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Sensory-specific anomomic aphasia following left occipital lesions - data from free oral descriptions of concrete word meanings

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Background

- Words activate brain regions associated with their referred objects and actions [1]
- Nouns with high semantic specificity ('robin') are likely to be more closely related to sensory information compared to those of low specificity ('animal') [2]
- Previous studies have found individuals with visual (occipital) lesions to have problems with accessing words from the visual modality (e.g. "optic aphasia") [3]

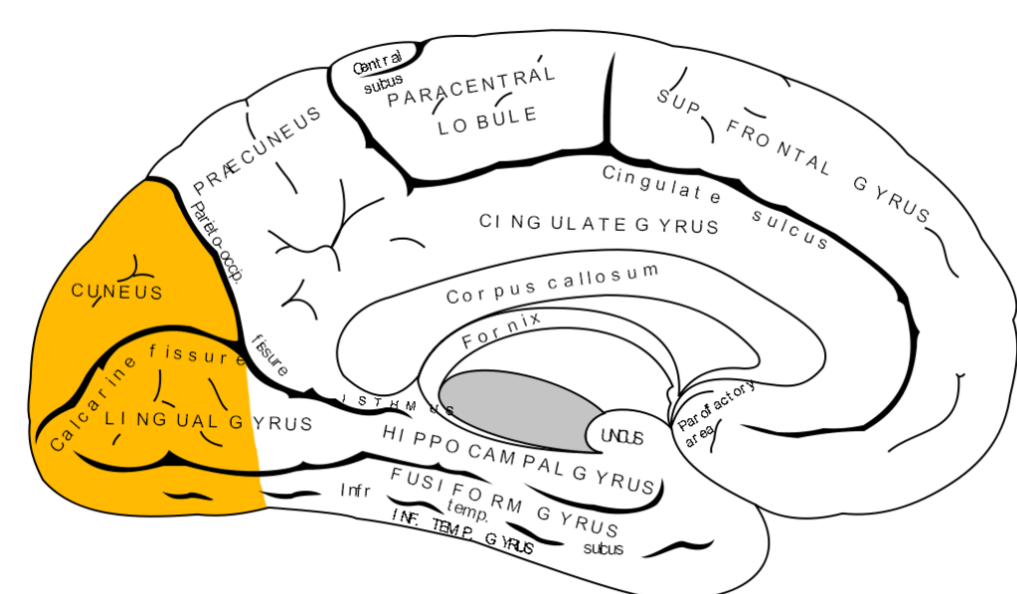


Figure 1: The occipital lobe [4]

- When visual areas of the brain are damaged, would the degree of visual semantic content and semantic specificity modulate performance in a lexical task?

Method

- Case study [5]
- Male Swedish speaker (ZZ) with left occipital lesions, diagnosed with anomomic aphasia
- 4 controls with aphasia due to frontal/temporoparietal lesions
- 5 healthy controls
- Free oral descriptions of word meanings (20 concrete ('wolf'), 20 abstract, ('variation'), 20 emotional ('joy'))
- Analysis of content words in the produced material: level of specificity + sensory modality

| Test word | Response | Level |
|-----------|---|--|
| wolf | (is) grey/(has) fur/howls/(can) bite (looks like a) German shepherd (looks like a) dog (is a) predator (is an) animal | 1 property/part-of-whole 2 subordinate level; perceptually detailed 3 basic level; perceptual Gestalt image possible to form 4 directly superordinate level; no or diffuse perceptual image 5 higher superordinate level; no or diffuse perceptual image |

- Purely verbal task
- Testing performance in running speech, not only access to specific words (naming)

Results

- ZZ produced fewer words of high lexical specificity (e.g. 'carrot'), in contrast to controls
- Instead, a strikingly high proportion of ZZ's words were at the most non-specific level (e.g. 'plant', 'thing')

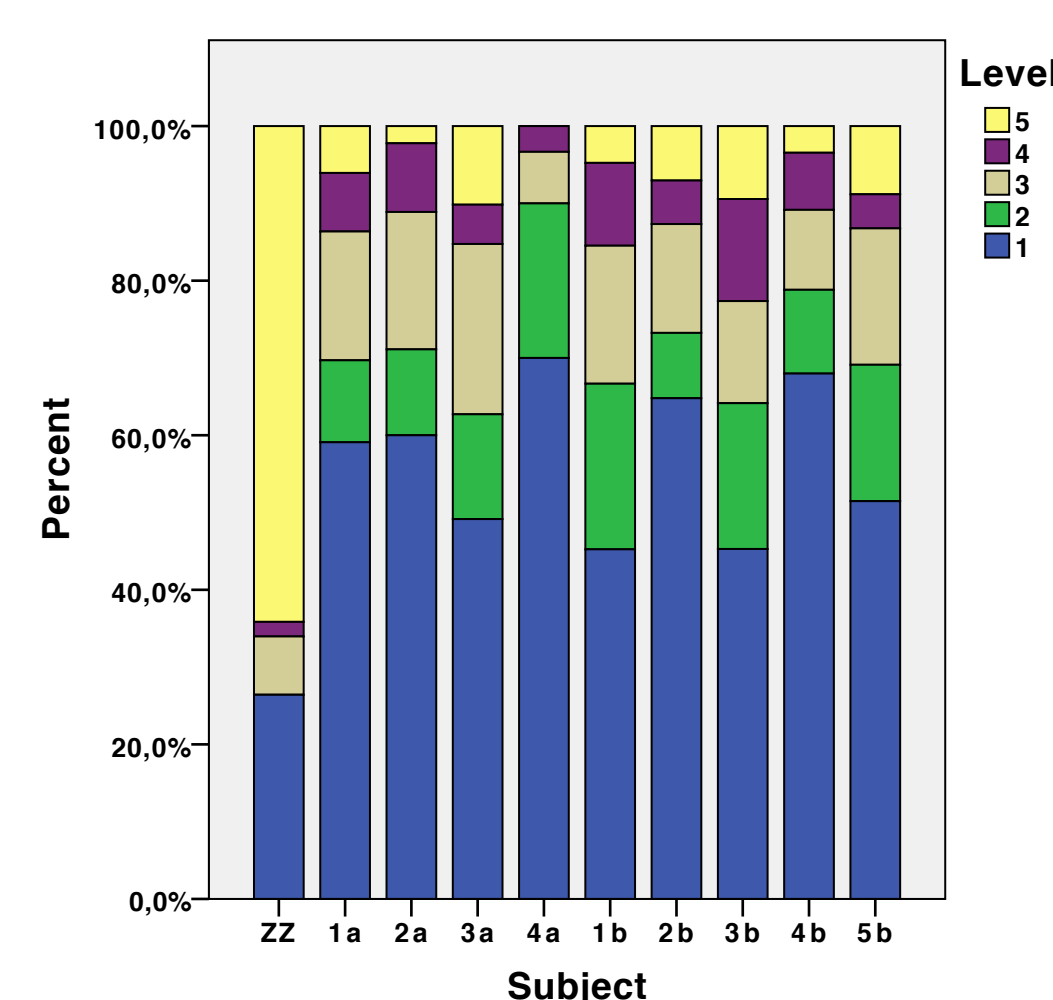


Figure 2: Distribution of words at different levels of semantic specificity

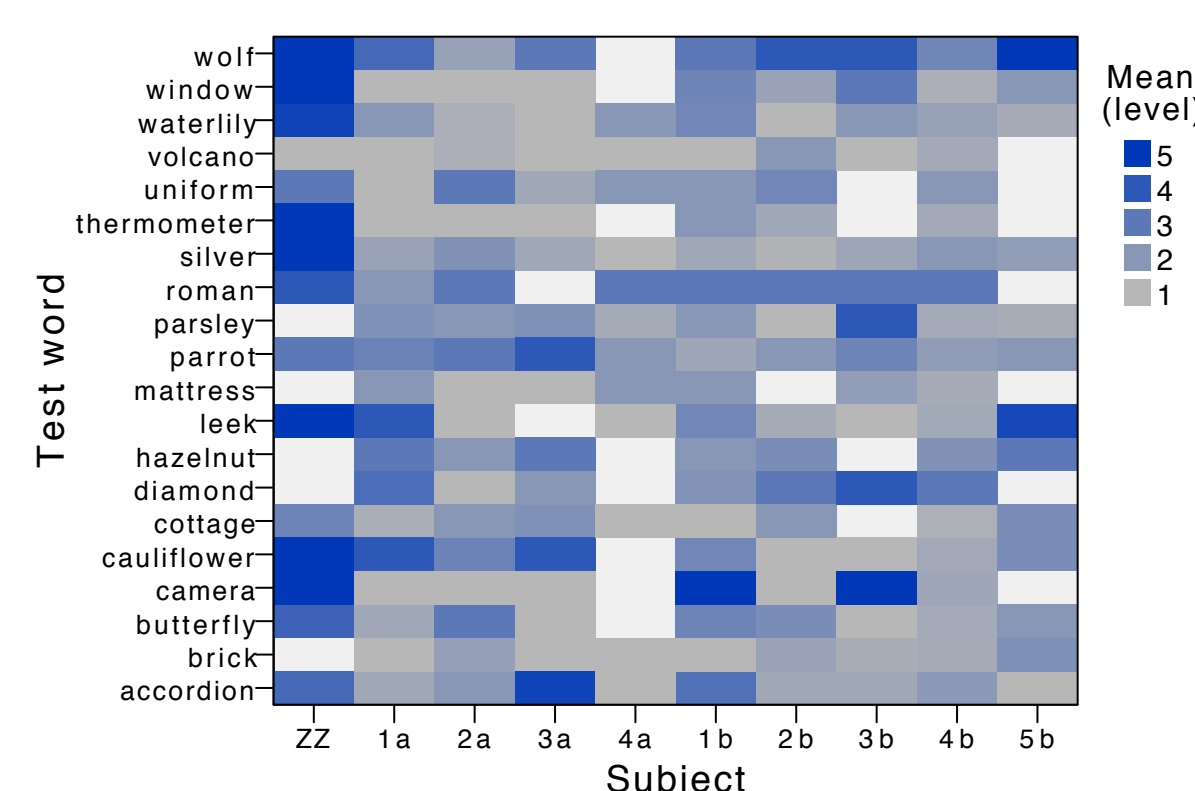


Figure 3: Mean level of semantic specificity for each test word for individual subjects

- Controls predominately produced vision-related words, ZZ most often words related to sound

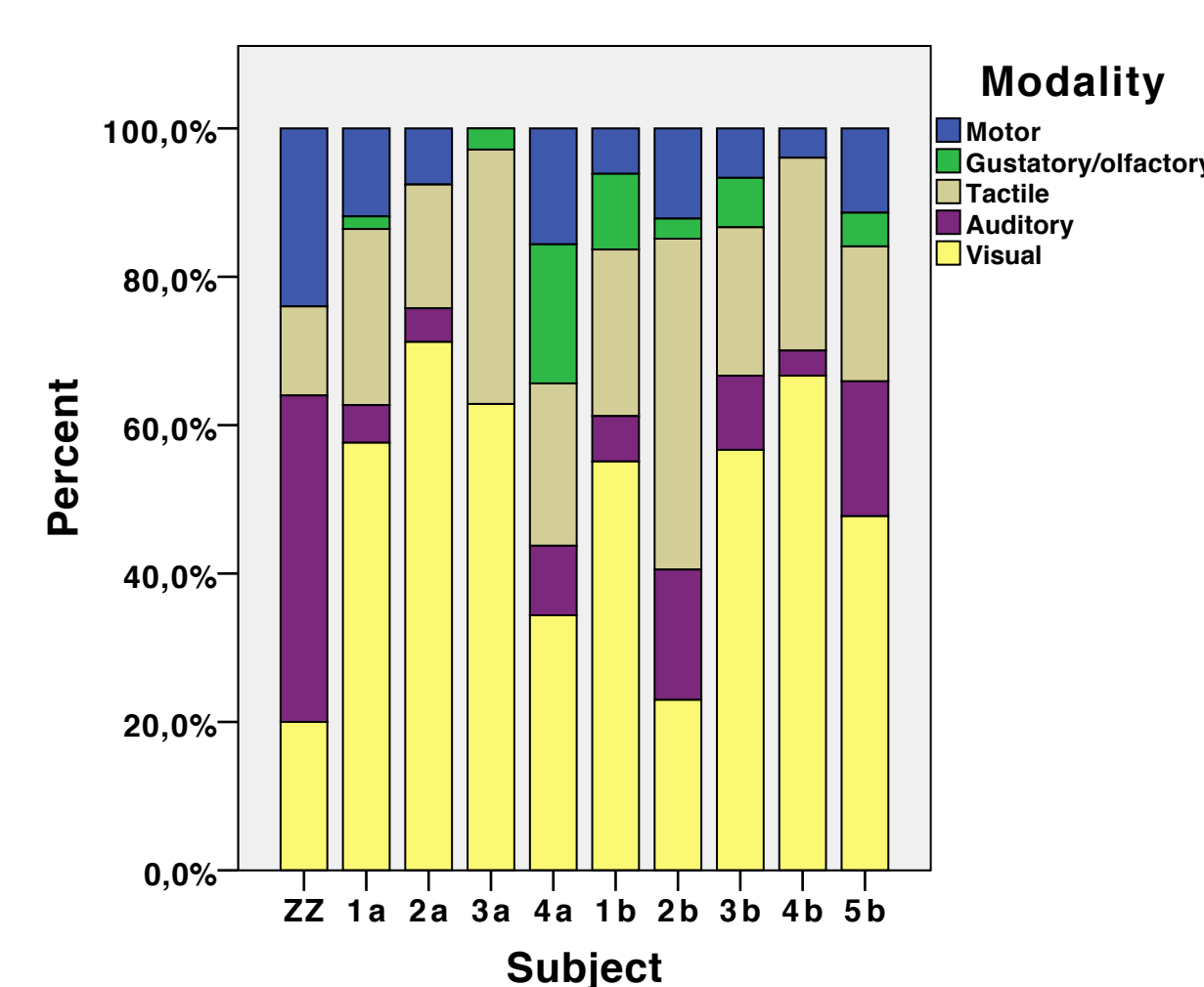


Figure 4: Distribution of sensory and motor features in the produced words

- ZZ's descriptions of concrete words were unspecific compared to those of aphasic and healthy controls (e.g. 'parrot'):

it is an an # an **animal** # that # well # that # I don't know how to describe that animal # it squeaks a little sometimes # and says something # and says something # I don't know so much about **animals** but # it is an **animal** anyways # that often has a certain sound or euphony # by which it can express itself -ZZ

it is a **bird** # and it talks perhaps # there are **macaws** # och **cockatiels** yes # and some other kinds # it # what's it called # it's on pirate ships or it just sits at home and and talks in the kitchen -aphasic control

Discussion

- Visual semantic features in left occipital lobe are crucial for vision-related words
- More specific levels in the semantic hierarchy seem to be associated with vision
- Semantic features of other sensory modalities, in particular audition, easier to access for ZZ
- ZZ's emotional and abstract word descriptions similar to those of healthy controls (e.g. 'abundance'):

things that are unnecessary to have # and that which is # which is more than enough # X is that which it is more than enough of # you can translate X with "more than enough" -ZZ

Further research

- Testing patients with lesions affecting other modalities (e.g. [6])
- More well-controlled stimuli set systematically including all sensory modalities
- Testing visual imagery

References

- [1] Pulvermüller, F. & Fadiga, L. (2010). Active perception: sensorimotor circuits as a cortical basis for language. *Nature Reviews Neuroscience* 11, 351-360.
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