sociality: Aren't we missing something?* In S. A. Rueschemeyer, & G. Gaskell (Eds.), *Oxford Handbook of Psycholinguistics* (pp. 644–669). Oxford: Oxford University Press.
- van Berkum, J. J. A. (2019). *Language comprehension and emotion: Where are the interfaces, and who cares?* In G. de Zubicaray, & N. O. Schiller (Eds.), *Oxford handbook of neurolinguistics* (pp. 736–766). Oxford: Oxford University Press.
- Van Berkum, J. J. A. (In press). What is emotion, and why is it relevant to language research? To appear. In G. L. Schiewer, J. Altarriba, & B. C. Ng (Eds.), *Language and Emotion: An international handbook*. Berlin: De Gruyter Mouton.
- Van Berkum, J. J. A., Holleman, B., Nieuwland, M., Otten, M., & Murre, J. (2009). Right or wrong? The brain's fast response to morally objectionable statements. *Psychological Science*, 20(9), 1092–1099.