Discussion of Marslen-Wilson 2007, led by Kie
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See there for fuller references on all the claims here.

1 What is this paper?

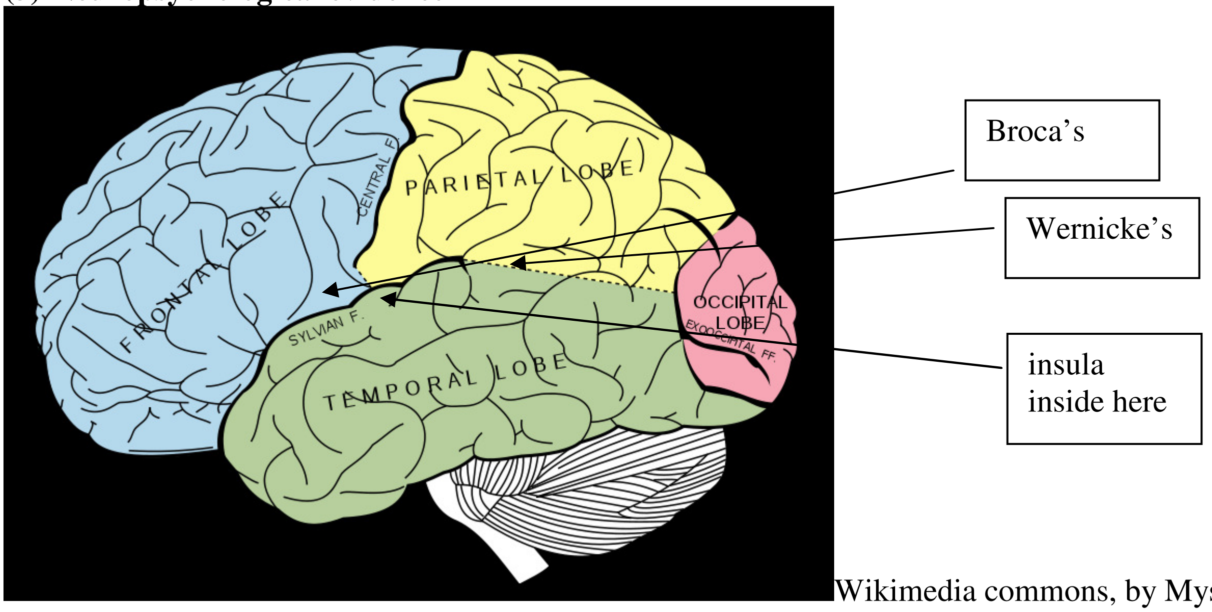
- Review for a handbook.
- Focuses on inflectional and derivational morphology, not compounding.
- Mentions many of the papers that you'll be presenting, so we can re-evaluate once we've heard all the details.

2 Inflectional morphology, especially the English past tense

(1) Important traits of inflectional morphology
- Its contribution is totally predictable: e.g., /-s/ adds only plurality.
- Its appearance or non-appearance depends on grammatical context

(2) English past tense: incredibly well studied case
- Most researchers agree that *sang* and *taught* must be "learned, represented, and processed as undecomposable whole forms" (p. 177)
  - e.g. with a connectionist-type network that learns to relate *sing* and *sang*, *teach* and *taught* because of their phonological and semantic overlap
  - though see Stockall & Marantz 2006
- But what about *jumped* and *walked*?
  - Connectionists want to treat them by the same mechanism as the irregulars, although mappings like *jump-jumped* might still be quantitatively different (easier to learn or use) because they're more numerous and the phonological overlap is greater.
  - Dual-mechanism proponents say that regulars are qualitatively different, involving symbolic computation: "add *-ed*".
  - See also Albright & Hayes 2006 for a rules-all-the-way-down approach.
- Research up through the mid-1990s was inconclusive because experimental results could often be accounted for under either theory.

(3) Neuropsychological evidence



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- Damage to "left hemisphere perisylvian language system" can affect ability to handle just regulars (p. 178)
  - E.g., patients who have no problem with the phonological or semantic processing of *jump*, *dog*, *gave*, *taught*, but are impaired on *jumped*, *dogs*
- "medial and inferior temporal" lesions (p. 178) can affect just irregulars, often <u>but not always</u> with accompanying semantic deficits

→ evidence for separate mechanisms

(4) Connectionist response

- Joanisse & Seidenberg 1999: model with a core linked to phonological and semantic subsystems
  - damage to semantic subsystem or its link to the core will affect "irregulars" more
  - damage to the phonological system or its link to the core will affect "regulars" more
  - scare quotes because the system doesn't have two separate categories, just verbs that follow better- or worse-attested mappings and past forms that are better or worse phonological matches to their bases.
- M-W argues this model makes wrong prediction that the relationship between *gave* and *give* should be similar to that between semantically related *cello* and *violin*
  - Wouldn't we also want a pair that are both semantically related and phonologically similar, such as *founder* and *flounder*, or *snotty* and *snooty*?

(5) Priming evidence for *gave/give* ≠ *cello/violin* (irregulars don't reduce to semantic relatedness)

(I'll keep using the same few word pairs, even if those aren't among the actual stimuli)

- *jump* primes *jumped* for a long time, and so does *gave* prime *give*. But *cello* primes *violin* for a short time only.

- In an ERP study of cross-modal priming, *jump/jumped* and *gave/give* again look similar ("both showing left anterior negativities standardly associated with linguistic processing" p. 178), while *cello/violin* "showed only a centrally distributed N400-type effect"
  - LAN (left anterior negativity): thought to reflect syntactic processing
  - N400: thought to reflect processing of word meanings

(6) Evidence for *played/play* ≠ *trade/tray* (regulars don't reduce to phonological similarity)

- Phonologically, *played*/*play* have the same relationship as *trade*/*tray*; whereas less-phonologically-similar *taught*/*teach* should act like *port*/*peach* (if you're British).
  - Though again, don't we also want comparison pairs that are both phonologically and semantically similar?
- In a same/different task, patients with left-hemisphere damage and lack of fluency were worse at *played/play* than *trade/tray* or similar non-word pairs.
  - Performance on task not correlated with severity of phonological processing problems.

(7) Summary of lesion-behavior correlations

- Damage to Broca's area (and, to a lesser extent, Wernicke's) correlates with reduced priming between *jumped* and *jump*, but not *pillow/pill*.
- Damage to the insula ("known to be involved in phonological processing mechanisms", p. 179) → reduced priming in *pillow/pill*, but not *jumped/jump*
- Damage to posterior temporo-parietal areas → reduced priming in *sleep/slept*

(8) So if regular inflectional morphology is real, how does it work?

- Three processing activities (in speech comprehension):
  - stem and affix access
  - "morphological segmentation of the original complex form" (p. 179)
  - morphosyntactic interpretation of the affixation
- You hear *jumped*: it doesn't match any of your "stored access representation[s]" (p. 180): *jump*, *dog*, *give*, *gave*, *teach*, *taught*, etc.
  - Footnote: you might have a "stored episodic trace" (p. 180) of *jumped*, but this wouldn't count as an access representation.
  - So, you have to break it apart.
- Now *jump* and *-ed* access their representations.
  - Segmentation is also attempted when you hear *trade* or non-word *snade* (argument from fMRI data), presumably because you can't know it's not *tray+ed* or *snay+ed* until you try.
  - There's discussion of where these processes would be localized in the brain.

3 Derivational morphology

(9) Characteristics

- Unlike inflectional morphology, derivation morphology can create "new words", by which I assume he mainly means that their semantic contribution isn't totally predictable.
- And, they're less context-dependent (apart from syntactic category).

(10) So are derivationally affixed words stored as wholes?

- <u>Full decomposition</u>: e.g., Taft & Forster 1975: *dark* and maybe *-ness* are listed, *darkness* isn't
- <u>Dual-route</u>: e.g., Schreuder & Baayen 1995: *dark, -ness*, and *darkness* are all listed
- <u>Full listing</u>: e.g., Seidenberg & Gonnerman 2000: only *darkness* is listed

- <u>Localist</u> computation (each word has its own node): tends to be used in full-decomposition and dual-route models; *dark* and (if it exists) *darkness* would be connected, directly or indirectly
- <u>Distributed</u> computation (a "word" is just a pattern of activation of various phonological and semantic feature nodes, not its own node): tends to be used in full-listing models; the activations patterns *dark* and *darkness* are just very overlapping

(11) Behavioral evidence I: effects of base frequency vs. whole-word frequency

- Say *darkness* has no lexical entry and is composed of *dark* and *ness* (full decomposition)
  - difference in reaction time to *darkness* vs. *lightness* should depend on difference in frequency between *dark* (summed over all its morphological spawn) and *light* (similarly summed), not on frequency difference between *darkness* and *lightness*.
- In a dual-route model, homonymous suffixes, like the two English *-er*s, should slow down decomposed access (you have to check two possible parses), making it easier for whole-word access to win.
- Some confusing results out there: Finnish derived (and some inflected) forms' response times depend more on whole-word frequency, but English *friendship* and *childhood* depend more on base frequency
  - but, that might be because the Finnish cases involved more allomorphy
- Taft 2004 argues that lack of base-frequency effects can still be accounted for in a full-listing theory
  - in full-listing, once you've accessed *dark* and *ness* you still have to put them together (whether in production, or in recognition, to check that they go together the way they need them to).
- Affix homonymy, productivity, and allomorphy could all slow down the putting-back-together (composition) step, wiping out effects of base frequency
  - though shouldn't we still see effects of base frequency if we hold those other things constant?
  - and what if there are whole-word frequency effects—can those be accounted for without a lexical entry for the whole word?

(12) Behavioral evidence II: overt priming (do *darkness* and *dark* prime each other?)

- Confound to control for: *darkness* and *dark* are similar phonologically, orthographically, and semantically.
- In regular priming, there's also the possibility of "strategic effects" (subject is trying to predict future stimuli: sees *darkness* and realized *dark* may be coming up) or responses that reflect "episodic memories of previously presented stimuli, rather than the relatedness of lexical representations" (p. 184).
  - I'm not sure exactly what that means, i.e. how it's different from activation of the related word and from phonological similarity effects—any ideas?

(13) Behavioral evidence III: masked priming

M-W says growing evidence for obligatory early decomposition, regardless of whether the word is also represented as a whole

- Visual prime is presented too briefly to be available to conscious awareness
  - If you try a demo on the web, you'll see that you're aware that the XXXXX mask is briefly interrupted by something else, but you can't tell what.
  - Supposed to reduce strategic effects (makes sense I guess) and episodic effects (I'm less clear on that part).
- Bound, semantically opaque stems: *permit* primes *submit* (as strongly as *unhappy/happy*) but control *rodent* doesn't prime *student*.
- Roots in Semitic: Arabic *ʔidxaalun* 'inserting' primes *duxuulun* 'entering' (/dxl/). So does semantically opaque *mudaaxalatun* 'interference'.
- Templates in Semitic: *ħaziinun* 'sad' primes *kariimun* 'generous' (CaCiiCun).
- *hardly/hard* just as strong priming as *bravely/brave*
  - → doesn't matter if the meaning of the suffix is opaque or transparent (since word hasn't been accessed yet, couldn't matter)
- Even priming in *corner/corn*
  - but not *scandal/scan* → it matters that *-er* is a possible suffix
  - → doesn't matter if the suffix is even really a suffix in that word
- Non-words with real suffixes also can prime their stems
  - *rapidify* (but not *rapidit*) primes *rapid* just as well as *rapidly* does, in French.
  - → since *rapidify* <u>can't</u> have a stored representation, priming must be via morphological segmentation.
- See M-W 2007 for discussion of neural substrates for this decomposition.

(14) What happens after this early decomposition? More overt priming evidence

Is a whole-word representation then accessed? And does it have information about morphological breakdown (in what form?)?

- Suppose:
  - masked priming triggers only decomposition, and not actual lexical access
  - (why should it work that way? if you've got enough info to do the decomposition, why not keep going?)
  - overt priming triggers initial decomposition and then lexical access.
- Somehow the effect of the initial decomposition also goes away:
  - Overt priming in semantically transparent pairs like *darkness/dark* and *unhappy/happy*, but not *department/depart* and *restrain/strain*, *submit/permit*.
- Same thing happens in masked priming with longer SOA (stimulus onset asynchrony) (Rastle et al. 2000)
  - with 43 ms. between prime and target, *apartment/apart* and *belly/bell* prime
  - at 250 ms., they don't (but transparent pairs still do)
- So somehow that early decomposition doesn't result in lasting activation of lexical entries.
  - Only morphological decomposition+recomp. that <u>succeeds</u> results in lasting priming.
- But: Hebrew and Arabic show priming of semantically opaque pairs (and even template-sharing pairs) not just in masked priming but also in overt priming.
  - "may reflect the special properties of non-concatenative morphology, interacting with the demands of different kinds of priming task" (p. 188)

(15) What are affixes?

- *darkness* primes *toughness*, *rebuild* primes *rethink*.
  - So (assuming appropriate phonological and semantic controls), an affix is not just something to be stripped off.
  - at the least, words that share an affix activate each other
  - or, affixes could even have their own representations.
- But, *darkness* does not prime *darkly*.
  - Interpreted as priming of the stem cancelled out by “interference between two affixes competing for linkage to the same stem” (p. 187).
  - Let’s try to think this through...

4 Summary: early decomposition, but some whole-word storage

- “It seems to be one of the highest priorities of the system, as soon as orthographic or phonological information starts to accumulate, to identify possible stems and possible grammatical morphemes.” (p. 189)
- “Unlike regular inflected forms, derivational forms do seem to be stored, but with considerable variation cross-linguistically both in the degree to which these stored representations are themselves morphologically organize[d], and in the criteria that determine whether or not this is the case.” (p. 189)

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