

i.e., the heteromodal cortex. These inconsistencies affect some of the study's findings.

Citing Mesulam (2), the article begins, "The heteromodal association cortex comprises primarily the prefrontal, superior temporal, and inferior parietal cortices." The faceplates opposite page 12 of the Mesulam text (2) show the presumed full extent of the heteromodal association cortex in humans. They depict clearly the following:

1. The heteromodal association cortex in the parietal lobe is not limited to the inferior parietal lobule. It also includes a significant portion of the posterior aspect of the superior parietal lobule.
2. The superior temporal gyrus contains primarily the unimodal (auditory) association cortex. The heteromodal association cortex does exist in the temporal lobe but is confined largely to the middle temporal gyrus (2).

Pages 32–49 of the Mesulam text (2) define further, in text form, the correct anatomical boundaries of heteromodal association cortices, as described.

Another point is that the posterior boundary of the prefrontal (heteromodal) cortex (including the inferior reaches targeted in this study) is not the precentral sulcus, as used by the authors. Rather, the boundary is the anterior border of the premotor (unimodal) cortex (2). Unlike the anterior border of the precentral gyrus, the prefrontal (heteromodal)/premotor (unimodal) border is not appreciable on structural magnetic resonance scans.

Thus, the data in the study by Dr. Buchanan and colleagues include measurements of substantial portions of the unimodal association cortex (premotor region and superior temporal gyrus) and do not take into account the heteromodal cortex in the middle temporal gyrus and superior parietal lobule. This affects some of the study's findings, since the distinction between the heteromodal and unimodal association cortices are not purely semantic. For example, in single-unit recording experiments in primates, the neurons in the unimodal (auditory) association cortex respond primarily to auditory stimuli (2). By contrast, single-unit recordings in the heteromodal association cortex identify a broad array of cells. Some respond to only one type of sensory stimulus (auditory, visual, or somatosensory), others respond to two, and still others respond in all three sensory channels (2).

These issues do not discount the authors' conclusion that the inferior parietal lobule is affected in schizophrenia but do temper claims such as negative findings in other heteromodal regions. In sum, the authors need to clarify their views on what constitutes the heteromodal association cortex in order to construct a richer study of it in schizophrenia.

References

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Drs. Buchanan and Pearlson Reply

TO THE EDITOR: Dr. Green correctly notes that there are a number of differences between our definition of the heteromodal cortex and the one provided by Mesulam in his textbook (his reference 2). We asserted that our definition was primarily based on the definition provided by Mesulam, but we agree that the use of the word "primarily" does not provide an accurate accounting of the noted differences between the two definitions, nor does it reflect accurately how we modified the Mesulam definition in our other written descriptions of the heteromodal association cortex (1). In particular, we attempted to refine the concept based on the work of Goldman-Rakic and colleagues, who conducted a series of studies demonstrating the intimate, reciprocal structural connections between the prefrontal cortex, the inferior parietal cortex, and the superior temporal gyrus (reviewed in reference 1). These considerations have led us and other researchers to adopt a more conservative definition of the heteromodal cortex (2, 3). In addition, we would argue that the faceplate (Dr. Green's reference 2) underestimates the extent of the involvement of the superior temporal gyrus in the heteromodal cortex, as reviewed by one of us (4).

Dr. Green also observes that our definition of the prefrontal cortex includes the premotor cortex. In a previous article (5), we acknowledged the point that there is no reliable sulcal boundary between the premotor cortex and the prefrontal cortex and that our definition of the superior and middle prefrontal regions includes the supplementary motor area and the premotor cortex, respectively. We did not reiterate this point in the current article. We thank Dr. Green for giving us an opportunity to clarify these issues.

References

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Psychodynamic Therapy and the Journal

TO THE EDITOR: I was delighted to see the essay by Glen O. Gabbard, M.D., on Sigmund Freud (1). Freud, who began his medical career as a neurologist, would have been amazed at the articles that appeared in the same issue: research on brain