French root, stem and maybe thematic vowel

L2C2
Gustavo L. ESTIVALET
Fanny MEUNIER

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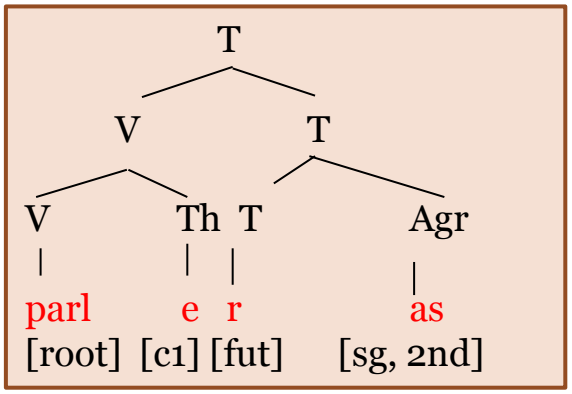
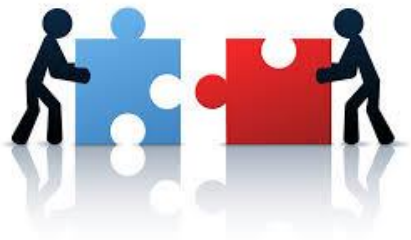
Verbal Morphological Structure

- Romance languages = verbal morphological system inherited from Latin
- Stem = form after inflectional suffix stripping
- Theme vowel (Th) = conjugational vowel merged with the root in stem formation (Latin: a/e/i)





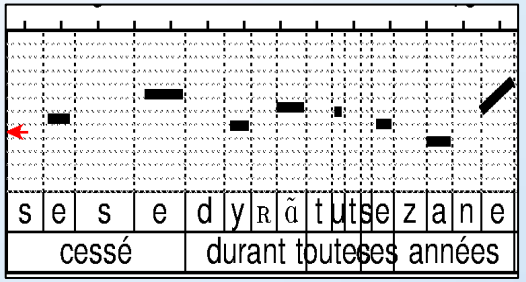
Language	ā	ĕ	ē	ī
Latin	*am**ā**re*	*prend**ĕ**re*	*vid**ē**re*	*aud**ī**re*
Spanish	amar	prender	ver	oír
Portuguese	amar	prender	ver	ouvir
Italian	amare	prendere	vedere	udire
Catalan	amar	prendre	veure	sentir
French	aim**er**	prend**re**	v**oir**	ou**ïr**

Questions???

- Is there a Th morpheme representation in French?
- Is there a stem (root+Th) representation in French?
- How 1st and 3rd verbal groups stems are represented and processed in French?
- Which are the differences between the subgroups:
  a) -er/eE,
  b) -ir/-ire/-dre/-indre
- How the stress system influence word representation and processing?

French Specificities

Prosody:
Iambic system



Phonology:
Idiosyncratic relation between grapheme and phoneme

'k'	's'	'ch'	'k'
car	cela	louche	chrono
abricot	cerise	riche	orchestre
coco	écorce	cheval	technique
café	ici	ruche	écho

Morphological System

- Word forms can be studied diachronically (parameter settling), but mental representations and processing have to be explained synchronically
- Morphemes are stored economically and are operated by a computational system

Stem Representation **Vs** **No Stem**

Anderson, 1998 (A-Morphous) Beard, 1995 (LMBM)

Aronoff, 2004 (WFR) Embick & Halle, 2005 (DM)

Person	Present	Simple Past	Imperfect	Future	Conditional	Subjunctive
1st sg	parl-e	parl-ai	parl-ai-s	parl-e-r-ai	parl-e-r-ai-s	parl-e
2nd sg	parl-e-s	parl-as	parl-ai-s	parl-e-r-as	parl-e-r-ai-s	parl-e-s
3th sg	parl-e	parl-a	parl-ai-t	parl-e-r-a	parl-e-r-ai-t	parl-e
1st pl	parl-ons	parl-â-mês	parl-i-ons	parl-e-r-ons	parl-e-r-i-ons	parl-i-ons
2nd pl	parl-ez	parl-â-tes	parl-i-ez	parl-e-r-ez	parl-e-r-i-ez	parl-i-ez
3th pl	parl-ent	parl-è-r-ent	parl-ai-ent	parl-e-r-ont	parl-e-r-ai-ent	parl-ent

French Stems

eE

jeter
|
jet-
|
jett-

/e/ -> /E/ /_*

IR

dormir
|
dorm-
|
dor-

C -> o/_C

IRE

écrire
|
écri-
|
écriv-

o -> v/_C

DRE

prendre
|
prend-
|
pren-

C -> o/_C

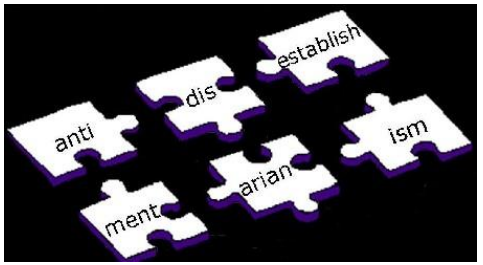
INDRE

joindre
|
join-
|
joign-

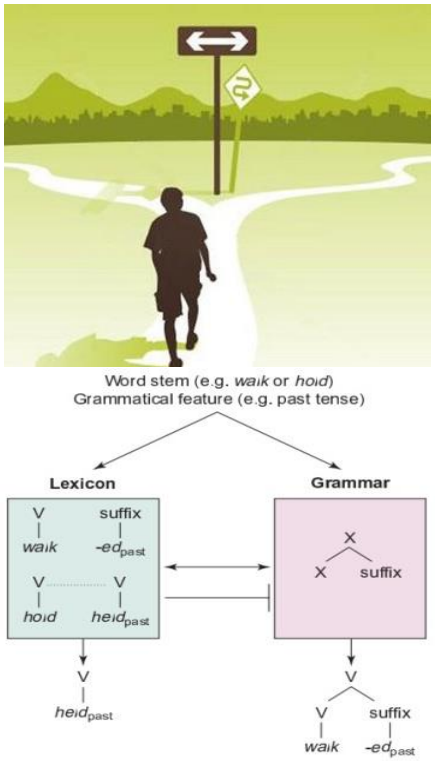
n -> gn/_V

Models

- **Obligatory Decomposition**: polymorphemic words are represented in the morphemic and lexical levels (Taft, 1979).



- **Race Model:** activation of the whole-word and morphemes in a parallel dual-route (Baayen, Dijkstra & Schreuder, 1997).



- **Words and Rules:** regular and irregular words are accessed by the declarative/procedural systems (Pinker & Ullman, 2002).

Verbal Inflection Warm-up Review

Language	Reference	Model
English	Stanners et al., 1979	Regular inflected verbs do not have different representations while irregulars do
	Pinker, & Ullman, 2002	Word & Rules, Pinker, 1999
German	Clahsen, 1999	Dual-route model
Spanish	Dominguez et al., 2000	Augmented Adressed Model
Catalan	Rodriguez-Fornells et al., 2001	Dual-route model
	Oltra-Massuet, 1999	Full-decomposition model, Halle, & Marantz, 2013
Italian	Orsolini, & Marslen-Wilson, 1997	Dual-route model
	Say, & Clahsen, 2002	Word & Rules, Pinker, 1999
French	Meunier, & Marlen-Wilson, 2004	Connexionism or dual-route model
	Kilani-Schoch, & Dressler, 2005	Dual-route model
Portuguese	Verissimo, & Clahsen, 2009	Words & Rules, Pinker, 1999
	Bassani, & Lunguinho, 2011	Full-decomposition model, Halle, & Marantz, 2013

Hypothesis

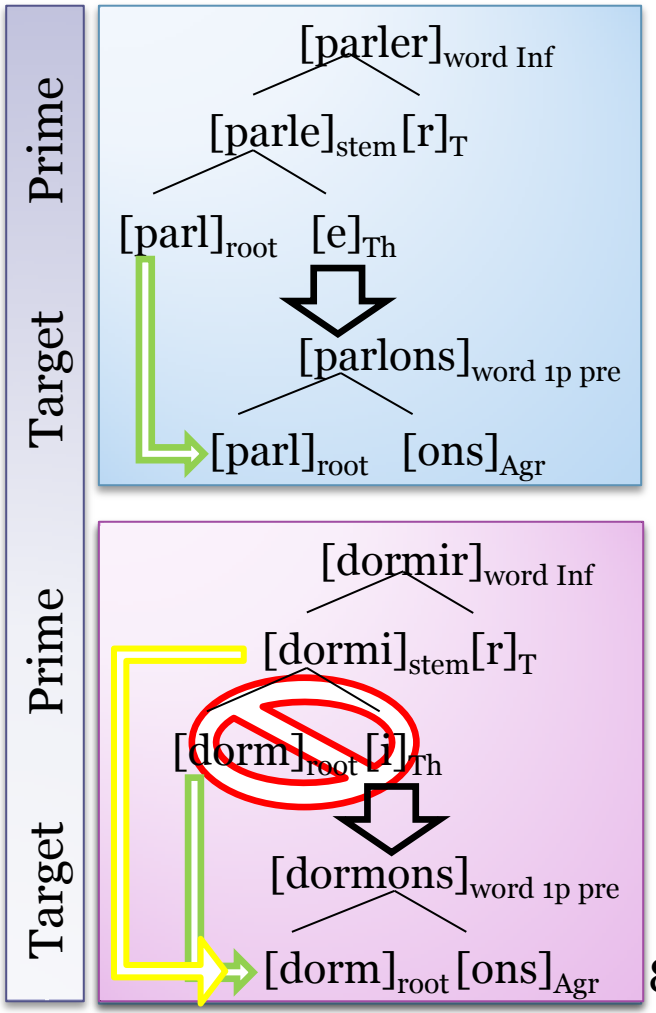
Full priming = Identical Prime (*parlons - parlons*)
No priming = Control Prime (*fermer - parlons*)
? = Test Prime (*parler – parlons*)

Hypothesis 1: full prime in Test Condition means the same lexical representation activated by the priming:

a) verb completely decomposed (root+(Th)+T+Agr)
a) Rule-based stem
b) phonological abstract representation /eE/

Hypothesis 2: partial prime in Test Condition means a distinct, but related representation between the priming and the target:

a) verb partialy decomposed (stem+T+Agr)
a) Stem allomorphs are stored
b) phonological representation /eE/



Method

Subjects: 48 subjects, 23 women, right hand, French as L1, mean age 21.8 years

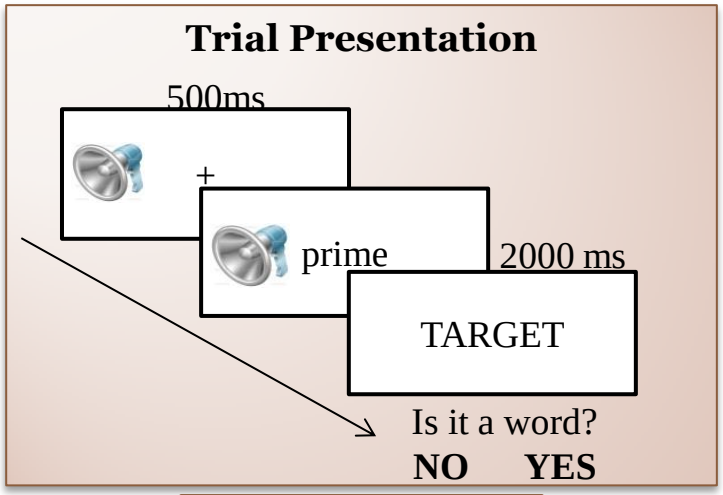
Experience: cross-modal priming with lexical decision task: auditory prime (woman voice .wav) and visual target (uppercase)

Study: 6 verb types:
1) 1st Group [-er], regulars
2) 1st Group [-er], morphophonological /e/, /ɛ/
3) 3rd Group [-ir]
4) 3rd Group [-ire]
5) 3rd Group [-dre]
6) 3rd Group [-indre]

Prime types (conditions):
-identical inflected (full priming)
-control inflected (no priming)
-test infinitive

Target: present tense inflected form 1st plural [-ons]

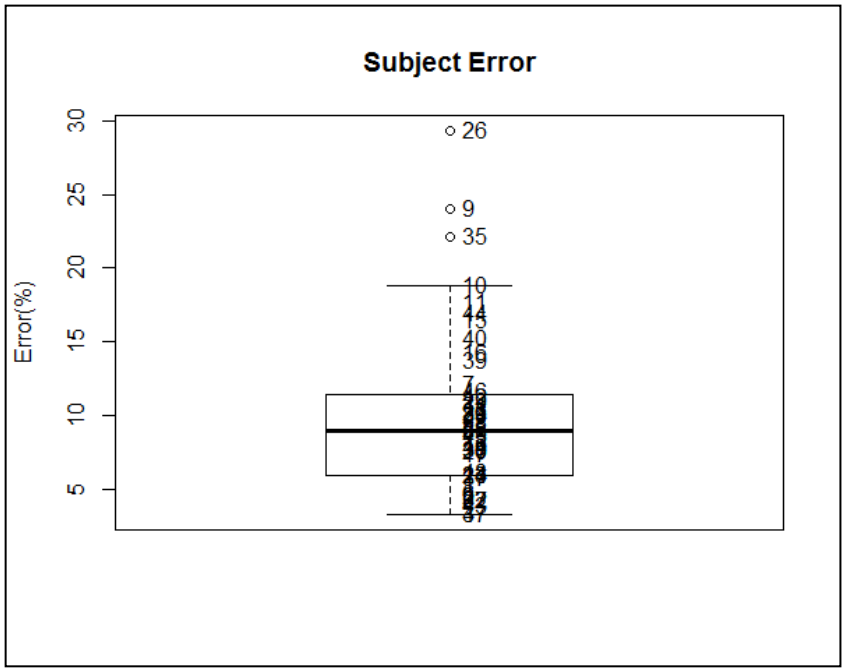
Stimuli:
-3 lists
-Experimental: 126 pair of verbs (21 per condition)
-Fillers: 294 pairs (84 w-w, 210 w-p (84 phono., 126 unrel.))

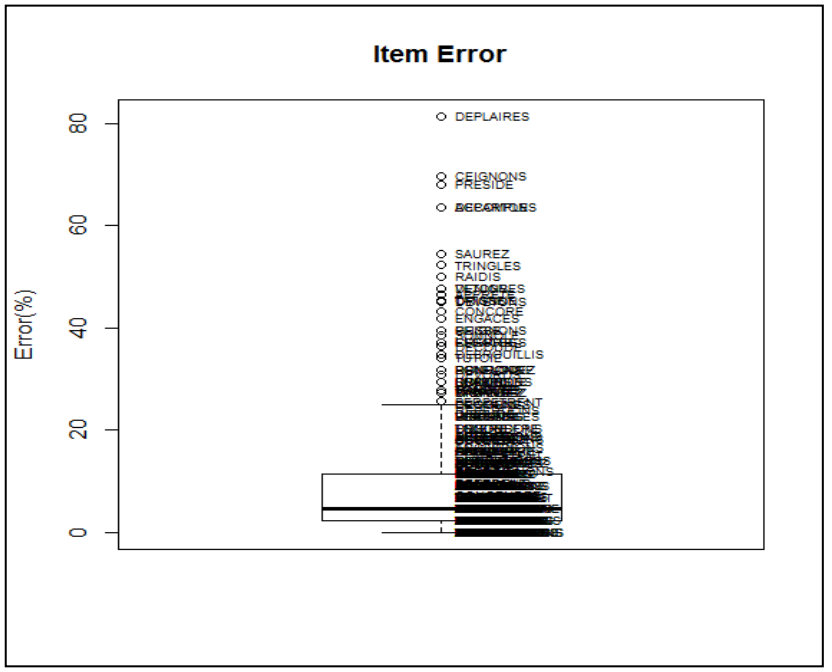


Stimuli Exemple

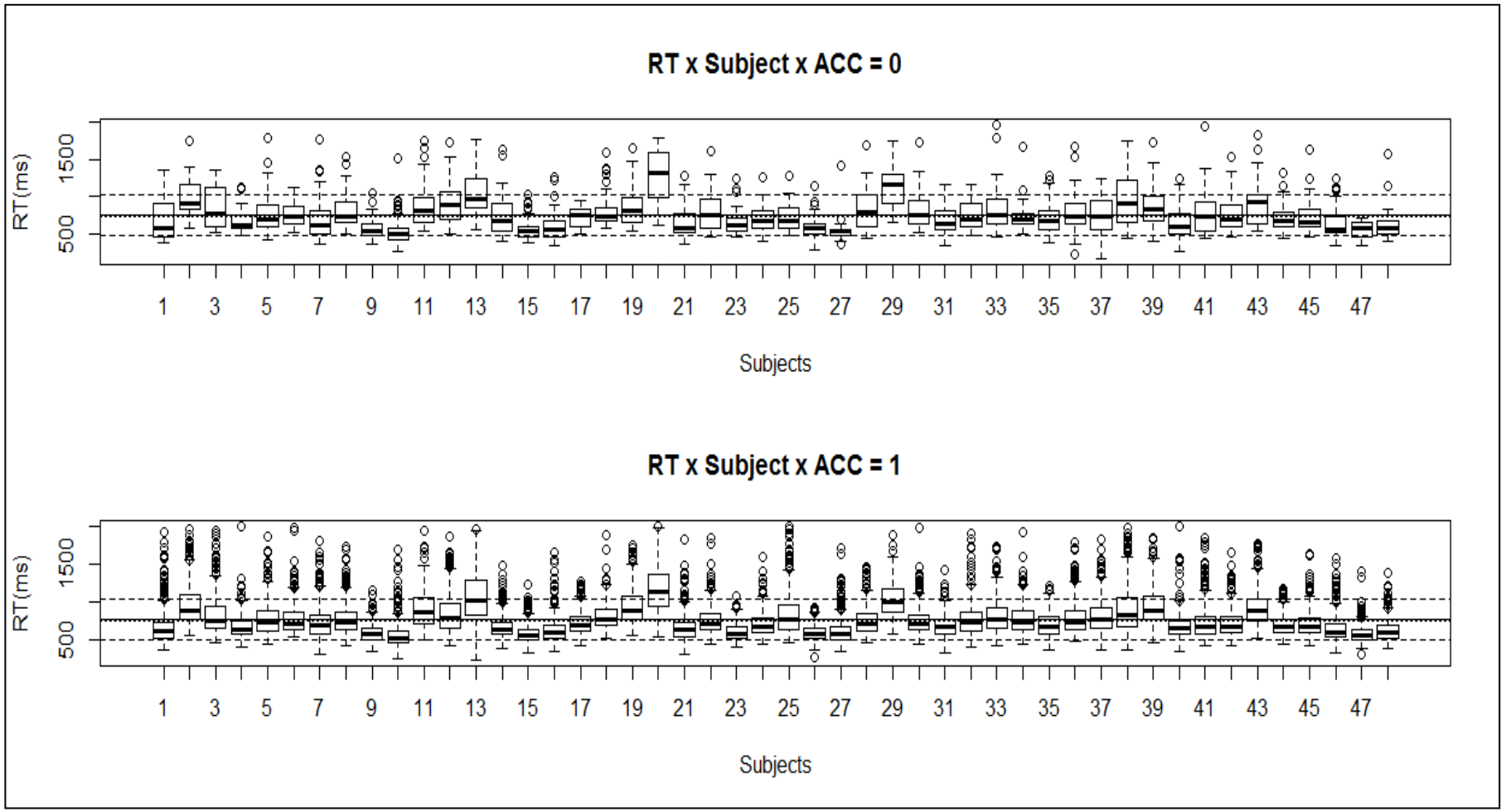
Verb Type	Identical	Control	Test	**Target**
1st reg	aimons	parler	aimer	**AIMONS**
1st eE	jetons	mener	jeter	**JETONS**
3rd [ir]	sentons	dormir	sentir	**SENTONS**
3rd [dre]	mordons	perdre	mordre	**MORDONS**

Results: error and outliers





Results: error and outliers



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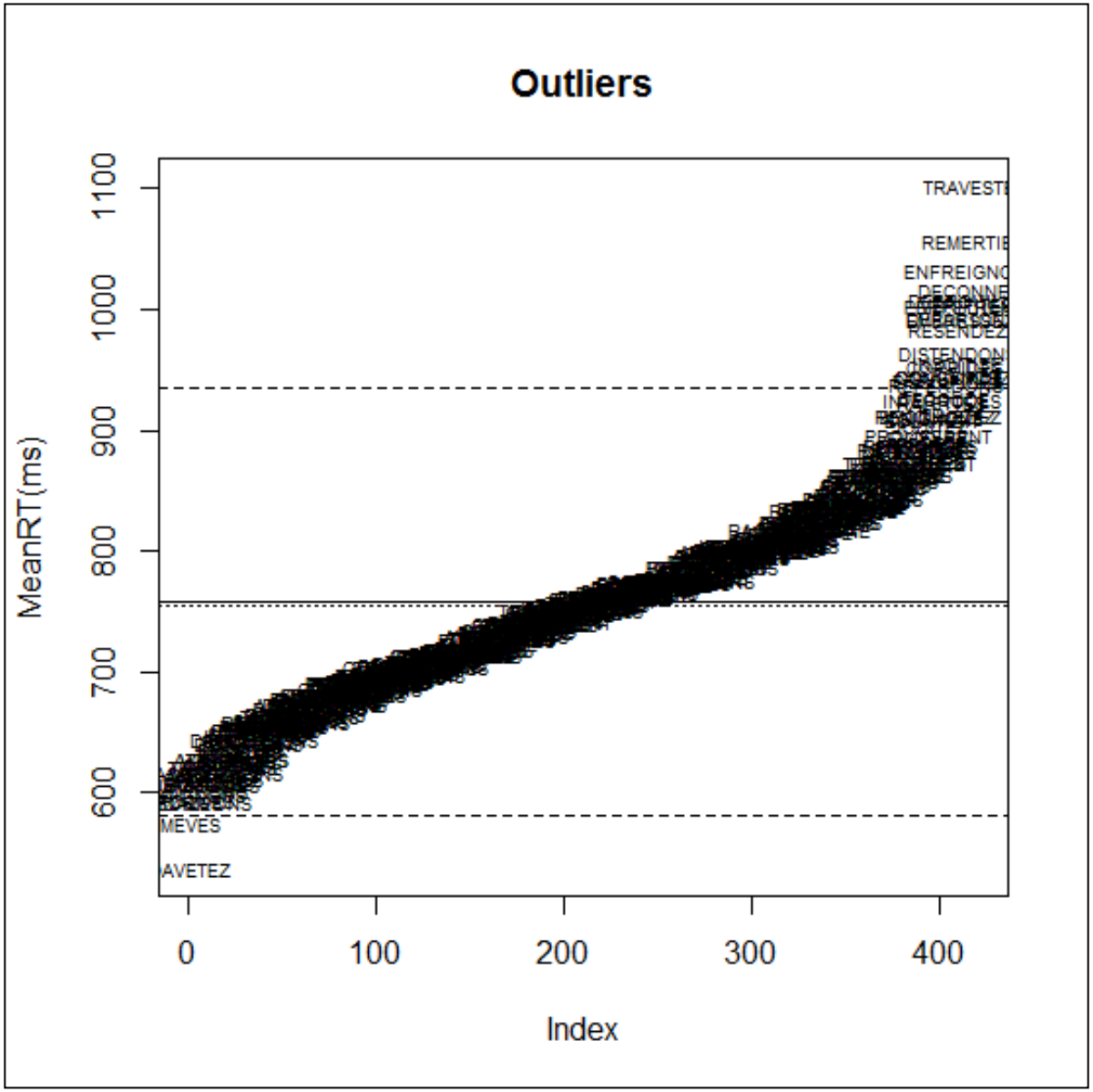
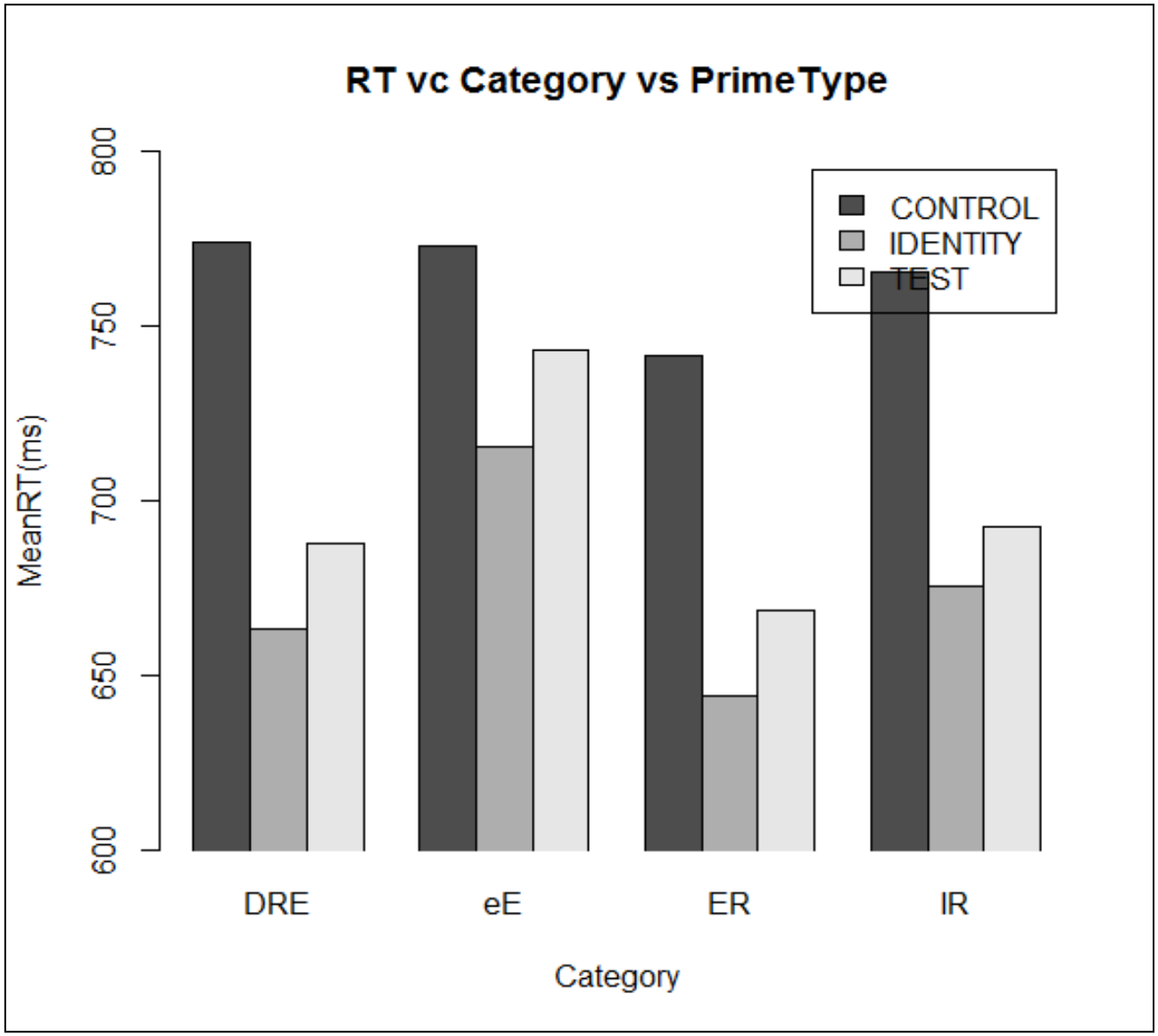
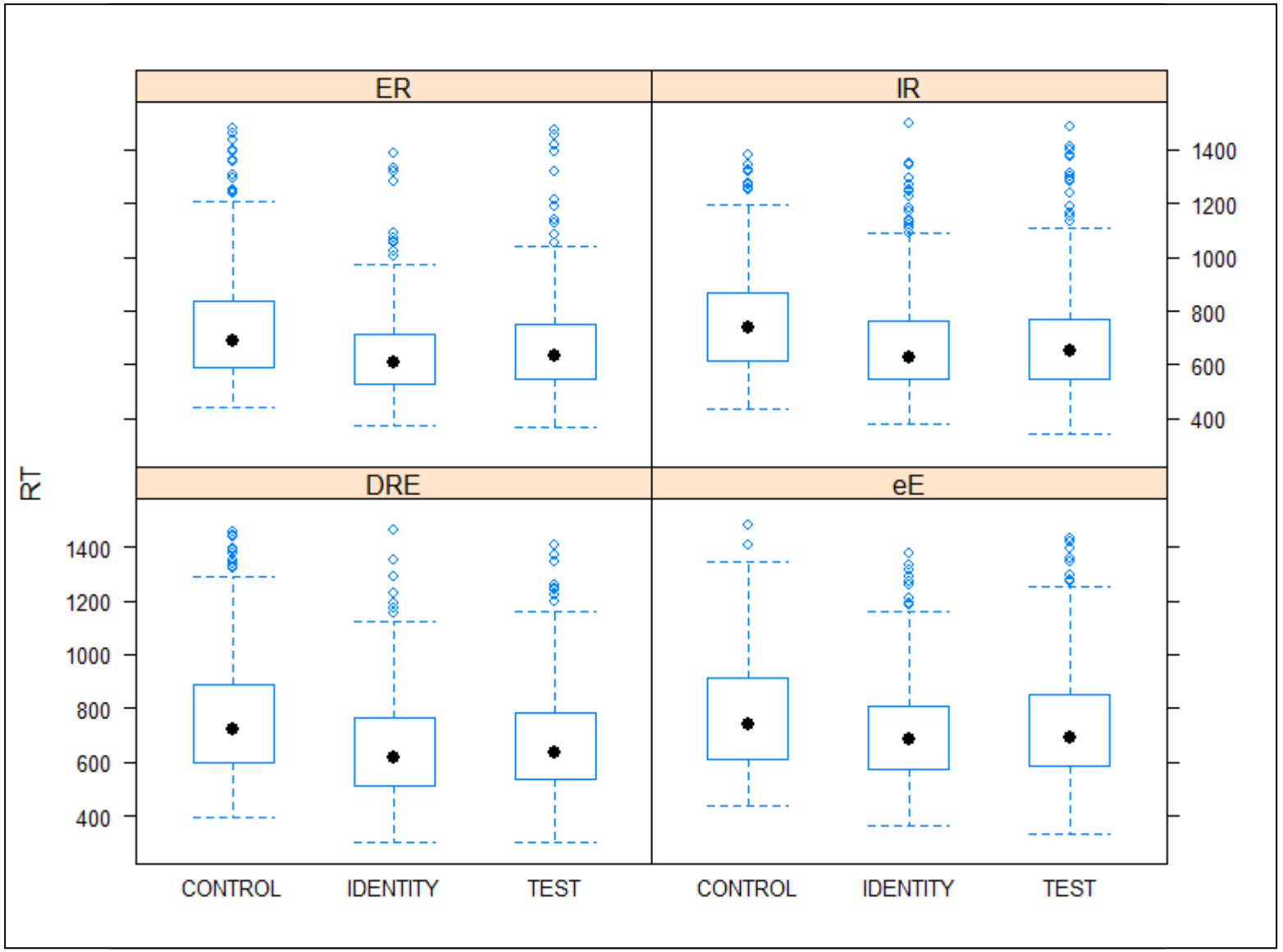


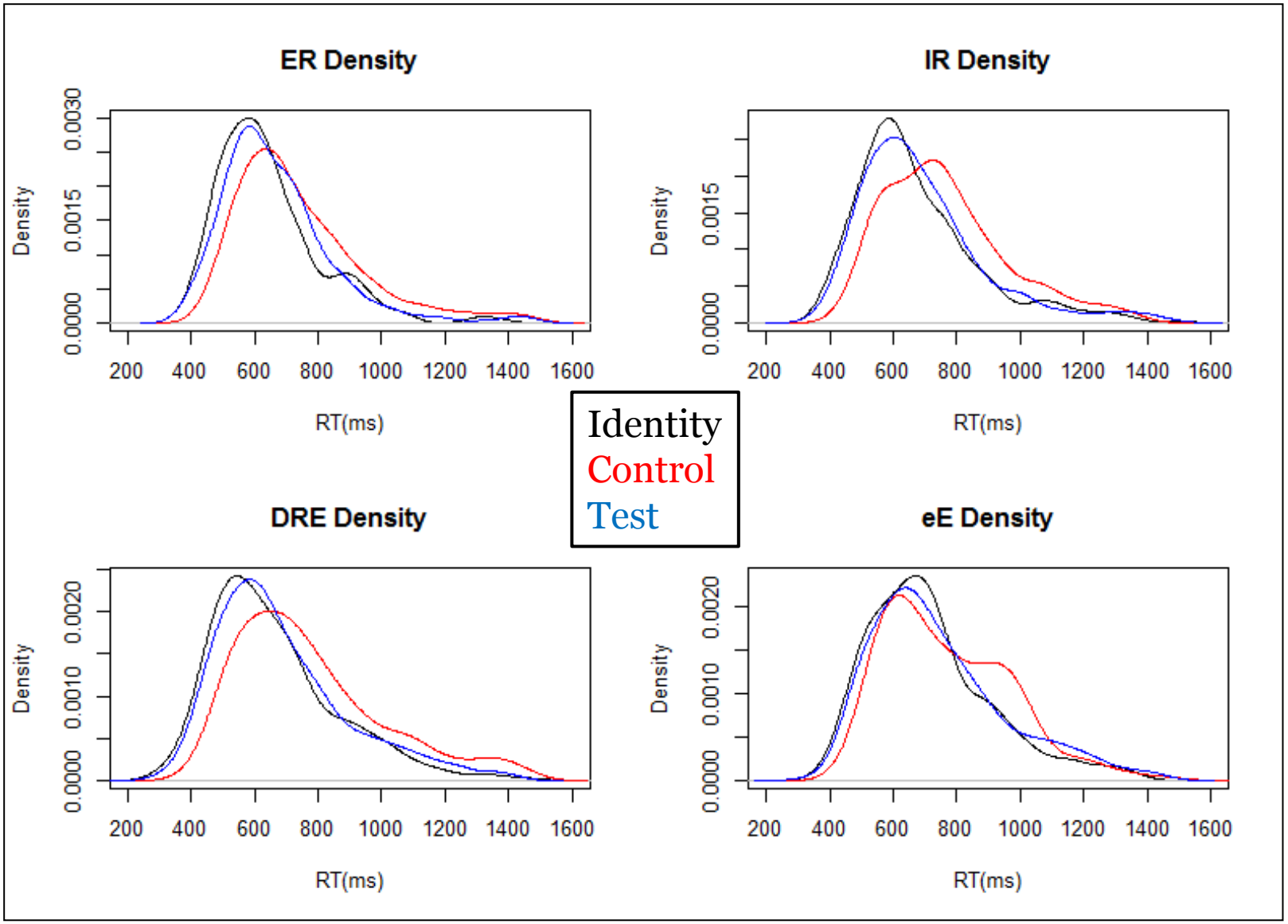
Results: RT summary



Results: RT summary



Results: RT summary



Results: Mixed Model Analysis

- Cross-modal priming
- 4 categories ([-er], [-ir], [-dre], /eE/)
- 3 conditions (identity, control, test)
- Split-splot design with 3 lists

- Student's *t*-test
- Multivariate Analysis of Variance (ANOVA)
- Tukey

- Mixed Effects

- verbs.lmer1 = lmer(RT ~ Category * PrimeType + (1|Subject), data = verbs8)
- verbs.lmer2 = lmer(RT ~ Category * PrimeType + (1|Target), data = verbs8)
- **verbs.lmer3 = lmer(RT ~ Category * PrimeType + (1|Subject) + (1|Target), data = verbs8)**
- verbs.lmer4 = lmer(RT ~ Category * PrimeType + (1+PrimeType|Subject) + (1|Target), data = verbs8)
- verbs.lmer5 = lmer(RT ~ Category * PrimeType + (1|Subject) + (1|NbLettres), data = verbs8)
- verbs.lmer6 = lmer(RT ~ Category * PrimeType + (1|Subject) + (1|NbSyll), data = verbs8)
- verbs.lmer.sex = lmer(RT ~ Sex * Category * PrimeType + (1|Subject) + (1|Target), data = verbs8)
- verbs.lmer.pre = lmer(RT ~ Prefixe * Category * PrimeType + (1|Subject) + (1|Target), data = verbs8)

Results: Mixed Model Analysis

```
Linear mixed model fit by REML ['lmerMod']
Formula: RT ~ Category * PrimeType + (1 | Subject) + (1 | Target)
   Data: verbs8

REML criterion at convergence: 43347.67

Random effects:
 Groups   Name        Variance Std.Dev.
 Target   (Intercept)  3518     59.31
 Subject  (Intercept) 12095    109.98
 Residual             26122    161.62
Number of obs: 3316, groups: Target, 84; Subject, 44

Fixed effects:
                                Estimate Std. Error t value
(Intercept)                      670.394     23.027  29.113
CategoryDRE                       28.564     22.738   1.256
CategoryeE                        75.375     22.656   3.327
CategoryIR                        27.952     22.793   1.226
PrimeTypeCONTROL                  72.141     13.450   5.364
PrimeTypeIDENTITY                -25.614     13.290  -1.927
CategoryDRE:PrimeTypeCONTROL      17.016     19.527   0.871
CategoryeE:PrimeTypeCONTROL      -32.983     19.322  -1.707
CategoryIR:PrimeTypeCONTROL        7.371     19.666   0.375
CategoryDRE:PrimeTypeIDENTITY     -3.748     19.081  -0.196
CategoryeE:PrimeTypeIDENTITY       2.043     18.969   0.108
CategoryIR:PrimeTypeIDENTITY      11.493     19.134   0.601
```

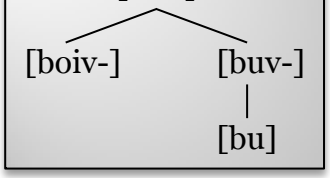
Discussion

- The results suggest that [-er], [-ir], [-dre] verbs are decomposed in the visual recognition by a similar process.
- Roots are stored as single lexical items and Stems are computed when merged with the possible thematic vowel.
- Thematic vowel
  - The morphemes [e], [es] are the singular subjunctive morphemes for all classes
  - Past simple and subjunctive imperfect have a clear Th
  - **It is most "economic" to process a Th than deal with root allomorphs and whole-word storage**
- Morphophonological can be further analysed and described by metrical phonology and irregulars by lexeme-based theories or distributed morphology
- Masked priming
  - Semantic control
  - Orthographic control

Metrical Phonology

*	*
(* *)	(* *)
	(*)(* *)
répètes	répétons

Lexeme-based



Thank you!

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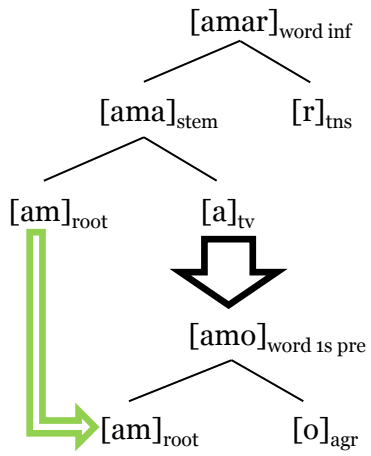
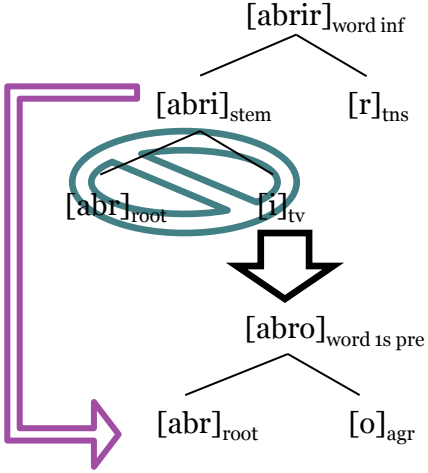
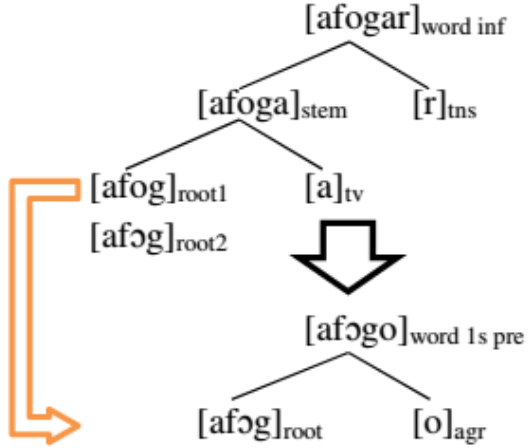
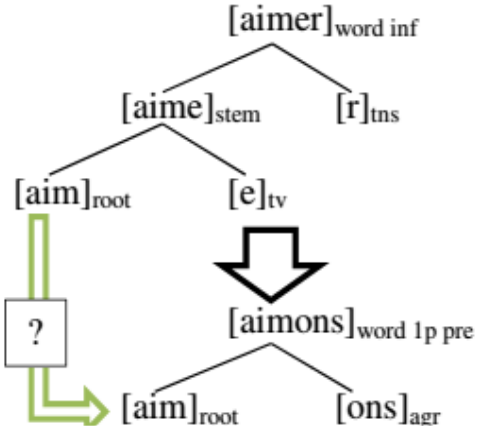
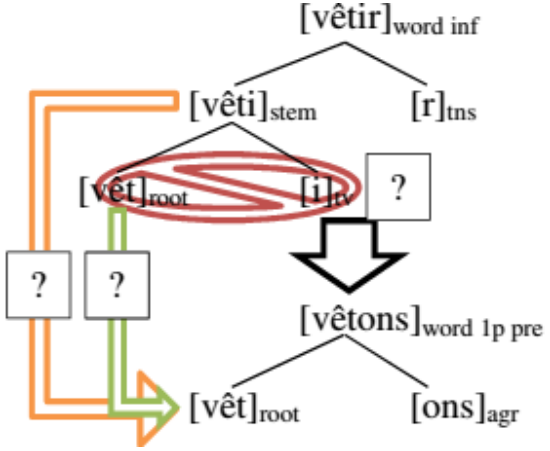
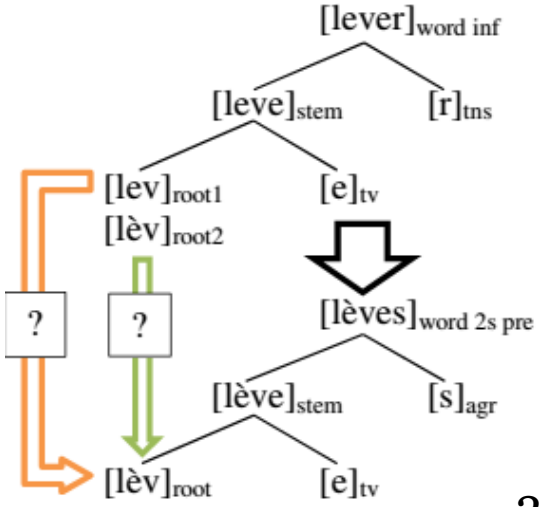
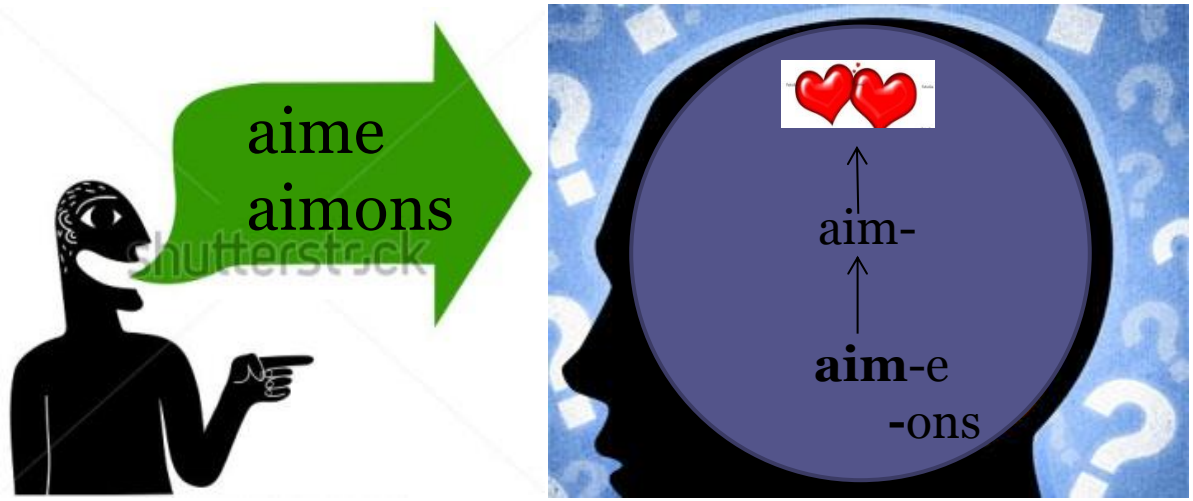
Root, Stem and Thematic Vowel Representation

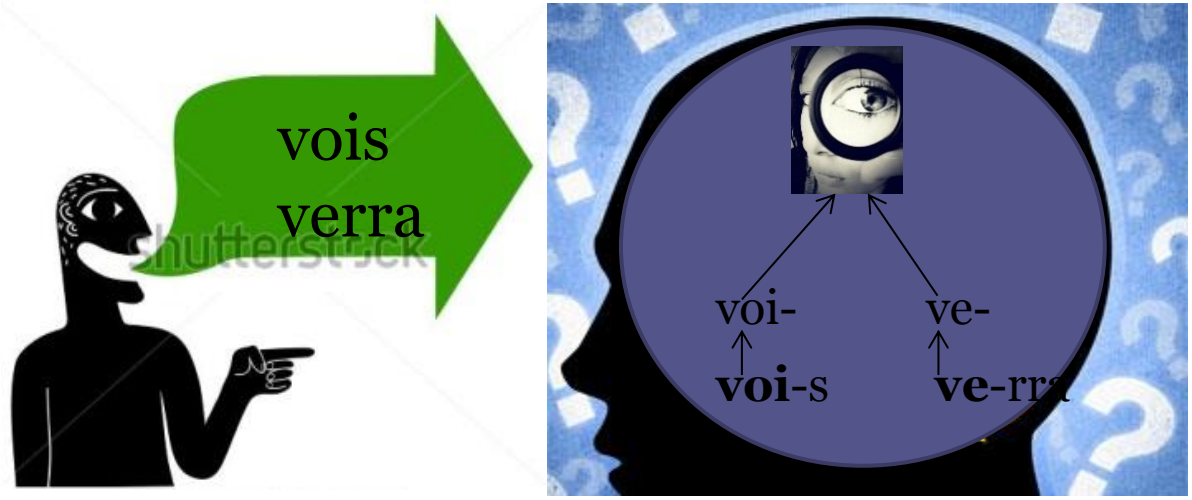
	1st Group (reg.)	3th Group	1st Group (morph.)
Portuguese Prime			
Portuguese Target			
French Prime			
French Target			

Morphological decomposition

REGULARS

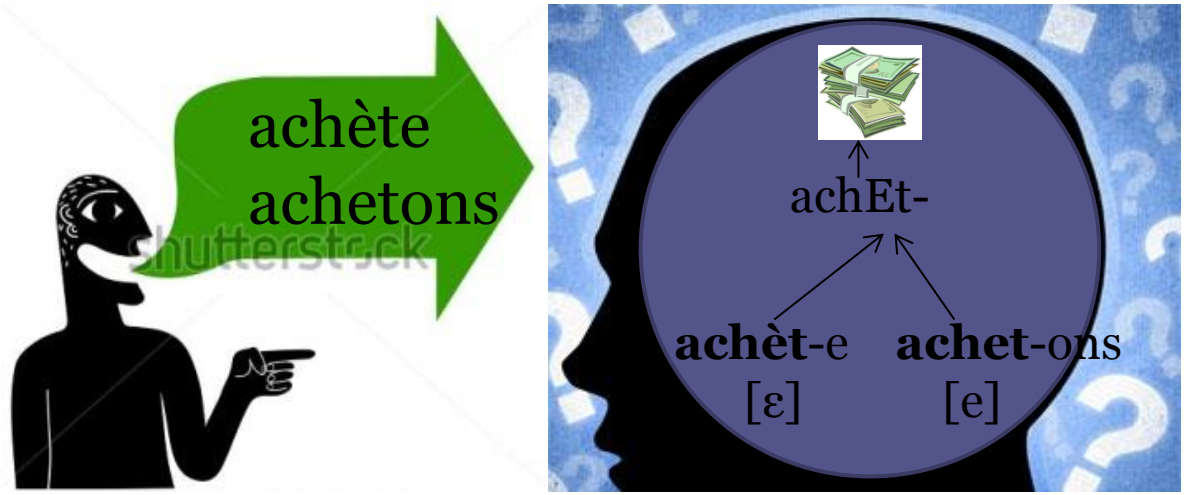


IRREGULARS

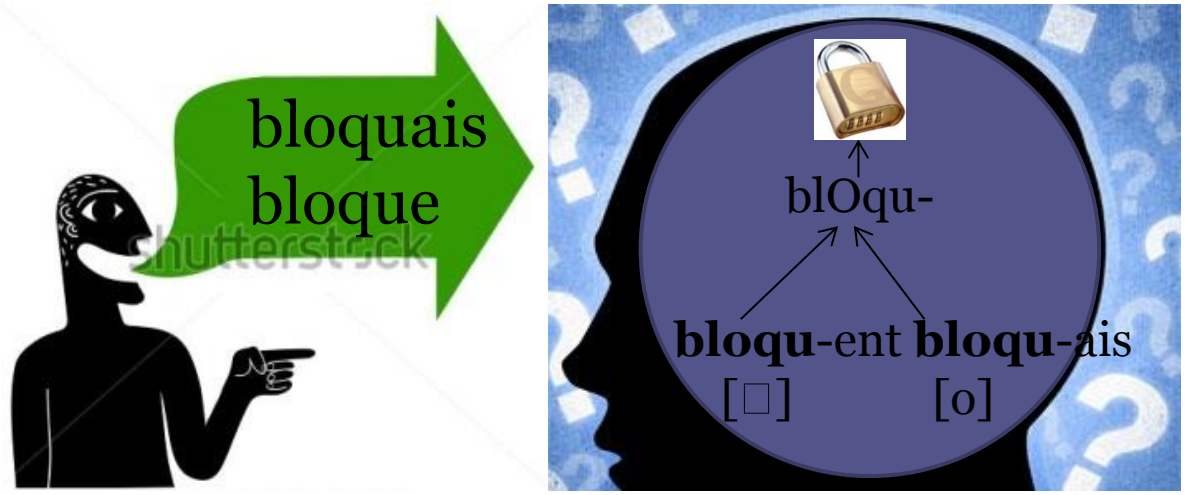


Morphological decomposition

MORPHO. [e], [ɛ]



MORPHO. [o], [□]



Morphological operation

OPERATION