NeuroImage 13, Number 6, 2001, Part 2 of 2 Parts IDEAL®

LANGUAGE

Brain activation during processing of metaphors - an eFMRI study

Alexander Michael Rapp*, Dirk Leube*, Michael Erb†, Gerhard Buchkremer*, Wolfgang Grodd†, Mathias Bartels*, Tilo Kircher*

**Dep. of Psychiatry, University of Tuebingen, Germany*

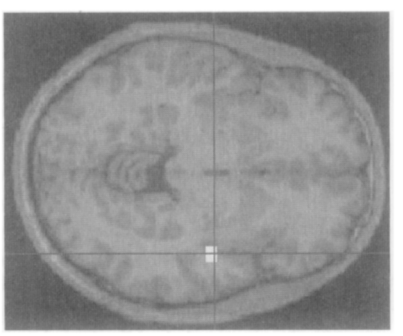
†*Section of Experimental MR of the CNS, University of Tuebingen, Germany*

Background

Metaphors (e.g. "Jim's head is full of rocks") are an ubiquitous form of speech. The mechanisms by which the brain processes figurative aspects of language are unknown. Neuropsychological [1] and brain lesion [2] studies indicate that the right hemisphere is necessary for effective processing of metaphors.

Objectives

To compare brain activation during reading of literal and metaphoric sentences using functional magnetic resonance imaging.



Subjects and methods

In our study healthy subjects read sentences with metaphoric or literal meaning silently while BOLD-contrast was measured with fMRI. Subjects responded by pressing one of two buttons with the right index finger to indicate whether a sentence had a metaphorical or literal meaning. Each sentence was presented for 5 seconds with a 3 second interstimulus interval.

60 short german sentence pairs, constructed de novo, served as stimuli. All were of the form "A is B". Sentence pairs differed only in their last word (e.g. metaphor "Der Wecker ist ein Folterknecht" [the alarm clock is a torturer] , literal sentence "Der Wecker ist ein Elektrogerät" [the alarm clock is an electrical appliance]). Metaphors and literal sentences were matched for comprehensability, connotation (positive or negative), tense and frequency of the last word in german language.

Data was collected from the whole brain (22 slices, slice thickness 5mm, TR= 2s, TE= 40ms) using a 1.5 T Siemens SONATA system. Differential contrast between metaphorical - literal sentences was analysed. Image processing and statistical analysis was performed using SPM 99.

Results

Contrasting metaphorical vs. literal sentences showed an activation in the right superior temporal gyrus (Tal x 44, Tal y -9, Tal z -5, BA 22).

Discussion

Our results of activation in the right superior temporal gyrus during the processing of metaphors are in line with neuropsychological [1], brain lesion [2] and a previous PET study [3]. Currently we are investigating patients with schizophrenia using the same task. This group of patients is known to have a specific deficit in metaphor processing [4].

Literature

1 Faust, M., Weisper, S., Brain Cogn., 43 (2000) 186-191.
2 Winner, E., Gardner, H., Brain, 100 (1977) 717-729.
3 Bottini, G., Frith, C.D et. al, Brain, 117 (1994) 1241-1253.
4 McCarley, R.W., Shenton, M.E. et. al, Biol.Psychiatry, 45 (1999) 1099-1119.
5 Pearlson, G.D., Prog.Neuropsychopharmacol.Biol.Psychiatry, 21 (1997) 1203-1229.