Task Requirements and Attention
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Abstract

Patients with unilateral neglect who show object-centered neglect typically ignore the left side of both objects and spaces. Yet the tasks used to assess performance with objects and environments may differentially activate the two hemispheres. For instance, certain right-hemisphere (RH) structures may be specialized for object tasks and certain left-hemisphere (LH) structures may be specialized for spatial tasks and certain left-hemisphere (LH) structures may be specialized for spatial tasks. We report extensive testing of a patient, JM, with a right occipito-temporal lesion. JM was biased to attend to the to the right side of objects, which would be expected were performance on object tasks mediated primarily by the RH. He was biased to attend to the to the left side of spaces, which would be expected were performance on spatial tasks mediated primarily by the RH. It seems that JM’s lesion interrupted fibers coursing through the splenium of the corpus callosum. As a consequence, the contralateral attentional bias of the hemisphere specialized for each of these tasks was not opposed by the other hemisphere’s tendency to allocate attention in the opposite direction.

Case History

JM, a 55 year old male, sustained a right occipital hemorrhagic stroke, that resulted in left hemianopia and hemiplegia. The location of his lesion is shown in Figure 1, where it is clear that the fibers coursing through the splenium of the corpus callosum were damaged. In initial neurological testing, he demonstrated right (paralexical) neglect on line bisection tasks. He was tested on the tasks reported here one month after his stroke. Further testing was not possible because he left the state.

In formal testing, we found that JM consistently neglected the right when his task concerned objects and the right when his task concerned spaces. We report the results obtained with objects first.

Object Tasks

Naming: JM was asked to name single objects shown briefly (500 ms) in his RVF. 24 were whole objects; 48 were chimeric objects. Samples are shown in Fig. 2A, 2C, and 2D below. JM named 92% of the whole objects correctly. His performance with chimeric objects is shown in Fig. 3.

Results: JM correctly said “no” on all no gap trials. Detection accuracy on gap present trials is shown in the Table below. In the BOX condition, JM detected gaps on the right side much better than gaps on the left side. He detected 83% of the gaps in critical segments lying on the right side of NEAR boxes and none of the gaps in critical segments lying on the left side of FAR boxes. His performance on critical segments in the line condition was perfect in both the NEAR and the FAR conditions.

Spatial Tasks

Manual Line Bisection: JM was asked to bisect horizontal lines of different lengths. He was shown short lines (1 - 4 cm) and longer lines (14 - 23 cm). The lines were shown in left, center, or right hemispace. JM bisected both short and long lines significantly to the left of the vertical line. His performance with short lines is shown in Figure 6. (His errors on longer lines are not shown because the pattern is very similar. Left errors on long lines ranged from 13 - 22% of the total line length.)

Summary and Conclusion

JM consistently neglects the right side when he engages in spatial tasks and the left side when he engages in object tasks. We suggest that his lesion caused a partial disconnection of the two hemispheres. As a consequence, the compensatory interactions between the attentional systems of the LH and RH, that normally safeguard against lateral bias, do not take place. Instead, the lateral bias of the hemisphere specialized for object tasks (i.e., the LH) is evident in tasks requiring operations on objects, and the lateral bias of the hemisphere specialized for spatial tasks (i.e., the RH) is evident in tasks requiring operations on spatial extents. (Right neglect was also evident in spatial memory tasks, not reported here.)

These results are consistent with Kinsbourne’s idea that inhibitory interactions between cortical areas in opposite hemispheres are callously mediated. The effects reported here are not specific to a RH lesion. A patient with a LH lesion also neglected the right side of spaces and the left side of objects.