WORD-FORMATION IN THE MENTAL LEXICON

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What is word-formation?
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  - **Word-formation** (production of new words)
    - Derivation, e.g. lehren ‘to teach’ → Lehrer ‘teacher’
    - Compounding, e.g. Lehrerzimmer ‘teachers’ room’
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- Morphology consists of the following components:
  - **Word-formation** (production of new words)
    - Derivation, e.g. lehren ‘to teach’ → Lehrer ‘teacher’
    - Compounding, e.g. Lehrerzimmer ‘teachers’ room’
  - **Inflection** (production of word-forms)
    - e.g. lehre, lehrst, lehrt, etc.
    - Lehrbuch, Lehrbücher, etc.
There are five basic morphological techniques:

- **Addition**, e.g. to teach → teach-er
  - er is an affix, more precisely a suffix
- **Substitution**, e.g. Marx-ism → Marx-ist
- **Modification**, to impórt → ímport
- **Conversion**, to cut → a cut
- **Subtraction**, e.g. Russian biologija ‘biology’ → biolog ‘biologist’

These techniques represent all possible cognitive operations that can be performed on a morphological form.

Suffixation and suffix ordering

real $\rightarrow$ real + -ize
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real $\rightarrow$ real + -ize $\rightarrow$

$\rightarrow$ real + -iz + -ation
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real → real + -ize →
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- Note that an alternative ordering of the suffixes is not possible, i.e. *real-iz-al-ation, *real-al-ation-ize, etc. do not exist.
Explanation of the order of the suffixes

- According to the type of information used in suffix ordering:
  1) phonological
  2) morphological
  3) syntactic
  4) semantic
  5) statistical
  6) psycholinguistic
  7) cognitive
  8) templatic

Manova & Aronoff (2010)
The mental lexicon

- A notion used in linguistics and psycholinguistics
  - Psycholinguistics is about how language works in the brain
- The mental lexicon is something like a mental dictionary where systematic information about language (words and their use) is stored in an easily accessible way
- There are different opinions about what information exactly is stored in the mental lexicon
  - Some linguists believe that only whole words (and no suffixes) are represented in the mental lexicon
Structure of the talk

- Empirical issues
- My approach
- Hypotheses about the organization of the mental lexicon
- Two psycholinguistic experiments
- Discussion of the results of the experiments
- Conclusions about what is stored in the mental lexicon
My research: Languages analyzed

- **Slavic**
  - Bulgarian (South Slavic)
  - Russian (East Slavic)
  - Polish (West Slavic)

- **Germanic**
  - English
  - German

- **Romance**
  - Italian

- Editor of papers on about 30 typologically diverse languages
Slavic word versus English word

**Slavic word**

(PREFIX)-BASE-(DERIVATIONAL SUFF)-(THEMATIC MARKER)-(INFLECTIONAL SUFF)

- non-evaluative
- evaluative

**English word**

(PREFIX)-BASE-(DERIVATIONAL SUFF)- (THEMATIC MARKER)-(INFLECTIONAL SUFF)

- non-evaluative
- Ø
The combinability of the English suffix \(-ist\)

<table>
<thead>
<tr>
<th>SUFF1</th>
<th>Lexical category of SUFF1</th>
<th>Followed by SUFF2</th>
</tr>
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<tbody>
<tr>
<td>(-ist)</td>
<td>N</td>
<td>(-dom, -ic, -y, -ize)</td>
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Data from Aronoff & Fuhrhop (2002), based on OED, CD 1994
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English -ist: Our cognitive approach

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Nouns, adjectives and verbs are seen as cognitive categories, cf. Langacker (1987).
Langacker (1987), based on *relationality* (i.e. +/- relational) and *way of scanning* (whether summarily scanned, i.e. conceived statistically and holistically, or sequentially scanned, i.e. mentally scanned through time), recognizes *things* (N), *processes* (V) and *modifiers* (ADJ).
### -ist: Fixed combinations

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Types of SUFF1-SUFF2 combination

- **Fixed (unique)**
  - SUFF1 combines with only one particular SUFF2 of a major lexical category, N, V, ADJ
**-ist: Predictable combinations**

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- **Fixed (unique)**
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- **Predictable**
  - SUFF2 applies by default – the majority of words are derived by that suffix.
    - Suffixes that ‘compete’ with the default suffix are unproductive and derive no more than 10 words
Hypotheses

- **H1**: If SUFF1 tends to combine with only one SUFF2 of a major lexical category (N, ADJ, V), SUFF1-SUFF2 combinations are unique pieces of structure and speakers should know them by heart.

- **H2**: If speakers know suffix combinations by heart, they should be able to differentiate between existing and non-existing combinations and existing combinations should be recognised with higher accuracy and faster than non-existing ones.
Experiment 1

- **Participants**: 64 native speakers of Polish
  - age: M=23.2, SD=1.76
  - no history of developmental dyslexia or reading disabilities
  - non-linguists

- **Materials**: 60 items
  - 30 existing suffix combinations from Polish, e.g.:
    - -ar-nia as in kawi-ar-nia ‘café’
  - 30 non-existing suffix combinations created by changing the order of the suffixes of the legal ones or by manipulating phonemes, e.g.:
    - from the existing -ar-nia → -ni-ar or -ur-nia.
  - 2 lists
    - each with the suffixes of the other in reverse order
    - each participant saw all combinations
Experiment 1: Procedure

- **Task**: decide as quickly and as accurately as possible if a combination exists or not
- **Training**: a few examples of derivations of existing and non-existing words with two suffixes in Polish to ensure that the participant understands the task
- **List of items**: participants received a list of existing and non-existing suffix combinations and have to complete the task
- **Maximum time for decision**: 10 minutes
Experiment 1: Accuracy of recognition of existing and non-existing combinations

Acc for existing: $M=81.72\%, SD=0.29$

Acc for non-existing: $M=75.99\%, SD=0.22$

The result is statistically significant:

$t(63)=2.34, p=0.02$
Experiment 2

- **Participants**: 53 native speakers of Polish
  - age: $M=21.43$, $SD=1.83$
  - no history of developmental dyslexia or reading disabilities
  - non-linguists

- **Task**: Press the right arrow button if a string of letters is an existing combination or the left CTRL button if it is not. In case of a doubt, behave as if a stimulus does not exist.

- **Materials**: 88 items, randomized with the E-prime 2.0 software
  - 44 existing and 44 non-existing suffix combinations
  - non-existing combinations produced as in Experiment 1
  - 2 lists
    - each with the suffixes of the other in reverse order
    - each participant saw all combinations
Experiment 2: Procedure
Experiment 2: Accuracy

Existing combinations:
\[ M_{\text{ACC}} = 81\%, \ SD = .09 \]

Non-existing combinations:
\[ M_{\text{ACC}} = 74\%, \ SD = .12 \]

The result is statistically significant:
\[ t(52) = 3.03, \ p = 0.004 \]
Experiment 2: RTs

Existing combinations:
1333 ms
\[ M_{RT}=1333.14, \ SD=420.57 \]

Non-existing combinations:
1610 ms
\[ M_{RT}=1610.38, \ SD=556.02 \]

The difference is statistically significant:
\[ t(51)=-7.53, \ p<0.001 \]
Experiment 2: Mean accuracy of the productive combinations (derive > 10 words)

Productive combinations: 
\[ M_{\text{ACC}} = 86\%, \ SD = .09 \]

Unproductive combinations: 
\[ M_{\text{ACC}} = 75\%, \ SD = .11 \]

The difference is statistically significant: 
\[ t(51) = 7.81, \ p < 0.001 \]
Experiment 2: Mean RTs of the productive combinations (derive > 10 words)

Productive combinations: \( M_{RT}=1288.44, \ SD=429.14 \)

Unproductive combinations: \( M_{RT}=1421.01, \ SD=488.41 \)

The difference is statistically significant:
\[ t(51)=-4.08, \ p<0.001 \]
The results of the two experiments converge:

- The accuracy of recognition of the existing combinations is significantly higher than the accuracy of recognition of the non-existing combinations.
- The reaction times to the existing combinations are significantly shorter than to the non-existing ones.
- Thus, recognition of suffix combinations seems to resemble recognition of words and non-words in psycholinguistics.
- The productive combinations are recognized more accurately and faster than the unproductive combinations.
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Suffixation in the mental lexicon: Conclusions

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- Our research shows that parts of words such as suffix combinations are stored in the mental lexicon.
- When speakers produce complex words, they, most probably, do not attach suffixes step by step but use them as wholes, i.e. as -ization, -ational and, maybe, -izational.
Thank you!

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