

# MAKE NEW WITH OLD: HUMAN LANGUAGE IN PHYLOGENETICALLY ANCIENT BRAIN REGIONS

MARIE MONTANT, JOHANNES C. ZIEGLER

*Laboratoire de Psychologie Cognitive, Aix-Marseille University and CNRS, Marseille, France*  
[Marie.Montant@univ-amu.fr](mailto:Marie.Montant@univ-amu.fr)

BENNY B. BRIESEMEISTER, TILA BRINK

*Freie Universität Berlin, Allgemeine und Neurokognitive Psychologie, Center for Applied Neuroscience, Berlin, Germany*

BRUNO WICKER, AURELIE PONZ

*Institut de Neurosciences de la Timone, Aix Marseille University and CNRS, Marseille, France*

MIREILLE BONNARD

*Institut de Neurosciences des Systèmes, Aix-Marseille University and INSERM, Marseille, France*

ARTHUR JACOBS

*Freie Universität Berlin, Allgemeine und Neurokognitive Psychologie, Center for Applied Neuroscience, and Dahlem Institute for Neuroimaging of Emotion (D.I.N.E.), Berlin, Germany*

MARIO BRAUN

*Centre for Cognitive Neuroscience (CCNS), University of Salzburg, Salzburg, Austria*

A common view in cognitive science is that human language consists of computations and transformations of mainly abstract symbolic information that takes place in various (mostly left) neocortical regions. According to this view, when hearing or reading emotionally loaded words, like “vomit” or “love”, the emotional content of these words is accessed through the activation of the perisylvian language network in charge of processing symbolic meaning. Alternatively, because language is one of the most recent cognitive products of human evolution, it has been argued that the language network has evolved through the re-use of already existing cortical and subcortical brain regions (Anderson, 2010). Thus, reading or hearing emotionally loaded words should therefore activate phylogenetically ancient and heteromodal brain structures that are in charge of emotions. In a functional magnetic resonance imaging (fMRI) experiment, we show that the same brain region is activated whether people observe facial expressions of disgust or whether they read words that refer to core disgust. This particular region corresponds to a portion of the insula (i.e. the anterior part) that is also known to be involved in the perception of disgusting odors (Wicker et al, 2003). In a subsequent transcranial magnetic stimulation (TMS) experiment, we show that transient disruption of the anterior insula affects the processing of core disgust words in a reading task. Participants are much slower to recognize visually presented disgust words, compared to neutral words, when TMS is applied over the anterior insula rather than the vertex. Altogether, these results are compatible with theories of embodied emotion (Niedenthal, 2007) and neural re-use (Anderson, 2010), according to which phylogenetically ancient brain structures that process basic emotions in all mammals actively participate in high-level cognitive skills, such as language.

## References

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