

## Brief Communication

## Abnormal moral reasoning in complete and partial callosotomy patients

Michael B. Miller<sup>a,\*</sup>, Walter Sinnott-Armstrong<sup>b</sup>, Liane Young<sup>c</sup>, Danielle King<sup>a</sup>, Aldo Paggi<sup>d</sup>, Mara Fabri<sup>d</sup>, Gabriele Polonara<sup>d</sup>, Michael S. Gazzaniga<sup>a</sup>

<sup>a</sup> University of California, Santa Barbara, CA, United States

<sup>b</sup> Dartmouth College, Hanover, NH, United States

<sup>c</sup> Massachusetts Institute of Technology, Cambridge, MA, United States

<sup>d</sup> Ospedali Riuniti and Università Politecnica, Ancona, Italy

## ARTICLE INFO

## Article history:

Received 26 November 2009

Received in revised form 29 January 2010

Accepted 17 February 2010

Available online 24 February 2010

## Keywords:

Split-brain research

Moral reasoning

## ABSTRACT

Recent neuroimaging studies suggest lateralized cerebral mechanisms in the right temporal parietal junction are involved in complex social and moral reasoning, such as ascribing beliefs to others. Based on this evidence, we tested 3 anterior-resected and 3 complete callosotomy patients along with 22 normal subjects on a reasoning task that required verbal moral judgments. All 6 patients based their judgments primarily on the outcome of the actions, disregarding the beliefs of the agents. The similarity in performance between complete and partial callosotomy patients suggests that normal judgments of morality require full interhemispheric integration of information critically supported by the right temporal parietal junction and right frontal processes.

© 2010 Elsevier Ltd. All rights reserved.

## 1. Introduction

Recent functional neuroimaging studies indicate that processes for ascribing beliefs and intentions to other people are lateralized to the right temporal parietal junction (TPJ) (Young, Cushman, Hauser, & Saxe, 2007; Young & Saxe, 2008). Specifically, Young and Saxe (2009) found that TPJ activity in the right hemisphere, but not the left, is correlated with moral judgments of accidental harms. These findings suggest that patients with disconnected hemispheres would provide abnormal moral judgments on accidental harms and failed attempts to harm, since normal judgments in these cases require information about beliefs and intentions from the right brain to reach the judgmental processes in the left brain.

The present study examines this hypothesis by comparing the performance of 22 normal subjects to 6 patients, 3 with the corpus callosum completely severed and 3 with only anterior portions severed (see Table 1 and Fig. 1). If normal moral judgments require transfer of information regarding an agent's beliefs from the rTPJ, full split-brain patients should be abnormal in their judgments. Partial split-brain patients with an intact splenium and isthmus, however, might show normal moral reasoning because the fibers connecting the right TPJ with the left hemisphere are intact.

Patients and controls made moral judgments about scenarios used in previous neuroimaging studies (Young et al., 2007). In each scenario the agent's action either caused harm or not, and the agent

believed that the action would either cause harm or cause no harm. The crucial scenarios involved accidental harm (where the agent falsely believed that harm would not occur, but the outcome was harmful) and failed attempts (where the agent falsely believed that harm would occur but the outcome was not harmful). After each scenario was read, subjects were asked to judge the agent's action by vocally responding "permissible" or "forbidden". For the patients, this testing did not require any lateralized procedures as only the left hemisphere was assumed to be responding verbally.

Previous studies show that normal subjects typically base their moral judgments on agents' beliefs even when these are inconsistent with the actions' outcomes (Young & Saxe, 2008). In the example in Fig. 2, if Grace believed the powder was sugar but it was really poison, normal subjects judge Grace's action to be morally permissible because of her neutral belief. In contrast, when Grace falsely believed the powder was poison, normal subjects judge Grace's action to be morally impermissible because of her negative belief even though no harm ensues. Given prior evidence that processing of agents' beliefs is supported by regions in the right hemisphere, whereas the left hemisphere is responsible for the verbalization of moral judgments, we hypothesized that agents' beliefs would have less impact on moral judgments when the hemispheres are disconnected in only full callosotomy patients.

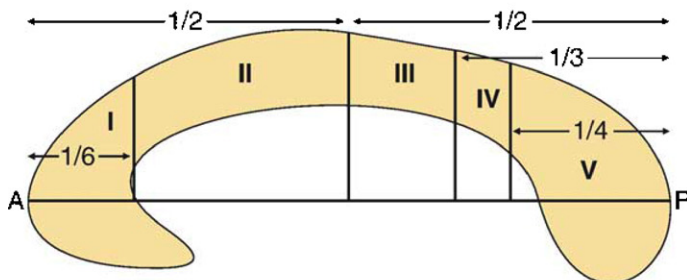
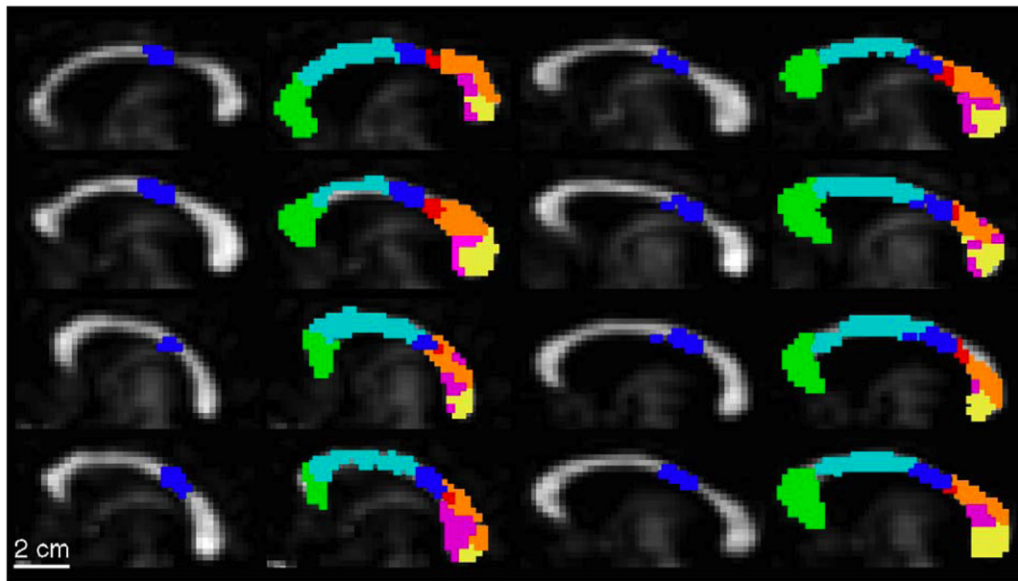
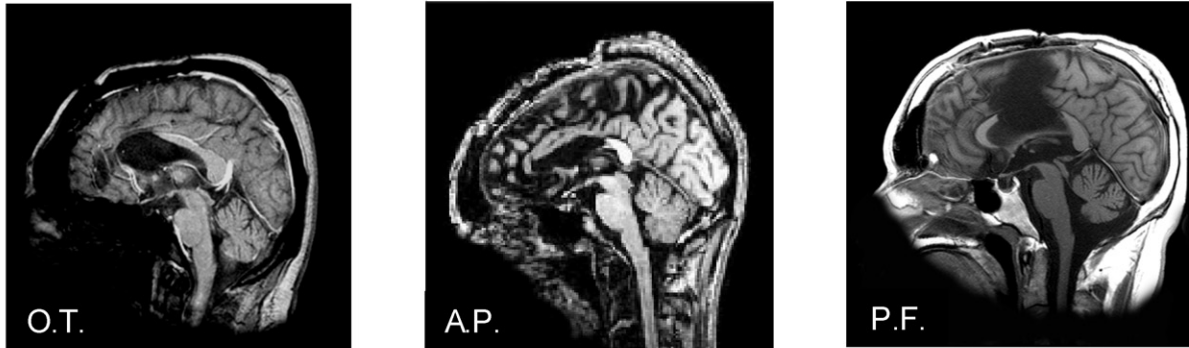
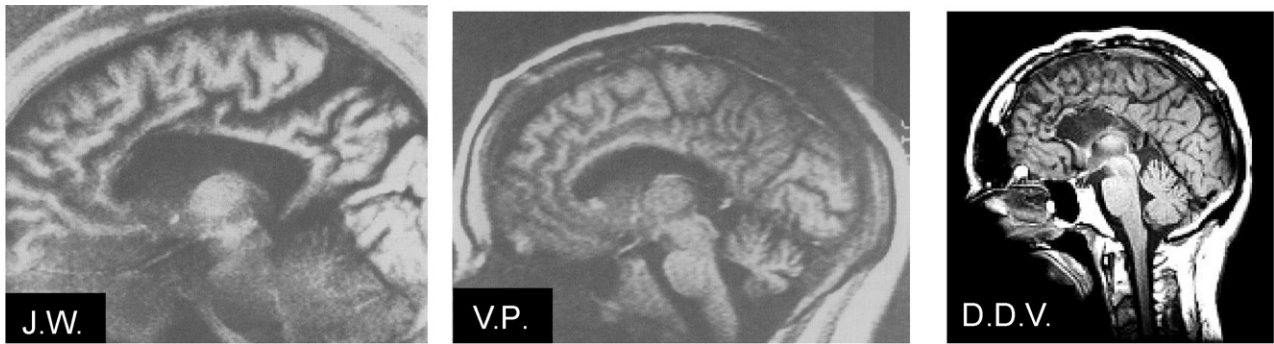
## 2. Methods

## 2.1. Participants

Twenty-eight participants (6 patients, 22 control subjects) provided prior informed consent and were treated according to APA ethical standards.

\* Corresponding author.

E-mail address: [miller@psych.ucsb.edu](mailto:miller@psych.ucsb.edu) (M.B. Miller).



Region I: prefrontal (green)  
 Region II: premotor (light blue)  
 Region III: motor (dark blue)  
 Region IV: sensory (red)  
 Region V: parietal (orange),  
 temporal (violet), and occipital (yellow)

From Hofer & Frahm, 2006

**Fig. 1.** The top panel shows MR images of midsagittal brain slices from the 6 patients with either full (J.W., V.P., and D.D.V.) or partial (O.T., A.P., and P.F.) corpus callosum resections. The bottom panel is from Hofer and Frahm (2006) showing fractional anisotropy maps of the midsagittal corpus callosum from 4 female (on the left side) and 4 male (on the right side) subjects and their classification scheme for originating brain regions of white matter projections.

Download English Version:

<https://daneshyari.com/en/article/945007>

Download Persian Version:

<https://daneshyari.com/article/945007>

[Daneshyari.com](https://daneshyari.com)