Behavi-or-al measure-s of morph-eme pro-cess-ing

> The "morpheme lexicon" and the "word lexicon" have different similarity relations

Decomposition theory

Storage theory

magnet

magnet ism

magnet ic

magnet ize

?

magnetize

magnolia

magnetic

magnet

magnetism

magnificent

Etc...

> Similarity relations matter for priming!

Decomposition theory   Storage theory

magnet

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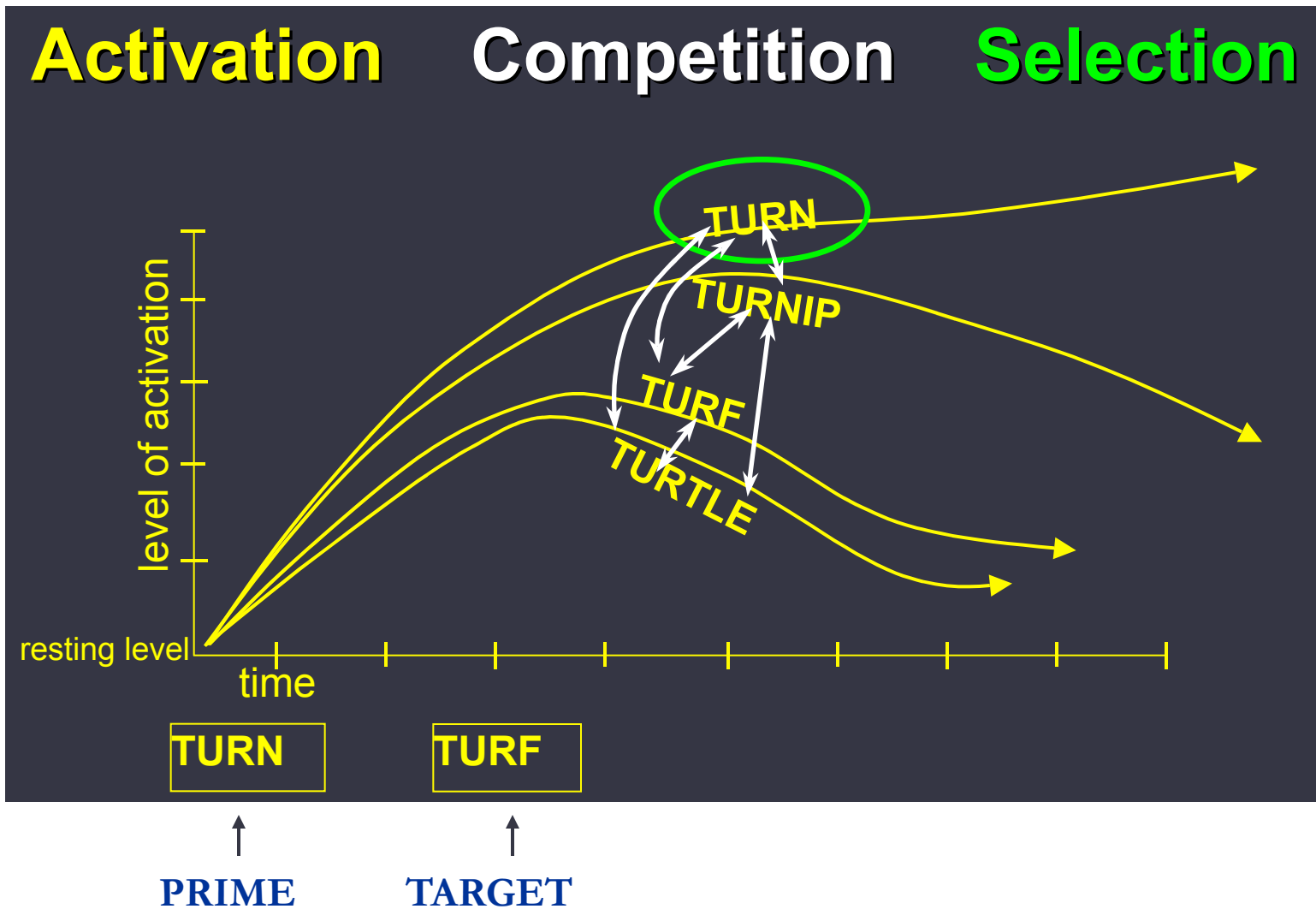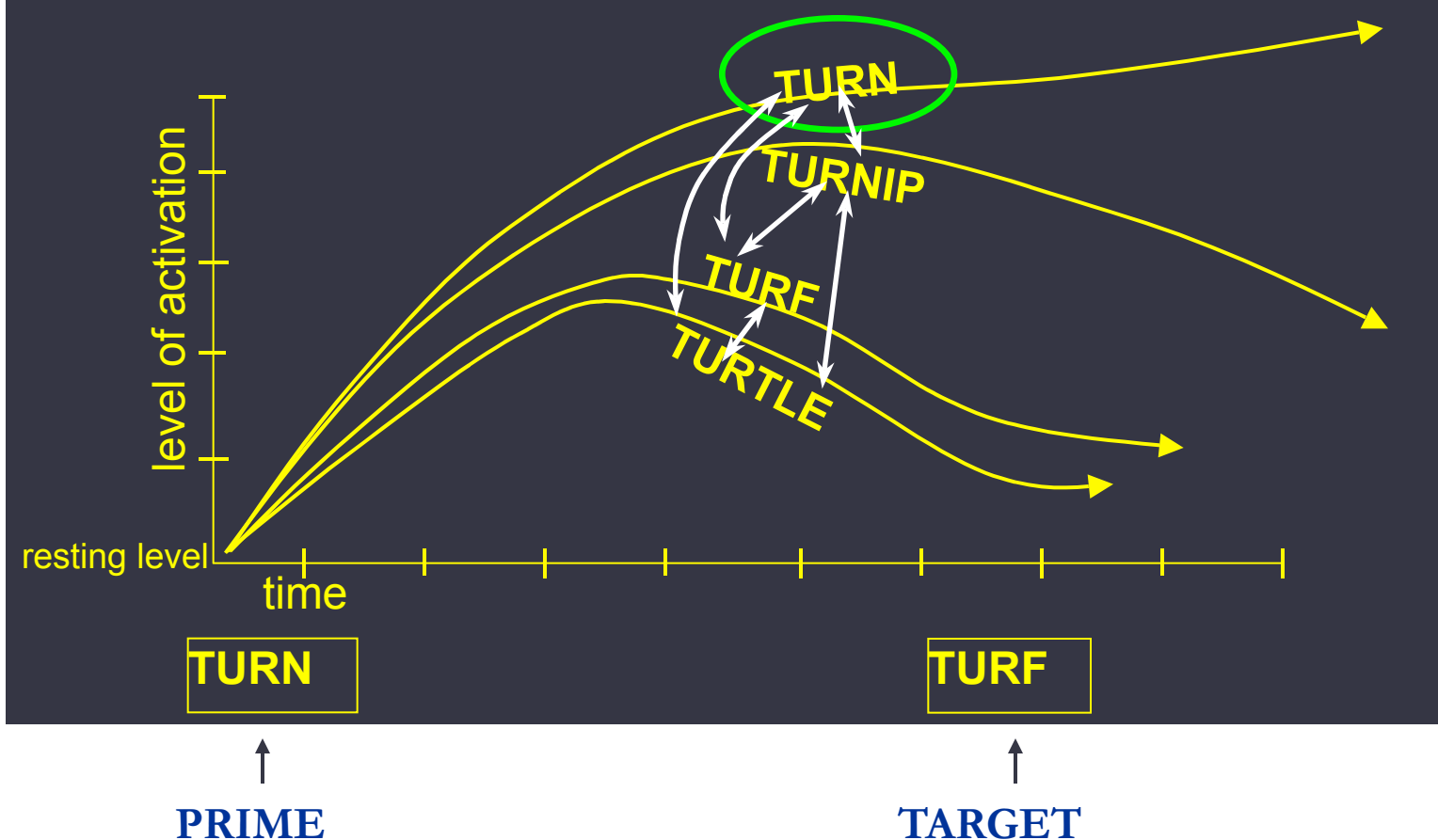
Etc…

Priming basics

In a lexical decision task:

- **Semantic similarity: helps!**
  - **doctor – nurse**
    - **doctor** activates **nurse** and thus, when **nurse** is encountered, it is already active
- **Phonological similarity: first helps, then hurts!**
  - **turn – turf**
    - **turn** activates **turf**, so if **turf** is presented quickly after **turn**, you may get some positive priming
    - But ultimately, recognizing **turn** requires rejecting **turf**, so if a longer interval passes before the target is presented, **turf** may suffer some inhibition.

TURF is presented before its activation starts to decrease due to inhibition from TURN ➔ Positive priming compared to unrelated control (e.g., CLOCK - TURF)

TURF is presented after its activation has been suppressed by TURN ➜ No priming or even slower processing times than in an unrelated control (e.g., CLOCK - TURF).

Priming basics

In a lexical decision task:

- **Semantic similarity: helps!**
  - **doctor – nurse**
    - **doctor** activates **nurse** and thus, when **nurse** is encountered, it is already active
- **Phonological similarity: first helps, then hurts!**
  - **turn – turf**
    - **turn** activates **turf**, so if **turf** is presented quickly after **turn**, you may get some positive priming
    - But ultimately, recognizing **turn** requires rejecting **turf**, so if a longer interval passes before the target is presented, **turf** may suffer some inhibition.
- **Identity: helps a LOT!**
  - **dog – dog**
  - Second presentation much faster since that very word was just recognized as the right match to the previous item.

Predictions

Decomposition theory

magnet

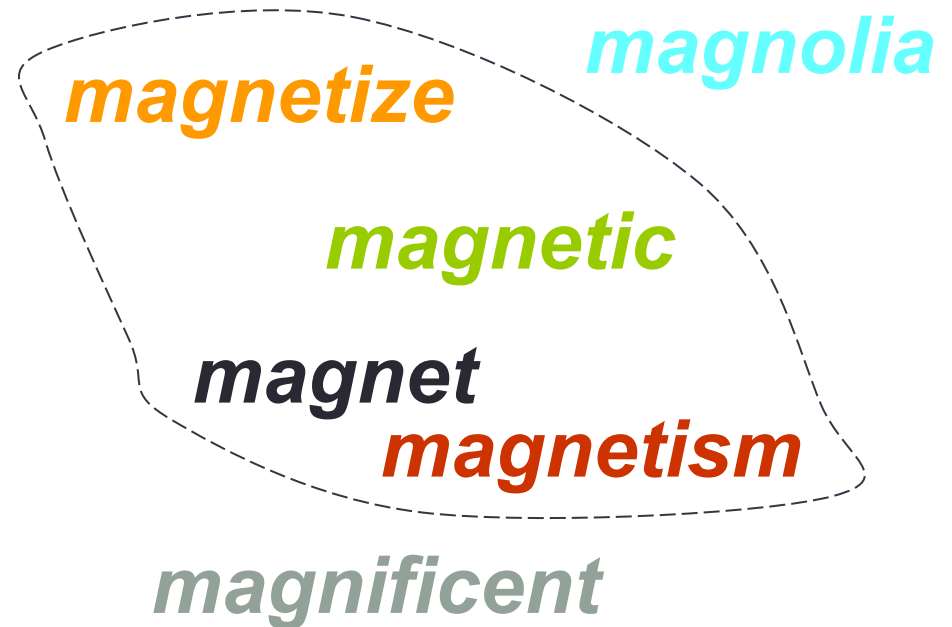*magnet* **ism**

magnet **ic**

magnet **ize**
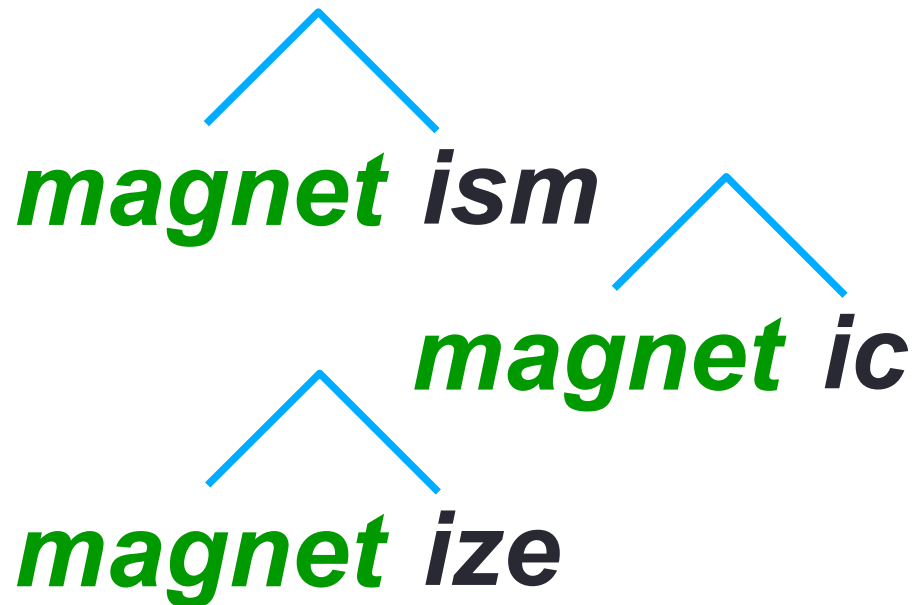
Morphologically related words should elicit identity priming (repetition priming)

Predictions

All priming effects between morphological relatives need to be explainable in terms of similarity effects.

Storage theory

magnetize

magnolia

magnetic

magnet

magnetism

magnificent

Etc…

Do morphologically related words elicit repetition priming effects or cumulative similarity effects?

- Rastle et a. (2000) tested for the priming effects of
  - Meaning similarity: **cello - VIOLIN**

    <unrel> - VIOLIN

  - Form/sound similarity: **typhoid - TYPHOON**

    <unrel> - TYPHOON

  - Meaning + form similarity: **screech - SCREAM**

    <unrel> - SCREAM

  - Morphological relatedness: **adapter - ADAPTABLE**

    <unrel> - ADAPTABLE

  - Identity: **church - CHURCH**

    <unrel> - CHURCH

- Lowercase visual prime followed by uppercase visual target.
- Lexical decisions to target only.
- Priming assessed with respect to unrelated controls.

Rastle, K., Davis, M. H., Marslen-Wilson, W. D., & Tyler, L. K. (2000). Morphological and semantic effects in visual word recognition: A time-course study. Language and cognitive processes, 15(4-5), 507-537.

Stimulus Onset Asynchrony (SOA)

- The interval between the onset of the prime and the onset of the target.

PRIME

cello

TARGET

VIOLIN

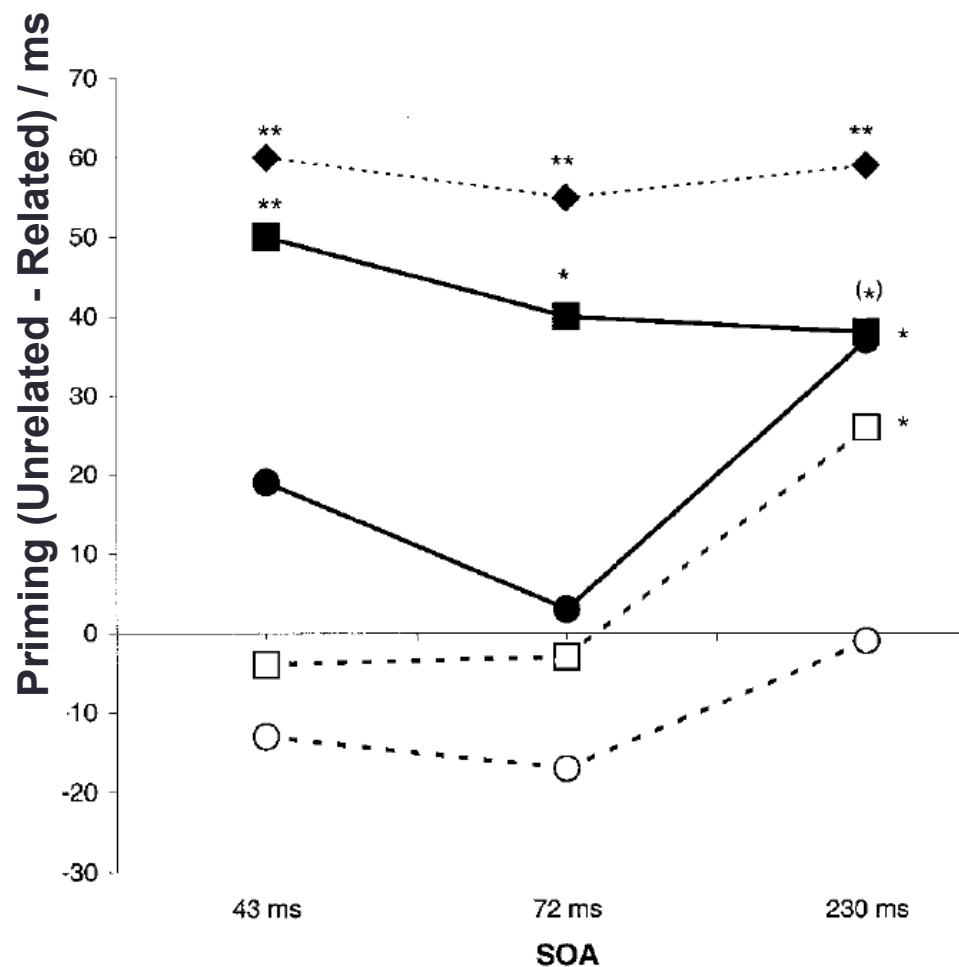Time [msec] 0   50   100   150   200   250   300   350

SOA = 200ms
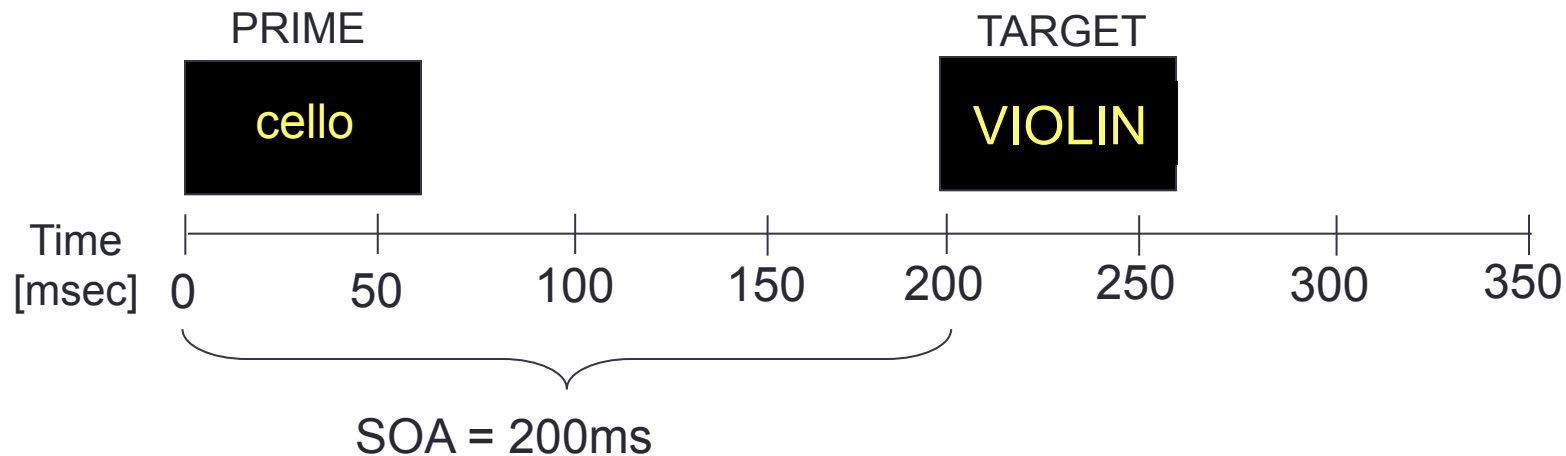
- Priming effects differ in how fast they develop and how long they last.
- Rastle et al. used 3 different SOA's:
  - 43 msec
  - 73 msec
  - 230 msec

Results (Rastle et al. 2000)

How much faster or slower were subjects' lexical decisions to the related than to the unrelated conditions?
Positive numbers = priming. Negative numbers = inhibition.

Legend	Description
···◆··· Identity **church-CHURCH**	Positive priming all around.
─■─ +Morph +Sem +Orth **adapter-ADAPTABLE**	Positive priming all around.
─●─ -Morph +Sem +Orth **screech-SCREAM**	Slowly developing priming effect.
·□· -Morph +Sem -Orth **cello-VIOLIN**	Slowly developing priming effect.
·○· -Morph -Sem +Orth **typhoid-TYPHOON**	No reliable effects.

Y-axis: Priming (Unrelated - Related) / ms
X-axis: SOA — 43 ms, 72 ms, 230 ms

Conclusions

- The effect of morphological relatedness patterned
  - □ similarly to the effect of identity (church – CHURCH)
  - □ not similarly to the effect of combined form and meaning similarity (screech – SCREAM)

- This follows straightforwardly from the decomposition theory but not from the storage theory.

- If our brains perceive morphemes, not whole words, when and where in the brain does this morpheme spotting occur?