Roots, affixes, and prosodic words in phonological selection

The case of the English comparative bracketing paradox

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Introduction

- Phonological selection: affixes appear on bases that share a phonological property.
  - English comparatives: big/bigger, easy/easier, productive/*productiver
  - English indefinites: a hat, an umbrella
- Are the phonological generalizations part of the rule, or are they emergent?
- Bracketing paradox in English comparatives/superlatives: unhappier
- It isn’t a paradox
Introduction

- English comparatives:
  - Most bases for -er are monosyllabic (big/bigger), a few disyllabic (easy/easier)—tend to end in [i]
  - Class of trisyllabic exceptions with un-: unhappier (cf. *redundanter, *insipider, *seductiver)

- Characterized as a bracketing paradox because -er bases are usually mono- or disyllabic, so phonological bracketing following semantics should be impossible (Pesetsky 1985, Marantz 1988 et seq.).
  - semantics: [ [un [ happy ]_{adj} ]_{adj} er]
  - phonology: [ un [(happy)_{Ft} er] ]

- Marantz: un- requires its stem to to be a phonological wd; surface syntactic bracketing differs from phonological bracketing much as with clitics.

- Pesetsky: judges “unpleasanter” to be acceptable. . .

- Assumptions: (i) cases like “unhappier”, “unpleasanter” are grammatical, and (ii) restrictions are stated in phonological terms
How is this phonological restriction stated?

- Hypothesis 1: **phonological selection.** -er attaches to stems that are at most disyllabic. Rule refers to a Pwd that is a moraic trochee (McCarthy and Prince 1986)
  \[ \text{COMP } \leftrightarrow \text{-er} / [( \text{ft } ]_{Pw}d \] ——
- Requires that base be phonologized before affix is realized. This causes some syntactic difficulties; see Embick 2007
- How to explain lexical exceptions that meet the phonological criterion but do not take -er, such as teal-er, beige-er
- Misses other phonological generalizations about -er and -est: avoidance of r-final adjectives (e.g., purer, sourer, bitterer), avoidance of final [a] (rawer), avoidance of clusters (moister) (see Hilpert 2008, Mondorf 2009)
- Formally odd: keeping track of the other side of the foot is non-local (why not se(rene)-er?)
- What to do with un-?
How is this phonological restriction stated?

- Hypothesis 2: *lexical selection*. “-er” attaches to a diacritically marked list of morphemes (Bobaljik 2012, Gouskova et al. 2015). The rule does not refer to phonology; the phonological generalizations are extracted separately.

  COMP $\leftrightarrow$ -er / \{big, dumb, happy, soft, ... \} ____

- Requires that there be a mechanism for learning phonological generalizations over the list (next section)

- Should work for *un-* without any embellishments—if the last morpheme determines the suffix choice, prefixes should not matter (spoiler: they do)
Sublexicons: the intuition

- General phonotactic learning:
  - “Does this word sound like other words of my language?”

- Morpho-phonological learning:
  - “Does this word sound like other words that combine with this affix?”
  - “Does the result of affixation sound like other words that contain this affix?”

- “Sounds like” means “is phonotactically likely”
Sublexicons

- Learning starts with general phonotactics, segmentation into phonological words, some basic morphological segmentation.
- Phonotactically conditioned alternations can be learned from distributions (Calamaro and Jarosz 2014).
- Eventually, learner encounters inconsistencies that cannot be reduced to general phonotactics.
- Example: English -er attaches to mono- and disyllables, but not trisyllables. But the deverbal nominalizer -er attaches to trisyllables (e.g., malínge-er, discóver-er, ánalyz-er).
- Some argue that this is due to the emergence of general constraints in English (stress lapse/clash, Mondorf 2009) but why is this lifted for verbs?
- Solution: sort the lexicon and restart phonotactic learning for subsets.
Sublexical phonotactic learning

- Selectional restrictions of morphemes are learned from sets of phonological words defined morphologically or phonologically (Albright and Hayes 2003, Becker and Gouskova to appear, Gouskova et al. 2015, Becker and Allen 2015)

- But the rules are stated over morphemes (Halle and Marantz 1993, Embick and Marantz 2008, inter alia)
  - Learning input: \{[bɪg], [bɪɡᵊ]\}, \{[sævi], [sæviᵊ] \ldots\}
  - Rules: COMP $\leftrightarrow$-er / \{savvy, big, sick, \ldots\}
  - Generalizations over the list \{savvy, big, sick\ldots\} — the sublexicon for COMP $\leftrightarrow$-er — are learned the same way phonotactic grammars are learned (Hayes and Wilson 2008). Should notice that initial unstressed syllables are un(der)attested in list; ditto for long lapses

- Evidence that people use sublexical phonotactics to decide which allomorph to put on wugs in cases of suppletion (Gouskova et al. 2015)
An experiment: nominalizer vs. comparative -er

Suzy Ahn and I presented \( \approx 300 \) nonce words as either adjectives or verbs, in isolation and combined with -er.

Items represented a “phonotactic spectrum” based on English lexical comparatives. E.g., “zice”, “ezzep”, “fudaddow” (with the aid of the UCLA Phonotactic Learner, Hayes and Wilson 2008)

Participants: 267 Mechanical Turkers, divided appx evenly between adjective and verb condition
An experiment: nominalizer vs. comparative -er

The task: adjective condition

Please push the “play” button to listen to the adjective:

I know you think I am chike. ►

Rate the adjective chike:


Now listen to the comparative form:

But you are even chiker. ►

How likely would an English speaker be to say chiker in this sentence?

An experiment: nominalizer vs. comparative -er

### The task: verb condition

Please push the “play” button to listen to the verb:

Flo recently learned how to **chike**.

Rate the verb **chike**:


Now listen to the noun:

She’s an amateur **chiker**.

How likely would an English speaker be to call someone who **chikes** a **chiker**?

Predictions

- **Bare forms**: Verbs are more restrictive phonotactically than nouns/adjectives, so bare V should be rated lower than bare Adj
- **-er forms**:
  - General phonotactics: there should not be a difference between V-er and Adj-er
  - Sublexical phonotactics: Adj-er should be worse than V-er
An experiment: nominalizer vs. comparative -er

The results

You think I am fudaddow (black)
Barbara likes to fudaddow (gray)

But you are even fudaddower (black)
She is quite the fudaddower (gray)

People's rating of Adj vs. Verb, grouped by violations in adjective base sublexical grammar

People's rating of Adj-er vs. Verb-er, grouped by violations in adjective-er sublexical grammar
People use sublexical phonotactic knowledge to generalize from lexical comparatives to nonce words—not just general phonotactic knowledge.

But these are monomorphemic nonce words—nonce roots, really.

What about morphologically complex words?
Is selection local?

- In at least some versions of Distributed Morphology, a morpheme’s realization is determined by string-local overt morphemes (Embick 2010). In x-y-z, y can determine shape of z, but x cannot. (though see Myler to appear)

- A simple case of local allomorph selection: English $n$. In English, -ity is not as productive as -ness except after -able and -al (Baayen and Renouf 1996)
  
googleable googleability ?googleableness
  theatrical theatricality ?theatricalness

- Analysis (Embick and Marantz 2008):
  $n \leftrightarrow$ -ity/ _____ Roots ($\sqrt{Atroc}, \sqrt{Curious...}$); [a, able], [a, al]
  $n \leftrightarrow$ -ness
Do affixes select -er?

- Suppose we combine this notion of locality with lexical selection (affixes come with a list of morphemes)
- Bare adjectives can clearly select -er: big~bigger, tidy~tidier, stupid~stupider, etc.
- What about adjectives formed with -ly and -y?
  - man-ly manlier craz-y
  - like-ly likelier eas-y
  - friend-ly friendlier ros-y
  - time-ly timelier fiddl-y
  - shape-ly shapelier savor-y
  - love-ly lovelier old-person-y
- Adjectival -ly appears to select for monosyllables as well, and contributes many of the disyllabic adjectives to the -er base list.
- But -y is much more productive, occurring on phrase-sized constituents, and it clearly forms at least some adjectives that can take -er
Does un- affect the acceptability of comparatives?

- Suppose the rules are:
  COMP $\leftrightarrow$-er / -ly, ROOTS {busy, big, savvy, sick, etc.} ___
  a $\leftrightarrow$-ly / ROOTS {friend, man, god, gain, wield...} ___

- Phonotactic generalizations: Roots in COMP sublexicon are at most disyllabic; roots in -ly sublexicon are at most monosyllabic. The disyllabicity of most comparative adjectives with -er is emergent

- If this is how the rule is stated, prefixes shouldn’t affect suffixation

- So do they?
The task and the participants

- Mechanical Turkers in Canada and the US, N=90

Please read this sentence, focusing on the boldfaced portion.

This is the *timeliest* visit you have ever made.

Now, please rate the sentence.

horrible! 1 2 3 4 5 just fine
The stimuli

- Adjectives were presented with and without un-, in comparative and superlative contexts.

  (un)busy   (un)earthly   (un)grabby   (un)lovely   (un)savvy   (un)timely
  (un)canny  (un)easy     (un)happy    (un)manly    (un)seemly  (un)wieldy
  (un)comely (un)friendly (un)healthy (un)ruly      (un)shapely
  (un)costly (un)gainly   (un)holy     (un)saintly   (un)sightly
  (un)crazy  (un)godly    (un)likely   (un)savory    (un)tidy
Experimental design

The stimuli

- Some occur mostly without *un-* (red), some mostly with (blue). Most occur with and without *un-* (magenta).
- The red and blue items have a frequency of 0 in the English Lexicon Project. Others (e.g., “canny”, “seemly”) have very low frequencies in the corpus.
- Included to ensure no floor or ceiling effect for ratings.

<table>
<thead>
<tr>
<th>unbusy</th>
<th>(un)earthly</th>
<th>(un)grabby</th>
<th>unlovely</th>
<th>unsavvy</th>
<th>(un)timely</th>
</tr>
</thead>
<tbody>
<tr>
<td>(un)canny</td>
<td>(un)easy</td>
<td>(un)happy</td>
<td>(un)manly</td>
<td>(un)seemly</td>
<td>wieldy</td>
</tr>
<tr>
<td>uncomely</td>
<td>(un)friendly</td>
<td>(un)healthy</td>
<td>ruly</td>
<td>unsapely</td>
<td></td>
</tr>
<tr>
<td>uncostly</td>
<td>gainly</td>
<td>(un)holy</td>
<td>unsainty</td>
<td>sightly</td>
<td></td>
</tr>
<tr>
<td>uncrazy</td>
<td>godly</td>
<td>(un)likely</td>
<td>(un)savory</td>
<td>(un)tidy</td>
<td></td>
</tr>
</tbody>
</table>
The frames: an example

- Pick a \{manlier/more manly\} hobby than stamp collecting.
- My hobby is the \{manliest/most manly\} of all hobbies.
- Stamp collection is an even \{unmanlier/more unmanly\} hobby than your last one.
- Stamp collection is the \{unmanliest/most unmanly\} hobby ever.
Overall trends: no paradox

- 1st bean: ppl like *adjective-er* better than *un-adjective-er*.
- 2nd bean: ppl like *more adj* better than *more un-adj*.
- 1st, 2nd vs 3rd, 4th: people like superlatives better than comparatives

![](image-url)

*Ratings for comparative and superlative adjectives with and without un-***
Stats

\[ \text{lmer(rating} \sim \text{log freq + more/most + superl + un + more/most:un + superl:un + most + (1 + log freq | participant) + (1 + more/most + superl + un + more/most:un + superl:un + most | stem)} \]

<table>
<thead>
<tr>
<th>Estimate</th>
<th>SE</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>intercept</td>
<td>2.18488</td>
<td>0.15547</td>
<td>14.053</td>
</tr>
<tr>
<td>log frequency (ELP)</td>
<td>0.18685</td>
<td>0.01617</td>
<td>11.557</td>
</tr>
<tr>
<td>more/most adj</td>
<td>0.29572</td>
<td>0.19748</td>
<td>1.497</td>
</tr>
<tr>
<td>superl. adj (most/-est)</td>
<td>0.22823</td>
<td>0.07724</td>
<td>2.955</td>
</tr>
<tr>
<td>un-adj</td>
<td>-0.44357</td>
<td>0.11869</td>
<td>-3.737</td>
</tr>
<tr>
<td>more/most un-adj</td>
<td>0.63368</td>
<td>0.14618</td>
<td>4.335</td>
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<tr>
<td>superl. unadj (most/-est)</td>
<td>0.23971</td>
<td>0.08362</td>
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<tr>
<td>most adj</td>
<td>-0.19608</td>
<td>0.09655</td>
<td>-2.031</td>
</tr>
</tbody>
</table>

- People prefer un- adjectives with more and most, and they disprefer -er adjectives with un-.
- “more unfriendly” \( \succ \) “unfriendlier”; “friendlier” \( \succ \) ”unfriendlier”
Individual adjectives: “friendly”

Ratings for ‘(un)friendly’

- Best: 5
- Worst: 1

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Individual adjectives: “likely”

Ratings for '(un)likely'
Individual adjectives: "tidy"

Ratings for '(un)tidy'

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Individual adjectives: “happy”

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Individual adjectives: “canny”

Ratings for '(un)canny'

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Discussion

Does -ly select -er/-est?

- No difference between -ly and -y in the study
- Doesn't matter if -y is morphemic, eas-y vs. busy
- Adjectives in -ly are likelier to get high ratings when presented with -er, but not hugely so
Does un- make comparatives and superlatives worse?

- YES.
- Sometimes, the difference is small, and sometimes it is fairly dramatic (untidier < more untidy, untidiest < most untidy)
- So there isn’t really a bracketing paradox. But now we need to explain why un- makes comparatives worse.
- Possibility: “un-” is less compatible with the comparative meaning
- Problem: “more un-” should also be bad, and it generally isn’t
- Matushansky (2012) argues -er and more forms are semantically distinct, and Embick (2007) shows why any adjective can combine with more in meta comparatives.
Back to the theories: phonological selection

- Phonological selection: -er/-est attach to a maximally disyllabic foot
- Theory of the task: people take the suffixed form and check whether the base is disyllabic; if so, higher rating
- Explains why “unfriendlier” is rated worse than “friendlier”—but only if the phonological bracketing is [un-friend-ly]-er
- Fails to explain the fine-grained distinctions that people made in the fudaddow/fudaddower experiment
Back to the theories: Lexical selection

- **-er/-est** attach after listed morphemes
- The rule: COMP <->-er / -ly, ROOTS {busy, happy, savvy, tidy, canny...}
- Theory of the task: when people encounter a comparative/superlative they haven’t heard, they run it through the sublexical phonotactic grammar
- Trisyllables are far less likely in these sublexicons than mono- and disyllables
- Doesn’t explain why “unhappier” gets lower ratings than “happier”—but something else can
Boyd (2007): “more Adj” easier to process

- People prefer “more Adj” forms to “-er” forms in complex environments.
  The cop was **angrier** than the sailor.
  The cop was **angrier** to hear that the band was breaking up than the sailor.
  The cop was **more angry** than the sailor.
  The cop was **more angry** to hear that the band was breaking up than the sailor.
Effects of complexity on ratings

Boyd (2007)

![Bar graph showing the effects of complexity on ratings.](image)

**Figure 2.5:** Effects of morphology type and complexity on acceptability

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Conclusions

- Most of the trisyllabic comparatives and superlatives with the un- prefix are rated lower than disyllabic equivalents—as one might expect from their phonotactics.
- This is consistent with a theory that the affixation rule checks the phonological size of the base, but that theory has other problems.
- Alternatives:
  - sublexicon checking of phonological words
  - semantic incompatibility with un-
  - effects of complexity in rating experiments
Thanks

- Exp 1 was done in collaboration with Suzy Ahn (NYU)
- Thanks to Lisa Davidson for recording audio stimuli for that experiment
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- Thanks to the members of NYU’s Morphology Research Group for listening to my “unfriendlier” rant


