Derivational depth and the role of the mental lexicon in morphological decomposition

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Introduction

Automatic decomposition into stem and affix has been shown to exist in masked priming (Rastle et al., 2004):

- **Corner** decomposes into **corn-** and **–er**
- But **broth-el** does not prime **broth**

Decomposition extends to pseudowords in masked priming, including grammatically ill-formed and semantically meaningless forms such as *sportation* in French (Longtin & Meunier, 2005).

Semantic interpretability of morphologically viable complex pseudowords can be determined through the number of semantic neighbours of a novel form (Marelli & Baroni, 2015). But interpretability judgments could also be driven by differences in derivational depth:

1. $acne_{Noun} > acneless_{Adjective}$
2. $hike_{Verb} > hike_{Noun} > hikeless_{Adjective}$

Thus, it is possible that *acneless* is judged to be semantically more interpretable than *hikeless* in Marelli and Baroni (2015) because of differences in derivational depth between the two novel forms.

Derivational depth in real words

In neuroimaging, we see stronger activation in the LIFG for words with more derivational depth compared with visually matched complex words (Pliatsikas et al., 2014).

➔ More activation for **eyeing** ($eye_N > eye_V > eyeing$) than for **running** ($run_V > running$)

Research question

Within meaningful pseudowords, do differences in the derivational chain affect processing?

Lexical gaps in derivational chains

Derivational chain in German:
adjectival base > zero-derived verb > noun ending in {–*ung*}

a) **heil** (A., *'safe'*) > **heilen** (V., 'heal') > **Heilung** (N., 'healing')

a) **spitz** (A., 'sharp') > **spitzen** (V., 'sharpen') > ***Spitzung** (N., 'sharpening')

b) **hübsch** (A., 'pretty') > ***hübschen** (V., 'make pretty') > ***Hübschung** (N., 'making pretty')

The noun derived in a) is an existing word found in everyday speech. It is derived following the sequence of derivations given by the derivational chain. Based on the structural rules of the derivational chain, new words were formed in b) and c). In an offline rating task with native speakers of German, the nouns in b) and c) were judged to be pseudowords in German. Stimuli in b) and c) differ in the presence of a lexical gap for the intermediate derivation.

Behavioural evidence

Experiments 1-3: Lexical decision with visual delayed priming

Delayed priming is only sensitive to purely morphological effects (Drews et al., 1995). Prime and target are separated by 5-7 intervening trials. Responses are made to primes and targets.

In Experiments 1 and 2, the priming between an existing complex word (e.g. *Heilung*) and its base word *heil* was compared with the priming for the two pseudowords *Spitzung* and *Hübschung* and their base words respectively.
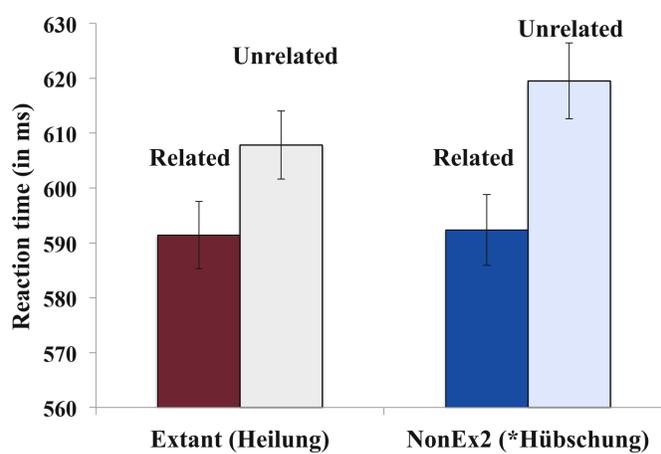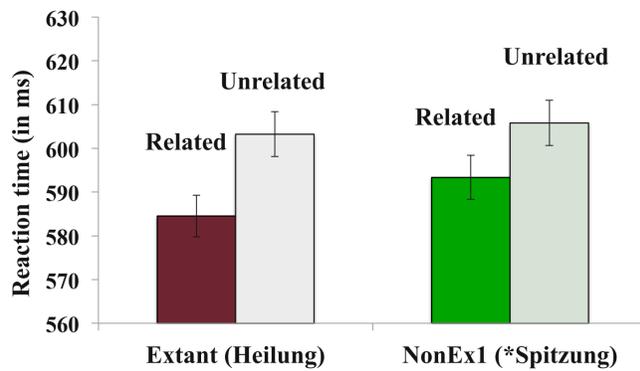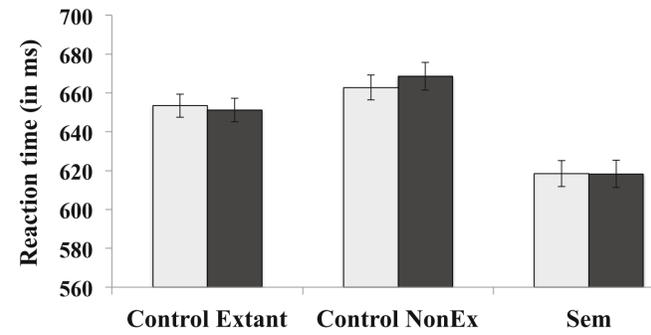

Experiments 1 & 2. Reaction time to the target following unrelated and related primes for conditions Extant, NonEx1, NonEx 2

In Experiments 1 and 2, both types of pseudowords prime their respective base words as well as existing words.

Experiment 3 shows a more direct comparison between the two pseudowords *Spitzung* and *Hübschung*. Semantic and form control pairs were included to control for the influence of non-morphological factors.
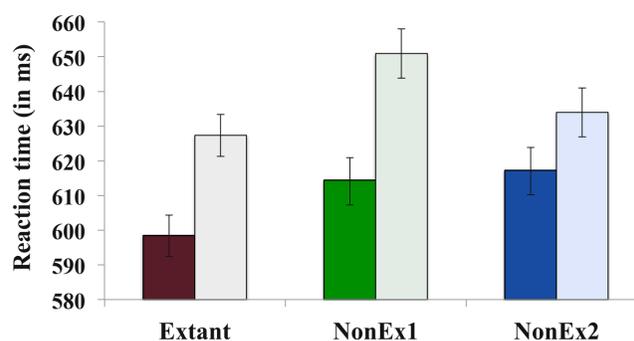
Experiments 3. Reaction time to the target following unrelated and related primes for conditions Extant, NonEx1, NonEx 2


Experiments 3. Reaction time to the target following unrelated (dark grey) and related primes (light grey) in form and semantic control pairs

In Experiment 3, we find significant priming in all three conditions. However, the degree of priming is **significantly larger in conditions 'Extant' and 'NonEx1' than for 'NonEx2'**. No priming is found for semantic and form control pairs.

Experiment 4: Simple lexical decision task

Based on differences in error rates to primes in Experiments 1-3, a simple lexical decision task to existing words and pseudowords was carried out in Experiment 4.

Again, we find processing differences between 'NonEx1' and 'NonEx2'. Items like *Spitzung* for which an intermediate derivation exists elicit significantly more errors.
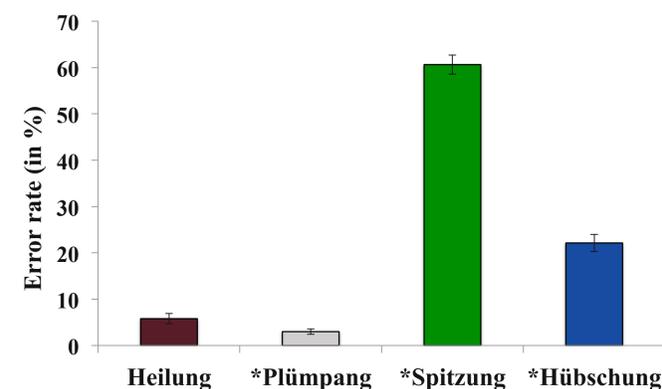
Experiment 4. Error rates in simple lexical decision task

Discussion

Both types of pseudowords *Spitzung* and *Hübschung* can be decomposed as they are semantically interpretable and grammatically well-formed. But their processing is also affected by the comparison with other forms presented in the experiment. This leads to a significantly weaker priming effect for 'NonEx2' in Experiment 3 where a direct comparison between the types of pseudowords could be established.

Thus, the composition of the derivational chain affects the processing of pseudowords. *Spitzung* primes its base as well as the existing noun *Heilung*. The priming effect in *Hübschung* is significantly weaker.

In a simple lexical decision task, pseudowords with fewer lexical gaps in their derivational chain are felt to be more difficult to be classified as 'nonwords'. Again, lexical gaps within the derivational chain affect the interpretability of novel forms.

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