A COGNITIVE APPROACH TO SUFFIX ORDERING: TWO-SUFFIX CONSTRUCTIONS IN ENGLISH AND SLAVIC

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Acknowledgements

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The support is gratefully acknowledged.
Structure of the talk

- What is affix ordering?
- Preliminaries
  - Goals
  - Data
  - Affixes and meaning
- Approaches to affix order
- Analysis
- Additional evidence for the results obtained
  - Linguistic
  - Psycholinguistic
  - From neuroscience
- Conclusions
What is affix ordering?

real ➔
What is affix ordering?

real $\rightarrow$ real + -ize
What is affix ordering?

real → real + -ize →
      → real + -iz + -ation
What is affix ordering?

\[ \text{real} \rightarrow \text{real} + \text{-ize} \rightarrow \]
\[ \rightarrow \text{real} + \text{-iz} + \text{-ation} \rightarrow \]
\[ \rightarrow \text{real} + \text{-iz} + \text{-ation} + \text{-al} \]
What is affix ordering?

\[ \textit{real} \rightarrow \textit{real} + \textit{-ize} \rightarrow \]
\[ \rightarrow \textit{real} + \textit{-iz} + \textit{-ation} \rightarrow \]
\[ \rightarrow \textit{real} + \textit{-iz} + \textit{-ation} + \textit{-al} \]

- An alternative ordering of the suffixes is not possible, i.e. *\textit{real-iz-al-ation}, *\textit{real-al-ation-ize}, etc. do not exist.
Goals

- to understand the mechanisms behind affix ordering
- to contribute to the typology of the phenomenon of affix order
- to contribute to the better understanding of the nature of morphological constructions
Languages investigated

- Slavic
  - Bulgarian
  - Russian
  - Polish
Languages investigated

- Slavic
  - Bulgarian
  - Russian
  - Polish
- Germanic
  - English
Languages investigated

- Slavic
  - Bulgarian
  - Russian
  - Polish
- Germanic
  - English
- Romance
  - Italian
Languages investigated

- **Slavic**
  - Bulgarian
  - Russian
  - Polish

- **Germanic**
  - English

- **Romance**
  - Italian

**Sources of data:** existing studies, grammars, dictionaries, corpora, native speaker intuition, Internet
Data

- Usage-based approach, i.e. data are particularly important
- Large sets of derivational suffixes and their combinations in Bulgarian, Russian and Polish (120 derivational suffixes from each language)
- Reanalysis of the combinability of 43 English suffixes according to our approach
- We have also analyzed the combinability of 36 Italian derivational suffixes (collaboration with L. Talamo)

Usually a study on affix ordering analyses about 30 suffixes.
Affixes and meaning 1

- The traditional view
  Morphemes are the smallest pieces of linguistic structure that relate form and meaning (or grammatical function). (Affixes are morphemes.)


Affixes are units of structure without semantics, i.e. they receive semantic interpretation in words / constructions.
Distributed morphology (Halle and Marantz 1993): affixes receive semantic interpretation at an abstract level, i.e. both -s in books and -en in oxen are the same suffix that marks ‘plural’, cf. feature geometry.

Some of the approaches to affix order are based on the traditional understanding of a morpheme, while others combine affixes without reference to semantics.
Approaches to affix order

- Overviews in Muysken (1986), Manova & Aronoff (2010), Rice (2011), Manova (submitted)
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- According to the type of information used in affix ordering, Manova & Aronoff (2010) differentiate eight different approaches to affix order:
Approaches to affix order

- Overviews in Muysken (1986), Manova & Aronoff (2010), Rice (2011), Manova (submitted)

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

- Depends on phonological information.
- This type of affix ordering is rare.

Tiene (Hyman 2006)

- bases in a vowel
  
  (a) IE ‘eat’ lees-E ‘feed’

- bases in a coronal consonant (alveolar or palatal)
  
  (b) mat-a ‘go away’ maas-a ‘cause to go away’
      kal-a ‘be’ kaas-a ‘cause to be, become’

- bases in a non-coronal consonant (labial or velar)
  
  (c) lab-a ‘walk’ lasab-a ‘cause to walk’
      lók-a ‘vomit’ lósek-E ‘cause to vomit’
The Mirror Principle

“Morphological derivations must directly reflect syntactic derivation (and vice versa).” (Baker 1985:375)
Syntactic ordering 1

- The Mirror Principle
  - “Morphological derivations must directly reflect syntactic derivation (and vice versa).” (Baker 1985:375)
  - Involvement of argument structure
Syntactic ordering 1

- **The Mirror Principle**
  - “Morphological derivations must directly reflect syntactic derivation (and vice versa).” (Baker 1985:375)
  - Involvement of argument structure
    - Koyukon (koy; Athabaskan; Jetté and Jones 2000)

object – aspect – (participant) subject

a) **dee-n’ooyh**
   ‘you sg. will handle object’

b) **ne-henee-h’aaah**
   ‘they are looking at you sg.’
Affix ordering in well-described languages is traditionally seen as not based on syntactic principles, though a syntactic analysis is possible, in some cases at least:
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- **English**
  - employ-er (sb. who employs people, i.e. employees)
    - V+subject
  - employ-ee (sb employed by an employer)
    - V+object
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Some linguists (Rice 2000) assume that semantic derivation directly maps syntactic derivation since both syntax and semantics mean compositionality.
Semantic ordering

- Depends on semantic information
- Semantic scope

Yup’ik (Mithun 1999: 43)

\[
\begin{align*}
\text{yug-pag-cuar} & \quad \text{yug-cuar-pag} \\
\text{person-big-little} & \quad \text{person-little-big} \\
\text{‘little giant’} & \quad \text{‘big midget’}
\end{align*}
\]

- Affix ordering in well-described languages is rarely described in terms of semantic scope.
Morphological ordering

- Depends on morphological information
Morphological ordering

- Depends on morphological information
  - Level ordering or stratal approach
  - Selectional restrictions
  - Monosuffix constraint
Level-ordering or stratal approach 1

- **Lexical phonology**
Level-ordering or stratal approach 1

- **Lexical phonology**

Class I suffixes: +ion, +ity, +y, +al, +ic, +ate, +ous, +ive
Class II suffixes: #ness, #less, #hood, #full, #ly, #y, #like

Class I prefixes: re+, con+, de+, sub+, pre+, in+, en+, be+
Class II prefixes: re#, sub#, un#, non#, de#, semi#, anti#

From Spencer (1991: 79)
Class I affixes frequently attach to bound roots and tend to be phonologically less transparent than class II affixes and cause stress shifts, resyllabification, and other morphonological alternations, whereas class II affixes do not.
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Class I affixes do not occur outside class II affixes.
The fact that in English, of all possible combinations of suffixes allowed by level-ordering only a few exist, makes Fabb (1988) claim that it is not the relation of a suffix with a particular stratum but selectional restrictions of individual suffixes that are responsible for the combinatorial properties of suffixes.
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- **Group 1:** suffixes that do not attach to already suffixed words
- **Group 2:** suffixes that attach outside one other suffix
- **Group 3:** suffixes that attach freely
- **Group 4:** problematic suffixes
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- Group 1: suffixes that do not attach to already suffixed words
- Group 2: suffixes that attach outside one other suffix
- Group 3: suffixes that attach freely
- Group 4: problematic suffixes

**Problem:** Plag (1996, 1999) established numerous counterexamples to Fabb’s model.
Selectional restrictions 2

- **Plag's solution:** for any given affix, its phonological, morphological, semantic and syntactic properties together are responsible for the possible and impossible combinations of the respective affix with stems and with other affixes.
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**Problem:** This approach is too complicated.
Selectional restrictions 3

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- Affix-driven versus base-driven morphology
  - Fabb’s approach is affix-driven, i.e. it is the affix that selects the base = affix-to-base direction of rules.
  - Plag’s analysis is base-driven, i.e. the base selects the suffix = base-to-affix direction rules.
Affixes do not have semantics and affix combinations should be described as depending on non-semantic facts.

Diachronic information such as Latinate versus Germanic bases (suffixes) determines suffix order.

According to the monosuffix constraint, in English “suffixes that select Germanic bases select unsuffixed bases” (Aronoff and Fuhrhop 2002: 473), i.e. the Germanic part of the English derivational morphology allows only one derivational suffix, therefore the label ‘monosuffix constraint’

**Problem:** How do speakers know which suffix is Latinate and which Germanic?
Some linguists consider this type of ordering morphological

Arbitrary assignment of affixes to slots, position class morphology or slot and filler morphology

“Morphological systems in which morphemes or morpheme classes are organized into a total linear ordering that has no apparent connection to syntactic, semantic, or even phonological organization.”  

Simpson and Withgott (1986): the first outline of the properties of template morphology

Templatic ordering is incompatible with the Mirror principle.
Templatic ordering 2

- Northern Iroquoian verb template

  prepronominal prefixes + pronominal prefix +
  reflexive prefix + noun stem + verb root +
  derivational suffixes + aspect suffixes + final
  suffixes

(Mithun 1999: 42)
Psycholinguistic ordering

- Parsability hypothesis
- Complexity-based ordering
Parsability hypothesis 1

- Hay (2000, 2003 and later work)
- *psycholinguistic* by nature - acknowledges the crucial role of processing constraints in affix ordering
- a *dual-route access* model of morphological processing, i.e. we access derived words either as whole words or as decomposable units.
- *relative frequency*
Dual-route access

- **whole word route**
  - helpless

- **decomposition route**
  - helpless
    - help
    - less
Whole word access is likely when the derivative has a high relative frequency, i.e. when the complex word is more frequent than its base, e.g. in the case of government vs. govern.
Relative frequency

- **Whole word access** is likely when the derivative has a high relative frequency, i.e. when the complex word is more frequent than its base, e.g. in the case of *government* vs. *govern*.

- The **decomposition route** is likely if the relative frequency is low, e.g. as in *blue* vs. *blueness*. 
Parsability hypothesis 2

- Parsability depends on different factors, such as productivity, semantic transparency and phonotactics across the morpheme boundary, and occurs by gradations, which allows affixes to be ordered hierarchically according to their ability to parse.
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- Affixes order in such a way that *more parsable affixes do not occur within less parsable affixes*, since the attachment of a less separable affix to a more separable one is difficult to process.
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**Problem:** Parsability cannot explain all combinations of English suffixes, selectional restrictions can override parsability. (Hay and Plag 2004)
Complexity-based ordering

- English suffixes can be ordered in a hierarchy of juncture strength (Hay 2002 and Hay and Plag 2004)
Complexity-based ordering

- English suffixes can be ordered in a hierarchy of juncture strength (Hay 2002 and Hay and Plag 2004).
- If the affixes A, B, C, D and E form a hierarchy, affixes that follow, let us say, C on the hierarchy can be added to words already affixed by C, whereas affixes preceding C on the hierarchy cannot be attached to words containing C, i.e. *CAD should be an impossible combination.
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**Problem:** If a suffix never combines with all other suffixes in a language, why do we need to relate it to all suffixes in terms of a hierarchy?
Some of the approaches suggest a linguistic explanation of affix ordering and rely on information to which the speaker does not have access, since the speaker is not a linguist. For example, the prototypical speaker does not necessarily know what syntactic subject and syntactic object are but produces correct words, which implies that information such as syntactic subject and syntactic object is most probably not used in affix ordering. To illustrate, we can define -er in teach-er as corresponding to the subject of the verb to teach (syntactic approach) but also as deriving a noun or a person (cognitive approach).
Cognitive ordering

- This type of affix ordering is based on general cognitive principles and do not require any specific knowledge.

- **Entrenchment**: a unit does not need to be assembled from its parts on each occasion of its use, nor the language users need to refer to its parts in order to understand it. (WF in Cognitive Grammar, Taylor 2002, recall the dual-route model)

- Two-suffix constructions are instances of entrenchment. (Construction Morphology belongs to the cognitive paradigm.)
Domain-specific affix ordering (Manova 2011c)

- The whole word is not derived on the same principle
- The word consists of domains
- Each domain has affix ordering principles of its own
Word-domains

Slavic word

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

non-evaluative  evaluative
Slavic word versus English word: Towards a typology

**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
```

Word-domains

Slavic word

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

non-evaluative  evaluative
Motivation of a domain-specific account

- Different ordering principles in the different domains
- Each domain has closing suffixes of its own
### Evaluative domain: Bulgarian diminutives

<table>
<thead>
<tr>
<th>Nouns in</th>
<th>DIM1 suffixes</th>
<th>DIM2 suffixes</th>
<th>DIM3 suffixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>in -C</td>
<td>-ec (unproductive)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-le (unproductive)</td>
<td>-ence</td>
<td>-ence</td>
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<tr>
<td></td>
<td>-če</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>-čica (unproductive)</td>
<td></td>
<td></td>
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<tr>
<td>in -a</td>
<td>-ica</td>
<td>-ka</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-ka</td>
<td>-ica</td>
<td>-ica</td>
</tr>
<tr>
<td></td>
<td>-ička (unproductive)</td>
<td></td>
<td></td>
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<tr>
<td>in -o</td>
<td>-ce</td>
<td>-ence</td>
<td>-ence</td>
</tr>
<tr>
<td>in -e</td>
<td>-ence</td>
<td>-ence</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-ice (unproductive)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Evaluative domain: Polish diminutives

<table>
<thead>
<tr>
<th></th>
<th>DIM1 suffixes</th>
<th>DIM2 suffixes</th>
<th>Unproductive (attach by substitution of a DIM1 suffix, i.e. do not combine with DIM1 suffixes)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nouns in</strong></td>
<td></td>
<td>Productive (attach by additon)</td>
<td></td>
</tr>
<tr>
<td><strong>-C</strong></td>
<td>-ek</td>
<td>-ek</td>
<td>-uszek, -aszek</td>
</tr>
<tr>
<td></td>
<td>-ik / -yk</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-uszek (unproductive)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-isztek /-ysztek (unproductive)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-aszek (unproductive)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>-ulek (unproductive)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-ka (unproductive, selects feminine nouns)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>-a</strong></td>
<td>-ka</td>
<td>-ka</td>
<td></td>
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<tr>
<td></td>
<td>-uszka (unproductive)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>-iczka /-yczka (unproductive)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>-o / -e</strong></td>
<td>-ko</td>
<td>-ko</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-uszko (unproductive)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Inflectional domain

BASE–GEND/NUM–DEF

krasiv-ø-ø ‘beautiful’ (masculine)
krasiv-ø-ijat ‘beautiful-DEF’
krasiv-a-ø ‘beautiful-FEM/SG’
krasiv-a-ta ‘beautiful-FEM/SG-DEF’
krasiv-o-ø ‘beautiful-NEUT/SG’
krasiv-o-to ‘beautiful-NEUT/SG-DEF’
krasiv-i-ø ‘beautiful-PL’
krasiv-i-te ‘beautiful-PL-DEF’
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*krasiv*-ø-ø ‘beautiful’ (masculine)

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*krasiv*-o-ø ‘beautiful-NEUT/SG’

*krasiv*-o-to ‘beautiful-NEUT/SG-DEF’

*krasiv*-i-ø ‘beautiful-PL’

*krasiv*-i-te ‘beautiful-PL-DEF’
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

∅
Traditional analyses versus my approach 1

SUFF1 + all SUFF2 that follow it (a single rule is expected to account for all combinations)

Strategies borrowed from the literature:

- Analysis in terms of binary combinations of suffixes
  - Suffixes are combined without relation to a lexical base
Traditional analyses versus my approach 2

$$\text{SUFF1} + \text{all SUFF2 that follow it}$$ versus

$$\text{SUFF2}_N \quad \text{SUFF2}_\text{ADJ} \quad \text{SUFF2}_V$$
Note on terminology

- Syntactic category
- Lexical category
- Word class
- Part of speech

**Major categories**

Noun – N
Adjective – ADJ
Verb - V
**-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>

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

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

<table>
<thead>
<tr>
<th>SUFF1</th>
<th>Syntactic category of SUFF1</th>
<th>SUFF2</th>
<th>SUFF2 suffixes with the same word-class in numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>-ist</td>
<td>N</td>
<td>N: -dom (2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ADJ: -ic (631), -y (5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>V: -ize (3)</td>
<td>N: 1 ADJ: 2 V: 1</td>
</tr>
</tbody>
</table>
Looking up for data (English)

- The British National Corpus (BNC)
  http://www.natcorp.ox.ac.uk/
- Corpus of Contemporary American English (COCA),
  http://corpus.byu.edu/coca/
- Oxford English Dictionary (OED)
  http://www.oed.com/
- Specialized internet sites, e.g. OneLook,
  http://www.onelook.com
- Google
The lexical-category specification of a suffix can be N, V and ADJ, and it is seen as cognitively defined in terms of semantic concepts.

- Langacker’s (1987) - conceptual analysis of parts of speech
- Croft (2001) – universal-typological theory of parts of speech
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).
Croft (2001) defines objects, properties and actions in terms of four semantic properties: relationality, stativity, transitoriness and gradability. Thus prototypically, nouns name things or objects, verbs denote processes or actions, and adjectives are modifiers and express properties.
The role of semantics

Semantic rules for selection of SUFF2 can be illustrated with the suffixes \(-\text{ful}_{\text{ADJ}}\) and \(-\text{less}_{\text{ADJ}}\). If the suffix \(-\text{ful}_{\text{ADJ}}\) attaches to a derived noun in English (e.g. \textit{mean-ing}_{\text{N}}\text{-ful}_{\text{ADJ}}) usually also the suffix \(-\text{less}_{\text{ADJ}}\) attaches to that noun (\textit{mean-ing}_{\text{N}}\text{-less}_{\text{ADJ}}). Thus, we have two SUFF2\(_{\text{ADJ}}\) that combine with the same SUFF1 (-\textit{ing}_{\text{N}}). However, the two SUFF2\(_{\text{ADJ}}\) are semantically opposite and are thus semantically assigned, based on intensional semantics (i.e. what the speaker intends to say).
We speak of blocking if the existence of one lexeme prevents the derivation of another lexeme with the same or similar semantics (Aronoff 1976, and many others).

The existence of *glory in English blocks the derivation of *gloriosity (Aronoff 1976: 44) and thus also the suffix combination -ous + -ity in this particular case.
Types of SUFF1-SUFF2 combination

- **Fixed (unique)**
  - SUFF1 combines with only one particular SUFF2 of a major syntactic category, N, V, ADJ
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  - SUFF2 is semantically determined (based on intentional semantics)

- **Unpredictable**
  - very few combinations are of this type
More data

<table>
<thead>
<tr>
<th>No</th>
<th>SUFF1</th>
<th>Syntactic category of SUFF1</th>
<th>SUFF2 (default instances in bold type)</th>
<th>Number of SUFF2 suffixes with the same word-class</th>
</tr>
</thead>
</table>
| 1  | -(t)an | ADJ | N: -ship (1), -ism (485), -ist (2), ness (1) V: -ize | **N:** 4  
**V:** 1 |
| 2  | -able | ADJ | N: -ity (810), -ness | **N:** 2 |
| 3  | -acy | N | V: substitutes -ate | N: 2  
V: 1 |
| 4  | -age | N | N: -er (1), -ist (1) ADJ: -ous (2) | N: 2  
V: 1 |
| 5  | -an | N | N: -ism (485), -ist (131), -ity (57) ADJ: -ic (201) V: -ize (218) | N: 3  
ADJ: 1  
V: 1 |
| 6  | -ance | N | ADJ: -ful (1), -less (2) | **ADJ:** 2 |
| 7  | -ant | N | ADJ: -ed (1) V: -ize (24) | ADJ: 1  
V: 1 |
| 8  | -ant | ADJ | N: -ness V: -ize | N: 1  
V: 1 |
| 9  | -ary | ADJ | N: -ity (3), -an, -ness (1) | **N:** 3 |
| 10 | -ate | V | N: -ion (-ation, 5570), -or (1025); -ee (8); -er (3) ADJ: -ive (991), -ory (745) | N: 4  
ADJ: 2 |
| 11 | -ation | N | ADJ: -al (257) V: -ize (6) | ADJ: 1  
V: 1 |
| 12 | -dom | N | ADJ: -ful (2); -less (3) | **ADJ:** 2 |
| 13 | -ed | ADJ | N: -hood (1), -ness ADJ: -ful (2) | **N:** 2  
ADJ: 1 |
| 14 | -ee | N | N: -dom (3), -ship (1), -ism (1) | **N:** 3 |
| 15 | -en | V | N: -er (32), -ment (5) | **N:** 2 |
Word-class change

ADJ real $\rightarrow$ V real + -ize $\rightarrow$
$\rightarrow$ N real + -iz + -ation $\rightarrow$
$\rightarrow$ ADJ real + -iz + -ation + -al
Word-class change

ADJ real $\rightarrow$ V real + -ize $\rightarrow$

$\rightarrow$ N real + -iz + -ation $\rightarrow$

$\rightarrow$ ADJ real + -iz + -ation + -al

ADJ $\rightarrow$ V $\rightarrow$ N $\rightarrow$ ADJ
In English and Bulgarian, up to 85% of the suffix combinations reported in different studies involve fixed suffix combinations, i.e. a SUFF1 combines with only one SUFF2 of a particular word class, N, ADJ or V.
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Up to 83% of the suffix combinations are word-class changing, i.e. there is a complementary relationship between the word-classes of the SUFF1 and SUFF2.
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Up to 83% of the suffix combinations are word-class changing, i.e. there is a complementary relationship between the word-classes of the SUFF1 and SUFF2.

Similar results for Russian, Polish and Italian.

Manova (2011c)
<table>
<thead>
<tr>
<th>No</th>
<th>SUFF1</th>
<th>Syntactic category and semantics of SUFF1</th>
<th>SUFF2</th>
<th>Examples</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>-an</td>
<td>N person</td>
<td>N: -in (5)¹</td>
<td>katorž-âň-in</td>
<td>convict</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>N: -in (3)</td>
<td>gražd-âň-in</td>
<td>citizen</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>N: -stvo (2)</td>
<td>gražd-âň-stvo</td>
<td>citizen’s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ADJ: -skij (3)</td>
<td>gražd-âň-skij</td>
<td>citizenship</td>
</tr>
<tr>
<td>2.</td>
<td>-(V)tel’</td>
<td>N person</td>
<td>ADJ: -skij</td>
<td>pîsa-tel’-skij</td>
<td>writer’s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>N: -stvo</td>
<td>uči-tel’-stvo</td>
<td>being a teacher /</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>N: -iščina (1)</td>
<td>ljubi-tel’-ščina</td>
<td>teachers (collect.)</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>dilettantism</td>
</tr>
<tr>
<td>3.</td>
<td>-ar’</td>
<td>N person</td>
<td>ADJ: -skij</td>
<td>aptek-ar-skij</td>
<td>chemist’s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>N: -stvo</td>
<td>aptek-ar-stvo</td>
<td>being a chemist/</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>N: -nik</td>
<td>svin-ar-nik (=svinarnja)</td>
<td>chemists (collect.)</td>
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<td></td>
<td></td>
<td></td>
<td>N: -nja</td>
<td>pek-ar-nja</td>
<td>pigsty</td>
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<tr>
<td>4.</td>
<td>-(j)ak</td>
<td>N person</td>
<td>ADJ: -eskij</td>
<td>zeml-jač-eskij</td>
<td>countryman’s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ADJ: -ovyj (1)</td>
<td>odinákovyj</td>
<td>equal</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>N: -estvo</td>
<td>zemljačestvo</td>
<td>countrymen (collect.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>N: -ina (1)</td>
<td>duračina (=durak)</td>
<td>fool</td>
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</tbody>
</table>
### Examples from Russian

<p>| | | | | | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>5.</td>
<td>-ec</td>
<td>N</td>
<td>person</td>
<td>ADJ: -kij</td>
<td>strel-ec-kij</td>
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<tr>
<td>6.</td>
<td>-(n)ik</td>
<td>N</td>
<td>person</td>
<td>N: -an (2)</td>
<td>star-ik-an (=starik fam.)</td>
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<td>N: -аška (1)</td>
<td>star-ik-аška (starik pej.)</td>
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<td>ADJ: -ov-skij (1)</td>
<td>star-ik-ovskij</td>
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<td></td>
<td>ADJ: -eskij</td>
<td>uč-енич-eskij</td>
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<td></td>
<td>N: -estvo</td>
<td>uč-енич-estvo</td>
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<tr>
<td>7.</td>
<td>-ač</td>
<td>N</td>
<td>person</td>
<td>ADJ: -eskij</td>
<td>trub-ač-eskij</td>
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<td>N: -estvo</td>
<td>trub-ač-estvo</td>
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<tr>
<td>8.</td>
<td>-ščik</td>
<td>N</td>
<td>person</td>
<td>ADJ: -kij</td>
<td>zagovor-ščic-kij (= zagovor-шčиц-eskij)</td>
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<tr>
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<td>-čik</td>
<td></td>
<td></td>
<td>ADJ: -ovyj</td>
<td>zakaz-čik-ovyj</td>
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<td>-овшčik</td>
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<td>N: -estvo</td>
<td>zagovor-ščič-estvo</td>
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<td>-л’шčik</td>
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<tr>
<td>9.</td>
<td>-un</td>
<td>N</td>
<td>person</td>
<td>ADJ: -skij</td>
<td>opek-un-skij</td>
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<td></td>
<td>N: -ec</td>
<td>brex-un-ec (= brex-un)</td>
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<td>N: - stvo</td>
<td>opek-un-stvo</td>
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</table>
**Examples from Italian**

<table>
<thead>
<tr>
<th>No</th>
<th>Suff 1 (Lexical and Sem class)</th>
<th>Suff 1 (according to lexical class)</th>
<th>Suff 2</th>
<th>In Numbers</th>
<th>Examples of Suff1-Suff2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-tore(pers)</td>
<td>N pers</td>
<td>N -ismo (1)</td>
<td>N 1</td>
<td>conservatorismo</td>
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<td></td>
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<td>A -ico (1), -ale (&gt;10)</td>
<td>A 2</td>
<td>pittorico, dittorale</td>
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<td></td>
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<td>V</td>
<td>V 0</td>
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<td>2</td>
<td>-iere(pers.)</td>
<td>N pers</td>
<td>N -ismo (8)</td>
<td>N 1</td>
<td>giustizierismo</td>
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<td>A -istico (1)</td>
<td>A 1</td>
<td>informieristico</td>
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<td>V</td>
<td>V 0</td>
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<td>3</td>
<td>-izzare</td>
<td>V caus</td>
<td>N -mente (8), -zione (&gt;1000), -tore (&gt;150)</td>
<td>N 3</td>
<td>volgarizzamento</td>
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<td>A -bile (&gt;100), -torio (8)</td>
<td>A 2</td>
<td>americanizzazione</td>
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<td>V</td>
<td>V 0</td>
<td>potabilizzatore</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>utilizzabile, privatizzatorio</td>
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<td>4</td>
<td>-mento</td>
<td>N abstr 'action noun'</td>
<td>N -ista (&gt;10), -ismo (3), -ario(loc) (1)</td>
<td>N 3</td>
<td>comportamentista,</td>
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<td>A -ale (&gt;10), -oso (5)</td>
<td>A 2</td>
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<td>filamentososo</td>
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<td>5</td>
<td>-(z)ione</td>
<td>N abstr 'action noun'</td>
<td>N -ista (&gt;10), -ismo (&gt;10)</td>
<td>N 2</td>
<td>nutrizionista, divisionismo,</td>
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<td>A -ario(adj)(4), -ale (&gt;10)</td>
<td>A 2</td>
<td>rivoluzionario,</td>
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<td></td>
<td></td>
<td>V</td>
<td>V 0</td>
<td>decisionale</td>
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</tbody>
</table>
Suffix particular semantics (Bulgarian)
(research in progress)

1) person – possessive/relational adjective
   - -tel-ski
   Examples: pisa-tel-ski ‘writer’s’, rodi-tel-ski ‘parent’s’
   - -ar-ski
   Examples: drug-ar-ski ‘friend’s, aptek-ar-ski ‘chemist’s’

2) object – qualitative adjective
   - -tel-en
Additional evidence for the results obtained

- Internal (linguistic) evidence
- Psycholinguistic evidence
- Evidence from neuroscience
Internal (linguistic) evidence

- Nouns, adjectives and verbs usually have different morphology, which means that speakers distinguish between them in some way, because in order to attach the right nominal / adjectival / verbal inflection to a word a speaker must identify the lexical category of that word. Verb inflection cannot be attached to nouns and adjectives, etc.

- N, ADJ, V also have different syntactic combinability.
Evidence from psycholinguistics

- Children acquire nouns and verbs differently: nouns are acquired faster.

Evidence from neuroscience

- Nouns and verbs activate different parts of the brain.
  - Mestres-Missé, Anna; Antoni Rodriguez-Fornells & Thomas F. Münte (2010)
  - Yang, Jing, Li Hai Tan b, Ping Li (2011) for Chinese-English bilinguals
Nouns and verbs in the brain

A. Effect of Type of word (Nw vs Rw)

B. Effect of Word exposure (2nd vs 1st)

C. Effect of Grammatical class
   - Noun vs Verb
   - Verb vs Noun
Evidence from neuroscience

- Nouns and verbs activate different parts of the brain.
  - (Mestres-Missé, Anna; Antoni Rodriguez-Fornells & Thomas F. Münte 2010, and many others)
  - Yang, Jing, Li Hai Tan b, Ping Li (2011) for Chinese-English bilinguals

- The regions in the brain responsible for face recognition differ from the regions responsible for recognition of objects, locations, etc.
  - (see Kandel et al. 2012 and reference therein)
Conclusions 1

- Suffixes are at least minimally specified in the lexicon in terms of lexical and semantic (cognitive) categories (Lieber 2005).

- The proper assessment of the combinability of a suffix requires not only information about the suffixes that can follow that suffix but also information about the number of types derived (suffixation by default).

- Most SUFF1-SUFF2 combinations are fixed and predictable, i.e. the speakers most probably use them as non-compositional pieces of structure (entrenchment, double-route access).
Conclusion 2

- SUFF1-SUFF2 combinations can be described without reference to a lexical base.
- SUFF1-SUFF2 combinations are purely morphological units of structure that are between morpheme and word, i.e. they cannot be derived syntactically and are instances of morphological constructions.
- Suffix ordering based on cognitive categories such as lexical-category specification and suffix semantics allows us to compare and see similarities between languages that belong to different families genealogically (Slavic, Germanic and Romance).
Selected references 1


Thank you!

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