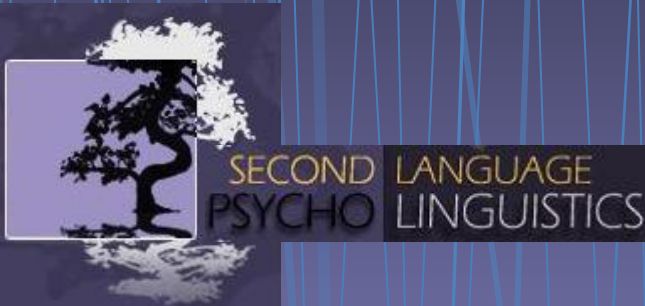


“They *sound* the same, but I *know*  
they are different”

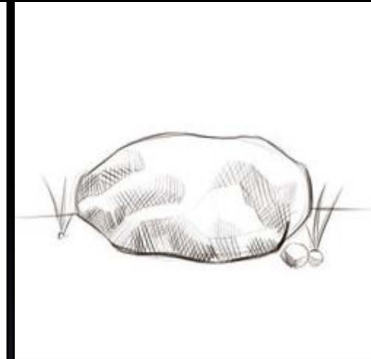
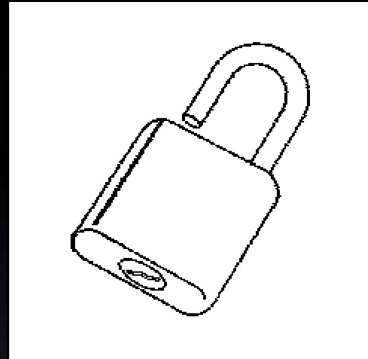
Dissociated mechanisms for phonetic  
and lexical learning in a second language

Isabelle Darcy  
Indiana University

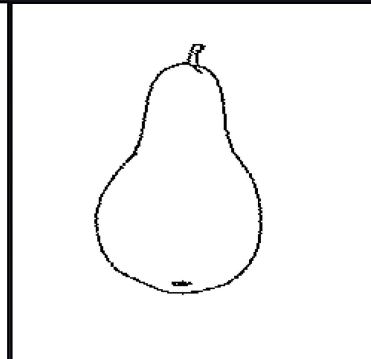
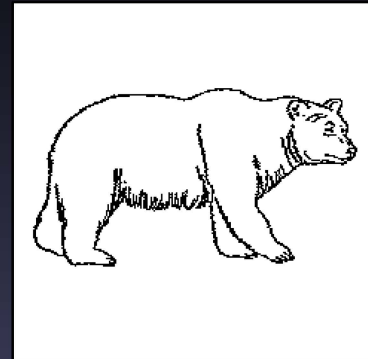
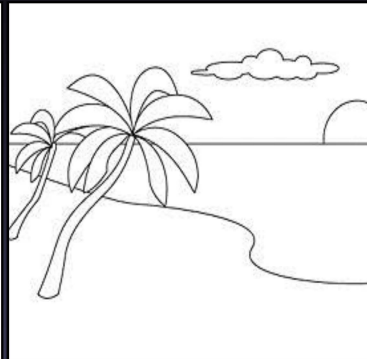
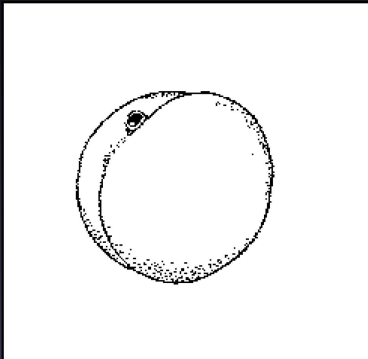
22 November 2014  
Universität Stuttgart



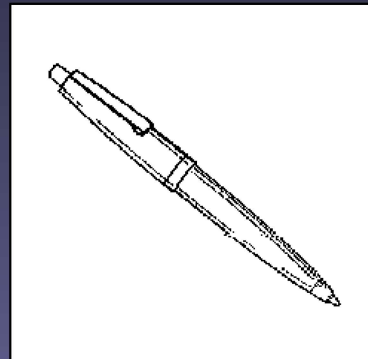
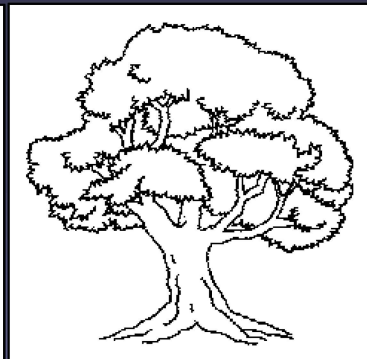
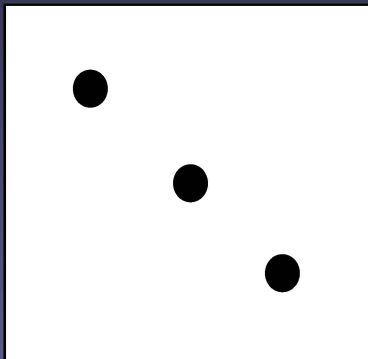
# L2 Learners often confuse words...



Japanese



Arabic



Quebec  
French

# And that's why...



Picture: Courtesy of Ryan Lidster; taken in Jerusalem

## Overview of the talk

- Spoken word recognition and the L2 mental lexicon
  - phonetic perception and lexical encoding are related
  - L2 learners differ from native speakers in lexical behavior
- **Experiment series 1**: Merged L2 lexical representations?
- **Experiment series 2**: Fuzzy or not fuzzy? Two hypotheses about the form of words in the L2 lexicon
- Discussion

# SPOKEN WORD RECOGNITION

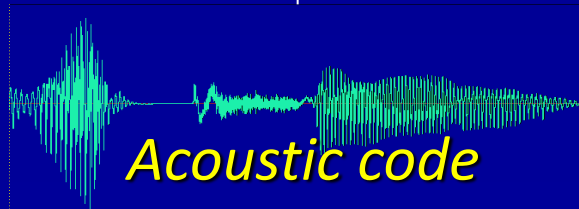
# Stages in perception

*Conceptual, syntactic,  
orthographic codes*

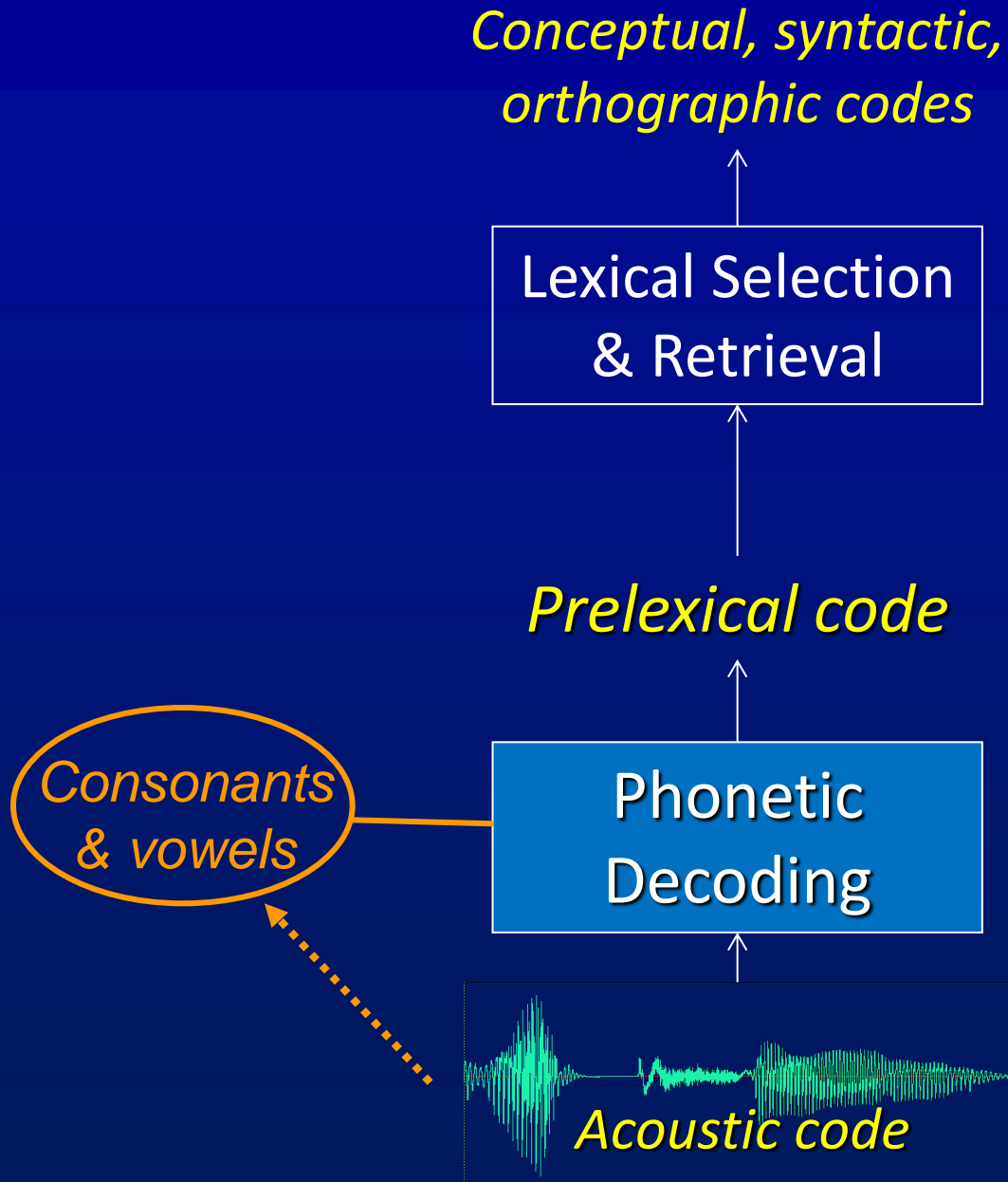
Lexical Selection  
& Retrieval

*Prelexical code*

Phonetic  
Decoding



# Stages in perception



# Stages in perception

*Conceptual, syntactic,  
orthographic codes*

Lexical Selection  
& Retrieval

*Prelexical code*

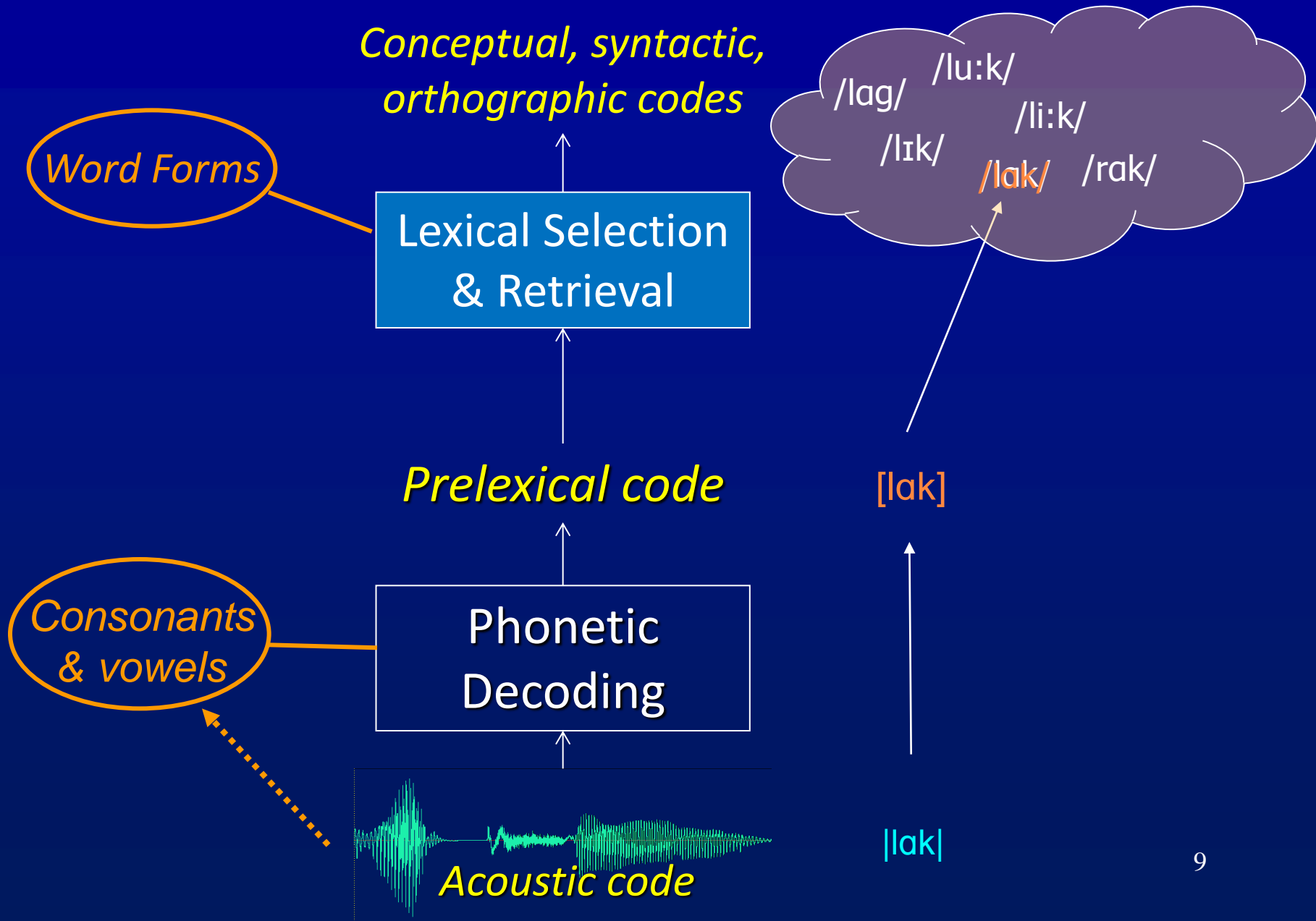
Phonetic  
Decoding

*Consonants  
& vowels*





# Stages in perception



# Spoken word recognition

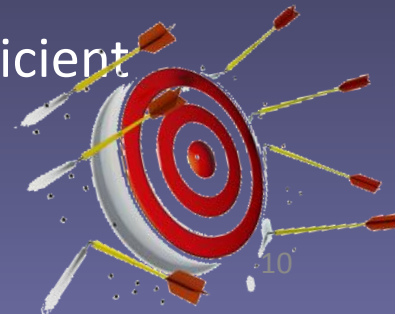
## Recognizing words in L1

- Cohort model
  - Activation, competition
  - Selection
  - (Marslen-Wilson, 1987)
- Input is perceived reliably
- Lexical representations are accurate
- Error free and fast recognition



## Recognizing words in L2

- Much more complex
  - Competition from both lexicons
  - (Ju & Luce, 2004; Marian & Spivey, 2003; Spivey & Marian, 1999; Costa & Santesteban, 2004)
- Spoken input perception is less reliable (Sebastian-Galles, 2005)
  - More competitors (unnecessarily) activated (Broersma, 2012)
- Lexical representations might be fuzzy
- Slower and less efficient recognition



# Stages in non-native perception

*Conceptual, syntactic, orthographic codes*

Lexical Selection & Retrieval

*Prelexical code*

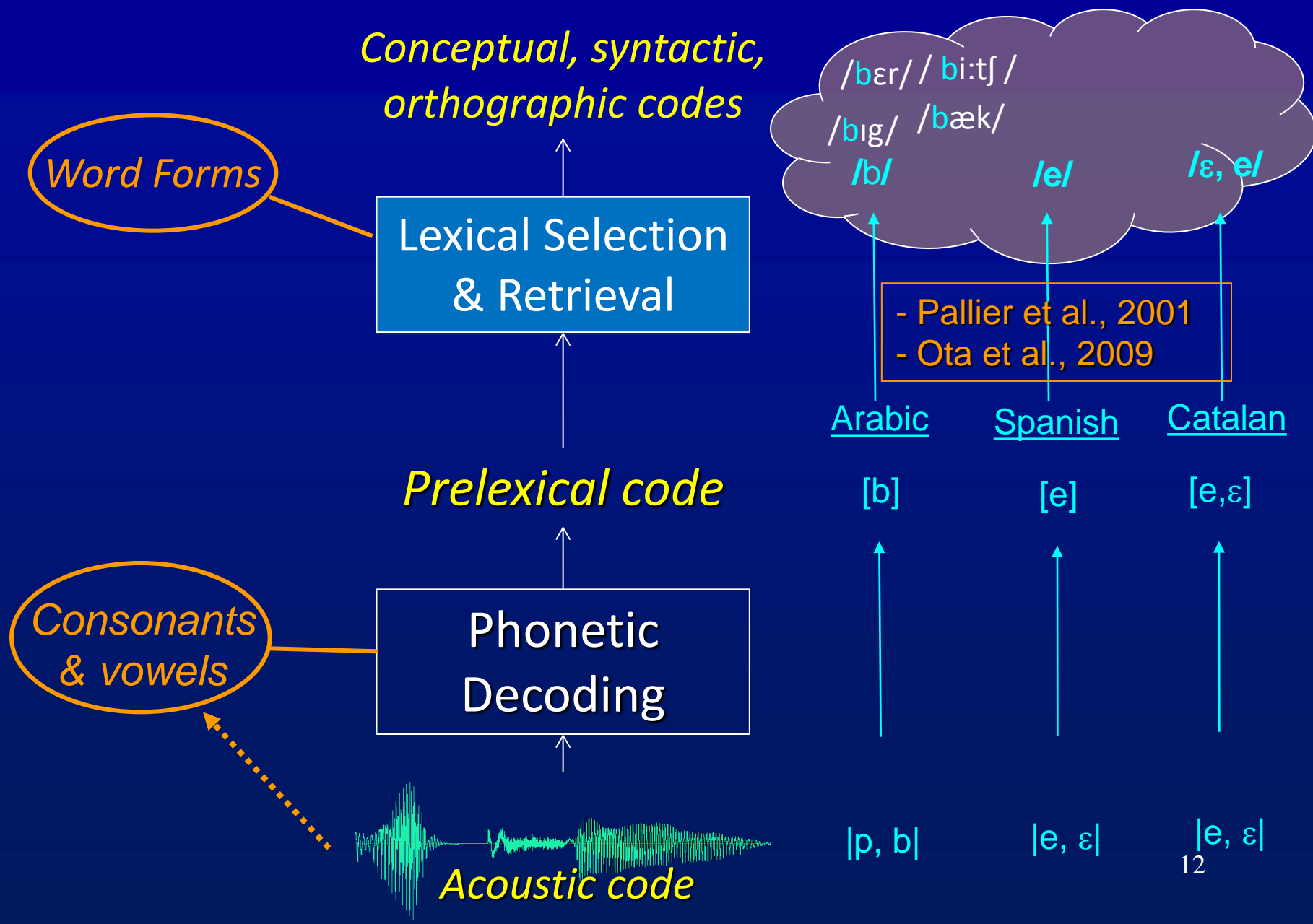
Phonetic Decoding

Consonants & vowels



| <u>Arabic</u>                                    | <u>Spanish</u>               | <u>Catalan</u>           |
|--|------------------------------|--------------------------|
| [b]  | [e]                          | [e, ε]                   |
| - Assimilate to the phonetically closest segment | - acquired early & bottom up | - not very plastic in L2 |
| p, b   | e, ε                         | e, ε                     |

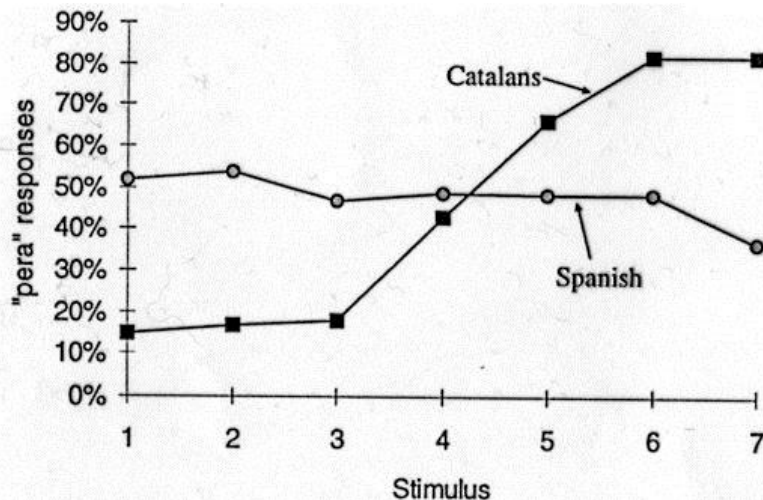
# Lexical encoding for L2 words



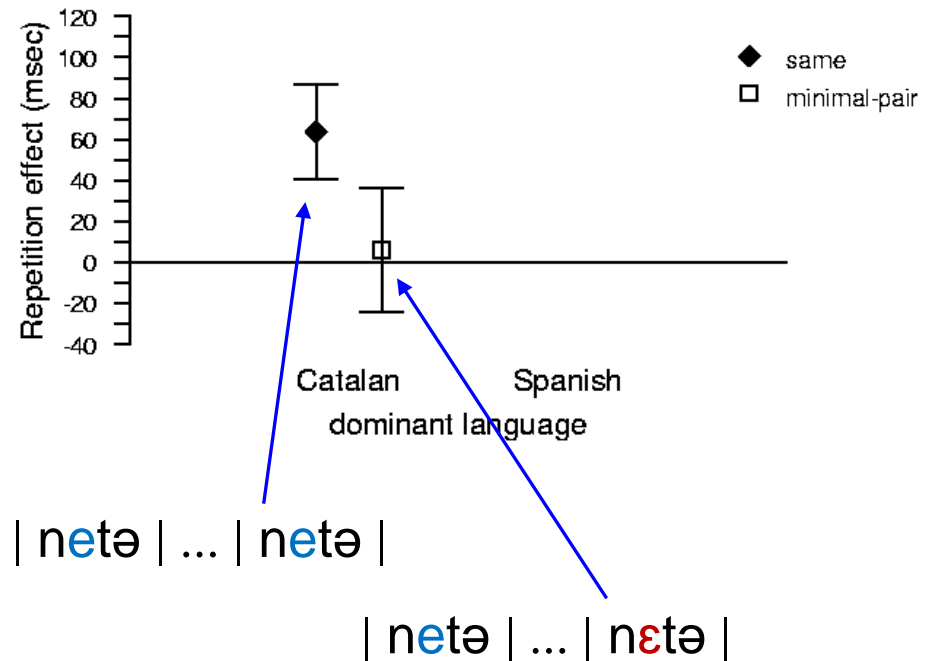
# Segmental “deafness”

Spanish-Catalan bilinguals (AoL : age 4) (*Pallier et al, 1997, 2001*)

[e] vs [ɛ] classification

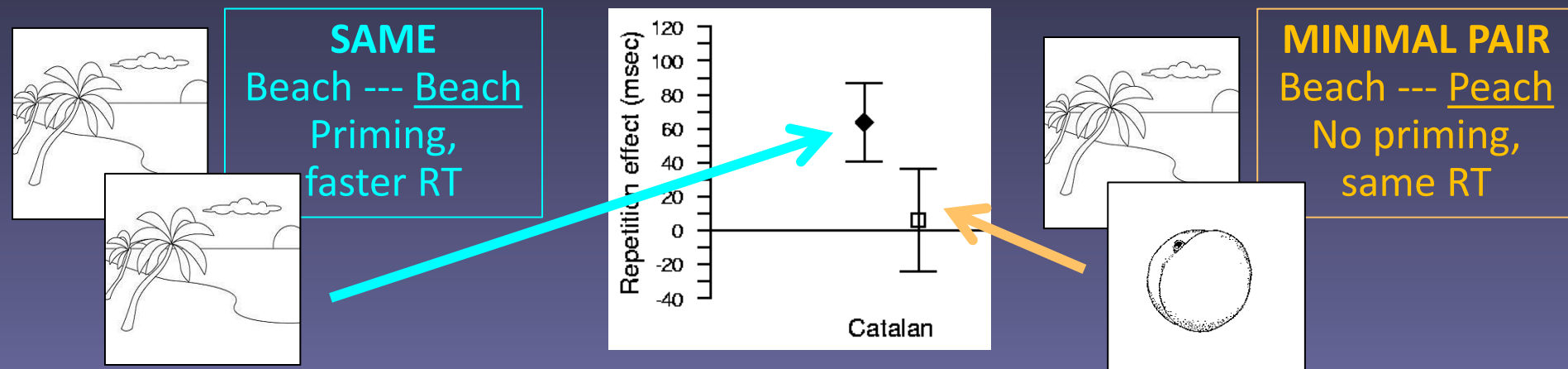


Lexical decision: repetition priming



# Lexical decision with repetition priming

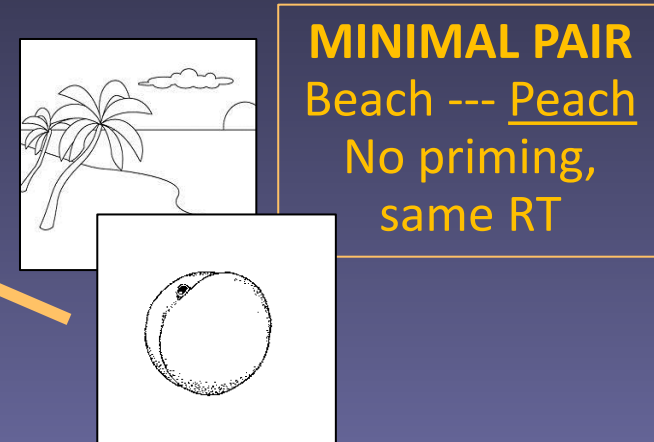
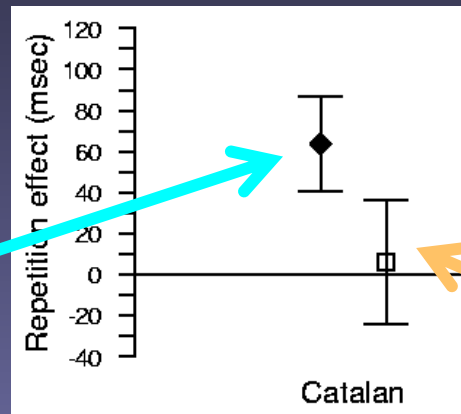
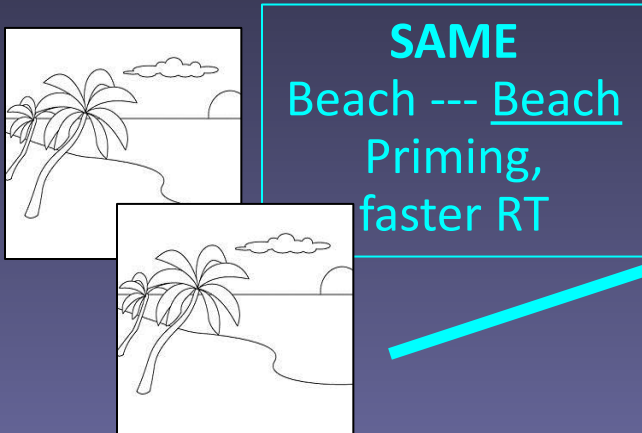
- Speeded auditory Lexical decision („real word?“)
- Word pairs separated by 8 – 20 items in between
- Repetition effect: faster decision on an item presented a second time
  - With lexical decision, or other types of decision
  - Task „taps“ lexical level, because the facilitation (priming) effect is observed only on words, not for non-words
- Facilitation (RT) on conditions „*same*“ vs. „*minimal pair*“



# Lexical decision with repetition priming

- Speeded auditory Lexical decision („real word?“)
- Word pairs separated by 8 – 20 items in between
- Repetition effect: faster decision on an item presented a second time
  - With lexical decision task
  - Task „taps“ lexicality effect is observed
- Facilitation (RT) of

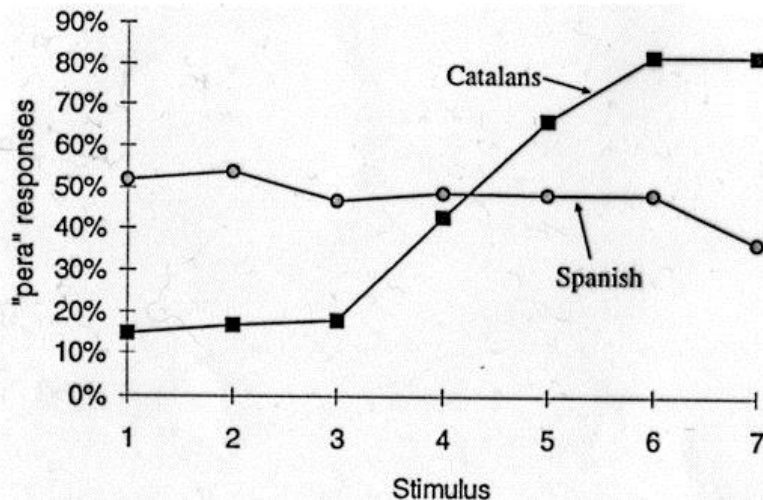
This is the case **ONLY** if lexical representations are different for **beach** and **peach**. If both are the same (e.g. for L1 Arabic), they will likely prime each other as if they were repetitions (see Pallier et al., 2001).



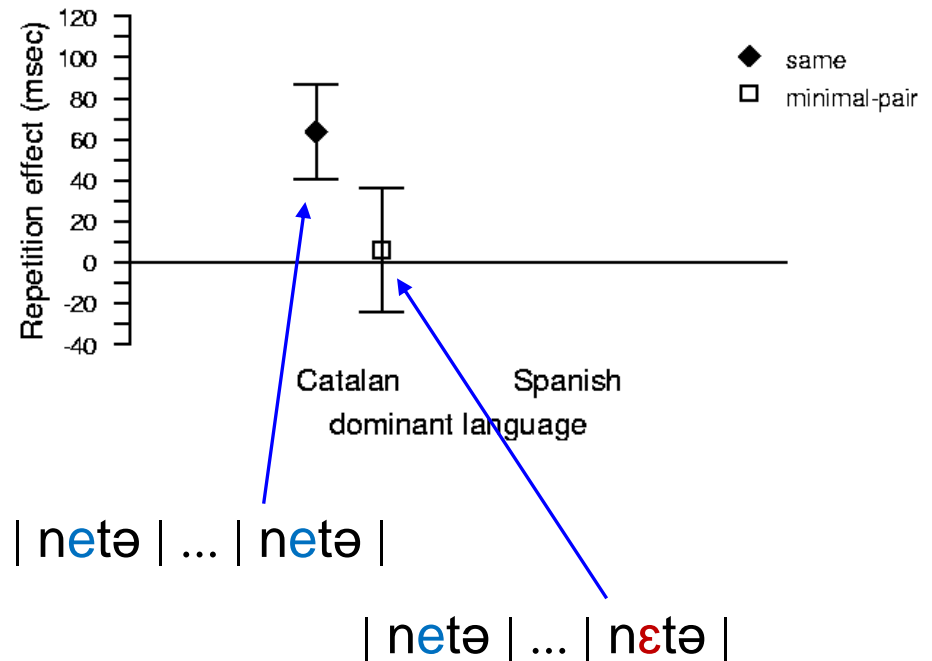
# Segmental “deafness”

Spanish-Catalan bilinguals (AoL : age 4) (*Pallier et al, 1997, 2001*)

[e] vs [ɛ] classification



Lexical decision: repetition priming

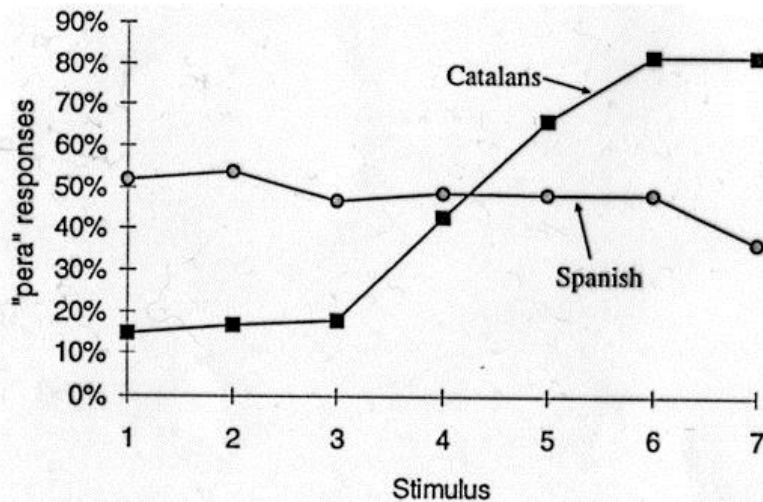




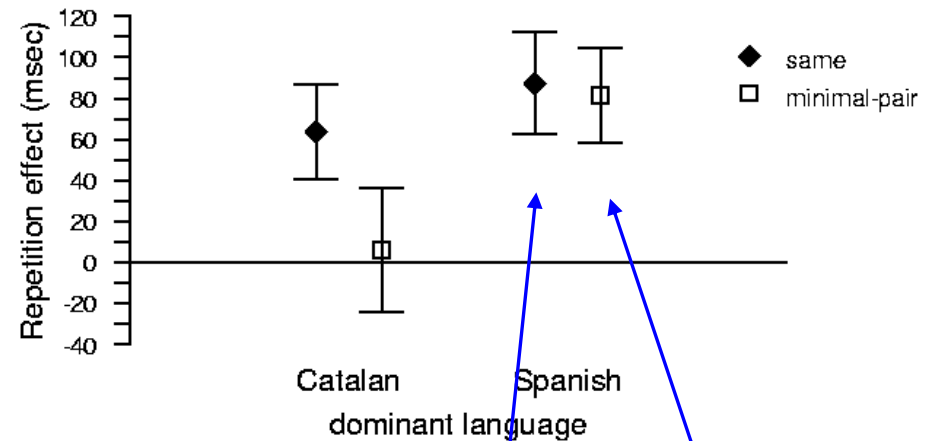
# Repetition priming for minimal pairs

Spanish-Catalan bilinguals (AoL : age 4) (*Pallier et al, 1997, 2001*)

[e] vs [ɛ] classification



Lexical decision: repetition priming



| netə | ... | netə |

| netə | ... | nɛtə |

# But Weber & Cutler (2004) found an asymmetry in lexical activation...

[ɛ] – [æ] confusable for Dutch listeners

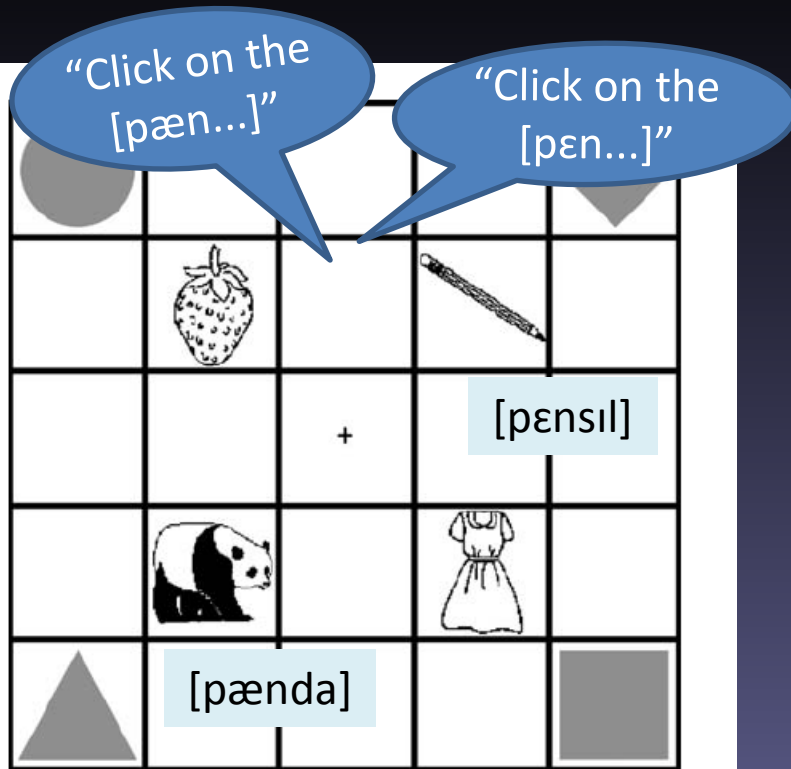


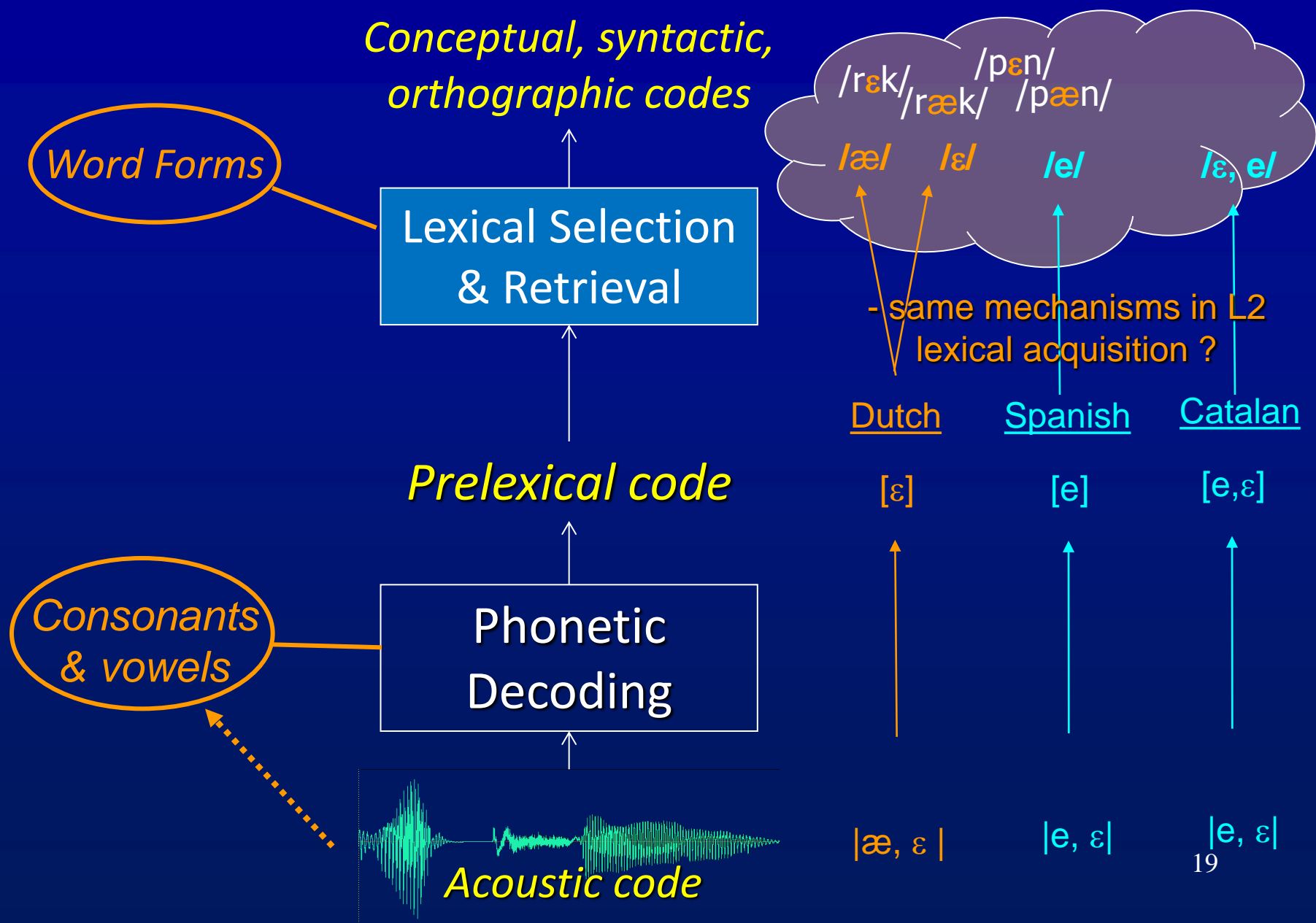
Fig. 1. Example of a visual display presented to participants.

- When Dutch hear |pæn...|, they activate both „pencil“ and „panda“
- When Dutch hear |pɛn...|, they do **not** look at the „panda“

• /ɛ/ is the vowel closest to a Dutch category => “dominant”

So, lexical separation is possible despite perceptual problems

# Lexical encoding for L2 words



Is there a dissociation  
between category and  
lexical learning in L2?

**EXPERIMENT SERIES I**

[i]  
[ɛ]

[y]  
[œ]

[u]  
[ɔ]

Stimuli:

# FRONT ROUNDED VOWELS

# Participants and stimuli

## L2 French

Front/Back rounded vowels

[front rounded] is new [œ] [y]

[back rounded] is familiar [ɔ] [u]

## L1 English

**Intermediate** [max. 4 semesters  
N = 19]

**Advanced** [> 6 months in  
France, 8 semesters, N = 19]

## French Native Speakers

[N = 8]

## L1 English (no French)

[N = 13]

## L2 French

|             |                       |   |
|-------------|-----------------------|---|
| Test (high) | [mub] – [myb] – [myb] | B |
| Test (mid)  | [mɔb] – [mœb] – [mɔb] | A |
| Control     | [sun] – [vub] – [sun] | A |
|             | [tid] – [tɛd] – [tɛd] | B |

|                  |         | <u>Word</u>            | <u>Word</u> | <u>Non Word</u>            | <u>Non Word</u> |
|------------------|---------|------------------------|-------------|----------------------------|-----------------|
| <b>L2 French</b> | /u/-/y/ | sourd                  | sure        | *choupe                    | *chupe          |
| <b>Test</b>      | /ɔ/-/œ/ | lors                   | leur        | *blove                     | *bleuve         |
| <b>Control</b>   | /i/-/y/ | vie                    | vue         | *nir                       | *nur            |
|                  | /e/-/œ/ | père                   | peur        | *lef                       | *leuf           |
| <b>Fillers</b>   |         | bague, homme,<br>neige |             | *chane,<br>*bromme, *dière |                 |

ABX: Categorization

Lexical Decision with repetition priming

# RESULTS

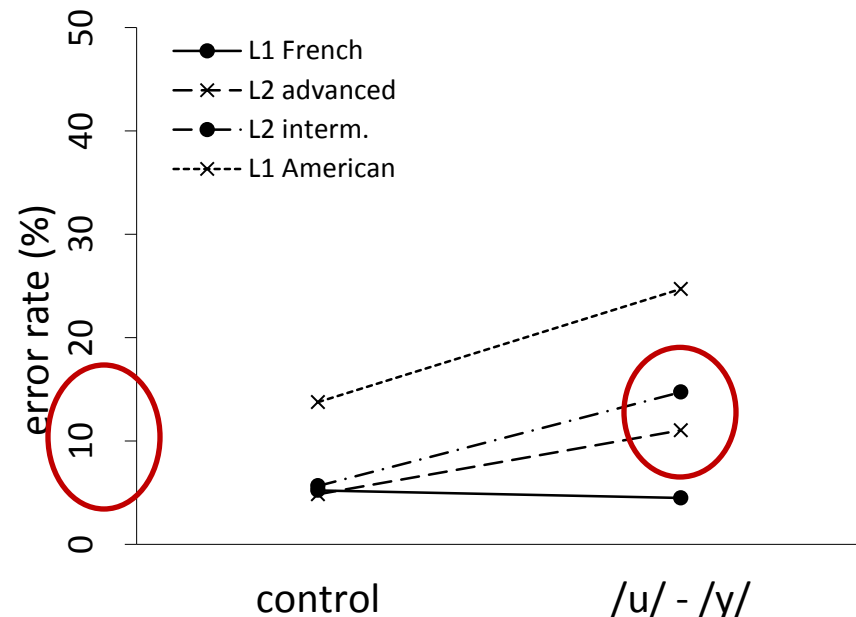


# High vowels: High segmental accuracy but repetition priming!

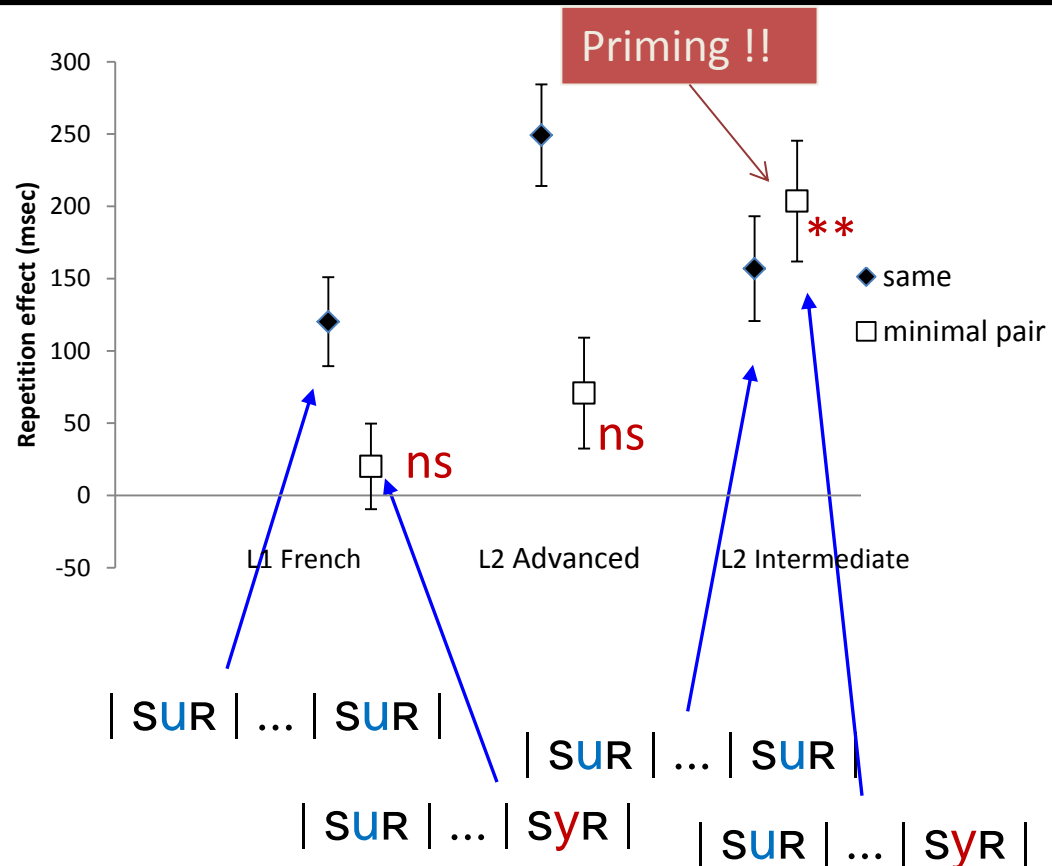
English-French bilinguals (AoL : after 10) (*Darcy et al., 2012*)

[u] vs [y] categorization (ABX)

Lexical decision: repetition priming



Accurate perception (around 10% error for either L2 group)



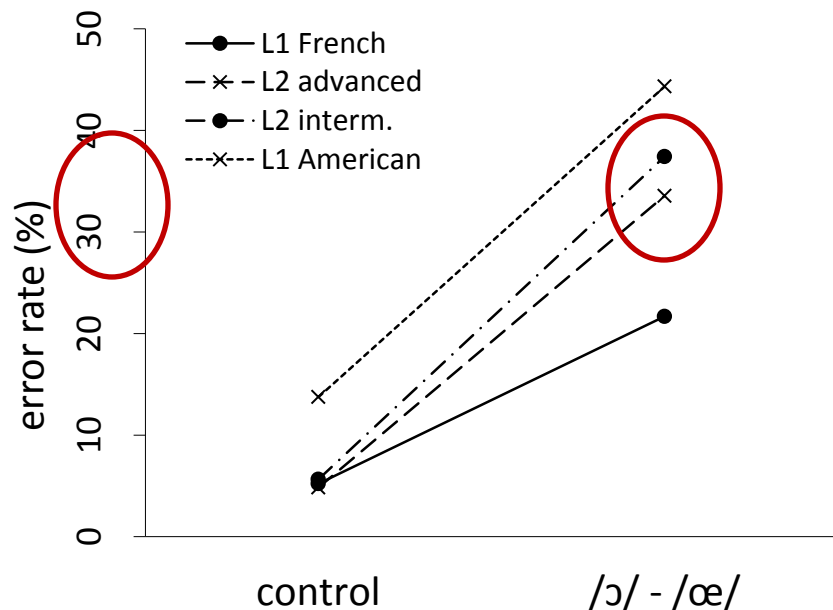
| SUR | ... | SUR |      | SUR | ... | SUR |  
 | SUR | ... | SYR |      | SUR | ... | SYR |

# Mid vowels: Lower accuracy, but NO repetition priming

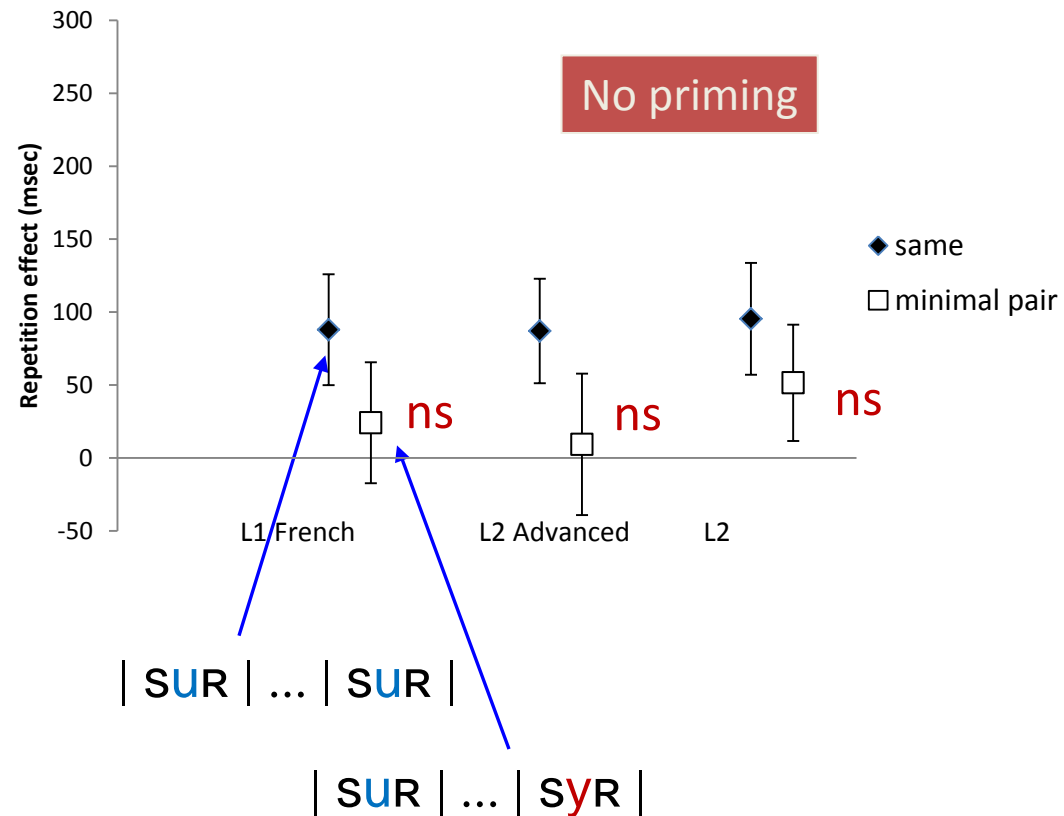
English-French bilinguals (AoL : after 10) (*Darcy et al., 2012*)

[ɔ] vs [œ] categorization (ABX)

Lexical decision: repetition priming



Less accurate perception (around 35% error for both L2 groups)



# Summary

ABX

Accurate categorization of high vowels [u-y]

Less accurate for mid vowels [ɔ-œ]

Advanced are *not* significantly more accurate than intermediates, both are not target-like

## Minimal Pair condition

[u-y] : for Intermediates, priming! => merged representations!

[u-y] : for NS and Advanced, no priming => separate representations

[ɔ-œ] (and [i-y]): for all groups, no priming => separate representations

Lexical  
decision

# L2 phonological acquisition

- Might proceed differently from L1 phonological acquisition
- Converging evidence towards dissociated mechanisms :
  - Category acquisition
  - Formation of contrastive lexical representations
- Lexical contrast does not always result in a benefit at the level of categories in L2 acquisition
- What are the mechanisms that allow development of lexical contrast in absence of robust sound categorization?

Lexical  
representations  
are merged!

Lexical  
representations  
are separated!

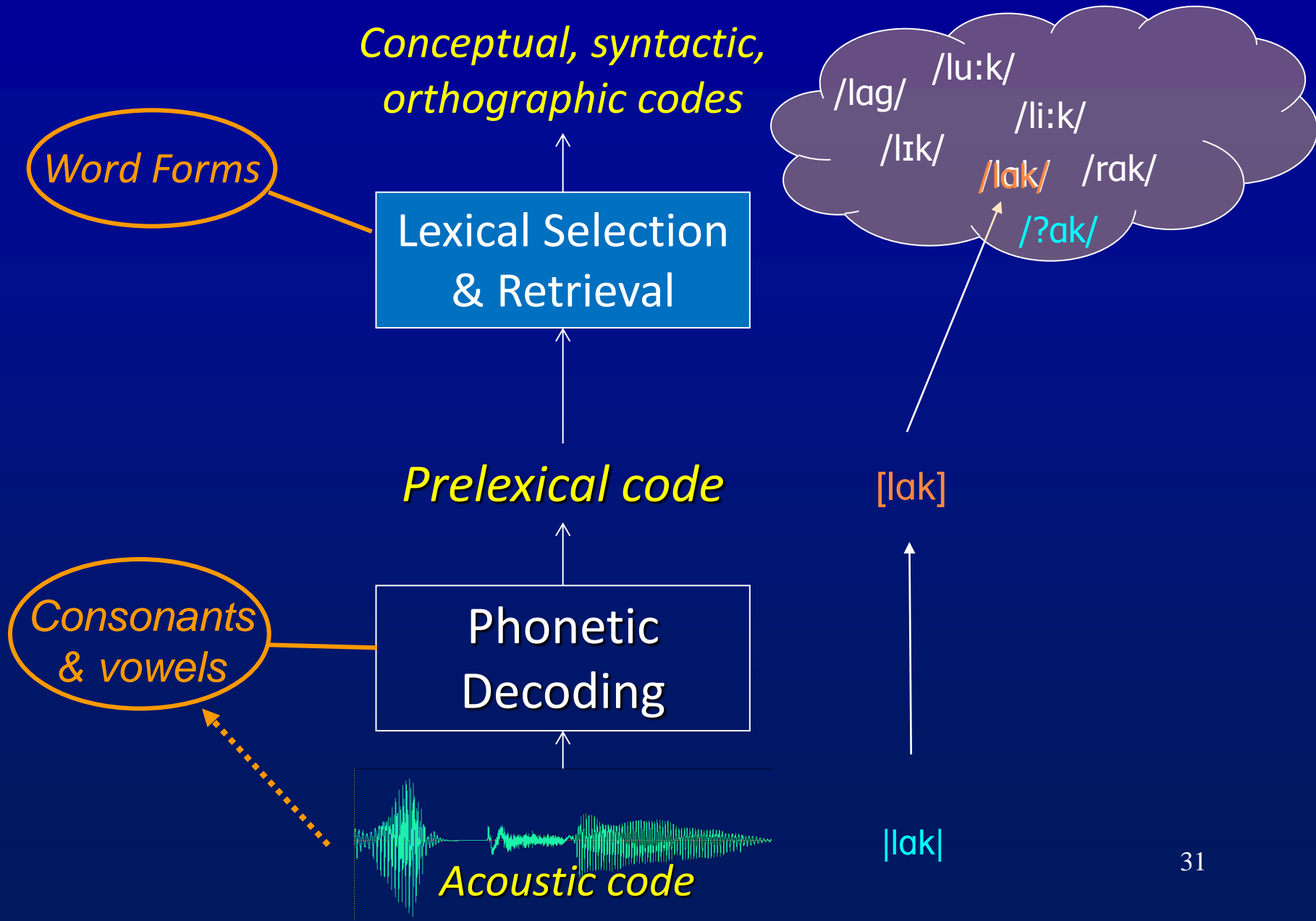


What about the  
phonological form of L2  
lexical representations?

To what extent are lexical  
representations in L2  
target-like?

**EXPERIMENT SERIES II**

# Stages in perception



**PHONETIC CATEGORIZATION**

**LEXICAL REPRESENTATIONS**

**HYPOTHESES**



# “old” and “new” sounds

- German vowels: /o/ and /ø/



[honiç]



[køniç]

- Only /o/ exists in English
- For English L1 listeners:

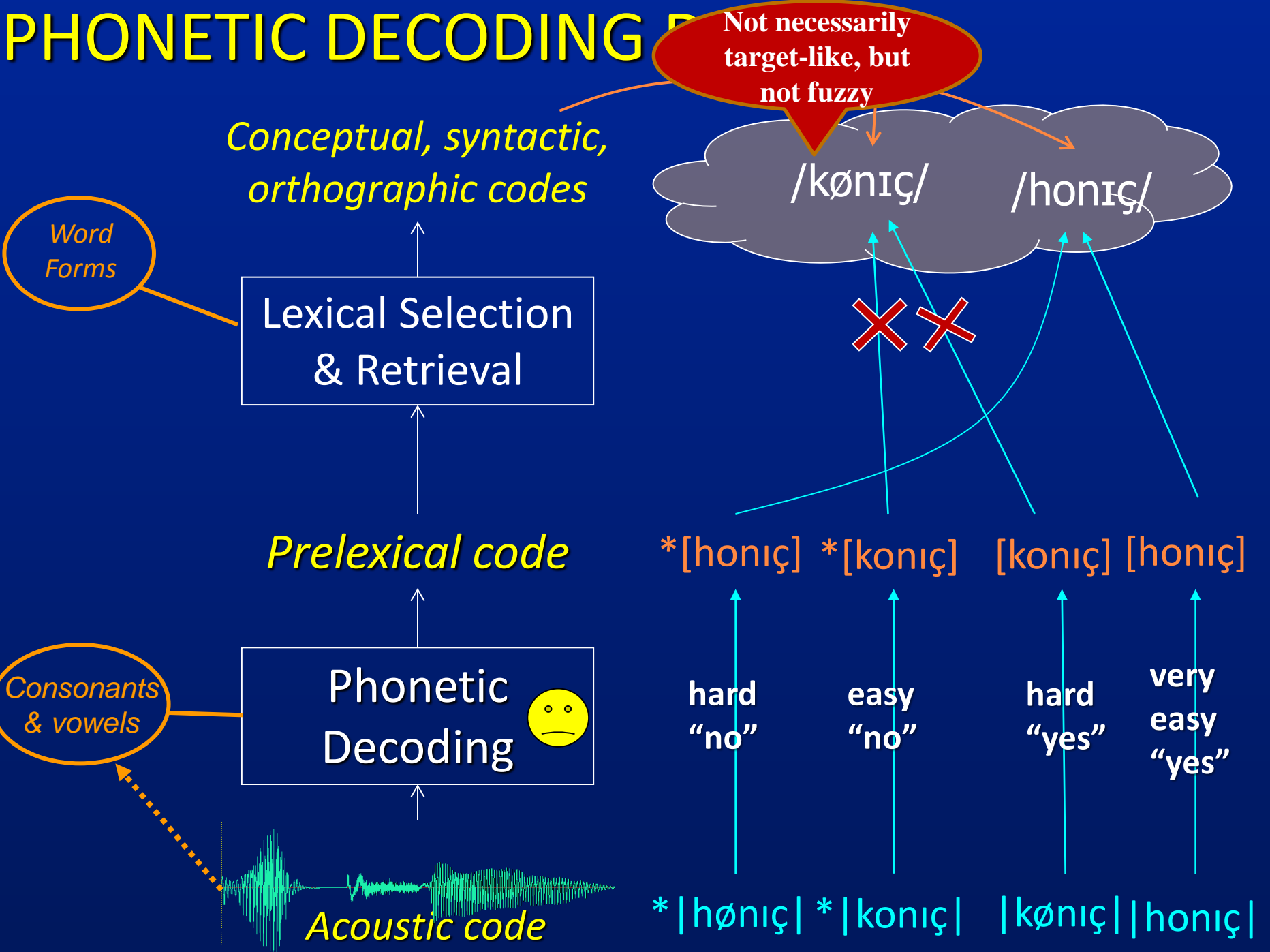
[o] is old

[ø] is new

/o/ is the vowel closest to an English category => “dominant”

# PHONETIC DECODING DEFICIT

# PHONETIC DECODING



Not necessarily target-like, but not fuzzy

Conceptual, syntactic, orthographic codes

Word Forms

Lexical Selection & Retrieval

Prelexical code

Consonants & vowels

Phonetic Decoding

/køniç/ /honiç/

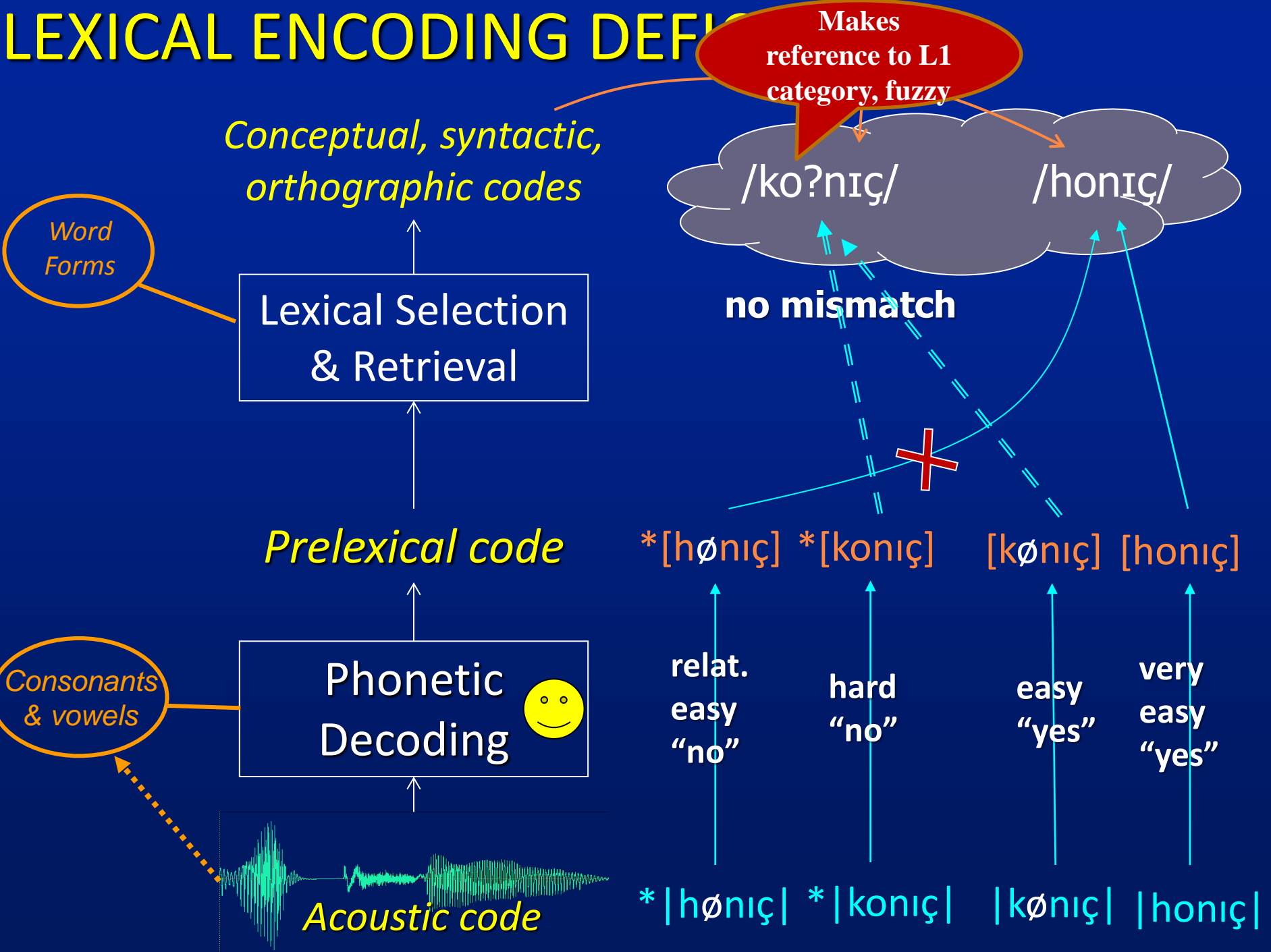
\*[honiç] \*[koniç] [koniç] [honiç]

hard "no" easy "no" hard "yes" very easy "yes"

\*|høniç| \*|koniç| |køniç| |honiç|

# LEXICAL ENCODING DEFICIT

# LEXICAL ENCODING DEFINITION



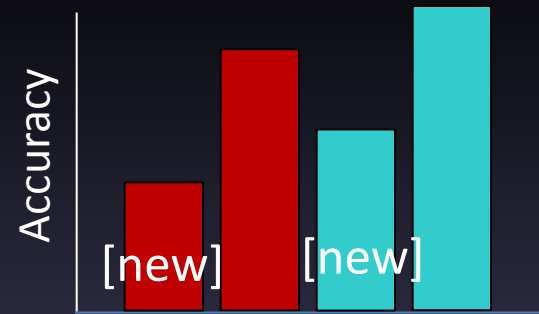
# Predictions for lexical decision

**NO**  
Non Word

**YES**  
Word

hard easy  
New Old

hard very easy  
New Old

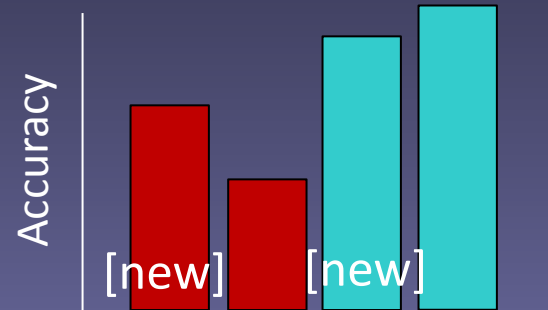


**NO**  
Non Word

**YES**  
Word

relat. easy hard  
New Old

easy very easy  
New Old



PHONETIC  
DECODING  
DEFICIT

LEXICAL  
ENCODING  
DEFICIT

# EXPERIMENTS

# Participants and stimuli

ABX

Lexical  
decision

## L2 German

Front/Back rounded vowels

[front rounded] is new      [ø] [y]

[back rounded] is old      [o] [u]

## L1 English

Intermediate [third-year,  
N = 55]

Advanced [> 6 months in  
Germany, N = 21]

## German Native Speakers

[N = 18]



**L2 German**

|            |                          |   |
|------------|--------------------------|---|
| Test       | [po:m] – [pøm] – [pøm]   | B |
| Control    | [pøm] – [pe:m] – [pøm]   | A |
| Distractor | [pa:m] – [pu:m] – [pa:m] | A |

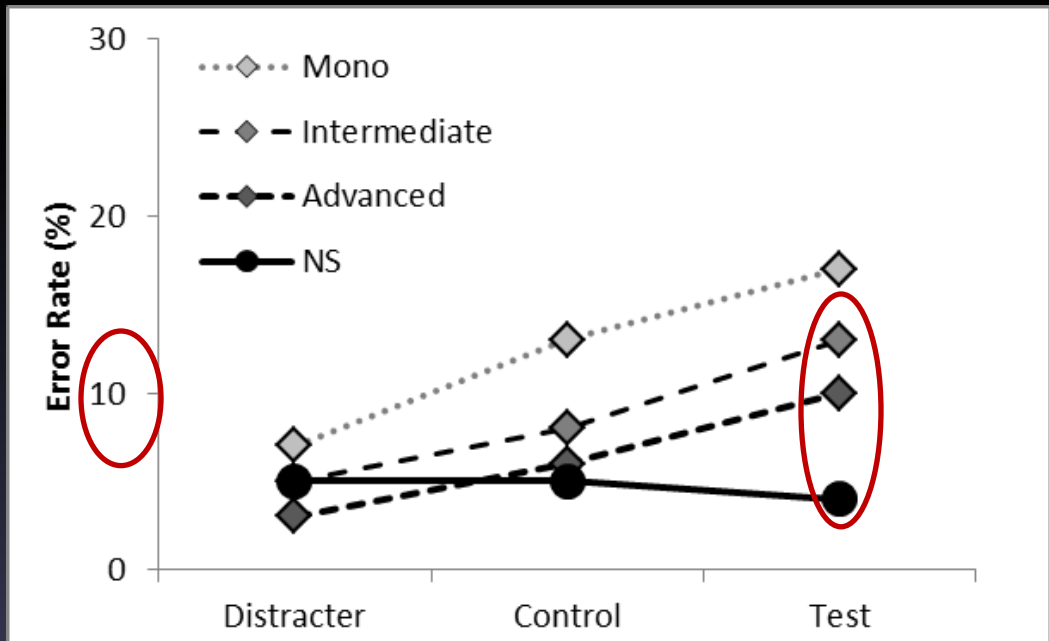
|                  | <u>Word</u> | <u>Non Word</u>     | <u>Word</u>        | <u>Non Word</u> |
|------------------|-------------|---------------------|--------------------|-----------------|
| <b>L2 German</b> | Honig       | *Hø <del>n</del> ig | Kø <del>n</del> ig | *Konig          |
|                  | Old         | New                 | New                | Old             |
| <b>Control</b>   | Kanne       | *Blanne             | Pflaume            | *Pfeude         |

ABX: Categorization  
Lexical Decision

# RESULTS

Error rate  
ABX

L2 German

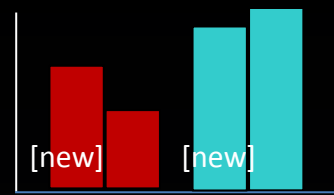


Interaction between “group” and “condition”: more errors on the test condition

Higher error rate for high vowels /y/ over mid vowels /ø/; Overall: high accuracy despite small statistical differences

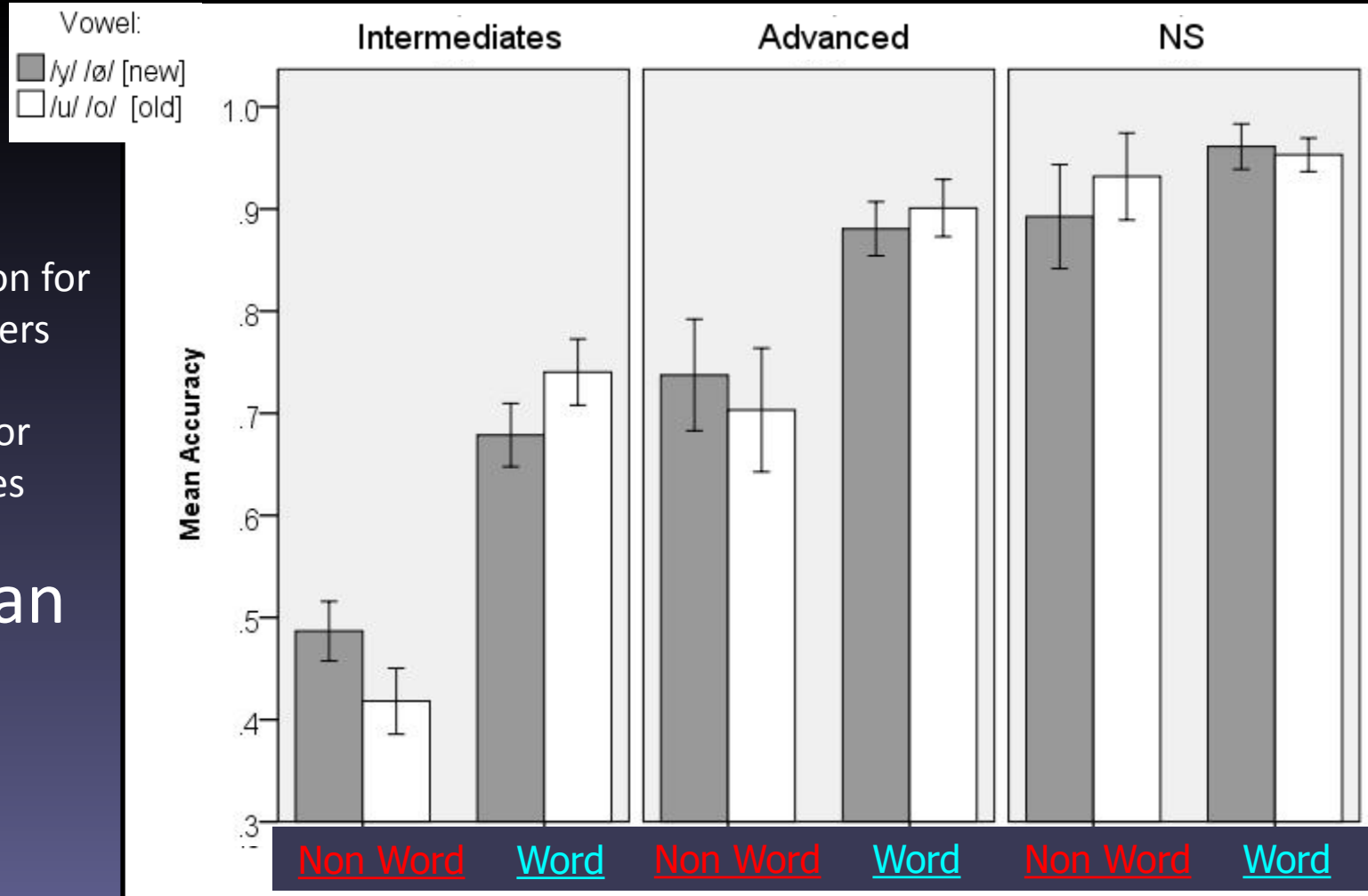
# Accuracy rate Lexical decision (test condition)

If lexical representations  
are fuzzy →



- No interaction for native speakers
- Significant interaction for Intermediates

## L2 German

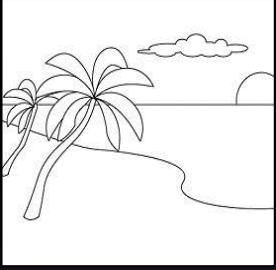


# SUMMARY AND CONCLUSIONS

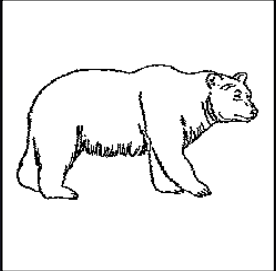
# Lexical representations can be fuzzy

- Fuzzy yet separate
  - Of course, learners might have merged representations, as we saw with experiment 1
- New categories **make reference** to L1
  - Advanced learners show signs of recovery
- Independent of phonetic perception
  - Persistent lexical issues co-occurs with highly accurate phonetic perception, and vice-versa
  - **Acquisition of L2 phonetic categories is neither a prerequisite nor a guarantee for target-like lexical encoding**

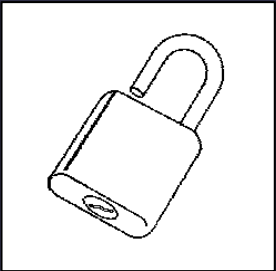
# L2 lexical representations are hard to build



- **Good part** : Don't feel bad (and there is hope!)



- **Distressing part** : Perceptual learning gives no guarantee
  - Task-induced? Too easy categorization tasks? How do we define „accurate perception“?



- **Bad part** : We don't know what's going on
  - Role of orthography (e.g. Showalter & Hayes-Harb, 2013; Escudero et al. 2008)
  - Phonological licensing like DMAP (Darcy et al., 2012) ...



- **Interesting part** : What can we do about it? (can we teach it?)

# Bright future for research...

- Understand in which case orthography helps and in which it doesn't
  - **Chung-Lin Yang**, Ph.D. work, in progress
  - **Cate Showalter**, Ph.D. work, in progress
- Understand how this works for non-segmentals (e.g. tones)
  - **Vance Schaefer**, Ph.D. work, in progress
  - **Chisato Kojima**, Ph.D. work, in progress
- Understand what happens when both categories are “new” or when there is no “dominant” category
  - **Danielle Daidone**, Ph.D. work, in progress
- Understand how L2 learners update the phonological form of their lexical entries
  - At once? Word by word? By frequency bands? Lexical diffusion?
  - **Danielle Daidone**, Ph.D. work, in progress



# Thanks to

All members of the SLPL lab  
Laurent Dedytspotter  
Justin Glover  
Christiane Kaden  
Franziska Krüger  
Rex Sprouse  
Chung-Lin Yang  
Stephanie Dickinson (IUSCC)

- Danielle Daidone
- Chisato Kojima
- John H.G. Scott



## Thank you!

comments welcome!  
[idarcy@indiana.edu]



[www.iub.edu/~psyling](http://www.iub.edu/~psyling)

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