Suffix combinations in the mental lexicon

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Scope

- Our research is on suffix combinability or suffix ordering, i.e. we investigate structures of the type BASE+SUFF1+SUFF2 and try to answer the question why it is lead-er-ship and not *lead-ship-er or strzel-ec-two ‘shooting’ and not *strzel-two-ec
- Restrictions on affix ordering exist in all languages of the world
Structure of the talk

1. Theoretical background
   a. Approaches to affix order
   b. This study: Cognitive approach

2. Psycholinguistic experiments (to verify the followed approach)

3. Discussion of results, their relevance and future directions
Affix ordering is a major issue in linguistics, there is much research on the topic and many theories (approaches) have been suggested to explain the way affixes combine in different languages, overviews in Manova & Aronoff 2010 and Rice 2011.
Approaches to affix order

• According to the type of information used in affix ordering, Manova & Aronoff (2010) differentiate eight different approaches:
  1) phonological
  2) morphological
  3) syntactic
  4) semantic
  5) statistical
  6) psycholinguistic
  7) cognitive
  8) templatic
English -ist: A traditional analysis

<table>
<thead>
<tr>
<th>SUFF1</th>
<th>Word class of SUFF1</th>
<th>Followed by SUFF2</th>
</tr>
</thead>
<tbody>
<tr>
<td>-ist</td>
<td>N</td>
<td>-dom, -ic, -y, -ize</td>
</tr>
</tbody>
</table>

Data from Aronoff & Fuhrhop (2002), based on OED, CD 1994
English -ist: A cognitive analysis

<table>
<thead>
<tr>
<th>SUFF1</th>
<th>Syntactic category of SUFF1</th>
<th>SUFF2</th>
</tr>
</thead>
<tbody>
<tr>
<td>-ist</td>
<td>N</td>
<td>N: -dom (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ADJ: -ic (631), -y (5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V: -ize (3)</td>
</tr>
</tbody>
</table>

Data from Aronoff & Fuhrhop (2002), based on OED, CD 1994

Nouns, adjectives and verbs are seen as being cognitive in nature. (cf. Langacker 1987)
-ist: Fixed combinations

<table>
<thead>
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<th>SUFF2</th>
</tr>
</thead>
<tbody>
<tr>
<td>-ist</td>
<td>N</td>
<td></td>
</tr>
</tbody>
</table>

N: -dom (2)  
ADJ: -ic (631), -y (5)  
V: -ize (3)  

Table from Manova (2011b)  
Data from Aronoff & Fuhrhop (2002)
-ist: Predictable combinations

<table>
<thead>
<tr>
<th>SUFF1</th>
<th>Syntactic category of SUFF1</th>
<th>SUFF2</th>
</tr>
</thead>
<tbody>
<tr>
<td>-ist</td>
<td>N</td>
<td>N: -dom (2) ADJ: -ic (631), -y (5) V: -ize (3)</td>
</tr>
</tbody>
</table>

Table from Manova (2011b)
Data from Aronoff & Fuhrhop (2002)
### Example from Polish

<table>
<thead>
<tr>
<th>SUFF1</th>
<th>Word class of SUFF1</th>
<th>Syntactic category of SUFF1</th>
<th>Examples</th>
<th>Translations</th>
</tr>
</thead>
<tbody>
<tr>
<td>-ak</td>
<td>N</td>
<td>N: -two, -ówka (1)</td>
<td>pływ-ac-two śpiew-ac-two ryb-acz-ówka</td>
<td>swimming singers fisher’s house</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ADJ: -ki, -owaty (3), -ny (3)</td>
<td>pływ-ac-ki prost-ak-owaty cud-acz-ny</td>
<td>swimmer- boorish Peculiar</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V: -nieć</td>
<td>cud-acz-nieć</td>
<td>to become strange</td>
</tr>
</tbody>
</table>
• The idea of fixed and predictable combinations of derivational suffixes has been tested against large sets of data from Bulgarian, Russian, Polish, English and Italian (Manova 2011, 2015; Bagasheva and Manova 2013; Manova and Talamo 2015).

• This presentation reports on experiments that used data from Polish.
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, existing combinations should be recognised with higher accuracy and faster than non-existing ones.
EXPERIMENTS
Experiment 1: Description

- 64 native speakers of Polish
- age: M=23.2 yo (SD=1.76)
- no history of developmental dyslexia or reading disabilities, non-linguists
- 60 items
  - 30 existing suffix combinations from Polish, e.g. -ar-nia as in kawi-ar-nia ‘café’;
  - 30 non-existing suffix combinations from Polish created by changing the order of the suffixes of the legal ones or by manipulating phonemes, e.g. from the existing -ar-nia \(\rightarrow\) -ni-ar or -ur-nia
- 2 lists
  - each with the suffixes of the other in reverse order
  - each participant saw all combinations
• 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.
• participants received a list of existing and non-existing suffix combinations and had to complete the task.
• maximum time for decision: 10 minutes
Results of experiment 1: Accuracy

Acc. for existing:
M=81.72% (SD=0.29)

Acc. for non-existing:
M=75.99% (SD=0.22)

$t(63)=2.34$;
$p=0.02$
Experiment 2: Description

- Participants: 53 subjects, age: M=21.43; SD=1.83
- 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: 44 existing and 44 non-existing suffix combinations organized in 2 lists
- Each participant saw all combinations.
Experiment 2: Procedure

TIME

500 ms

7,000 ms

250 ms

+ arnia
Experiment 2: Results – Accuracy

Existing combinations: $M_{ACC} = 81\%, \ SD = .09$

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

$t(52)=3.03; \ p=0.004$
Experiment 2: Results – RTs

Existing combinations:
$M_{RT}=1333.14; \quad SD=420.57$

Non-existing combinations:
$M_{RT}=1610.38; \quad SD=556.02$

$t(51)=-7.53; \quad p<0.001$
Discussion of results

- Experiment 2 confirms the result of experiment 1

- Accuracy for existing combinations higher than for non-existing, reaction times to existing combinations shorter than to non-existing

- Recognition of suffix combinations seems to resemble recognition of words, cf. word superiority effect

- If suffix combinations are represented in the mental lexicon, why is the accuracy of the existing combinations not (close to)100%?
  - existing combinations with low accuracy, e.g., -acz-ostwo as in smark-acz-ostwo ‘bratness’ (derived from smarkacz ‘brat’) are unproductive and infrequent

- Suffix combinations are most probably stored in the mental lexicon
Productivity and accuracy (exp.2)

Productive combinations:
\[ M_{ACC} = 86\%, \ SD = 0.09 \]

Unproductive combinations:
\[ M_{ACC} = 75\%, \ SD = 0.11 \]

\[ t(51) = 7.81; \ p < 0.001 \]
Productivity and RTs (exp.2)

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

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

\( t(51) = -4.08; p < 0.001 \)
Further research

• investigating the processing of L2 suffix combinations with L2 learners of Polish to see whether the L2 learners produce and process word structure in the way native speakers do

• testing the processing of existing and non-existing suffix combinations in words with existing and non-existing bases (stems)


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