

## THE EFFECT OF ONE LEFT-SIDED DORSOLATERAL PREFRONTAL CORTICAL HF-rTMS SESSION ON EMOTIONAL BRAIN PROCESSES IN WOMEN

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### SUMMARY

Although repetitive Transcranial Magnetic Stimulation (rTMS) is frequently used to examine emotional changes in healthy volunteers, it remains largely unknown how rTMS is able to influence emotion. We carried out a sham-controlled single-blind crossover study using fMRI, we examined in 20 right-handed healthy female volunteers whether a single high frequency (HF)-rTMS session applied to the left dorsolateral prefrontal cortex (DLPFC) could influence emotional processing while focussing on blocks of positively and negatively valenced baby faces. A single HF-rTMS session selectively influenced the processing of positively and negatively valenced baby faces. In essence, our results indicate that the effects of one left-sided HF-rTMS sessions results in improved processing of positive emotions and reduced negative emotional processing in never depressed female subjects.

**Key words:** repetitive Transcranial Magnetic Stimulation - emotion - prefrontal brain cortex

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### Objectives

Although repetitive Transcranial Magnetic Stimulation (rTMS) is frequently used to examine emotional changes in healthy volunteers, it remains largely unknown how rTMS is able to influence emotion.

### Methods

In this sham-controlled single-blind crossover study using fMRI, we examined in 20 right-handed healthy female volunteers whether a single high frequency (HF)-rTMS session applied to the left dorsolateral prefrontal cortex (DLPFC) could influence emotional processing while focussing on blocks of positively and negatively valenced baby faces. The task instruction was to focus on one's own emotional status elicited by the visual stimuli.

### Results

A single HF-rTMS session selectively influenced the processing of positively and negatively valenced baby faces. When positive information was being processed, one active left-sided HF-rTMS session resulted in enhanced neuronal activity in the left superior frontal

cortex (Brodmann area 10) and right inferior parietal cortex (Brodmann area 39). When negative information was processed, one active stimulation attenuated neuronal activity in the right insula, while sham stimulation did not.

### Discussion

These observations suggest that after one active HF-rTMS session, psychophysiological reactions while processing withdrawal-related stimuli decrease. Concerning the processing of positively valenced baby faces our findings suggest that one left-sided HF-rTMS session influences the 'attentional set' predominantly linked with executive functions present in the left DLPFC. The increased neuronal activity might reflect enhanced task-related processing caused by the neuronal activation of the left DLPFC, which could indicate that females are more able to empathize with the depicted happy baby faces. In essence, our results indicate that the effects of one left-sided HF-rTMS sessions results in improved processing of positive emotions and reduced negative emotional processing in never depressed female subjects. Our results add further evidence as to why HF-rTMS applied to the left DLPFC might improve mood in depressive populations.

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