

Is Right-hemispheric Processing Linked to Fuzzier Concept Representations and a Preference for Divergent over Convergent Thinking?

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Overview

- **Laterality** in language processing
 - Role of the hemispheres in language processing
 - Asymmetry in semantic interpretations
- **Experiment**
 - Design
 - Results
- **Discussion**
 - Interpretation of findings
 - Questions for linguists

Laterality - Experiment - Discussion

Lateralization of language

- Left hemisphere dominant in
 - in 96 % of right-handers
 - in 66 % of left-handers and ambidextrous persons

(Bryden & Steenhuis, 1991)
- but: Blood-flow images of sentence reading typically show activation of left and right frontal lobe

Ni, Coinstable, Menel, Pugh, Fulbright, Shaywitz, Shaywitz, Gore & Shankweiler (2000)

Laterality - Experiment - Discussion

Right hemisphere involvement

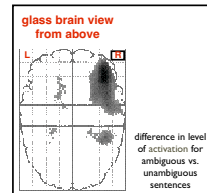
- understanding affective aspects of language

Saravi (1993)
- understanding metaphors

Gardner et al. (1993)
- processing novel metaphors

Bottini et al. (1993)
- disambiguation of sentence meaning

Stowe et al. (2002)



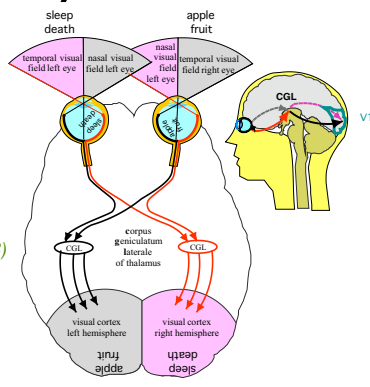
Laterality - Experiment - Discussion

Semantic asymmetries

Left hemisphere better at recognizing close associates (*fruit - apple*)

right hemisphere better at recognizing remote associates (*sleep - death*)

Cook, Regard & Landis (1993)



Laterality - Experiment - Discussion

Semantic asymmetries

Left hemisphere more sensitive to semantic abnormalities

"Checkmate", Rosaline said with a glee, she was getting to be really good at ...

- ... chess. expected word (EW)
- ... monopoly. unexpected word from expected semantic category (UW)
- ... football. word from unexpected semantic category (UC)

N400 signals greater for UC than for UW items in the left but not in the right hemisphere

Federmeier & Kutas (1999)

N400: negative polarity peaks ca. 400 ms after stimulus presentations resembling a 'surprise'

Laterality - Summary

- Left hemisphere language-dominant in most individuals - but
- Right hemisphere shown to
 - be involved in processing affective information and metaphors and in resolving ambiguity
 - make wider conceptual links
 - have fuzzier expectations towards new input

Experiment - Overview

- Information about subjects
- Introduction to tests

Word Halo Test	Handedness Index
Remote Associates Test	Language laterality Test
Magical Ideation Scale	Creative Personality Scale
	Mental Dice Test

- Presentation of results

Subjects

- 48 healthy right-handed persons, native speakers of (Swiss-)German
 - 25 females, 20-48 years, mean age 27.4
 - 23 males, 20-49 years, mean age 30.4
- subset of 66 person sample with varying handedness
- recruited via blackboard ads, predominantly in university buildings, no payment offered

Word Halo Test

- Developed by **Armstrong & McConaghy (1977)** as a measure of “allusive thinking”
- 20 items consisting of a stimulus word and five near-synonyms (all taken from a thesaurus)

great: huge - world-wide - infinite - precious - intense
- Participants are asked to mark those words which they perceive as being “identical or nearly identical” in meaning to the first word
- German-language design based on nouns. Items with highest variance picked from a pre-test.

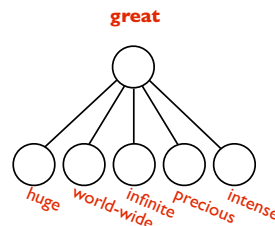
Remote Associates Test

- Developed by **Mednick (1958)** as a general measure of creativity which he defined as

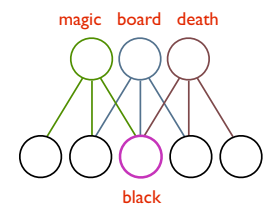
“the forming of associative elements into new combination, which either meet specified requirements or are in some way useful”
- 20 items consisting of 3 words: **magic - board - death**
- Participants are asked to find a word which can be related to every one of the stimulus items: **black**
- Own design based on nouns. Selection of easy / medium / difficult items picked from a pre-test.

Word Halo vs. RAT

divergent thinking



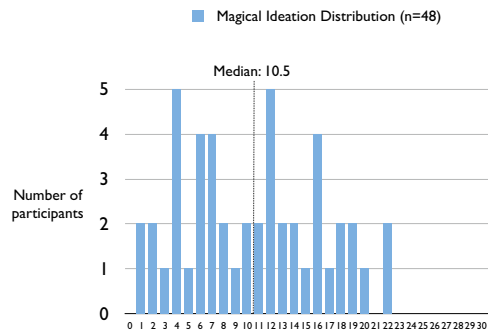
convergent thinking



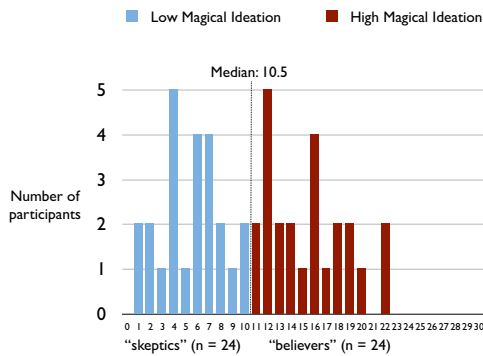
Magical Ideation Scale

- Developed by Eckblad & Chapman (1983) as a measure for paranormal and delusion-like beliefs
- 30 yes/no-questions about people's beliefs in telepathy, astrology, conspiracy theories, UFOs, etc.:
I think I could read other people's minds if I wanted to.
- correlates with other schizotypy measures
- assumed to be an indicator for right-hemispheric bias in interpreting novel information

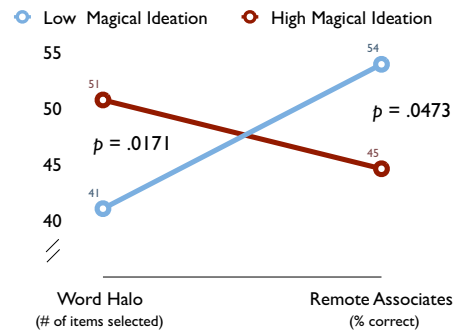
Magical Ideation Distribution



Magical Ideation Distribution

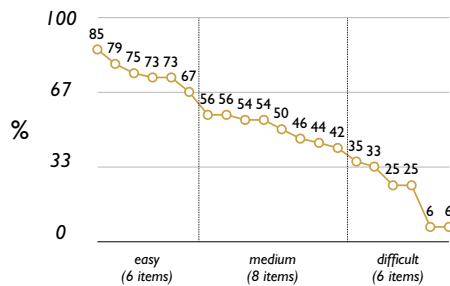


Word Halo & RAT

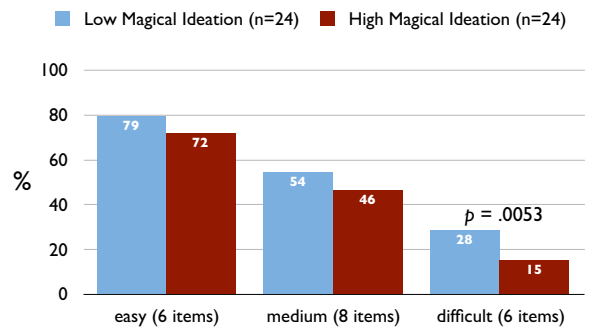


RAT item categorization

Basis: Percentage of correct answers per item (n=48)

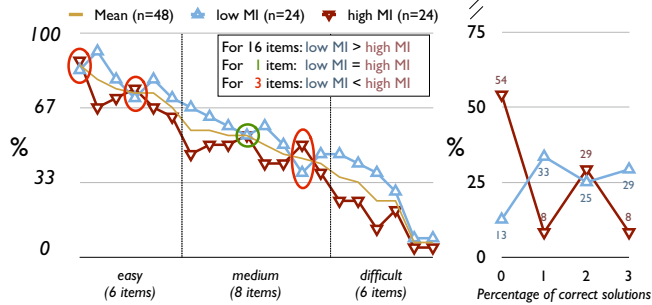


RAT performance



RAT per item analysis

Per item percentage of participants giving correct answers for low & high MI groups

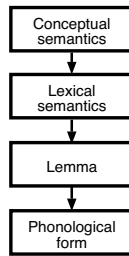


Interpretation (by inference)

- Results are (at least in part) due to differences in the degree of right-hemispheric activity
- Persons with an assumed right-hemispheric bias
 - show more spreading activation in their semantic network
 - they show a more pronounced pattern of *divergent thinking*
 - are less well able to control this activation
 - they are poorer at *convergent thinking*

Questions for linguists

- Convergent and thinking equivalent to paradigmatic and syntagmatic processing (Jakobson, 1956)?
- Which model of language production best describes the processes occurring during the solving of Remote Associates Test problems?
 At which level(s) does spreading activation occur?



Levelt, et al. (1999)