Suffix combinability in Polish: A psycholinguistic study

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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 e.g. *strzel-ec-two ‘shooting’ and not *strzel-two-ec?

Restrictions on affix ordering exist in all languages of the word
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 and relevance for foreign language learning
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).
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
Polish *-ak*: a traditional analysis

<table>
<thead>
<tr>
<th>SUFF1</th>
<th>Word class of SUFF1</th>
<th>SUFF1 Semantics</th>
<th>Followed by SUFF2</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>-ak</em></td>
<td>N</td>
<td>Person</td>
<td><em>-two,</em></td>
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<td></td>
<td></td>
<td></td>
<td><em>-ówka,</em></td>
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<td><em>-ki,</em></td>
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<td><em>-ny,</em></td>
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<td><em>-nieć</em></td>
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</table>
Nouns, adjectives and verbs are seen as being cognitive in nature. (cf. Langacker 1987)
-ak: fixed combinations

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<tr>
<th>SUFF1</th>
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<th>SUFF2</th>
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<td>N: -two, -ówka (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ADJ: -ki, -owaty (3), -ny (3)</td>
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<td>V: -nieć</td>
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</table>
-ak: predictable combinations

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<td>V: -nieć</td>
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Data

• 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

• The Polish suffix combinations were checked in the grammatical dictionary of Polish (Saloni et al. 2007) and the National Corpus of Polish (Przepiórkowski et al. 2012)
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/more quickly 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 → -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.
- **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

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, randomised
• Each participant saw all combinations.
Experiment 2: Procedure

+ 500 ms

-arnia 7,000 ms

250 ms
Experiment 2: Results – Accuracy

**Existing combinations:**
\[ M_{\text{ACC}} = 81\%, \ SD = 0.09 \]

**Non-existing combinations:**
\[ M_{\text{ACC}} = 74\%, \ SD = 0.12 \]

\[ t(52) = 3.03; \ p = 0.004 \]
Experiment 2: Results – Reaction times

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

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

$t(51)=-7.53; p<0.001$
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 (experiment 2 results)

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

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

\[ t(51) = 7.81; \ p < 0.001 \]
Productivity and reaction times (experiment 2 results)

**Productive combinations:**
- $M_{RT} = 1288.44$
- $SD = 429.14$

**Unproductive combinations:**
- $M_{RT} = 1421.01$
- $SD = 488.41$

$t(51) = -4.08; p < 0.001$
Relevance for language learning

- The experimental part shows that suff. comb. are stored in ML
- Fixed and predictable combinations are semantically motivated, e.g. SUFF1 that derives nouns for objects forms fixed and predictable combinations with SUFF2 for derivation of:
  - qualitative adjectives by -owy, -(a)ny, -Vsty
  - persons in -arz
  - places in -arnia
  - and objects in -(ów)ka or -nica

- Not all combinations are productive, i.e. some combinations derive less than 10 types, e.g. places in -arnia (as in okle-ini-arnia ‘veneer workshop’ and my-dl-arnia ‘soap shop’) and objects in -nica (as in my-del-nica ‘soap dish’)
## Combinability of SUFF1 for objects

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</table>
| 1 | -ina | N | ADJ: -owy  
N: -arnia (1) (place),  
-arz (1) (person)  
N: -ówka (1) (object) | wykładz-in-owy  
okle-ini-arnia  
okle-ini-arz  
okle-in-ówka | flooring-  
veneer workshop  
veneer producing worker  
veneer cutter |   |
| 2 | -nik | N | ADJ: -owy  
N: -ka (object),  
-arz (person) | grzej-nik-owy  
zapal-nicz-ka  
dzien-nik-arz | heater-  
lighter  
journalist |   |
| 3 | -idło, -ydło, -adło | N | ADJ: -any (3),  
-isty (1),  
-owy (default),  
-asty (1)  
N: -arz (person),  
-arnia (1) (place),  
-nica (1) (object) | krop-idł-any  
zwierci-adl-isty  
wah-adł-owy  
my-dl-asty  
my-dl-adl-arz  
my-dl-arnia  
my-dl-nica | aspergillum-  
mirror-  
pendular  
soapy  
stupid teacher  
soap shop  
soap dish |   |
| 4 | -nia | N | ADJ: -owy | przekład-ni-owy | gear- |   |
| 5 | -Vnie | N | ADJ: -ny (4),  
-owy (default) | sklepi-en-ny  
mieszk-ani-owy | vault-  
housing- |   |
| 6 | -ak | N | ADJ: -owy | leż-ak-owy | deckchair- |   |

* A fragment of data
Combinability of SUFF1 for objects (productive combinations)

|   |   | N       | ADJ: -owy                  | wykładz-in-owy | flooring-
|---|---|---------|----------------------------|----------------|----------------|
| 1 | -ina | N       | ADJ: -owy                  | wykładz-in-owy | flooring-
|   |     |         | N: -ka (object)            | grzej-nik-owy  | heater-
|   |     |         | N: -arz (person)           | zapal-nicz-ka  | lighter       |
|   |     |         |                            | dzien-nik-arz  | journalist    |
| 2 | -nik | N       | ADJ: -owy                  | wah-adł-owy    | pendular      |
|   |     |         | N: -ka (object)            | abec-adl-arz   | stupid teacher|
|   |     |         | N: -arz (person)           | leż-ak-owy     | deckchair-    |
| 3 | -idło, | N       | ADJ: -owy                  | przekład-ni-owy| gear-
|   | -ydło|         |                            |                |               |
| 4 | -nia | N       | ADJ: -owy                  | mieszk-ani-owy | housing-
| 5 | -Vnie| N       | ADJ: -owy                  | leż-ak-owy     | deckchair-    |
Relevance for language learning

- Foreign language learners of Polish could use the native speakers’ strategies for vocabulary learning:
  - learn the semantic rules that derive the fixed and predictable combinations,
  - learn the productive fixed and predictable combinations by heart, e.g., -inowy, -nikowy, etc.
  - learn the exact words derived by unproductive combinations of suffixes
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.


References
