

HEMISPHERIC CONTRIBUTIONS TO LANGUAGE COMPREHENSION

**Word and Message-level Processing Mechanisms of the Right
Cerebral Hemisphere.**

by

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Doctor of Philosophy
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I declare that this thesis is my own account of my research and contains as its main content work which has not previously been submitted for a degree at any tertiary institution.

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ABSTRACT

Recent research into hemispheric differences in sentence comprehension has produced a puzzling disparity between the results from behavioral studies on neurologically normal individuals and studies utilizing other methods such as electrophysiology, neuroimaging and the investigation of neuropsychological patients. The former approach tends to produce results that indicate a restriction of the right hemisphere (RH) to lower-level processing mechanisms that are comparatively less sensitive to context than the left hemisphere (LH), while the combined findings of the latter approaches suggest that not only is the RH capable of processing language at a higher level, it is particularly sensitive to contextual information and, furthermore, this may form part of the special role of the RH in language tasks. Accordingly, the present series of studies employed a normal-behavioral approach to further investigate the underlying processing mechanisms of the RH during sentence comprehension tasks. In each of the four experiments, right-handed adult participants completed a computer-based lexical decision task where reaction time and error rates were recorded. Stimuli were always

centrally-presented, followed by a laterally-presented target word or non-word. In the first experiment, the sensitivity of the RH to message-level meaning was investigated by assessing whether it benefits from additional contextual information in sentences that was not the result of simple word-level associations. The remaining experiments aimed to examine several current models of RH language processing; specifically, they examined the applicability of the coarse-coding hypothesis (Beeman, 1993) and the integrative processing model (Federmeier, 2007) to RH sentence processing. The combined results of the four experiments lead to several conclusions. Firstly, this series of investigation consistently demonstrated that the RH does display a sensitivity to message-level processing that appears to be at least equivalent to that of the LH. This conclusion is uncommon in the normal-behavioral literature, but is consistent with evidence produced by other methodologies. Secondly, the coarse-coding hypothesis is insufficient in explaining RH language processing at the sentential level. Although there is considerable evidence in support of the coarse-coding model of RH processing of individual words, the findings of the present investigations do not support its applicability beyond this level. Thirdly, the integrative/predictive distinction between RH/LH language processing also appears to have limited applicability beyond sentence fragments and may instead be reflective of higher-level processing differences (e.g., wherein the RH may utilize a para-linguistic situation-model processing method whereas the LH may rely purely on a linguistic mechanism). Based on these conclusions, the present series of investigations appears to have resolved the inconsistent finding previously prominent in normal-behavioral literature and goes some way in determining the applicability of current models of RH language processing.

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1. Gouldthorp, B. & Coney, J. (2009). The sensitivity of the right hemisphere to contextual information in sentences. *Brain and Language*, 110, 95-100.

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