

## Neurobiological effects of Lourdes water: An fMRI study

### **ABSTRACT:**

#### **Background**

Water from Lourdes (a Catholic pilgrimage site in France) has been associated with medical miracles. From a skeptical point of view, Lourdes's water is a placebo.

#### **Aims**

The project investigated neurobiological correlates of the belief in the healing power of Lourdes water.

#### **Method**

In the conducted studies (with structural/ functional magnetic resonance imaging/ resting-state functional connectivity; rsFC), participants drank either tap water that was labeled 'Lourdes water' (placebo), water from the sanctuary in Lourdes (verum), or 'tap water' (labeled as tap water; control). Additionally, they evaluated their subjective state (emotions, thoughts, somatic symptoms).

#### **Results**

The belief in the miracles of Lourdes was positively associated with brain volume in the temporo-parietal junction (TPJ) and negatively with volume in the medial prefrontal cortex (MPFC). The mentioned brain regions are involved in mentalizing and self-control. The placebo reduced rsFC in the fronto-parietal cognitive control network and increased rsFC in the salience network (insular-cerebellar connectivity). The three groups did not differ in the intensity of reported emotions, thoughts, somatic symptoms, and whole-brain activity during the experiment. After the fMRI session, the placebo group reported increased intensity of bodily sensations (e.g. feelings of warmth, tingling) and positive emotions (e.g., gratefulness).

#### **Conclusions**

The findings provide the first evidence that the belief in the miracles of Lourdes is associated with brain activity in large-scale functional networks and brain volume in regions involved in processes related to self-regulation and self-awareness.

#### **Keywords**

Lourdes water, Resting state connectivity, Placebo, Magnetic resonance imaging

### **Published Work:**

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