Mid-course summary and prospect
7 Feb. 2011

1 Psychological reality of morphology

(1) Cf. emergentist view

- The relationship between *farm* and *farmer* is qualitatively the same as the relationship between *plough* and *farmer* and between *board* and *border*.
- But it's quantitatively stronger, because there are many words that have the semantic relation *X/one-who-Xes* plus the form relationship *Y/Yer*.

(2) Evidence?

- William D. Marslen-Wilson 2007 review: morphological relations don't reduce to either form or semantic similarity
- Kathleen Rastle et al. 2000b: *adapter-ADAPTABLE* gives more priming (at short SOA) than does *screech-SCREAM*.
  - But, the *Ych/Ym* form relationship doesn't line up with a whole bunch of *X/~X* semantic relationships, whereas *Yer/Yable* lines up with *sthg-that-Xs/able-to-be-Xed* in thousands of pairs.
- Feldman 2000 (not presented): as SOA increases, morphological priming increases although the sum of orthgraphic+semantic ought to be decreasing.

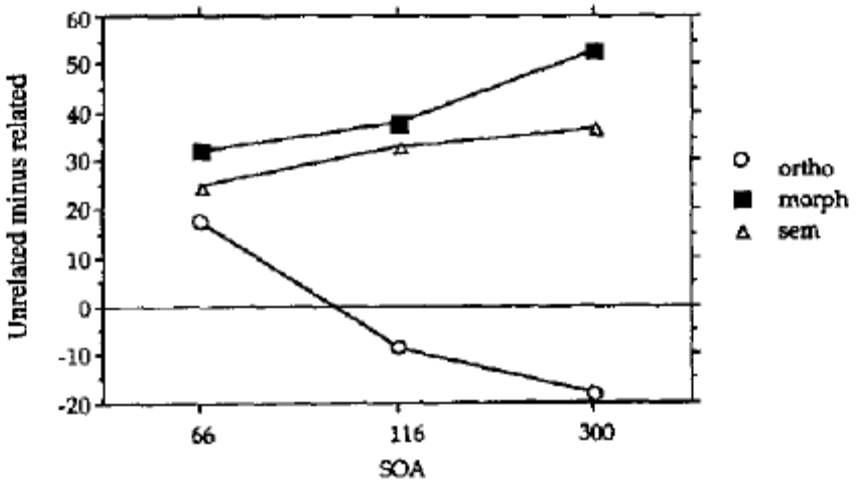


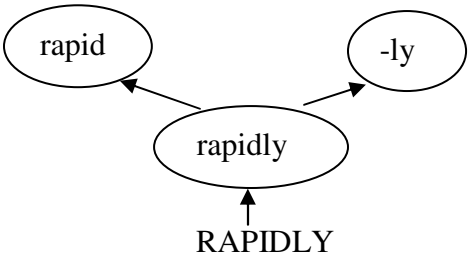
Figure 1. Facilitation as a function of stimulus onset asynchrony (SOA) after orthographic (ortho), semantic (sem), and morphologically (morph) related primes.

(p. 1437)

- Plaut & Gonnerman 2000 (not presented): simulation of emergentist model (distributed--no nodes for morphemes or words, just patterns of activation).
  - Varying the morphological "richness" of an artificial language determines whether morphological priming (without semantic relationship) is predicted
  - --> you *can* get morphological priming that's more than ortho+semantic, without symbolic morphology

2 Competing models of lexical access/representation

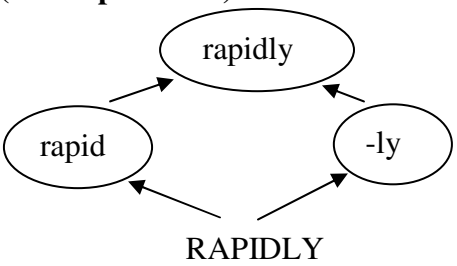
(3) Supralexical (decompose later)



For novel words, nothing will be found on the lower layer, so there must be a way to move on to the upper layer.

- Giraudo & Grainger 2000: The more frequent a masked prime like RAPIDLY, the faster the response to target *rapid*.
  - Since it's masked priming, not enough time for activation to bounce from *rapidly* back down to *rapid* in the other models
  - I guess we'd want to follow up RAPID masked-priming *rapidly*. This model--and the assumption about how much time there is--predicts that the frequency of RAPID won't matter.

(4) Sublexical (decompose first)



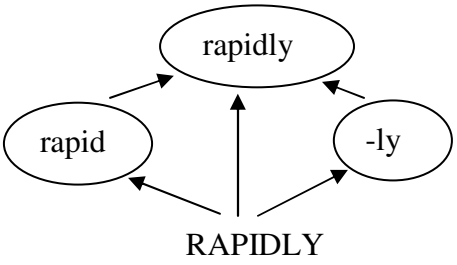
Semantically opaque words *might* have a representation on the lower layer

- Longtin & Meunier 2005: fake word RAPID-IFIER facilitates *rapide* just as much as a real derived word does.
  - you have to be able to access *rapide* even if you don't manage to access a real word that contains it
- Taft & Forster 1975: *juvenate* takes longer to reject than *pertoire*
  - --> even bound stems have representations on the lower layer
  - also, words like *vent* (bound stems that are also free words) take longer to reject if the bound version is more frequent than the free version (because you find the bound version first, determine that it's not a freestanding word, and keep searching)
- Kathleen Rastle, Matthew H Davis, & Boris New 2004b: *corner* masked-primes *corn* about as much as *farmer* primes *farm*
  - supports the idea that decomposition happens before you can check whether the two parts actually go together to form the whole
  - supported by part of Morris, Grainger, & Holcomb 2008's results
  - we don't see this result in overt priming (W Marslen-Wilson et al. 1994): so with more time, if composition fails, the pseudoparts are deactivated?

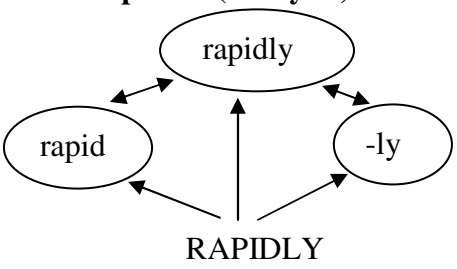
- Longtin, Juan Segui, & Halle 2003 (not presented): similar results
  - In masked priming, obligatory decomposition.
    - *baguette*/BAGUE (pseudo-derived: *baguette* has nothing to do with *bague*), *vignette*/VIGNE (opaque: *vignette* no longer has anything to do with *vigne*), *gaufrette*/GAUFRE (transparent: *gaufrette* is indeed a small *gaufre*) all facilitate about the same amount, whereas *abricot*/ABRI (orthographic: there is not suffix *-cot* in the language) inhibits.
  - Cross-modal priming study with the same items (auditory prime, followed immediately by visual target)
    - only *baguette*/BAGUE facilitates; the rest inhibit.
- Taft & Ardasinski 2006: stem frequency matters to word recognition, even when (depending on the non-word fillers, which are assumed to bias overall strategy), a dual-route model might predict the whole-word route to dominate.

See also Kathleen Rastle & Matthew H. Davis 2008d for a review of findings like this.

(5) Two routes that race



(6) Two routes that cooperate (or try to)



- V Kuperman, R Bertram, & RH Baayen 2008f: whole-compound frequency for early eye movements.
  - left-constituent frequency and family size also matter early, though
  - "the processing of complex words appears to draw information from multiple routes, even when one of them is more favorable" (p. 1111)
- LH Wurm 1997: whole-word properties (uniqueness point) and morphological properties (judged prefixedness, semantic transparency, prefix likelihood) both matter to identification point (gating task)
- L Winther Balling & RH Baayen 2008: whole-word frequency and suffix frequency both facilititate, except when both are high!
  - "optimal conditions for each route separately do not guarantee optimal processing for the system as a whole" (p. ?)

3 Elaborations of the models

(7) Prefixes vs. suffixes

- W Marslen-Wilson et al. 1994: suffixes, but not prefixes, inhibit each other (so *government* inhibits *governor*):
  - can this be made to emerge from the model of lexical access? or does it really need to be built in to the representation?

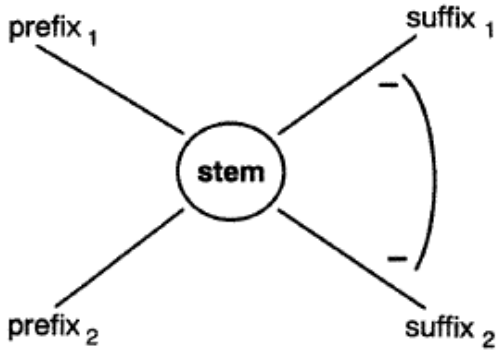


Figure 9. The expanded stem–affix model of the lexical entry for semantically transparent prefixed and suffixed forms sharing the same stem, with inhibitory links between suffixes but not between prefixes or between prefixes and suffixes.

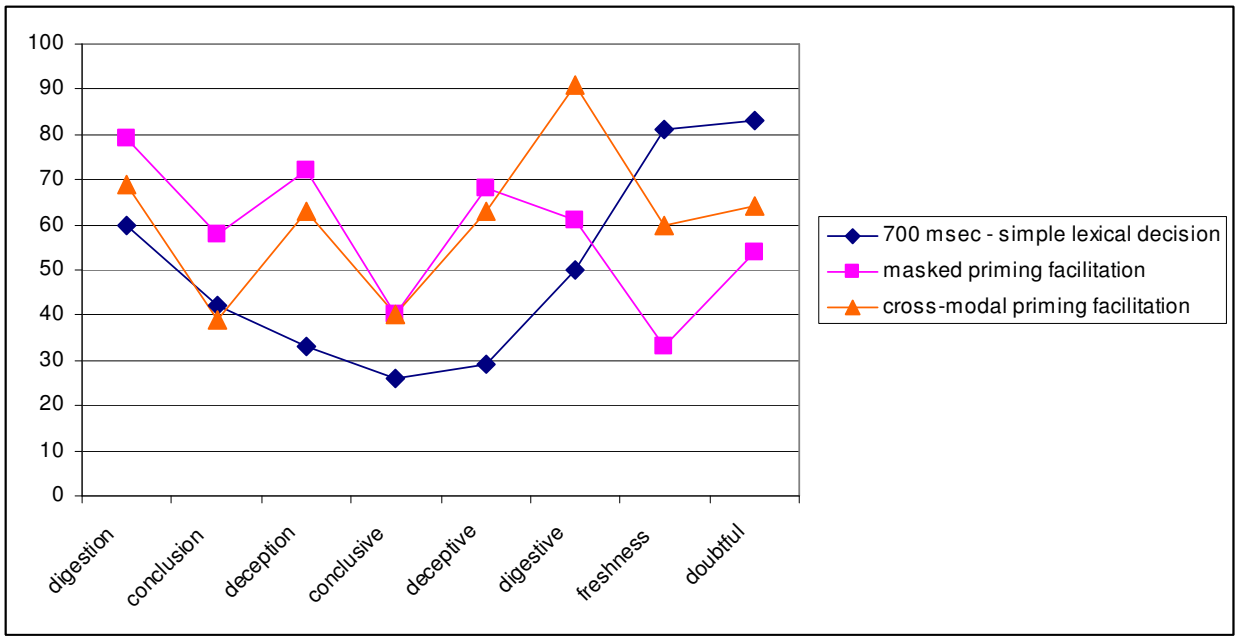
(p. ?)

- Giraudo & Grainger 2003a: prefixes masked-prime themselves, but suffixes don't
  - as prime duration increases, priming effect is only for real prefixes, not pseudo-prefixes

(8) Affix type

- Vannest & Boland 1999: We started to move into more linguistic territory here, with the finding that *-less* is different from *-ity* and *-ation*
  - stem frequency matters for *X-less* words and not for the others
  - but, the effect goes away if we look at a bunch of Level 2 affixes (*-ship, -ness, -less, -hood, -er-*) in a group vs. some Level 1 affixes (*-ous, -ory, -ity, -ian, -ation, -ary, -ion*).
- William D. Marslen-Wilson et al. 1996a (not presented)
  - overt, cross-modal priming: hear the item, then see it immediately
  - *-ness* and *re-* prime themselves (*darkness* primes *toughness* as much as *absurdity* primes *absurd*)
  - but *-ment* (classified as less productive) doesn't prime itself, and *en-* only marginally primes itself.
- Tsapkini, Kehayia, & Jarema 1999 (not presented):

example	affix	stem-final change?	stem-internal change?
digestion	*-ion*	yes but not spelled	no
conclusion	*-ion*	yes	no
deception	*-ion*	yes	yes
conclusive	*-ive*	yes	no
deceptive	*-ive*	yes	yes
digestive	*-ive*	no	no
freshness	*-ness*	no	no
doubtful	*-ful*	no	no



- Items with a phonological change seem to be slower over all (simple lexical decision)
- no difference in masked priming degree
- slightly more cross-modal priming when no phonological change

4 Detour: separate representations for affixes?

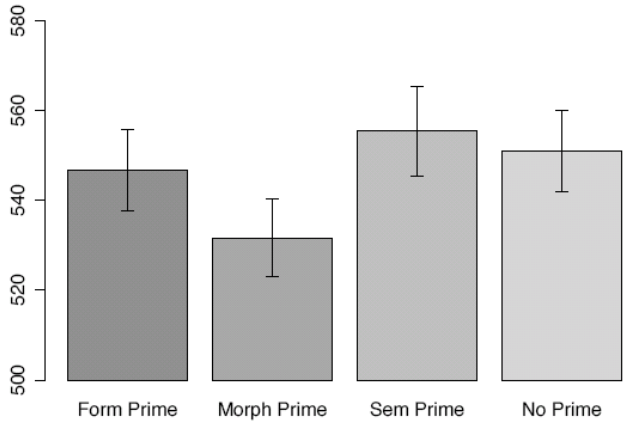
(9) Masked priming

- As mentioned above, Giraudo & Grainger 2003a found that prefixes masked-prime themselves (though not suffixes).
- Duñabeitia, Perea, & Carreiras 2008 (not presented):
  - *dad* '-ity' facilitates IGUALDAD 'equality' (control: *men* doesn't facilitate monomorphemic CERTAMEN)
  - *%%%%dad* facilitates IGUALDAD too
  - *brevedad* 'brevity' also facilitates IGUALDAD
- Why the difference? Differences between affixes in question, differences between French and Spanish?

(10) VanWagenen 2005 **(not presented): delayed priming**

- M-W & al. 1996's result suggests that affixes do have their own representations, whose activation can be increased through priming (i.e., they're not just rules or operations).
- M-W & al. argue that the semantics of *-ness* are so vague that we can't just be seeing semantic priming.
- VanWagenen 2005: we can't be sure of that--after all, the semantic contribution of *-ness* is very predictable even if abstract.
- Also, the comparison pairs have different targets: we're comparing *toughness-darkness* to *darkness-harness* --> danger of item-driven effects

- VanWagenen therefore uses delayed priming
  - lexical decision task for every item
  - several items intervene between prime and target
  - --> subject doesn't know what's a prime and what's a target, or which items form pairs
  - previous work finds that semantic facilitation (*idea-notion*) and form inhibition disappear ~ 1 sec, after prime, but morphological priming persists after dozens of intervening items



e.g., *heroism* if preceded somewhere in the list by *heresy*, *humanism*, *valor*, or none of those.
Only the *humanism* (morph prime) condition showed significant facilitation.

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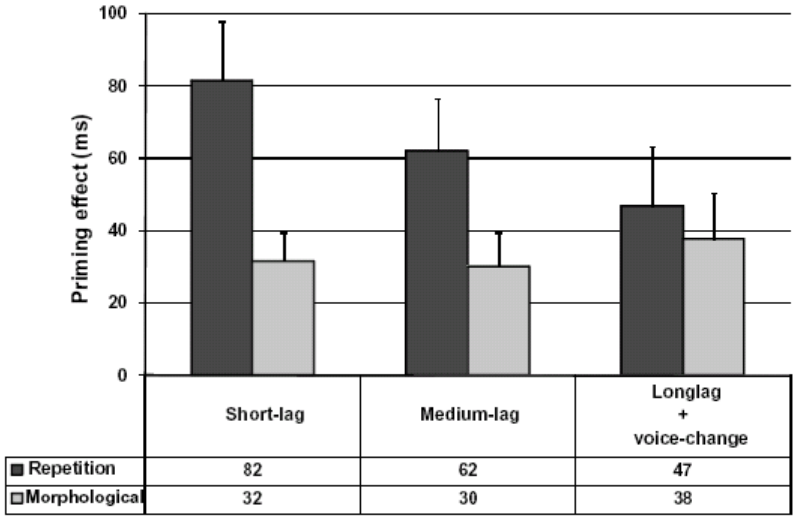
(11) Kouider & Dupoux 2009 **(not presented): episodic traces vs. representations**

- How do you know whether priming is due to activation of a representation or to (somehow) facilitation by an episodic trace? (and should we believe there's a difference?)
- You can change the physical characteristics of prime and target (lowercase/uppercase, katakana/hiragana, female voice/male voice...)
- Why is this important?
  - Sublexical models predict that *cars* should prime *car* just as much as *car* itself does.
  - But we might need to get rid of episodic effects to see this clearly.
- Same items, three different setups
  - Exp. 1: auditory prime, 12-24 intervening items, then auditory target
  - Exp. 2: 48-96 intervening items
  - Exp. 3: 96-192 intervening items, plus voice changes (one voice male, one voice female)
- Result: as lag increases (+ voice change), morph. and repetition priming become similar



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(12) Roots vs. templates

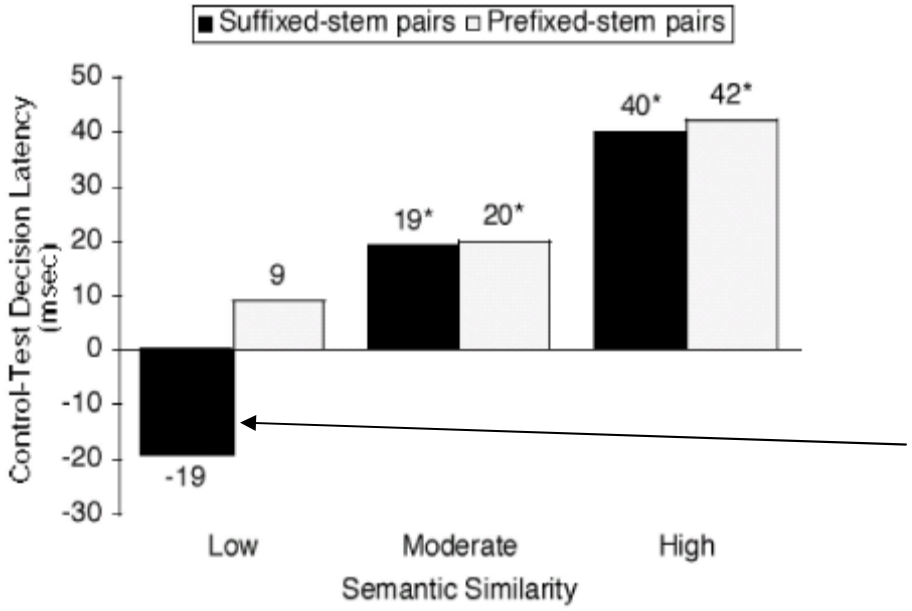
- Frost, Forster, & Deutsch 1997 (not presented): in Hebrew, consonantal roots masked-prime themselves (and it's not just semantic priming), but noun templates don't
  - e.g., *taklit* 'record' doesn't facilitate TARGIL 'exercise' (both are *taCCiC*)
  - but *zemer* 'song' does facilitate TIZMORET 'orchestra' (both are /zmr/)
- Verb templates, however, do prime themselves (Deutsch & al. 1998)
- Frost et al. 2000 (not presented): cross-modal priming
  - verb template primes itself; noun template doesn't significantly
  - noun roots prime themselves even when the semantic relationship is tenuous (*drixut* 'alertness' *hadraxa* 'guidance'), but not as much as when the semantics are transparent (*madrix* 'a guide' *hadraxa* 'guidance').

5 Detour over; back to elaborations of the model

(13) Transparency of the semantic relationship

We've been mostly ignoring the strength of the various arrows in the model--does it matter how strongly a word is connected to its components?

- Gonnerman, Seidenberg, & Andersen 2007 (not presented): auditory prime, followed immediately by visual target
  - the greater the semantic similarity (as rated in a pre-test), the more facilitation.



(reminiscent of Marslen-Wilson & al. 1994 result: if semantic similarity isn't enough to overcome inhibitory connection between suffixes, you get net inhibition.)

Figure 2. Comparison of the mean priming effects by condition for suffixed–stem and prefixed–stem pairs. Conditions vary in the degree of semantic similarity between primes and targets: Low (*hardly–hard* and *rehearse–hearse*); Moderate (*lately–late and midstream–stream*); and High (*boldly–bold* and *preheat–heat*). *$p < .05$.

(p. 337)

6 Where are we?

(14) While the timecourse is disputed, there seems to be good evidence that...

- At least some morphologically complex words are treated decompositionally at some point.
- Even words whose morphology is opaque, or that don't even have real morphology, can be treated decompositionally, at least early on.
- On the other hand, even words whose morphology is transparent can reference whole-word representations.

(15) What does it mean for phonology?

- If we're interested in explaining a given word's phonology by claiming that it's stored or accessed more as a whole or more as parts...
- we may need to treat the elements of these debates as a black box,
- and just look for factors that seem to encourage/discourage access to or influence of the parts or the whole.

(16) Coming next

- We look in more detail at papers claiming influences of such factors.
- In the previous portion of the course, we read a lot of visual word recognition papers, because that's where the central results and debates are.
- But for the next portion I privileged papers that involve production, or at least auditory recognition (there will still be a couple visual lexical decision papers, though)

(17) Factors to look at

- Distributional:
  - frequency (word, stem, affix)
  - family size (how many relatives does the word have? what counts as a relative?)
  - paradigm entropy (how evenly distributed, or typically distributed, are the members of this word's morphological paradigm?)
- Phonology (alternations, resyllabification, stress...)
- Semantic opacity/transparency
- Timecourse issues (prefix vs. suffix, non-continguous morphemes)

(18) Let's divide up the next few readings

Distributional properties (frequency, family size, entropy...)

1. Vannest, J., Bertram, R., Järvikivi, J., and Niemi, J. 2002. Counterintuitive crosslinguistic differences: More morphological computation in English than in Finnish. *Journal of Psycholinguistic Research* 31:83-106.
   Distributional effects at the language-wide level
2. Ford, M.A., Davis, M.H., and Marslen-Wilson**,** W.D. (2010) *Derivational morphology and base morpheme frequency*, Journal of Memory and Language, 63(1), 117-130
   Base frequency facilitates lexical decision, but only if the word is *productively* suffixed; family size facilitates regardless of frequency.
3. Pluymaekers, M., Ernestus, M., & Baayen, R. (2005). Lexical frequency and acoustic reduction in spoken Dutch. *Journal of the Acoustical Society of America,* 118, 2561-2569.
   Whole-word frequency affects duration of affix in speech.

4. De Jong, N. H., Schreuder, R., & Baayen, R. H. (2000). The morphological family size effect and morphology. Language and Cognitive Processes, 15, 329–365.
   It matters how many derivational relatives a word has.
5. Bertram, R., Schreuder, R., and Baayen, H. 2000c. The balance of storage and computation in morphological processing: The role of word formation type, affixal homonymy, and productivity. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 26:489-511
   affix type, productivity, and affixal homonymy as predictors of whole-word processing
6. Alegre, M., & Gordon, P. (1999). Frequency effects and the representational status of regular inflections. Journal of Memory and Language, 40, 41–61.
   Only the most frequent inflected forms have whole-word representations.
7. Baayen, H., Dijkstra, T., & Schreuder, R. (1997). Singulars and plurals Dutch: Evidence for a parallel dual-route model. Journal of Memory and Language, 37, 94–117.
   Whether you see frequency effects or not in inflected words can depend on whether the affix is ambiguous (Dutch has two *-en*s)
8. Tabak, Wieke, Robert Schreuder and R. Harald Baayen. 2010. Producing inflected verbs: A picture naming study.
   Effects of paradigm entropy and frequency on speed of naming in regulars and irregulars
9. Bien, H., Levelt, W., and Baayen, R.H. 2005. Frequency effects in compound production. Proceedings of the National Academy of Science 102:17876- 17881.
   also fancier predictors, such as paradigm entropy
10. Jannsen, N., Bi, Y., and Caramazza, A. ms. A tale of two frequencies: determining the speed of lexical access for English and Mandarin Chinese compounds.
    effect of frequency on compound production
11. Jarema, G., Busson, C., and Nikolova, R. 1999. Processing compounds: A crosslinguistic study. *Brain & Language* 68:362-369.
    Effect of frequency, semantic transparency, and headedness on compound repetition speed
12. Koester, D., Gunter, T.C., Wagner, S., and Friederici, A.D. 2004. Morphosyntax, prosody, and linking elements: The auditory processing of German nominal compounds. *Journal of Cognitive Neuroscience* 16:1647-1668.
    Role of prosody (Exp. 3) in differentiating compounds and simple nouns

Effects of phonology (alternations, resyllabification, other prosody...)

13. Fiorentino, Robert. 2006. “Rapid Structure Prediction in Lexical Access: Rendaku in the Processing Japanese Spoken Compounds”, ch. 5 of *Lexical structure and the nature of linguistic representations*. Dissertation, U of Maryland.
    Decomposition in spite of phonological change.
14. Kemps, Rachèl J. J. K. ; Lee H. Wurm; Mirjam Ernestus; Robert Schreuder; Harald Baayen. 2005. Prosodic cues for morphological complexity in Dutch and English. *Language and Cognitive Processes*. 20 (1/2): 43-73.
    Effect of prosodic information on lexical decision; interactions with productivity
15. Järvikivi, Juhani and Jussi Niemi. 2002. Form-Based Representation in the Mental Lexicon: Priming (with) Bound Stem Allomorphs in Finnish. *Brain and Language* 81: 412-423.
    stem allomorphy doesn’t impede priming

Effects of semantic opacity/transparency

16. Pollatsek, Alexander ; Jukka Hyönä . 2005. The role of semantic transparency in the processing of Finnish compound words. *Language and Cognitive Processes*. 20 (1/2): 261-290.
    role turned out to be: very little
17. Feldman, Laurie Beth; Emily G. Soltano; Matthew J. Pastizzo; Sarah E. Francis. 2004. What do graded effects of semantic transparency reveal about morphological processing? *Brain and Language* 90: 17-30.
18. Roelofs, A., and Baayen, H. 2002. Morphology by itself in planning the production of spoken words. *Psychonomic Bulletin & Review* 9:132-138.
    Semantic transparency affects how long it takes to produce a prefixed word.

Left-to-right issues, and discontiguous morphemes

19. Boudelaa, Sami; William D. Marslen-Wilson. 2005. Discontinuous morphology in time: Incremental masked priming in Arabic. *Language and Cognitive Processes*. 20 (1/2): 207-260.
20. Colé, P., Beauvillain, C., & Segui, J. (1989). On the representation and processing of prefixed and suffixed derived words: A differential frequency effect. Journal of Memory and Language, 28, 1–13.
    like the title says
21. Plag, Ingo & Harald Baayen. 2009. Suffix ordering and morphological processing. *Language* 85(1): 109-152
22. Meyer, Antje S. 1990. The time course of phonological encoding in language production: the encoding of successive syllables of a word. *Journal of Memory and Language* 29: 524-545.
    Not about morphology, but useful background.
23. Cholin, Joana; Niels O. Schiller; Willem J.M. Levelt. 2004. The preparation of syllables in speech production. *Journal of Memory and Language* 50: 47-61.
    compares suffixed Dutch words where the stem-final C does or doesn't resyllabify.
24. Chen, Jenn-Yeu; Train-Min Chen; Gary S. Dell. Word-form encoding in Mandarin Chinese as assessed by the implicit priming task. *Journal of Memory and Language* 46: 751-781.
    tone as separate planning unit

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