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Selective cerebral response to autobiographical memory in the persistent vegetative state: a fMRI case study

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INTRODUCTION

- The vegetative state is characterized by the absence of awareness of self or the environment and preserved autonomic functions. Clinical assessment of awareness is based on the observation of voluntary behavioral responses to visual, auditory, tactile or noxious stimuli. Thus, in patients with voluntary motor function impairment, standard clinical approach can lead to misdiagnosis concerning their level of consciousness.

- Functional neuroimaging may be useful in the identification of residual cognitive function in such patients, in particular to detect speech perception and comprehension.

- We designed a fMRI experiment in order to determine the influence of the emotional charge of speech on its processing, in patients with disorders of consciousness.

SUBJECTS, MATERIAL AND METHODS

- We investigated the case of a 32-year-old, right-handed man, who has sustained severe traumatic brain injury 12 years before. According to clinical testing, the patient was considered to be in persistent vegetative state (CGAS-R score = 6.4 ± 1.1, based on 15 observations during the last 2 months).

- fMRI scanning was performed during passive language auditory processing tasks, using a block design with five conditions: 1) Narratives with neutral content spoken by an unfamiliar voice, played forward. 2) Narratives with neutral content spoken by an unfamiliar voice, played backward. 3) Silence. 4) Narratives with neutral content spoken by a familiar voice, played forward. 5) Narratives with autobiographical content spoken by a familiar voice, played forward. (Images were acquired on a 3T GE Discovery MR750. fMRI was performed using a whole brain gradient-echo EPI sequence [TR = 3000 ms, TE = 30 ms, resolution = 3.75x3.75x4 mm³]).

- Several contrasts were analyzed, and compared to three healthy voluntary subjects (all right-handed, mean age of 23.7 ± 0.9 years), in order to isolate the following components:

RESULTS

- In summary, contrary to the diagnostic criteria defining the vegetative state, the patient showed a cerebral activity in response to autobiographical narratives. Furthermore the observed activation pattern, widely distributed in regions known to be involved in memory retrieval, is coherent with the nature of speech content.

- The present study provides further evidence of possible residual cognitive functions in the vegetative state, and highlights the importance of emotional charge of speech to pass through an attentional filter, of which selectivity might be altered by cerebral lesions. These findings may have implications in neurorehabilitation programs.

REFERENCES