IMAGEABILITY ASYMMETRY IN MENTAL LEXICON OF CROATIAN APHASIC AND HEALTHY SPEAKERS

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RESEARCH BACKGROUND

In aphasia, semantic processing is commonly assumed to be affected by impairment specific to language.

Imageability (HI or LI) has been argued to induce asymmetry in processing of nominal lexical units as this feature of the mental lexicon unit is sensitive to the stimulus modality and to the conceptual system. Double modality of the representation of concrete nouns in the mental lexicon, verbal and non-verbal representation, contrasted with single, verbal, representation in abstract nouns (Paivio 1990, 2010), is argued to facilitate the processing of a concrete noun and slow down successful retrieval, access and any further processing of an abstract noun (Sabsevitz et al., 2005).

General assumptions about types of aphasia are as follows: **Broca's aphasia** is defined as an impairment in syntactic processing described as 'agrammatism', mostly in processing of syntactically complex sentences and lack of functional words. **Anomia** is defined as an inability to select and use appropriate substantive words in verbal output, usually labeled word-finding deficit.

MATERIALS AND METHODS

PARTICIPANTS: 30 aphasic participants (among them specifically 11 Broca's and 11 anomic aphasics) and 30 paired neurologically healthy participants (gender, age, education, right/left handed) ; all native speakers of Croatian.

Behavioral classification for aphasic patients (clinical assessment) and CT scan data.

MATERIAL: Set of semantic tests of different complexity from the battery of tests **Psycholinguistic Assessments of Language Processing in Aphasia** (PALPA) adapted for Croatian (Kay et al. 1992, Erdeljac et al. submitted).

The first test is designed to examine the processing of the lexical feature of imageability: Auditory and Written Synonym Judgments (PALPA 49 and 50).

Two follow-up comprehension tests of lesser and higher processing complexity: Spoken and Written Word-Picture Matching (PALPA 47 and 48), and Word Semantic Association (PALPA 51).

RESEARCH AIMS

1. To investigate the difference in the semantic processing of HI and LI words in aphasic patients compared to healthy controls when presented with visual or auditive stimuli.
2. To compare accuracy of HI and LI words for Broca's and anomic aphasics on semantic processing tasks of different complexity.
3. To investigate the correlation between the semantic processing of HI and LI words and the stimulus modality.

HYPOTHESIS

H1: Activation of lexical mental representation depends on the imageability and on the complexity of the task. The accuracy is expected to be higher in the condition with higher imageability and the lower complexity of the task. The accuracy is expected to be lower in the condition with lower imageability and the higher complexity of the task.

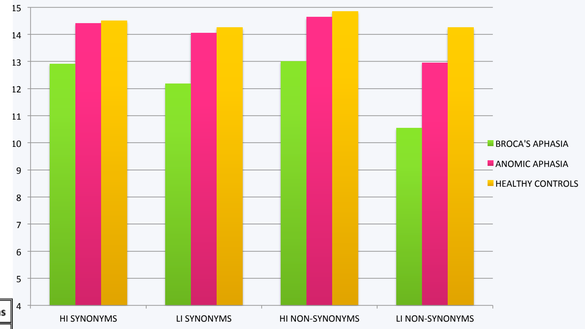
H2: Anomia is taken to be an impairment of the ability to retrieve words, and Broca's aphasia is taken to be agrammatic aphasia, or the inability to understand and produce certain grammatical structures. For that reason, Broca's aphasics are expected to score higher than the anomic aphasics on semantic processing tasks of any complexity.

EXPERIMENT 1

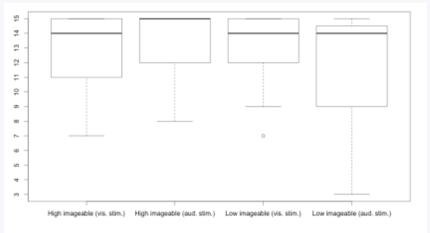
PALPA 49 AUDITORY SYNONYM JUDGMENT
PALPA 50 WRITTEN SYNONYM JUDGMENT

TTest HEALTHY vs APHASICS		
	HI	LI
SYNONYMS	0.005245543	0.004842909
NON-SYNONYMS	9.19769E-08	1.54397E-05

SYNONYMS HI (auditive+written)		
Broca's	Mean	13.0000
	SD	2.2039
Anomics	Mean	14.6250
	SD	0.7109
BROCA's vs ANOMICS	**TTest**	**0.0013**
SYNONYMS LI (auditive+written)		
Broca's	Mean	10.5455
	SD	*3.8013*
Anomics	Mean	13.0833
	SD	1.9542
BROCA's vs ANOMICS	**TTest**	**0.0061**



TTest	Broca's	Synonyms	Non-synonyms
HI	AUD vs WRITTEN	0.42	0.12
LI	AUD vs WRITTEN	0.07	0.34
TTest	**Anomics**	**Synonyms**	**Non-synonyms**
HI	AUD vs WRITTEN	0.78	0.27
LI	AUD vs WRITTEN	0.64	0.44



Synonyms BROCA	
AUD vs WRITTEN	HI + LI
TTest	0.3966
Synonyms ANOMICS	
AUD vs WRITTEN	HI + LI
TTest	0.7796

EXPERIMENTS 2 and 3

PALPA 47 SPOKEN WORD-PICTURE MATCHING
PALPA 48 WRITTEN WORD-PICTURE MATCHING
PALPA 51 WORD SEMANTIC ASSOCIATIONS – HI AND LI WORDS

SPOKEN WORD-PICTURE MATCHING (47)		
Broca's	Mean	35.72
	SD	3.37
Anomics	Mean	37.33
	SD	1.77
BROCA's vs ANOMICS	**TTest**	**0.1631**
WRITTEN WORD-PICTURE MATCHING (48)		
Broca's	Mean	36.18
	SD	3.09
Anomics	Mean	38.17
	SD	1.64
BROCA's vs ANOMICS	**TTest**	**0.07**
SPOKEN vs WRITTEN WORD-PICTURE MATCHING		
Broca's	TTest	0.3409
Anomics	TTest	0.1169

WORD SEMANTIC ASSOCIATIONS (51)		
Broca's	Mean	9.5909
	SD	3.2317
Anomics	Mean	12.6667
	SD	1.7856
BROCA's vs ANOMICS	TTest	0.0002

HI	Broca's vs Anomics	TTest	0.0021
LI	Broca's vs Anomics	TTest	0.0086

DISCUSSION

Results confirm the first hypothesis. Aphasics as a group scored higher on accuracy of HI words in the task of lower complexity than in the task of higher complexity. Also, aphasics as a group scored lower on the accuracy of LI than HI words in complex semantic processing task. Statistical analysis showed significant difference between aphasic patients as a group, as well as between subgroups of aphasics (Broca's, anomics) in comparison to healthy controls.

Results suggest that imageability facilitates lexical unit's activation, even in the semantic processing tasks of higher complexity.

Results do not confirm the second hypothesis. Broca's aphasics scored lower than anomic aphasics on all tests. This means that Broca's scored lower on levels of complexity of semantic processing. Statistically significant difference between Broca's and anomic aphasic is obtained when comparing processing of HI and LI. While the overall performance of Broca's aphasics was depressed in comparison to anomic aphasics, it was significantly more depressed in processing tasks with higher semantic complexity (Test 51 and non-synonyms).

The most interesting result for the linguistic theory concerns the fact that, although agrammatic (Broca's) aphasics are thought not to be impaired in lexical processing, the number of their errors in semantic processing increased with the increase of task complexity. Alongside with the available data on their syntactic impairment, this suggests that it is not the specific module that is impaired, than, rather, the complexity itself.

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