



REFERRING EXPRESSIONS AND EXECUTIVE FUNCTIONS IN CHILD AND ADULT BILINGUALS

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Main points

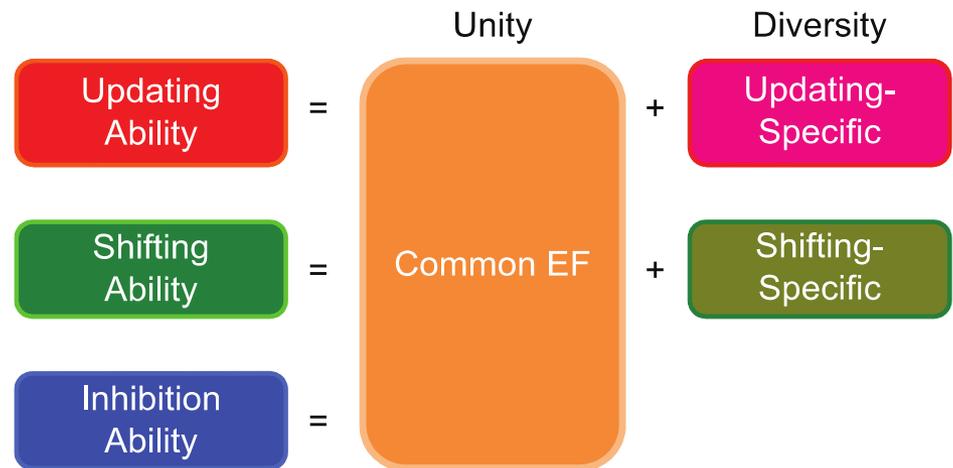
- *Reciprocal* interactions between language and general cognitive processes
- Bilingualism may modulate *the relation* between components of EFs
- This in turn affects the processing of particular linguistic structures
- Evidence for the ‘bilingual paradox’?

Some assumptions

- If a phenomenon can be shown to derive from general cognitive mechanisms, it doesn't need to be explained by linguistic theories (Phillips et al 2011).

Some assumptions

- Executive function (EF) refers to a set of cognitive control processes that underlie goal-directed behaviors, including inhibitory control, shifting, and updating.



(from Miyake & Friedman 2012)

Some assumptions

- Overlap between inhibitory control for language and for non-linguistic cognition.

(but see Calabria et al 2012 for evidence of qualitative differences between the two)

Some assumptions

- Individual differences in cognitive control abilities affect sentence-processing abilities (Vuong & Martin 2013; Novick et al 2014).
- Individual differences in cognitive control abilities are MORE visible in (probabilistic) pronoun resolution than in (categorical) syntactic processing (Neuwlund & Van Berkum 2006)

Extension of overt pronouns in late bilingual speakers of Italian

Different bilingual groups

- advanced L2 speakers of Italian
- attrited L1 speakers of Italian

overextend the scope of the OVERT subject pronoun to contents in which a NULL pronoun would be expected, but not vice versa.

L2 speakers > L1 attriters.

(Belletti et al. 2007; Sorace & Filiaci 2006; Tsimpli, Sorace, Heycock & Filiaci 2004; Sorace et al 2009)

Monolingual Italians



Mario non vede **suo fratello** da quando **lui** è partito

Mario hasn't seen his brother since he left

OVERT PRONOUN: BILINGUALS ≠ MONOLINGUALS



Mario non vede suo fratello da quando **lui** è partito
Mario hasn't seen his brother since he left

NULL PRONOUN: BILINGUALS = MONOLINGUALS

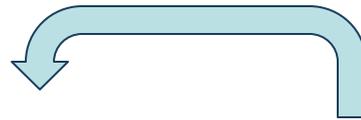

Mario non vede suo fratello da quando \emptyset è partito
Mario hasn't seen his brother since he left

Similar results obtained for bilinguals speaking English and a pro-drop language.

Extension of demonstratives in bilingual speakers of German

- Both L2 speakers of German L2ers and native German speakers under attrition extend the scope of the DEMONSTRATIVE form to contexts in which the PRONOUN would be appropriate (Wilson et al 2010, submitted)

Monolingual Germans



Der Kellner begrüßt **den Kassierer**. **Der** ist offensichtlich sehr nett

The waiter greets the cashier. He is apparently very nice.

DEM PRONOUN: BILINGUALS ≠ MONOLINGUALS



Der Kellner begrüßt den Kassierer. **Der** ist offensichtlich sehr nett

The waiter greets the cashier. He is apparently very nice.

PERSONAL PRONOUN: BILINGUALS = MONOLINGUALS



Der Kellner begrüßt den Kassierer. **Er** ist offensichtlich sehr nett

- What changes in individual L1 attrition?

A test: attrition and recent L1 exposure (Chamorro, Sorace & Sturt 2015)

Bilingualism: Language and Cognition: page 1 of 13 © Cambridge University Press 2015 doi:10.1017/S1366728915000152

What is the source of L1 attrition? The effect of recent L1 re-exposure on Spanish speakers under L1 attrition*

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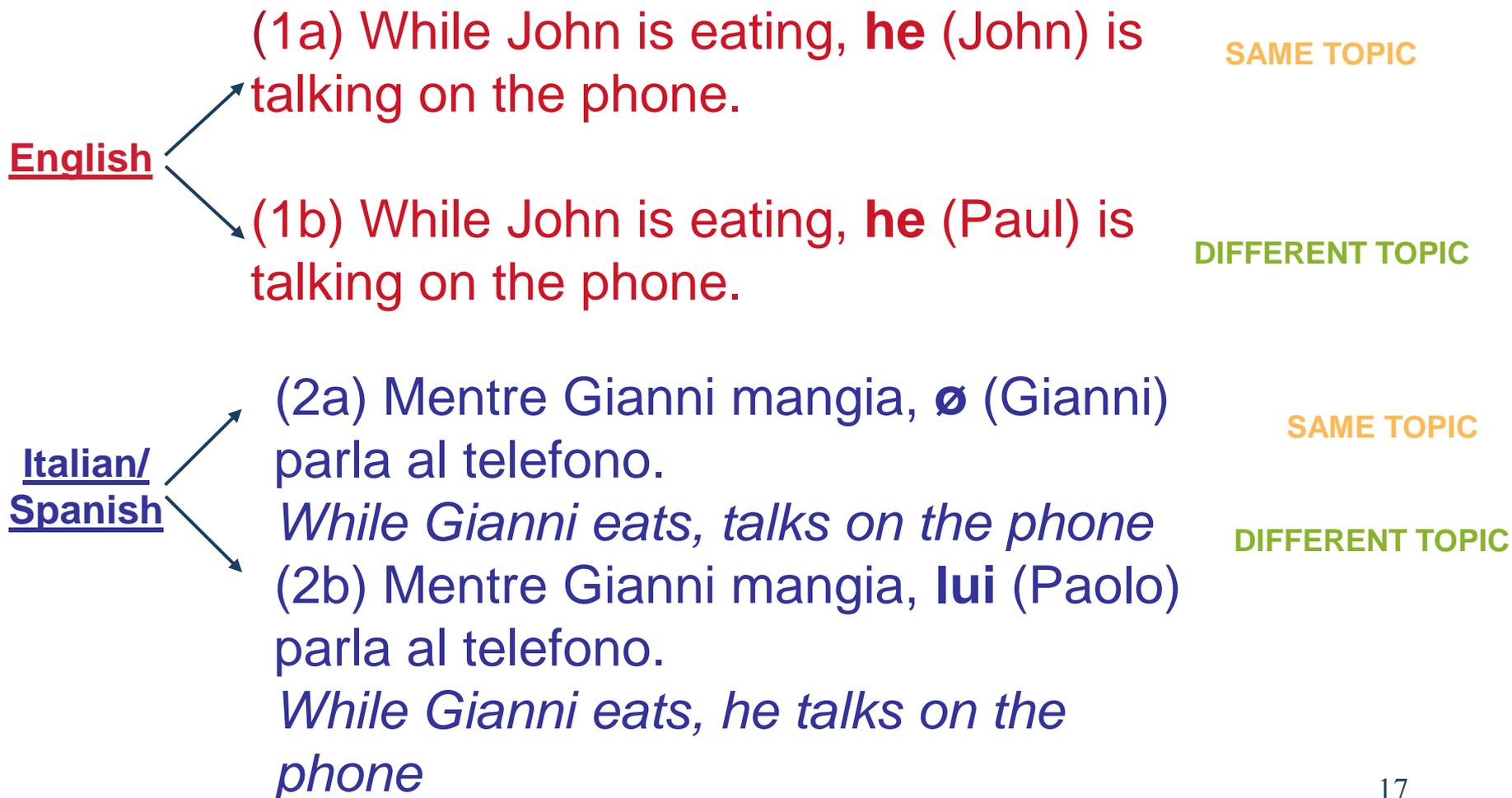
- L1 Spanish attrited speakers in the UK overextend subject pronouns.
- Attrition effects are sensitive to recent immersion in a Spanish-speaking environment.
- Speakers recently re-exposed to native input show partly reversed effects and are intermediate between L1 attriters in the UK and monolinguals in Spain..

Bilingual children

(Serratrice et al. 2009; Sorace et al. 2009; Sorace & Serratrice 2009; Serratrice et al, 2012)

- Large group (N=167) of older bilingual children: age ranges 6-8 and 9-10.
- Two language combinations: Italian-Spanish, Italian-English
- Two acquisition settings for English-Italian bilinguals: UK and Italy.
- Three phenomena: **presence/absence of articles with specific/generic plural nouns; null vs. overt subject pronouns**; object pronouns in focused vs. unfocused contexts).

Subject pronouns/facts



Determiners with plural nouns/facts

<u>English</u>	(3a) Ø Sharks are dangerous animals.	GENERIC
	(3b) The sharks at the aquarium are rather small	SPECIFIC
<u>Italian/ Spanish</u>	(4a) Gli squali sono animali pericolosi. <i>The sharks are animals dangerous</i>	GENERIC
	(4b) Gli squali all'acquario sono piccoli. <i>The sharks at the aquarium are rather small</i>	SPECIFIC

Results: pronouns

- Overt subject pronouns in null subject pronoun contexts (*Paperino_i ha detto che lui_i è caduto* ‘Donald Duck_i said that he_i fell’) accepted by both I-E and I-S bilinguals.
- Bilingual children in the UK do so significantly more often than bilingual children in Italy.
- Younger monolingual control children also accept inappropriate overt pronouns.

Results: bare plurals

- Ungrammatical bare plurals (**In genere fragole sono rosse* ‘Generally strawberries are red’) are accepted in Italian **only by I-E group, but not by the I-S group.**
- Effect larger for I-E group in UK
- Both child and adult controls at ceiling

Summary of results on children

- Crosslinguistic effects for generic plurals, but not for subject pronouns.
- For subject pronouns, language combination doesn't seem to matter.
- Over-explicitness in both child and adult bilinguals.

- Are children and adults over-explicit for the same reason?
- Or are these superficially similar patterns of behaviour due to different causes?

So what's the problem with subject pronouns?

- Knowledge representations?
 - influenced by the other language (English)
 - not completely acquired in L2
 - 'lost' in L1 attrition
- Processing?
 - integration of grammatical and pragmatic information in real time

Crosslinguistic influence?

(when English is the other language)

- The language that has the least restrictive option (English) affects the other (regardless of whether it is L1 or L2), but not vice versa.
- L1 attrition: neutralization of L1 distinctions towards the less restrictive L2 system.
- L2 acquisition: neutralization of L2 distinctions towards the less restrictive L1 system.

But this can't be the whole story....

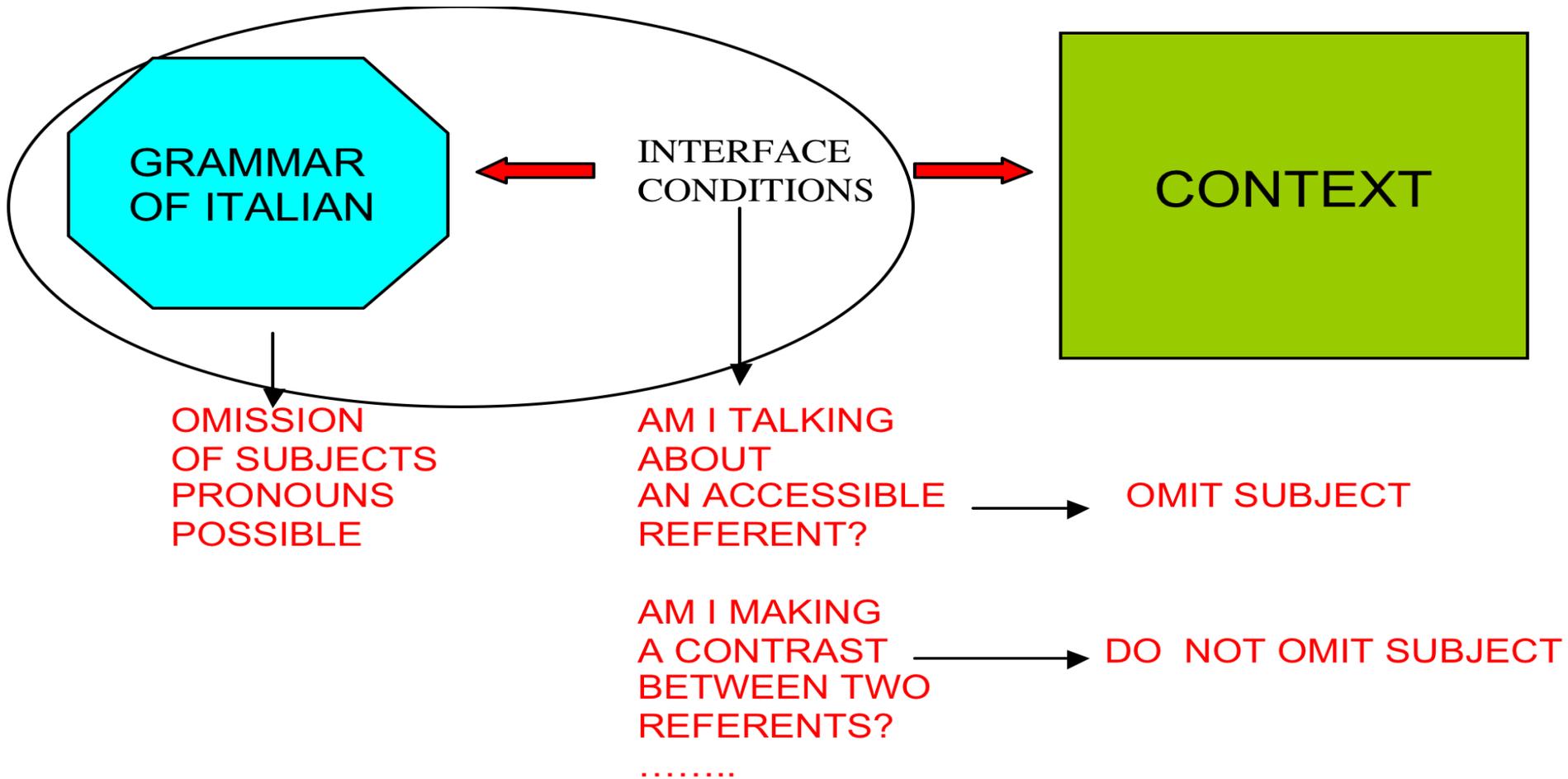
- The overuse of overt pronouns is also attested in late bilingual speakers of two pro-drop languages of the same type (Italian-Spanish, Greek-Spanish, Spanish-Portuguese...)

(e.g. Bini 1993; Malgaza & Bel 2006; Lozano 2007; Mendes & Iribarren 2007; Serratrice & Sorace 2009, Prada 2007, a.o.)

What's the problem with subject pronouns?

- Knowledge representations?
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- Processing?
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Grammar-context coordination



What aspects of executive function are involved in using anaphoric forms?

- In natural interaction, bilingual speakers have to be able to rapidly **inhibit** irrelevant pronoun-antecedent mappings, **integrate** changing information from the context and from the assessment of the interlocutor's knowledge state, and **update** the discourse model accordingly (see Brown-Schmidt 2009 a.o.)

Insufficient resources?

- Competition with resources necessary for keeping the two languages separate?



Competition for resources

- Bilinguals need to exercise executive control to avoid interference from the unwanted language.
- This may take attentional resources away from other (linguistic) tasks.
- This might explain why bilinguals are not consistent at computing these dependencies

Effect size and L1 vs. L2 inhibition

- The overextension of overt pronouns is **SMALLER** in attrited L1 speakers than in L2 speakers of Italian.
- In L2 speakers, the unwanted language is their (still dominant) L1, which needs more resources to be inhibited.
- In ‘attrited’ L1 speakers, the unwanted language is their (less dominant) L2 which needs fewer resources to be inhibited.

An updating problem?

- Inefficient integration of contextual changes and updating?



Two steps in producing referential forms

- Choosing a referring expression in production consists of:
 - First, choose the most reduced (default) form
 - Next, select a form that can be best understood by the listener if needed

- **So maintaining reference** should not a problem, but...
- More explicit /less reduced forms for less prominent referents are more costly to produce → mentalizing about the listener's interpretation and discarding the less informative forms → updating discourse model.

- Bilinguals are **over-explicit**: they produce fewer reduced forms.
- Other populations (e.g. young autistic people) also overuse explicit forms (Arnold, Benetto & Diehl 2009)

Higher threshold for salience

- Bilinguals may have a higher threshold for deciding that a reduced form is sufficiently clear, especially for a referent with slightly decayed activation.

Paolo non vede suo padre da quando **lui** si è sposato

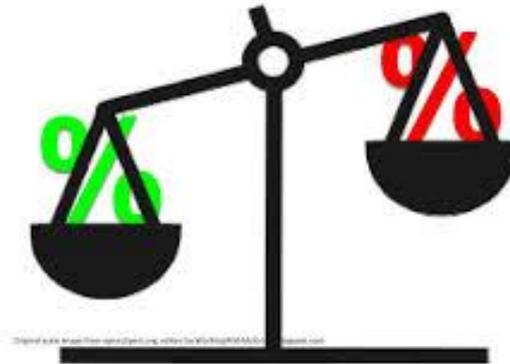
Paolo hasn't seen his father since he got married

The two-step model in comprehending referential forms

- First, the interpretation of pronouns is based on default mapping to the most prominent referent.
- Next, the perspective of the speaker is considered: the use of a marked form signals a shift of reference to the less prominent antecedent → mentalizing about the speaker's intention → updating discourse model.

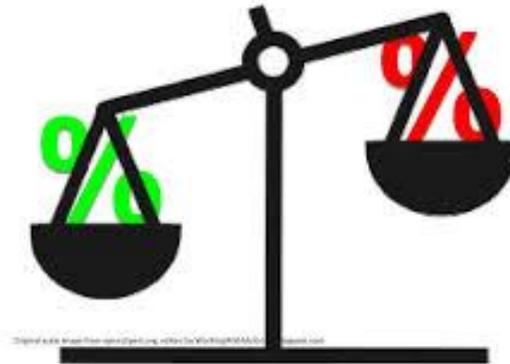
A trade-off between inhibitory control and integration/updating

- The ability to integrate and update is in a trade-off relation with inhibitory control (see e.g. Braver 2012; Bunting & Conway 2002; Gotschke and Driesbach 2008)



A trade-off between inhibitory control and integration/updating

- (Late) bilingualism → very good inhibitory control → less good integration/updating.



A trade-off between inhibitory control and integration/updating

- Integration of cues that signal switching to a different interpretation requires “disengagement” of inhibition (Blumenfeld & Marian 2010).
- The two components can be dissociated in several impaired and typical populations (Titone et al 2000; Phillips & Silverstein 2003; Watson et al 2012; Arnold, Bennetto & Diehl 2009).

Early vs. late bilinguals

- Early bilinguals can inhibit but also “disengage” inhibition more easily than monolinguals; release of inhibition allows easier task switching and updating of mental sets.

A new hypothesis

- The bilingual experience may have different effects on different EF components.

enhanced inhibitory control

loss of efficiency in modulation of
inhibition and integration
of cues

- Early bilinguals more successful than late bilinguals at solving the the trade-off tension between the two components.

AoO effects on bilingual EFs

Bak, Vega-Mendoza & Sorace (2014)

frontiers in
PSYCHOLOGY

ORIGINAL RESEARCH ARTICLE

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Never too late? An advantage on tests of auditory attention extends to late bilinguals

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Three tasks from the Test of Everyday Attention (Robertson et al 1994) with early and late bilinguals controlled for age and SES:

- 1: count the tones (**sustained attention**)
- 2: count only the high tones but not the low tones (**selective attention and inhibition**)
- 3: count up if you hear a high tone, reverse the direction of counting if you hear a low tone (**updating and switching**)

Results

- No group difference for TEA 1
- Early bilinguals better than monolinguals at both TEA 2 and TEA 3
- Late bilinguals better than monolinguals at TEA 2, but effect much weaker in TEA 3.



Contents lists available at [ScienceDirect](#)

Cognition

journal homepage: www.elsevier.com/locate/COGNIT



Brief article

The impact of late, non-balanced bilingualism on cognitive performance



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- However, our more recent study found cognitive effects on both TEA 2 and 3 in university language students.

Interim conclusions

- Bilingual speakers are not monolingual-like in their use of pronominal forms, in L2 or in L1; but are not radically different either.
- The phenomenon has both a linguistic and a cognitive side (general effects of bilingualism).

- These differences (= 'effects') can be seen as advantages or disadvantages only if one takes the monolingual system as a point of reference.
- But as Grosjean first taught us, bilinguals are not the sum of two monolinguals.....

An alternative, more 'unified' account

- Need to take into account the whole attentional system rather than isolated components (Bialystok 2015).
- Different balance between proactive and reactive control (Braver 2012; Braver, Gray & Burgess 2007)
- Bilingualism entails a reconfiguration of the cognitive network that affects both linguistic and non-linguistic processing.

- Reconfiguring of the language space in successful late bilinguals → convergence between L1 and L2
- Proficient bilinguals are not monolingual-like in either the L1 or the L2.

Mutual L1-L2 influence: a desirable thing!

A new hypothesis:
more cognitive flexibility => less monolingualism in L1 => more success at learning L2.



(some of many) open questions

- There is variation in monolinguals too (largely restricted to the same pronominal form overextended by bilinguals).
- The simple lack of resources account predicts that monolinguals under pressure would produce similar patterns.
- The reconfiguration account predicts differences between monolinguals and bilinguals.

(some of many) open questions

- Children and adults: same patterns, different reasons?
(ALL bilingual children are exposed to L1 attrited and L2 speakers, to varying extents)
- Inhibiting LANGUAGES vs. inhibiting particular STRUCTURES.

We need bridges...

- Interdisciplinarity is one of the keys to increasing our scientific understanding of bilingualism.



There's more to bilingualism than executive functions

- The effects of bilingualism on EFs is only **one** of many aspects of the bilingual experience that have been studied extensively.

THANK YOU!

Sorace, Rohde & van Gompel (ongoing)

Interactions with EFs with the resolution of pronominal incongruence in (a) and (b) but not in (c):

(a) Verb semantics: Implicit causality

The knight frightened/feared the witch because ...
HE/SHE

(b) Semantics of connectives

The knight frightened the witch because / so....
HE/SHE

(c) Number morphology

*The witch frightened the knights in the castle
because all of a sudden SHE /THEY ran away.*