Case study: Right hemisphere communicative functions in right hemisphere aphasia

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Abstract
For most people, the left hemisphere is dominant for language; however, for a small percentage of right-handers and 30% of left-handers, language is lateralized in the right hemisphere or is bilaterally distributed, a pattern known as anomalous dominance. The project described here is a case study of an individual who became aphasic after right hemisphere cerebrovascular disease, thus indicating anomalous dominance. The individual’s right hemisphere communicative functions were carefully studied to determine how communicative functions traditionally associated with the right hemisphere (comprehension of figurative and affective prosody and figurative meanings) were not impaired after his RH strokes. He may be a mirror-image case where typical “right-hemisphere” functions of affective prosody and figurative language representation were well preserved in his undamaged left hemisphere.

Introduction & Background
The primary individual in this project is a left-handed male who became aphasic after cerebrovascular disease in the right hemisphere. As a left-hander, he does not meet the definition for crossed aphasia. Nevertheless, he does display a pattern of anomalous dominance for language because he became aphasic from a right hemisphere lesion.

Several previous studies indicated the right hemisphere contributes to communication primarily in the domain of pragmatics, including understanding of figurative language as well as intonation.

Therefore, the goal for this project was to administer several assessments of right hemisphere communicative functions, specifically relating to affective prosody and figurative language comprehension in an individual who had a right hemisphere stroke.

Research Questions
(1) To what extent are the typical right hemisphere functions in communication, affective prosody and figurative meanings, impaired or spared after the presence of aphasia in a man with RH stroke?
(2) How do the symptoms of his right hemisphere aphasia differ from typical left hemisphere aphasia given his anomalous dominance?
(3) Is he a mirror-image case whose language presents typical aphasia symptoms with right hemisphere functions preserved?
(4) Is he a case of bilateralization who has dual representation of aspects of language and/or right hemisphere functions?

Case Descriptions
- Subject 1 is a 50 year-old left handed man who suffered a right hemisphere stroke after a carotid dissection 5 years ago, at the age of 45. This resulted in aphasia and some left-sided motor impairments. Neuroimaging indicated two separate infarctions in the frontal and temporal/parietal areas of his right hemisphere.
- A “control” subject, Subject 2, was selected who demonstrated aphasic symptoms close to Subject 1 in terms of verbal output and auditory comprehension. However, he is a right-hander with a left hemisphere lesion (i.e. the opposite pattern to what Subject 1 displays).

Assessments
- An inventory of right hemisphere functions, in the areas of affective prosody and figurative language was created using 1) Burns Brief Inventory of Communication and Cognition (Burns Inventory), 2) Mini Inventory of Right Brain Injury-Second Edition (MIRBI-2), 3) Florida Affect Battery (FAB), 4) Gorham’s Proverbs Test, and 5) Familiar and Novel Language Comprehension Test (FANL-C).
- The Boston Diagnostic Aphasia Examination (BDAE-3)
- The Cognitive Linguistic Quick Test (CLQT).

Results

| Test Results of Assessments of Right Hemispheric Function: Affective Prosody (Burns Inventory & MIRBI-2) |
|---------------------------------|------------------|-----------------|-----------------|
| Assessment Tool                 | Subtest          | Subject 1’s score | Subject 2’s score |
| Burns Inventory:                | Spontaneous      | 10/10            | 10/10            |
|                                | Receptive Prosody | 7/10             | 4/10             |
| MIRBI-2                         | Expressing Emotion | 2/2              | 1/1              |
| MIRBI-2                         | General Affect    | 1/1              | 1/1              |

Discussion (continued)
Q2
- Subject 1’s symptoms of his right hemisphere aphasia were basically within the range of typical left hemisphere aphasia.

Anecdotal reports also indicated that he responded positively to retaining the phoneme-grapheme conversion route for spelling perhaps indicating atypical bilateral language representation.

Q3 & Q4
- Subject 1 may have dual language representation with most linguistic functions in his right hemisphere and some residual language abilities available in his intact left hemisphere.

- He may be a mirror-image case where typical “right-hemisphere” functions of affective prosody and figurative language comprehension were well preserved in his undamaged left hemisphere.

Conclusions
- A possible mirror-imaged case of right hemisphere functions
- A case of bilateral representation for language functions
- Through evaluations of both typical left and right hemisphere communicative functions for individuals who suffer from brain injury are valuable, since several aphasia treatments are designed to target the non-damaged right hemisphere.

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Subject 1’s right hemisphere communicative functions in affective prosody and figurative meanings were not impaired after his RH strokes.

Subject 2’s performance on both affective prosody and figurative language was surprisingly poor.

This may be related to two small lesions in his right hemisphere in addition to extensive lesion in the left hemisphere (the right lesions were unknown at the start of the project).