



How Late Bilinguals Process Complex Words

Harald Clahsen

Outline

- Introducing the PRIM
- Background & research questions
- Child vs. adult language learning
- Native vs. non-native language processing
- Case Study 1: Regular and irregular inflection in German
- Case Study 2: Derivational word forms in English
- Summary & outlook

What's Special About PRIM?

- The *Potsdam Research Institute for Multilingualism* (PRIM) investigates the representation and processing of language in multilingual individuals, focusing on morphological and syntactic phenomena
- Core areas of grammatical processing will be investigated using current psycholinguistic and neuro-cognitive experimental techniques

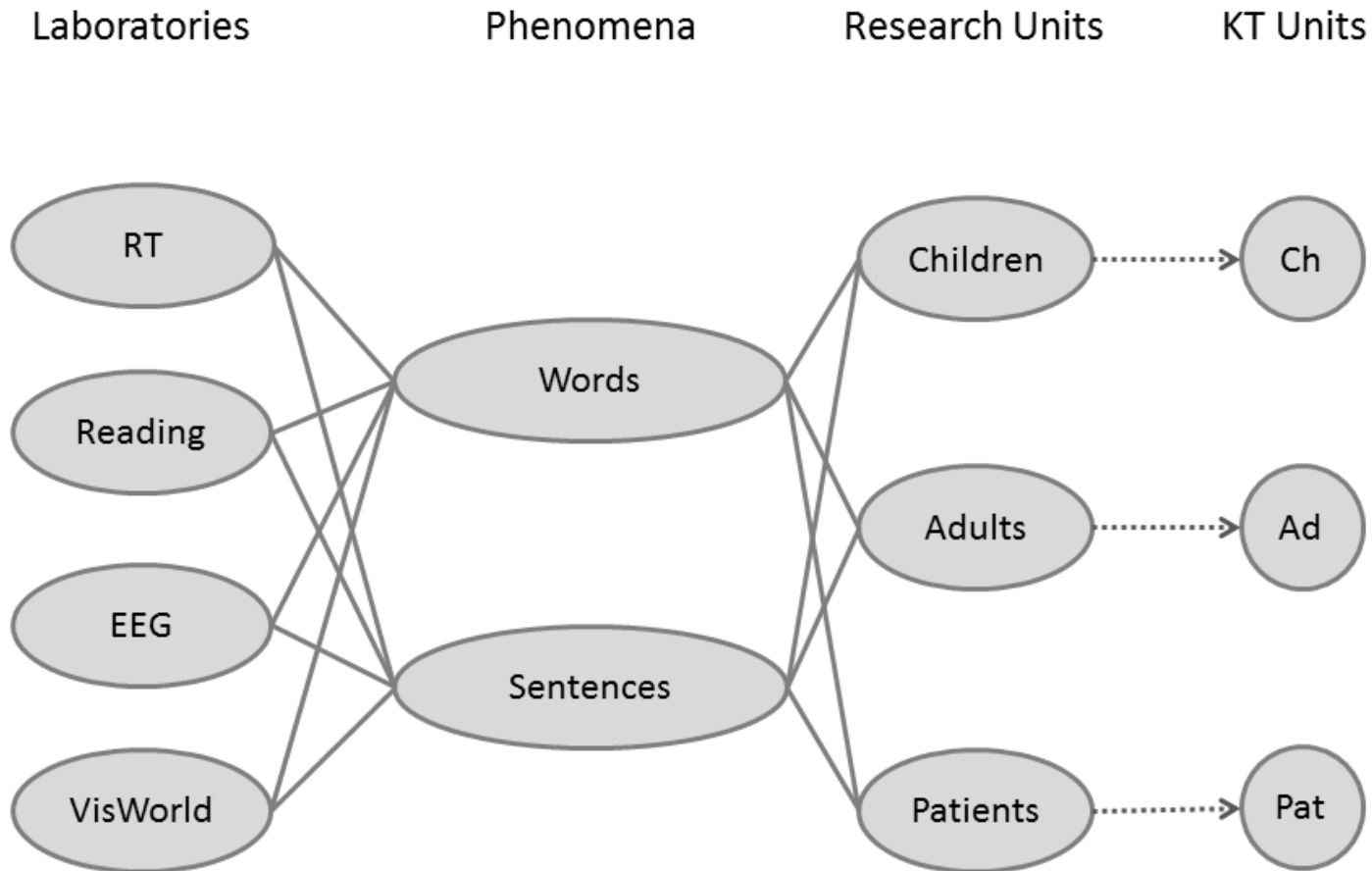
Objectives

- PRIM will contribute to a better understanding of how multiple languages are represented and processed in a person's mind/brain
- Our research will focus on the temporal dynamics of multiple language use, both at the micro-level and at the macro-level
- In addition to its research activities, PRIM will also provide advice to practitioners and educators concerned with multilingual individuals

Participants

- We will study people who have learnt (or are learning) more than one language
 - early multilinguals
 - late multilinguals
 - multilingual patients

Structure



Facilities

RT-Lab	Behavioural (response time) experiments
Eyetracking During Reading Lab Eyelink 1000 system	Eye movement monitoring during reading
EEG Lab BrainAmp DC System to	Recording ERPs using both the violation paradigm as well as the novel delayed vocalization technique.
Visual-World Eyetracking Lab RED 250/500 system	Eye movement monitoring during listening

Native vs Non-Native Processing

Today we will look specifically at potential differences between native and non-native ('late bilingual') speakers' grammatical processing abilities.

What's special about native language acquisition?

Learning (general): Adding new knowledge/capacities to previous knowledge/capacities

For example: studying linguistics, learning how to swim

Language learning in childhood: Loss of given options by fixing on a particular language

Before the acquisition of a particular language:

- a set of genetically given options
- not pre-wired to a specific language

After the acquisition of a particular language

- universal options no longer available
- language faculty fixed to specific language(s)

→ L1 (native) language acquisition is qualitatively different from general learning.

How is non-native grammar acquisition different?

- Success in L2 grammar acquisition is the exception.
- Ultimate attainment varies.
- There is variation in L2 developmental sequences.
- Fossilization in L2 grammar acquisition is common.
- Even advanced L2 learners often fail to give reliable grammaticality judgments.
- Language teaching and corrections are required for successful L2 grammar acquisition.
- Success of L2 acquisition depends upon external factors such as motivation, attitude, aptitude.

On the other hand ...

- Near-native-like levels of attainment can occasionally be achieved.
- L2 learners usually receive less input than children learning their L1.
- Adult L2 learners usually learn language in less favourable learning environments than children learning their native language.
- Perhaps language teaching and explicit corrections are not that relevant for successful L2 learning.

How is non-native grammar acquisition different?

Hypothesis A:

Native and non-native grammar acquisition are fundamentally different:

L1: genetically determined process of development/maturation using a task-specific learning device

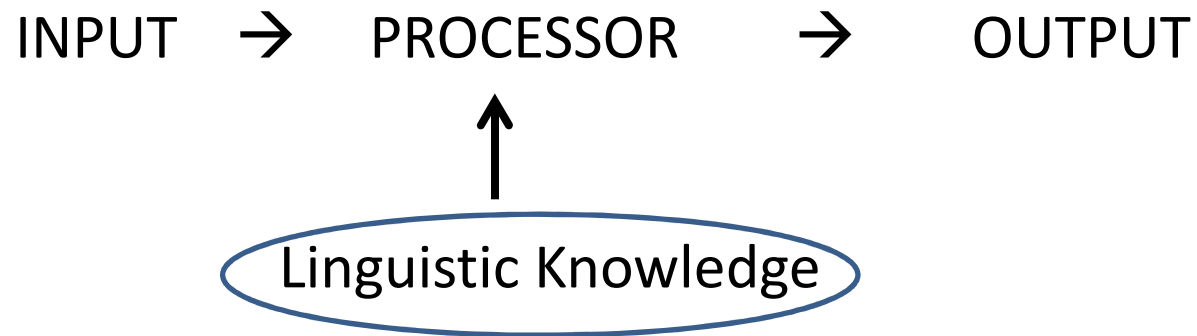
L2: general learning process

Hypothesis B:

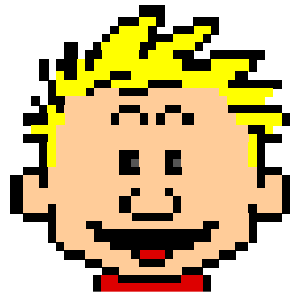
Adults and children make use of the same mechanisms for learning grammar.

L1/L2 differences are less dramatic and due to other factors.

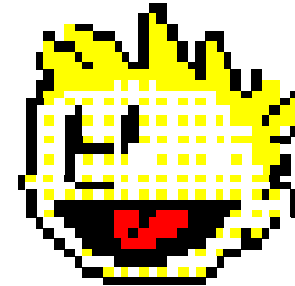
Language acquisition and language processing



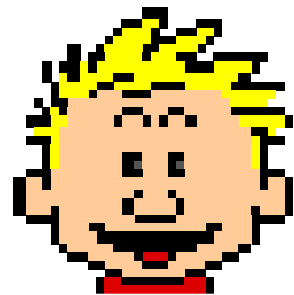
Real-time language processing



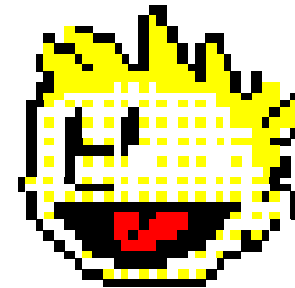
"The"



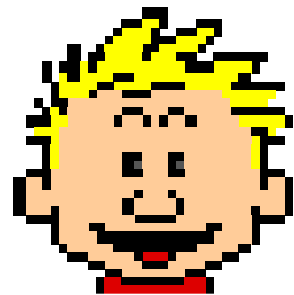
Real-time language processing



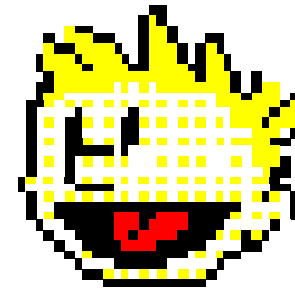
"cat"



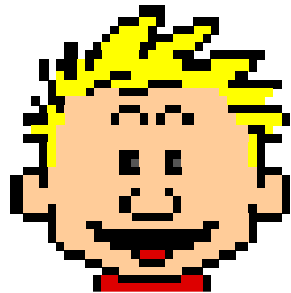
Real-time language processing



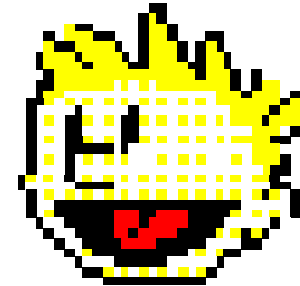
“chased”



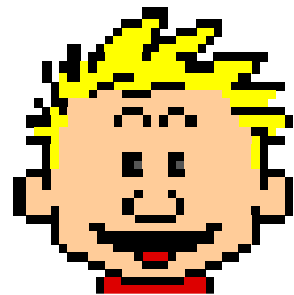
Real-time language processing



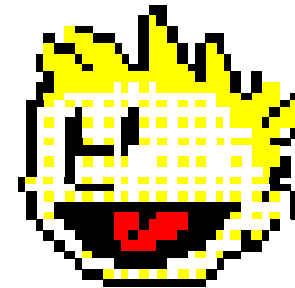
"the"



Real-time language processing

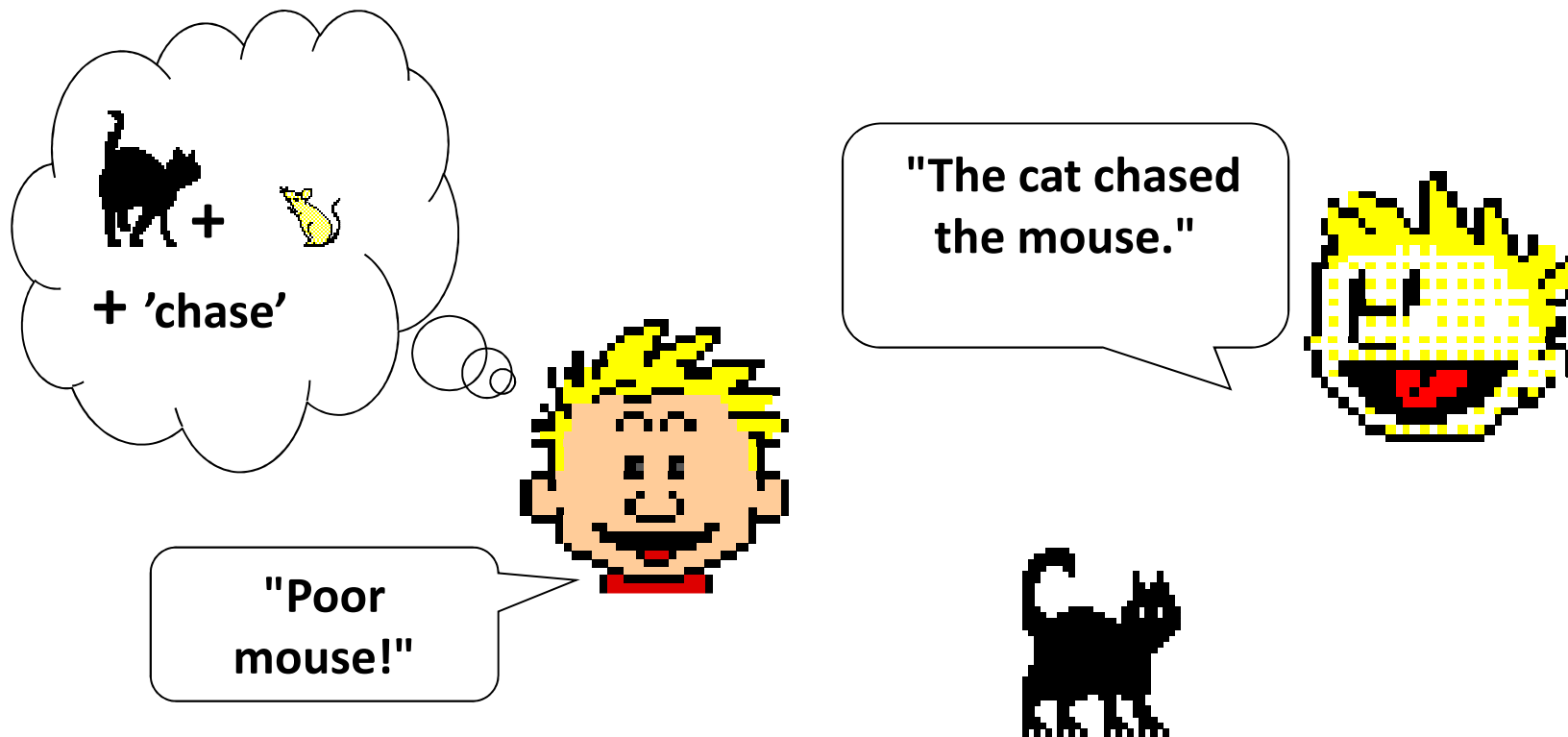


"mouse"



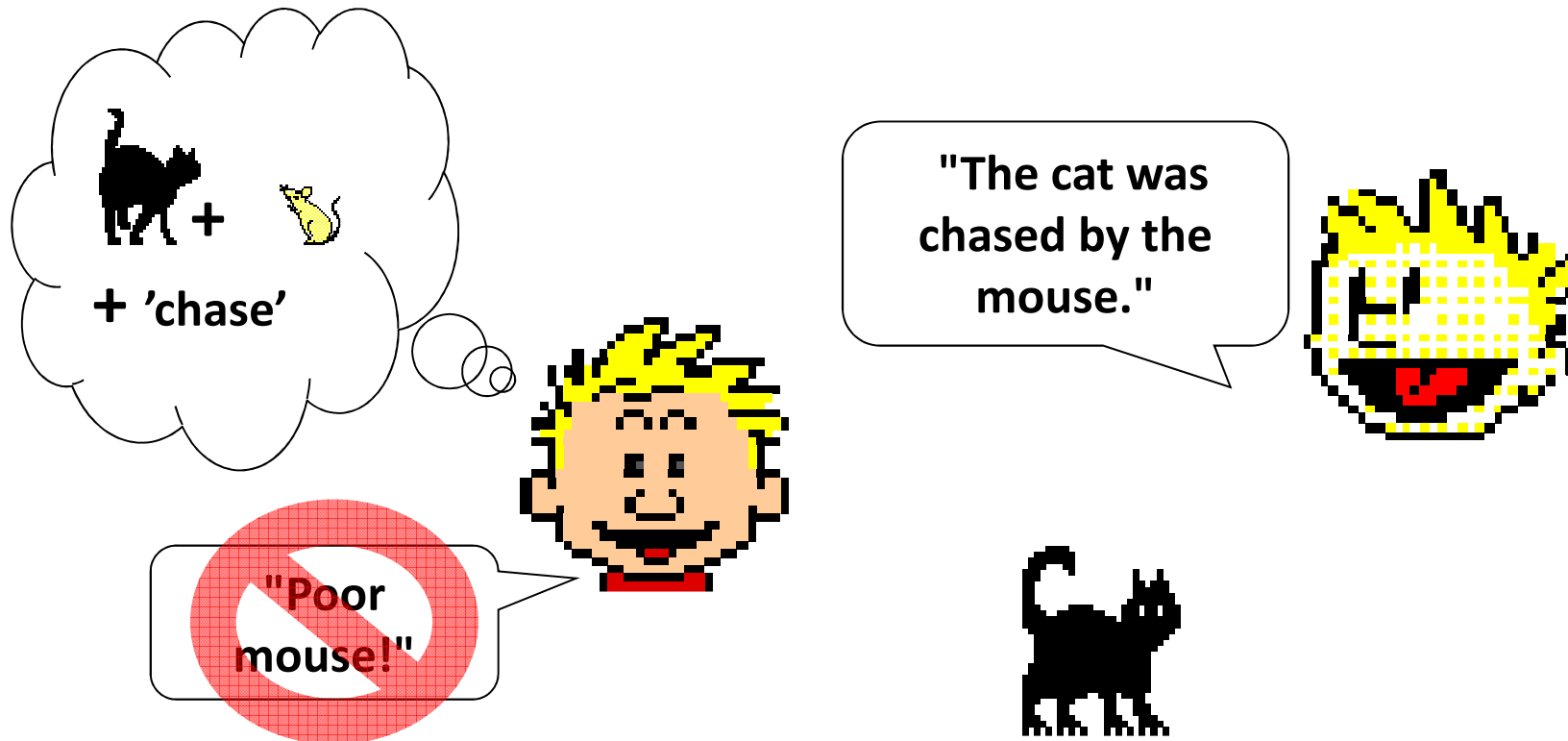
The 'semantic' route to interpretation

...sometimes works.



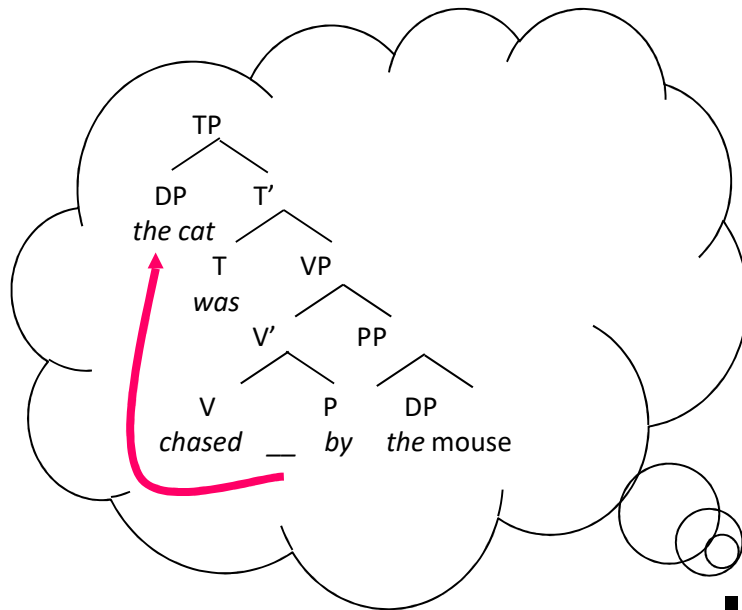
The 'semantic' route to interpretation

...often doesn't work.

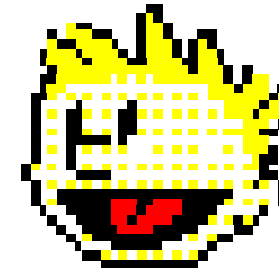


Real-time language processing

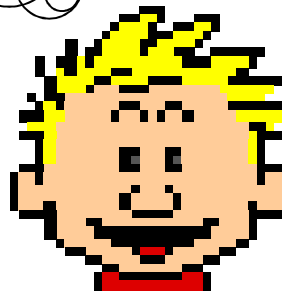
The 'syntactic' route to interpretation



"The cat was
chased by the
mouse."



"Poor cat!"



Non-Native Processing: Current Controversy

Non-native processing = Native processing

but slower and more resource-demanding, and also potentially subject to L1 influence (e.g. McDonald, 2006)



Non-native processing ≠ Native processing

Problems with real-time grammatical analysis of the non-native input (e.g. Clahsen & Felser 2006), and relatively greater reliance on semantic and pragmatic cues to interpretation (Pan & Felser 2011, Roberts & Felser 2011)

Case Study I: Regular and irregular inflection in German

Regulars: öffnen - geöffn*et* 'to open – opened'

- are affixed with *-t*
- never exhibit any stem changes

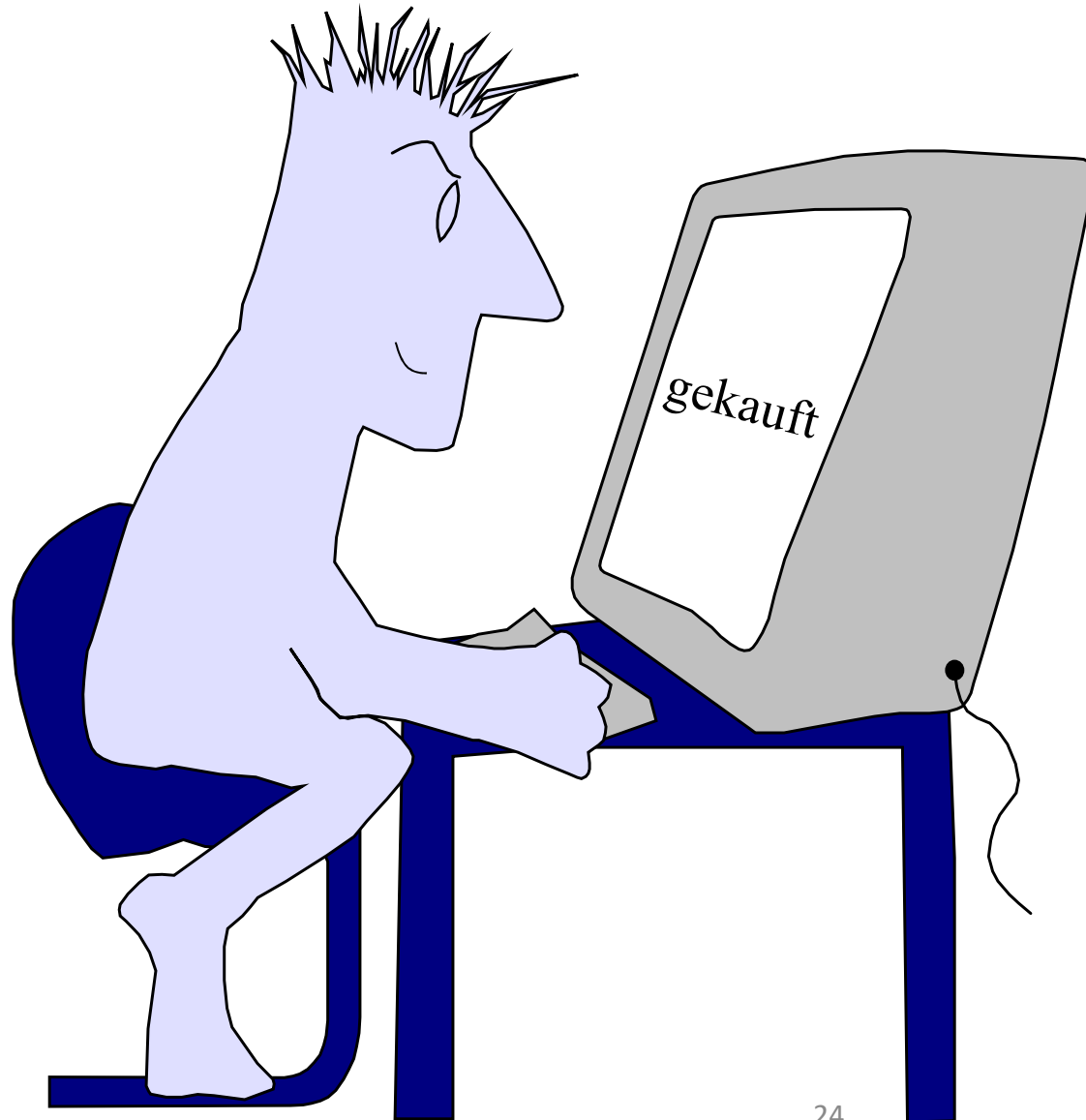
Irregulars:

A-B-A verbs: *kommen – kam - gekomm*en**
'to come – came - come'

A-B-C verbs: *trinken – trank - getrunk*en**
'to drink – drank - drunk'

- All irregulars are affixed with *-(e)n*.

Study I: Frequency effects in lexical decision



Unprimed
Lexical Decision

Experiment I: Lexical decision

Shorter lexical decision times for high-frequency forms are generally interpreted as effects of memory storage.

Prediction:

If L2 learners store morphologically complex words as wholes, RTs to high-frequency forms should be shorter than to low-frequency forms, for both $-t$ and $-n$ participles.

Neubauer & Clahsen (2009), *Studies in Second Language Acquisition*

Participants

- 30 German native speakers
mean age: 28.8, 15 males
- 31 Polish L2 learners
 - mean age: 24.3, 9 males
 - mean proficiency score in Goethe Institute test: 26.3 (out of 30)
 - 'competent language user'

Results: Experiment I

Response time advantage (in ms) for high-frequency forms

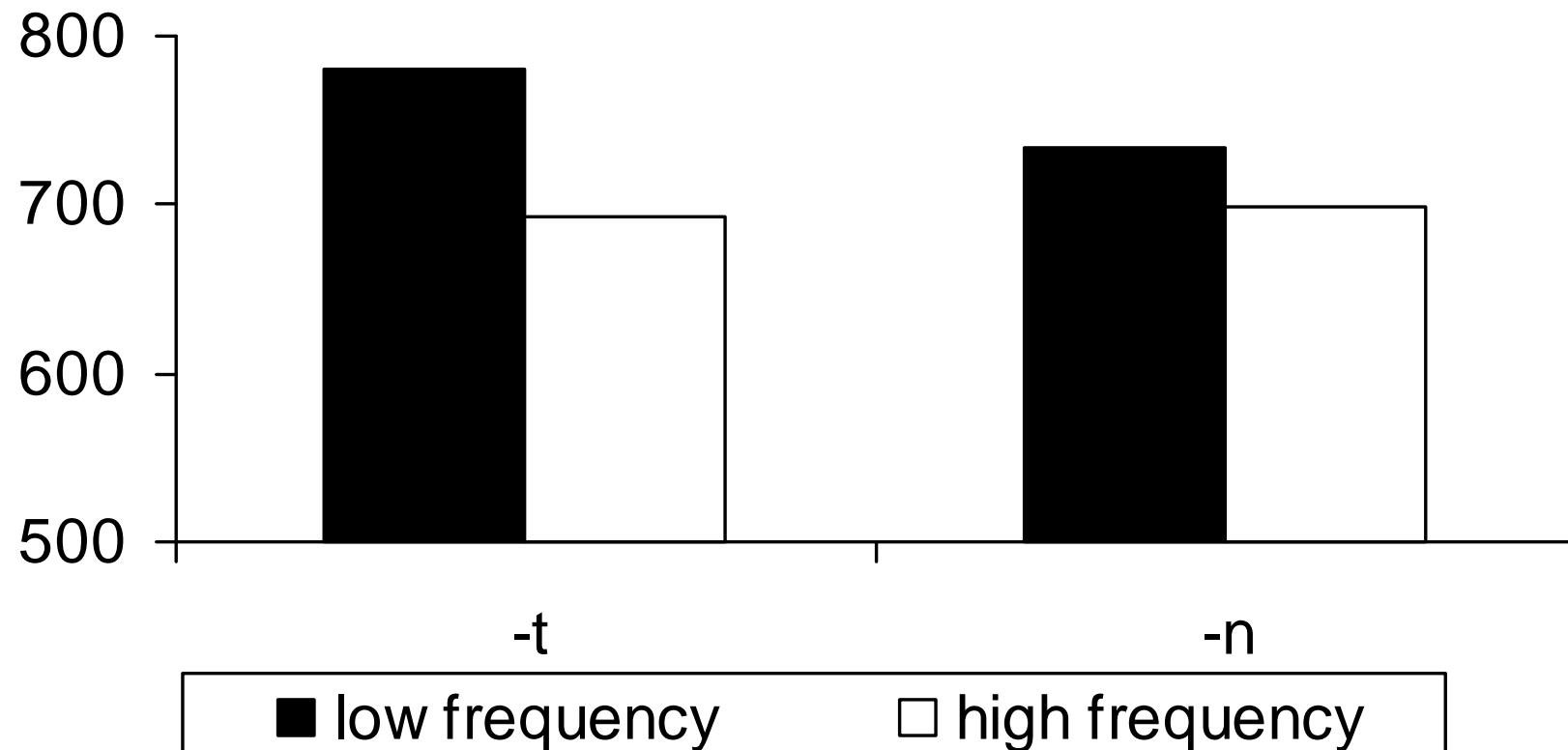
	-t participles	-n participles
L1	17ms	57ms*
L2	85ms*	67ms*

* = significant at $p < .05$

Results: Fast L2 learners (n=21)

L1: mean overall RT: 730 ms (SD 186)

fast L2: mean overall RT: 726 ms (SD 180)



Summary: Frequency effects in lexical decision

- L1: selective frequency effect (for -n but not for -t participles)
 - L2: overall frequency effect (for both -n and -t participles)
- L2 learners rely more on stored representations for inflected words during lexical access than native speakers.

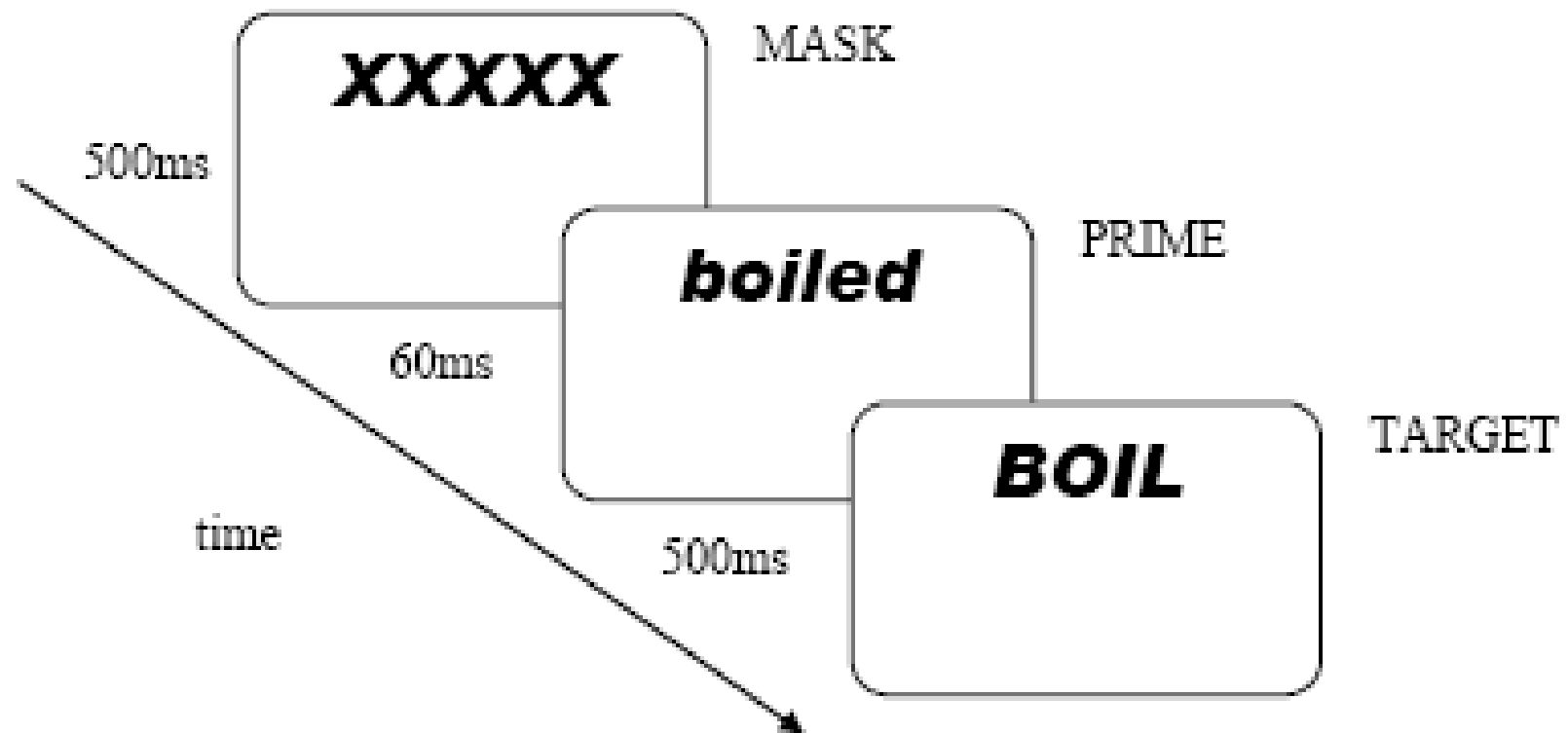
Experiment II: Masked priming

Differences/similarities in priming for regular *-t* and irregular *-n* participles of German in native speakers and advanced Polish L2 learners

Neubauer & Clahsen (2009)

Masked Priming

e.g. Silva & Clahsen (2008)



Materials

36 critical triplets of verb forms, 18 with regular targets and 18 with irregular A-B-A verbs as targets (matched for frequency, word length, & syllable length) plus 108 fillers; three versions in a Latin square design.

	Prime	Target
REGULAR	öffne (open)	öffne (open)
	geöffnet (opened)	öffne (open)
	wähle (choose)	öffne (open)
IRREGULAR	komme (come)	komme (come)
	gekommen (come)	komme (come)
	schwöre (swear)	komme (come)

Results: Experiment II

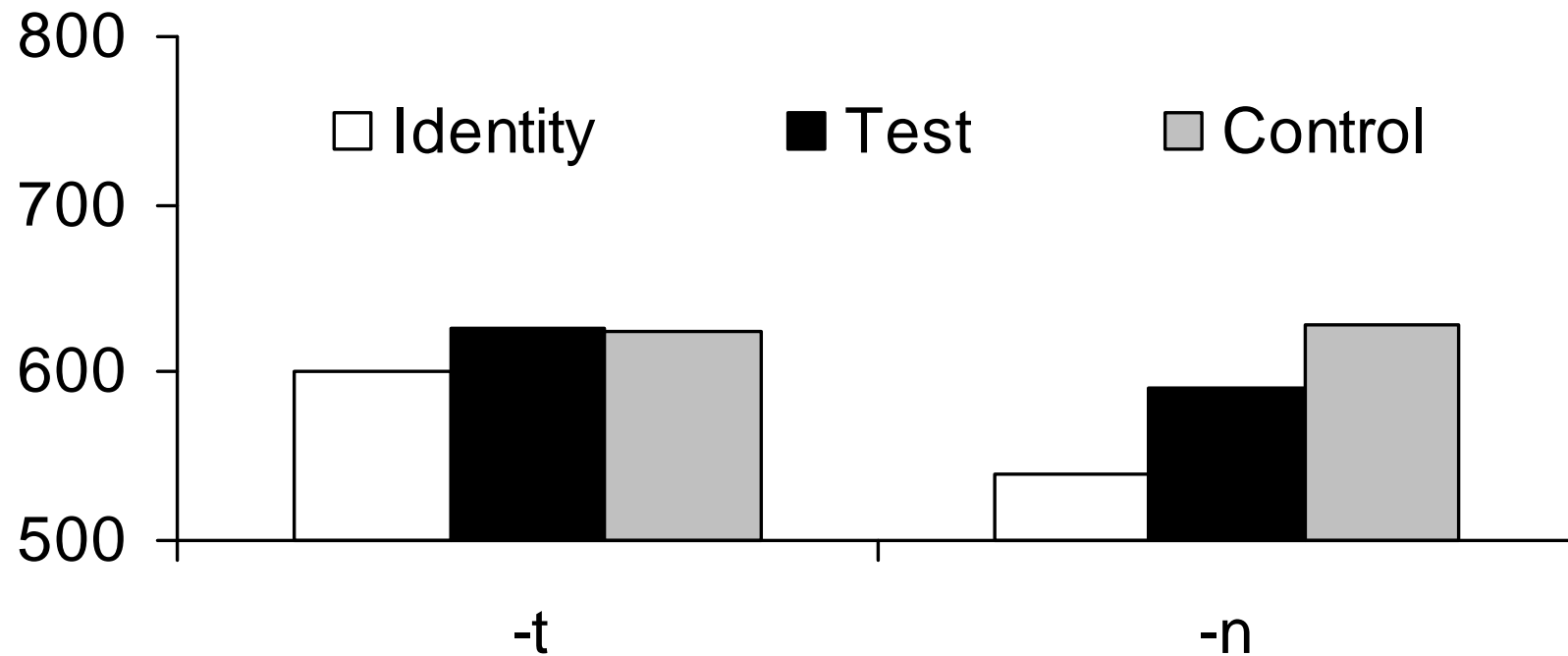
Size of priming effect (in ms.) for the morphological ('Test') condition

	-t participles: gekauft 'bought'		-n participles: gelaufen 'run'	
	Identity- Test	Control- Test	Identity- Test	Control- Test
L1	-12ms	62ms*	-45ms*	27ms*
L2	-54ms*	11ms	-41ms*	44ms*

* = significant at $p < .05$

Results: Fast L2 learners (n=13)

L1: mean overall RT: 533-696 ms
fast L2: mean overall RT: 538-664 ms



-t: → No priming

-n: → Partial priming

Summary: Masked priming - Native speakers

- Repetition priming in both conditions
- Full priming for –t participles
ge+[öffne]+t
→ **direct stem reactivation**
- Reduced priming for –n participles
[gekomm-en]
→ **indirect stem priming**

Summary: Masked priming – L2 learners

Masked priming in L2 German:

- Repetition priming in both conditions
- Reduced priming for –n participles
 - indirect stem priming: [gekomm-en]
- No priming for -t participles
 - no stem priming: [geöffnet]

Masked in L2 English:

- No priming for -ed past tense forms in German, Japanese, and Chinese learners of English

Silva & Clahsen (2008), Bilingualism: Language & Cognition

Case study II: Processing of derivational forms

Differences/similarities in the processing of derivational word forms between native speakers and L2 learners of English

e.g. *happiness, bitterness*

Are they recognised as wholes: [bitterness]

or through their component parts: bitter+ness ?

Experiment III: Lexical decision for -ness nominalizations

- Participants
 - 22 native speakers of English
 - 27 Chinese L2 learners of English
 - 22 German L2 learners of English
 - All L2 learners were 'advanced/proficient users'.
- Materials
 - 40 critical items (20 with low, 20 with high word-form frequencies, otherwise matched (e.g. for word length, & syllable length) plus 290 fillers

Silva (2008)

Results: Experiment III

Response time advantage (in ms) for high-frequency forms

	<i>-ness</i> forms
L1	66ms*
German L2	118ms*
Chinese L2	112ms*

* = significant at $p < .05$

→ Significant advantage for high-frequency forms for all participant groups.

Experiment IV: Masked priming with -ness forms

- Participants
 - 21 native speakers of English
 - 21 Chinese L2 learners of English
 - 21 German L2 learners of English→ All L2 learners were 'advanced/proficient users' in terms of the OPT.
- Materials
 - 21 critical items in three conditions (Test, Identity, unrelated Control) plus 303 fillers, e.g. neatness → NEAT

Silva & Clahsen (2008), Bilingualism: Language & Cognition

Results: Experiment IV

Size of priming effect (in ms.) for the morphological ('Test') condition

	<i>-ness forms :</i> <i>bitterness → bitter</i>	
	Identity- Test	Control- Test
L1	-6ms	44ms*
German L2	-69ms*	52ms*
Chinese L2	-103ms*	97ms*

* = significant at $p < .05$

→ Full stem priming for L1, partial priming for L2.

Summary: Nominalizations

- L1
 - Frequency effect in unprimed lexical decision
 - Repetition priming
 - Full priming for *-ness* forms
 - Decomposition ([bitter] + ness)
- L2
 - Frequency effect in unprimed lexical decision
 - Repetition priming
 - Reduced priming for *-ness*
 - Decomposition less efficient

Conclusions

- L1 transfer effects on L2 processing:
=> more limited than might be expected
- Cognitive resource limitations in L2 processing:
=> provide only partial explanations
- Shallow processing:
=> grammatical limitations affect L2 processing