Abstract View

LESION EVIDENCE FOR THE NEUROANATOMICAL BASIS OF VERBAL AND NONVERBAL WORKING MEMORY

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The neuroanatomical correlates of verbal and nonverbal working memory have been studied extensively with functional imaging techniques, whereas neuropsychological studies have made fewer contributions to this topic. It is important to examine areas of convergence and divergence in the evidence generated by these different approaches. To gather further evidence on the lesion side, we conducted a large-sample study of verbal and nonverbal working memory, taking advantage of our Patient Registry. Verbal working memory was measured with the digit span (DS) subtest from the WAIS-III and with three sentence repetition (SR1, SR2, SR3) tests; nonverbal working memory was measured with the Visual Retention Test (VRT). For each test, patients who performed normally and those who performed defectively (according to normative data) were grouped into separate groups, lesion overlap maps were calculated for each group, and then the overlap maps were subtracted to determine neural systems critical for normal test performance. The verbal working memory measures all pointed to the left anterior/inferior parietal operculum and underlying white matter as a critical region; this was true of DS (overall N = 213, subtraction = 13 minus 147), SR1 (overall N = 130, subtraction = 22 minus 80), SR2 (overall N = 63, subtraction = 11 minus 52), and SR3 (overall N = 63, subtraction = 12 minus 36). By contrast, nonverbal working memory was associated with right subcortical structures, especially the basal ganglia (VRT overall N = 219, subtraction = 43 minus 113). These outcomes provide further evidence for the neural basis of verbal and nonverbal working memory. They also point to important areas of agreement and disagreement between lesion and functional imaging evidence, the examination of which should help sharpen our understanding of how the brain operates working memory.

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