University of Minho, School of Psychology

Psycholinguistic Research Group

The contribution of phonology to visual cognate word recognition: Is it modulated by second language exposure?

Comesaña, M.[1,3]; **Ferré**, P. [2]; **Sánchez-Casas**, R. [2]; **Fraga**, I. [3]; **Soares**, A. P. [1]; **Rauber**, A. [4]; & **Romero**, J.[5]

[1]Human Cognition Lab, University of Minho(Portugal)
[2]Department of Psychology and CRAMC, University Rovira i Virgili(Spain)
[3]Cognitive Processes & Behaviour Research Group, University of Santiago de Compostela(Spain)
[4]Graduate Program in Applied Linguistics, Catholic University of Pelotas(Brazil)
[5]Department of English and German Studies, Rovira I Virgili University, Spain

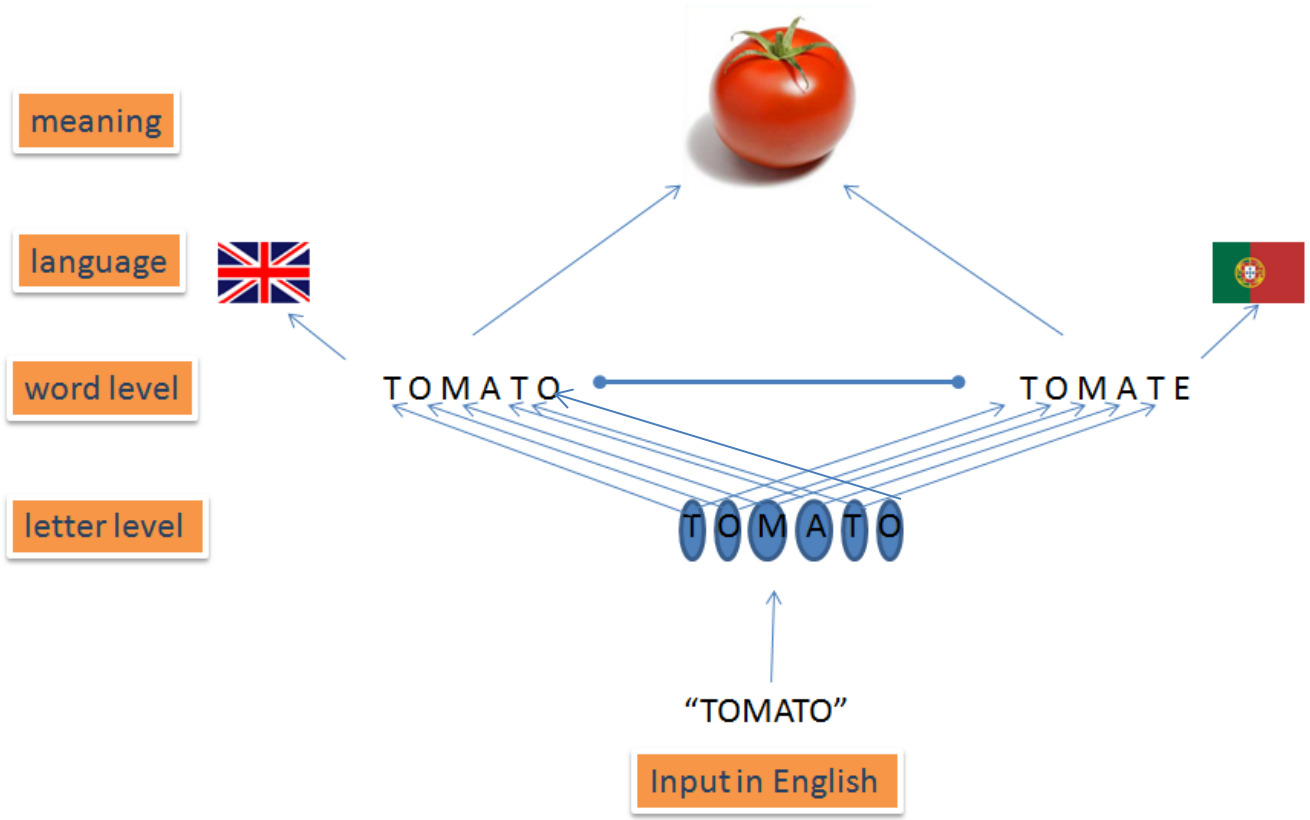
"Gin **drinken** in het **restaurant**, whisky in het **hotel**, champagne in **bed**. **Later effect**: Oh **God**, **migraine**. Tablet in warm **water**!"

Background

http://www.u.arizona.edu/~kforster/priming/masked_priming_demo.htm

✓How cognate words are represented in bilingual memory?

❑**A symbolic, localist connectionist framework (Dijkstra et al., 2010)**



Study	Participants	L2 Task	Results	
Schwartz et al. (2007). *Language and Cognitive Processes.*	English-Spanish bilinguals	Naming	✓No differences between CG and NCG words ✓O+P+ < O+P-	
Dijkstra et al. (2010) *Journal of Memory and Language*	Dutch-English bilinguals	Lexical Decision (LDT)	✓CG < NCG ✓O+ < O- ✓P affected only Identical CG	
		Language Decision	✓CG > NCG	✓O+ > O-
		Progressive Demasking	✓Identical < NCG	
Comesaña et al. (2012) *Neuroscience Letters*	European Portuguese-English bilinguals	Silent Reading with Masked Priming	✓CG > NCG ✓O-P+ > O-P-	

VARIABLES that may explain the inconsistencies in data

- Task requirements
- Second language (L2) exposure/usage
- Stimuli list composition (blocked vs. mixed)

OBJECTIVES

- **Experiment 1: To explore the contribution of P to visual CG word recognition as a function of L2 exposure.**

  The effects of P to visual CG word recognition would be greater the higher degree of L2 exposure

- **Experiment 2: To explore the role of the stimuli list composition in CG word processing.**

  The presence of identical CG words (e.g., hotel-*hotel*)in the stimuli list composition will lead to facilitative effects. Conversely when the stimuli list is composed by only non-identical CG words (paper-*papel*), there will be an inhibition effect.

EXPERIMENT 1

❑**42** Portuguese – English (L1 – L2) proficient bilinguals (Language History Questionnaire, Li, Sepanski, & Zhao, 2010)

	Low L2 exposure (23 participants)	**High L2 exposure (19 participants)**
L2 exposure (% of L2 use)	26.7%	46.5%
M_{age}	23.6 (1.85)	38.6 (7.5)
M_{AoA}	8.3 (2.5)	9.4 (3.5)

❑**DMDX software** (Forster & Forster, 2003)

Self-ratings (Mean and SD) of L2 proficiency based on a 7-point Likert scale (from 1-low to 7-high)for each group

Proficiency	High L2 exposure	Low L2 exposure
Reading	6.3 (0.7)	5.9 (0.7)
Writing	5.9 (0.9)	5.5 (0.6)
Speaking	6.2 (0.7)	5.7 (0.8)
Listening	6.2 (0.5)	5.9 (0.5)

❑Materials

- **Targets**
  - 192 English target words (96 non-identical cognates - CG + 96 non-cognates – NCG matched in frequency and length)
  - CG words were divided in 4 experimental conditions matched in frequency, MLBF, length, and orthographic and phonological neighbors.

Means (SD) of the Phonological (P) and orthographic (O) overlap of CG words in 4 experimental conditions.

	O+P+	O+P-	O-P+	O-P-
O overlap (objective)	0.76 (0.06)	0.77 (0.07)	0.58 (0.11)	0.56 (0.09)
O overlap (subjective)	0.93 (0.04)	0.94 (0.03)	0.69 (0.13)	0.7 (0.11)
P overlap (objective)	0.78 (0.02)	0.38 (0.04)	0.68 (0.03)	0.30 (0.03)
P overlap (subjective)	0.83 (0.09)	0.77 (0.04)	0.76 (0.09)	0.68 (0.09)
	banda-BAND	prosa-PROSE	circo-CIRCUS	raça-RACE

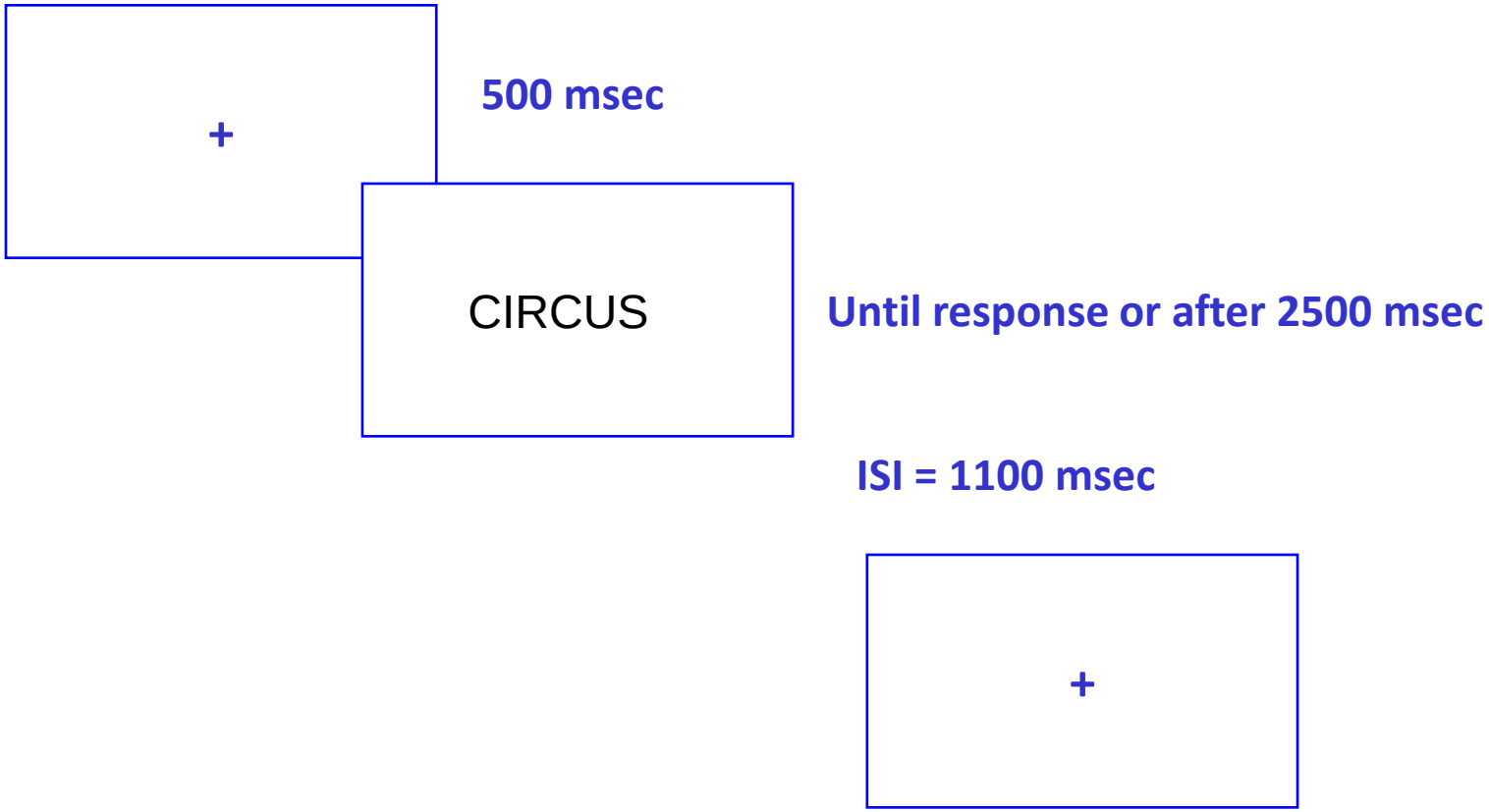
Rsp= .76 (p<.001)

Rsp= .26 (p<.01)

Method

❑Procedure

Lexical Decision Task (LDT) in L2



❑Design

- **Lexicality** (word vs. nonword) x **Word Status** (CG vs. NCG) x **O Overlap** (O+ vs. O-) x **P Overlap** (P+ vs. P-) x **L2 Exposure** (high vs. low)

Experiment 1: Overall Results TRs

Overall Anova:

- Lexicality, $p < .001$
  $p < .001$

words	nowords
651 (18.6)	796 (28.1)

CG	NCG
734 (24.1)	713 (20,9)

- Status, $F_1(1, 40) = 4.04$; $p < .05$, $\eta^2 = .091$
  $F_2(1, 368) = 2.82$; $p = .094$; $\eta^2 = .094$

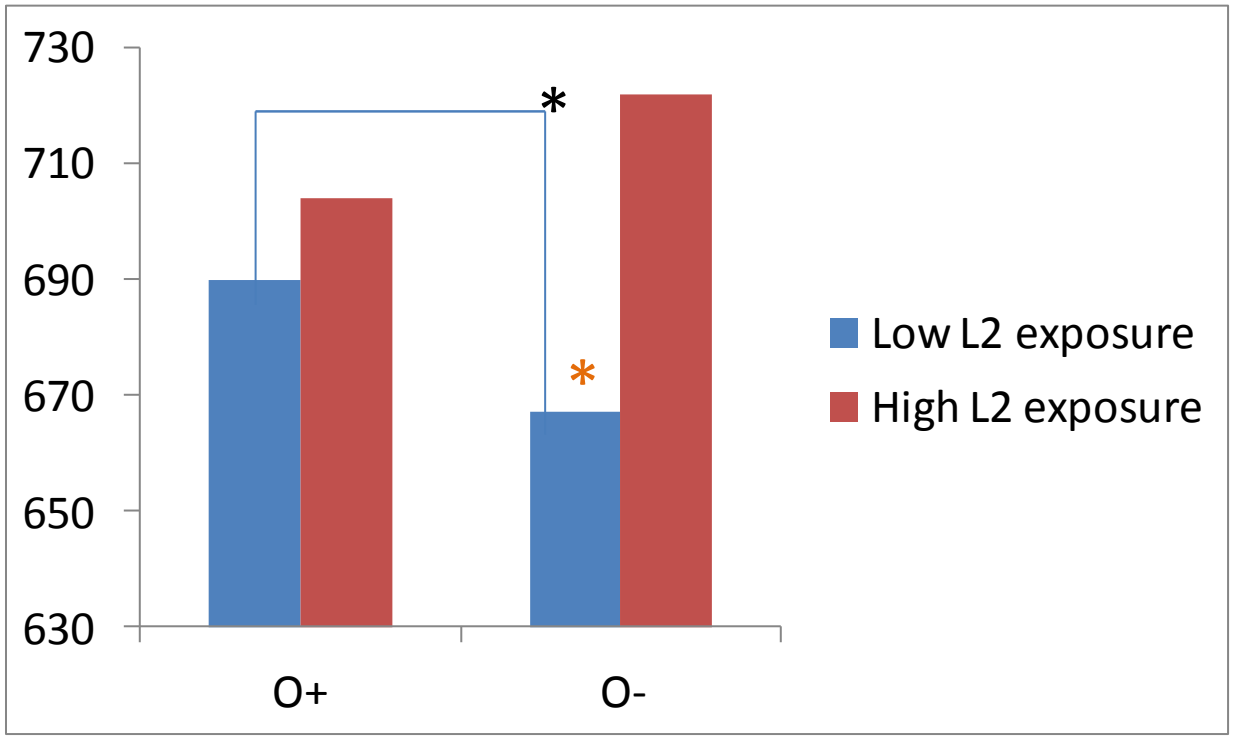
- L2 exposure group, $F_1(1, 40) = 4.03$; $p < .05$, $\eta^2 = .09$
  $F_2(1, 368) = 380.15$; $p < .001$; $\eta^2 = .51$

high	low
789 (24.3)	723 (22.1)

Experiment 1: Anova of CG words

- L2 exposure, $F_1(1, 40) = 1.56$; $p = .22$, $\eta^2 = .004$
  $F_2(1, 92) = 44.35$; $p < .001$; $\eta^2 = .33$

- L2 exposure x O, $F_1(1, 22) = 9.20$; $p < .05$, $\eta^2 = .18$
  $F_2(1, 92) = 13.74$; $p < .001$; $\eta^2 = .13$



SUMMARY

✓L2 exposure modulates the effects but not as expected. We failed to observe any effect of P or its interaction with O in the processing of CG words. O+ CG words led to slower RTs than O- CG but only for participants from the low L2 exposure group.

✓CG words were slower recognized than NCG words. **WHY?**

OBJECTIVES

- **Experiment 1: To explore the contribution of P to visual CG word recognition as a function of L2 exposure.**

  The effects of P to visual CG word recognition would be greater the higher degree of L2 exposure

- Experiment 2: To explore the role of the stimuli list composition in CG word processing.

  The presence of identical CG words in the stimuli list composition will lead to facilitative effects. Conversely, when the stimuli list is composed by only non-identical CG words the effects will be of inhibition.

EXPERIMENT 2a

- **Participants: 23** Catalan- Spanish(L1 – L2) proficient bilinguals(*Language History Questionnaire*, Li et al., 2010)
- Oriental dialect of the Catalan Language

	Catalan-Spanish bilinguals
L2 exposure (% L2 use)	25.6%
M_{age}	23.3 (4.14)
M_{AoA}	4.3 (1.65)

- **DMDX**

Self-ratings (Mean and SD) of L2 proficiency based on a 7-point Likert scale (from 1-low to 7-high)

Proficiency	Catalan-Spanish participants
Reading	6.7 (0.6)
Writing	6.7 (0.6)
Speaking	6.3 (0.9)
Listening	6.8 (0.6)

❑Materials

•Targets

- 192 Spanish target words (96 non-identical cognates - CG + 96 non-cognates – NCG matched in frequency and length)
- CG words were divided in 4 experimental conditions matched in frequency, MLBF, length, and orthographic and phonological neighbors.

Means (SD) of the Phonological (P) and orthographic (O) overlap of CG words in 4 experimental conditions.

	O+P+	O+P-	O-P+	O-P-
O overlap (objective)	0.77 (0.03)	0.77 (0.03)	0.58 (0.08)	0.55 (0.07)
P overlap (objective)	0.88 (0.05)	0.74 (0.05)	0.88 (0.06)	0.72 (0.07)
	lluna-LUNA	sord-SORDO	dada-DATO	nuvi-NOVIO

Task: Lexical Decision
Design: Lexicality x Status x O x P

Experiment 2a: Overall Results TRs

- Lexicality, $p < .001$
  $p < .001$

words	nonwords
654	784

- Status, $F_1(1, 22) = 17.42$; $p < .001$; $\eta^2 = .44$;
  $F_2(1, 368) = 6.36$; $p < .05$; $\eta^2 = .033$

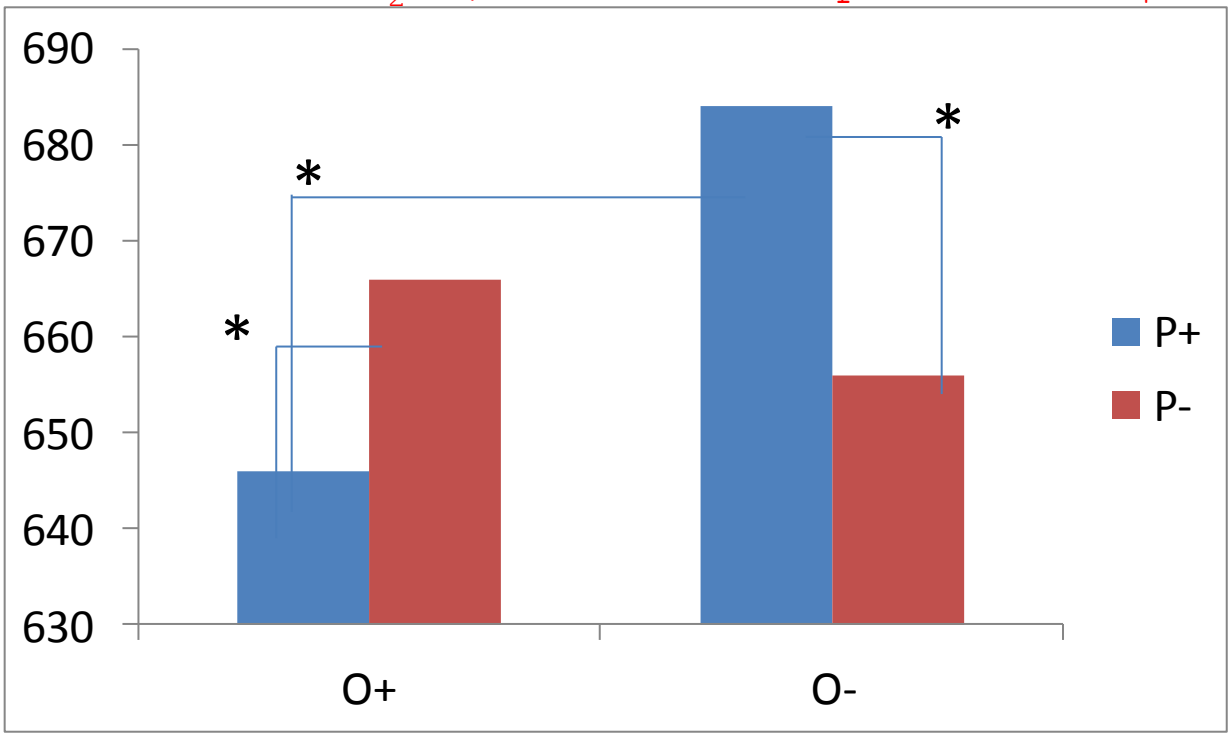
CG	NCG
663	644
(21.8)	(20.4)

Experiment 2a: Anova of CG words

- O overlap, $F_1(1, 22) = 6.41$; $p < .05$, $\eta^2 = .23$
  $F_2(1, 92) = 1.05$; $p = .31$; $\eta^2 = .011$

O+	O-
657 (21.7)	670 (22.3)

- O ovelap x P overlap, $F_1(1, 22) = 13.20$; $p \leq .001$, $\eta^2 = .38$
  $F_2(1, 92) = 3.65$; $p = .059$; $\eta^2 = .04$



EXPERIMENT 2b

- **Participants: 20** Catalan- Spanish(L1 – L2) proficient bilinguals(*Language History Questionnaire*, Li et al., 2010)
- Oriental dialect of the Catalan Language

	Catalan-Spanish bilinguals
L2 exposure (% L2 use)	25.2%
M_{age}	23.2 (2.7)
M_{AoA}	5.0 (1.1)

- **DMDX**

❑Materials

- **Targets**
  - 192 Spanish target words (96 CG[48 identical + 48 non-identical] + 96 non-cognates – NCG matched in frequency and length)
  - CG words were divided in 4 experimental conditions matched in frequency, MLBF, length, and orthographic and phonological neighbors.

Means (SD) of the Phonological(P) and Orthographic (O) overlap of CG words in 4 experimental conditions.

	IDENTICAL O+P+	IDENTICAL O+P-	NON IDENTICAL O-P+	NON IDENTICAL O-P-
O overlap (objective)	1.0 (0.0)	1.0 (0.0)	0.70 (0.08)	0.69 (0.10)
P overlap (objective)	0.97 (0.01)	0.78 (0.04)	0.98 (0.01)	0.78 (0.01)
	plata-PLATA	pintor-PINTOR	xifra-CIFRA	premi-PREMIO

Task: Lexical Decision
Design: Lexicality x Status x O x P

Experiment 2b: Overall Results TRs

- Lexicality, $p < .001$
  $p < .001$

words	nonwords
622	737

- Status, $F_1(1, 19) = 5,32;\ p < .05;\ \eta^2 = .22;$
  $F_2(1, 368) = 1.65;\ p = .020;\ \eta^2 = .01$

CG	NCG
617	628
(17.8)	(17.9)

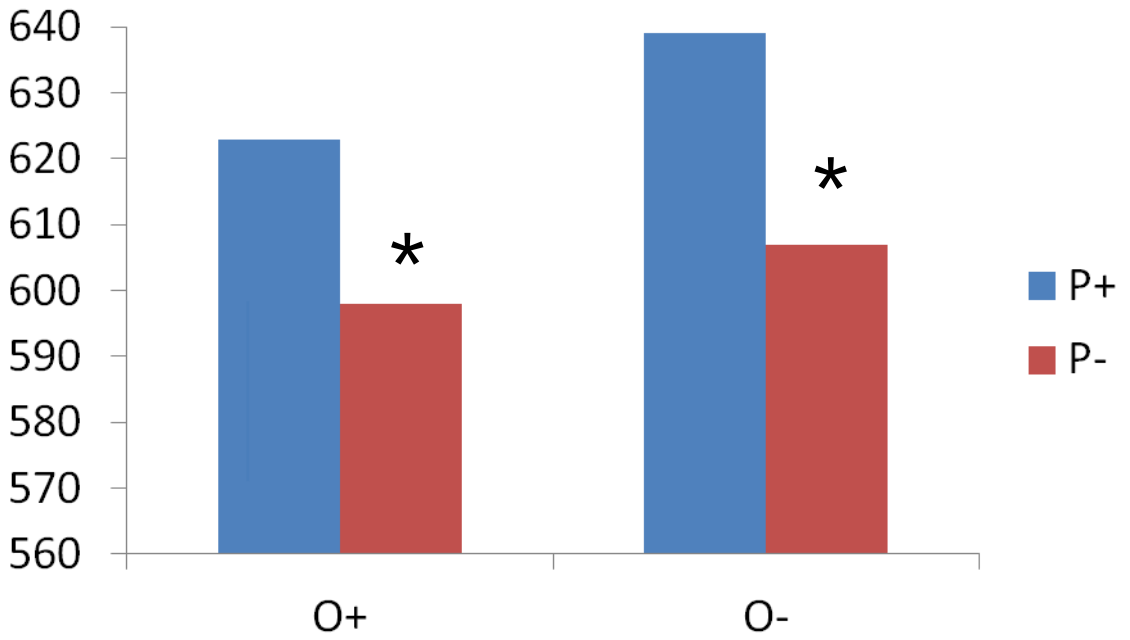
Experiment 2b: Anova of CG words

- O overlap, $F_2(1, 19) = 3.90$; $p = .06$; $\eta^2 = .17$
  $F_2(1, 92) = 2.84$; $p = .09$; $\eta^2 = .030$

O+	O-
611 (16.9)	623 (19.1)

P+	P-
631 (18.8)	603 (17.3)

- P overlap, $F_1(1, 19) = 19.65$; $p \leq .001$, $\eta^2 = .51$
  $F_2(1, 92) = 10.09$; $p < .05$; $\eta^2 = .10$



SUMMARY

✓Non-identical CG words led to higher RTs than NCG words. Conversely when the experimental list contains identical CG the effect is reversed.

✓The effect of P on CG word processing varied as a function of the stimuli list composition.

✓Thus, identical and non-identical CG words are differently processed, probably because they have a differential representation in bilingual memory, as Dijkstra et al. (2010) pointed out.

CONCLUSIONS

✓L2 exposure affects visual cognate word recognition.

✓The direction of CG effects depends not only on task requirements but also on stimuli list composition.

Bilingual models as the localist, connectionist one need to accommodate these results.

Rosa Sánchez-Casas
Universitat Rovira i Virgili, Spain

Isabel Fraga
USC, Spain

Andreia Rauber
Universidade Católica de Pelotas, Brazil

Pilar Ferré
Universitat Rovira i Virgili, Spain

Joaquin Romero
Universitat Rovira i Virgili, Spain

Ana P. Soares
Universidade do Minho, Portugal

CG words

Moitas grazas!

NCG words

This research has been funded by the Spanish Ministry of Economy and Competitiveness (PSI2012-37623) as well as by FCT (Fundação para a Ciência e Tecnologia), and FEDER (Fundo Europeu de Desenvolvimento Regional) through the European programs QREN (Quadro de Referência Estratégico Nacional), and COMPETE (Programa Operacional Factores de Competitividade) (Grant PTDC/PSI-PCO/104679/2008).

FCT Fundação para a Ciência e a Tecnologia
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR

UNIÃO EUROPEIA
FEDER

COMPETE
PROGRAMA OPERACIONAL FACTORES DE COMPETITIVIDADE

QREN QUADRO DE REFERÊNCIA ESTRATÉGICO NACIONAL