Bilingualism and Executive Function: An Interdisciplinary Approach
May 18-19, 2015
City University of New York Graduate Center

DISCUSSION

on

BILINGUALISM, LINGUISTIC STRUCTURE, AND EXECUTIVE FUNCTION IN CHILDREN

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Antonella Sorace

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THIS SESSION: 2 impressive, thought-provoking studies:

Marton: Do bilingual children perform more efficiently in experimental tasks than their monolingual peers?

Sorace: L1 attrition meets L2 acquisition in proficient late bilingualism

Both Studies:

Provide rich food for thought concerning exactly **what is influencing what** in bilinguals' performance on linguistic and non-linguistic tasks, EF in particular.

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Are attempting to **separate a range of factors** influencing performance in Bilinguals and Monolinguals

Compare **types of Bilinguals** to explore the generality of effects across populations

Marton:

- Influence of **language proficiency** on **speed** of processing
  - Comparison of baseline, labeling, non-verbal cue, and proactive interference conditions on Accuracy and RT performance
  - Comparison of monolinguals and bilinguals
  - Comparison of bilingual children in distinct contexts

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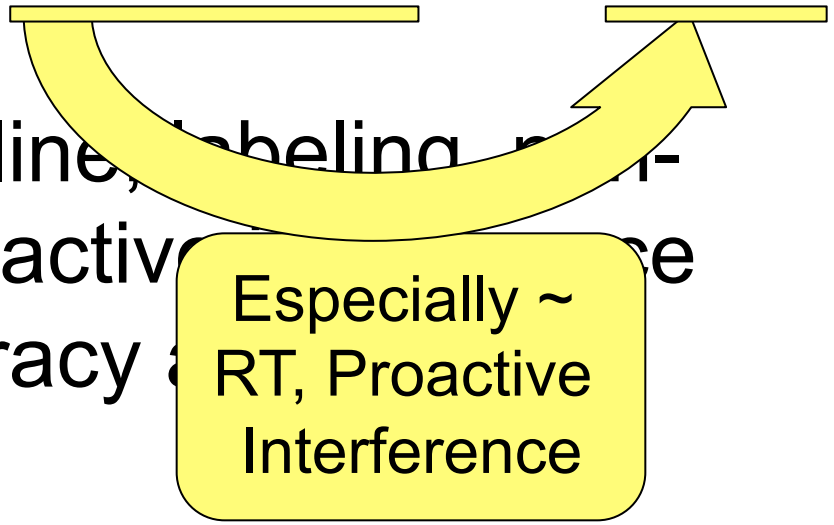

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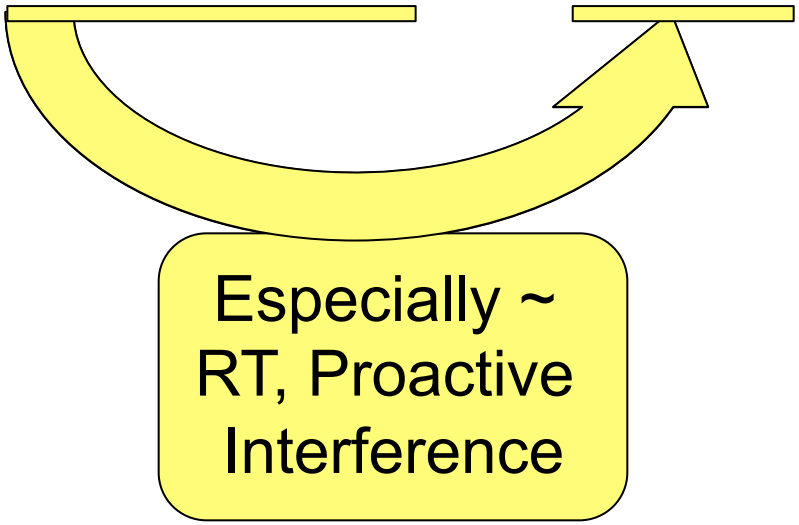

- Examination of performance **monitoring**

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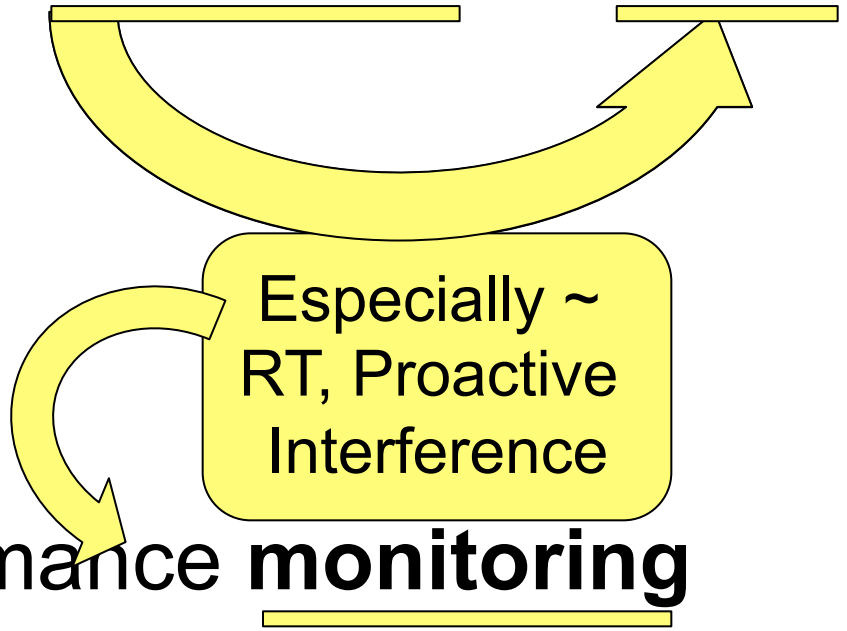

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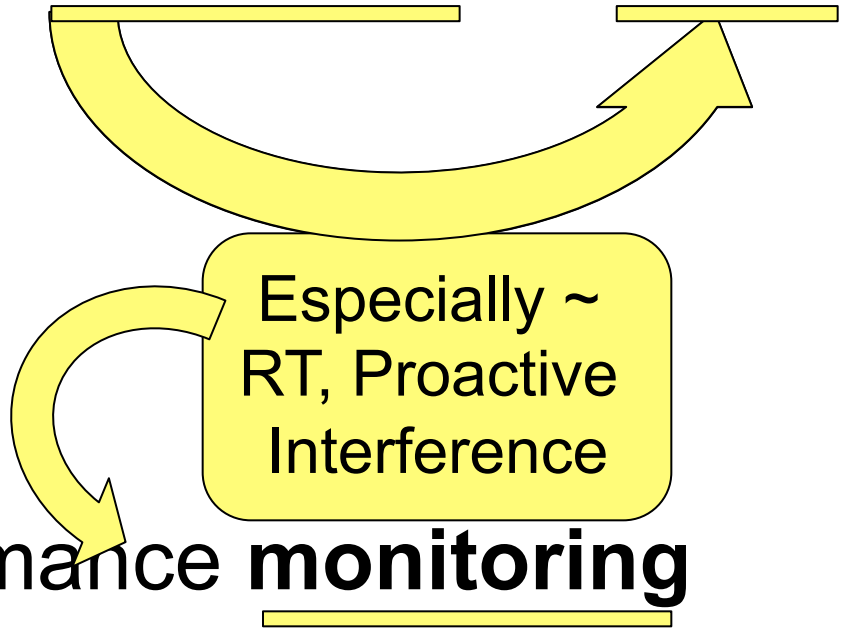

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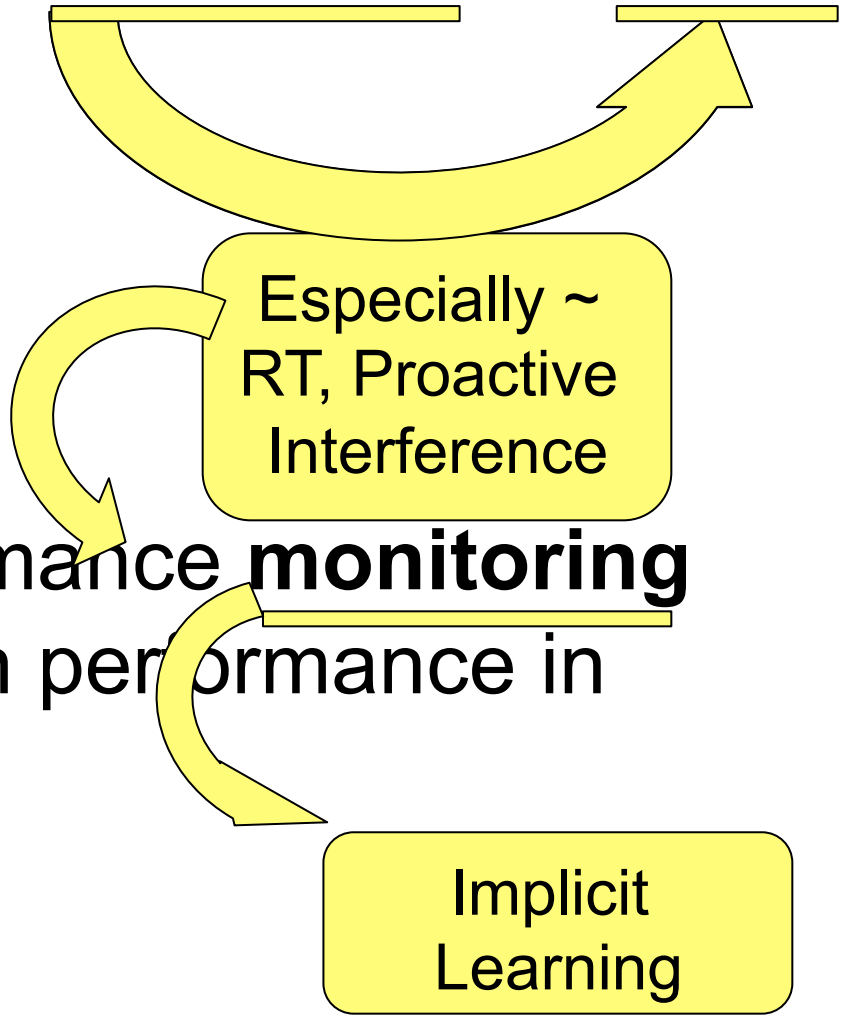

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- Relationships between performance in **distinct tasks**

Sorace:

- Explores the role of **cognition** – especially **EF** – in the **linguistic performance** of bilinguals
  - Examines performance on a range of linguistic structures:
    - **Overt/null pronouns** in Italian
    - (Absence of) use of definite articles for **generics** in Italian
  - Compares bilinguals with monolinguals
  - Compares types of bilinguals

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~ Referential ambiguity; syntax-pragmatics interface

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- Addresses the separate contributions of **Processing** and **Transfer** to Bilinguals' performance

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Both are in evidence:

Processing: all Bils: over-use of overt pros (and under-use of null pros)

Transfer: E-I bilinguals: greater use of bare Ns for generics, more over-use of overt pros than S-I bilinguals

Sorace:

- Proposes a trade-off in bilinguals' performance between
  - **integration** and updating in linguistic processing
  - and
  - **inhibitory control**

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Mons > Bils

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Competition between resources responsible for bilinguals' difficulties with referential ambiguity in null/overt pronoun use.

Strengths of these talks:

Attempt to uncover in more detail what **factors contribute** to bilinguals' performance:

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What are the **roles of language balance and environment** on performance?

Type of bilingual matters

Marton: range of proficiency? environment?

Sorace: L2ers with distinct L1s? environ?

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Address the **role of EF and cognition** in general in **linguistic performance** of bilinguals

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Examine **contributions of processing limitations** to bilinguals' language performance

Try to identify the **locus of interaction** between the two languages

Delineate **linguistic sub-systems that are and are not affected** by EF, processing limitations, and transfer

Questions/Issues: Specific:

Marton:

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Lang Proficiency → Speed in Proactive Interference Tasks → Monitor-ing → Implicit Learning

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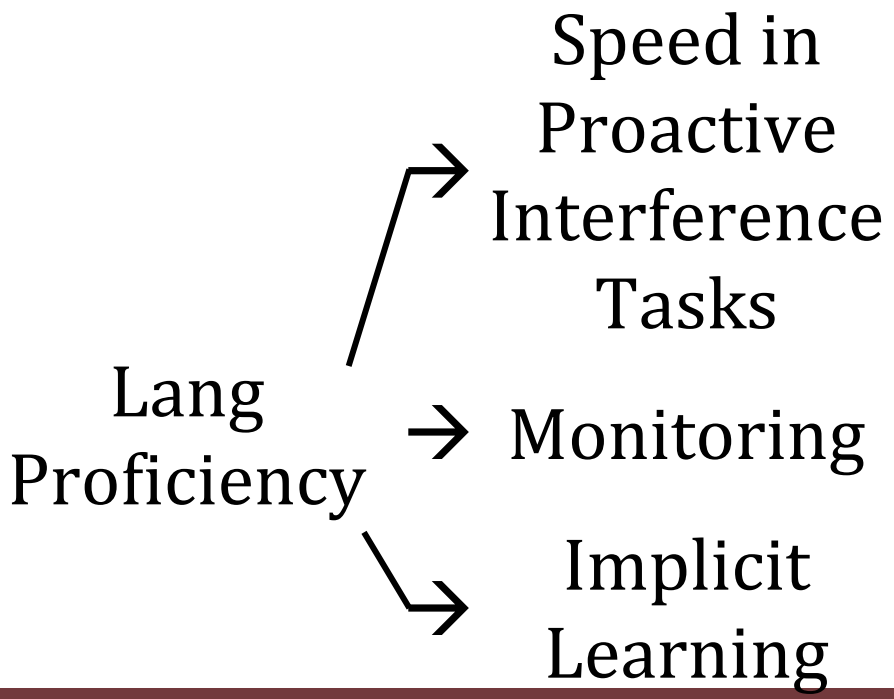

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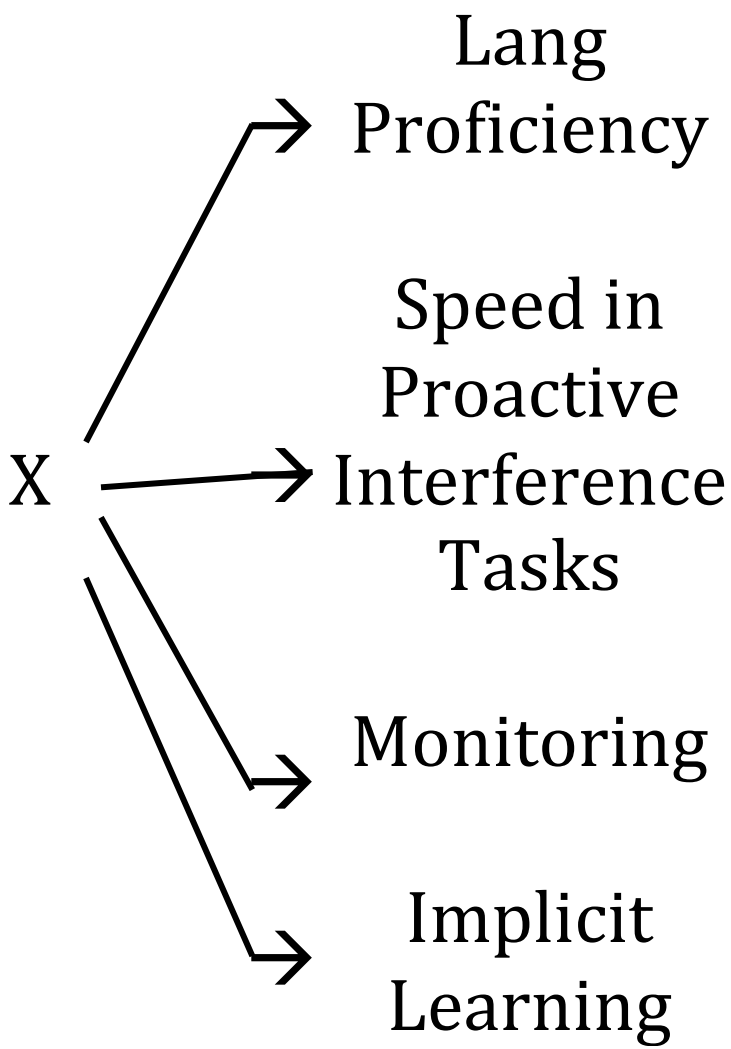

Questions/Issues: Specific:

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Sorace:

Why wouldn't a superior control of inhibition in bilinguals offset or compensate for any deficiencies in integration?

Questions/Issues: More general:

1. Both bring up Q of role of **linguistic proficiency**:

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   Sorace raises the Q of whether the items are "not completely acquired"

Questions/Issues: More general:

1. Both bring up Q of role of **linguistic proficiency**:

   Marton: Clear effects of language proficiency on performance on proactive interference task

   Sorace raises the Q of whether the items are "not completely acquired"

      Also: "Younger monolingual control children also accept inappropriate overt pronouns"

      as well as autistic individuals.

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   and
   How do effects of **general cognitive** abilities influence performance **relative** to:
   - **Exposure**
   - **SES**

Questions/Issues: More general:

Clear evidence that **Exposure** and **SES** affect language performance

Exposure: Both talks here; Bialystok, Luk, Peets, & Yang, 2010; Bridges and Hoff, 2014; Gathercole & Thomas, 2009; Harley, Allen, Cummins, & Swain, 1991; Hoff, Core, Place, Rumiche, Senor, & Parra, 2012; Kohnert & Windsor, 2004; Lapkin, Swain, & Shapson, 1990; Letts, 2013; Oller & Eilers,2002; Paradis,2010; Place and Hoff, 2011; Gathercole, 2007; Thordardottir, 2011; Unsworth, in press; Windsor & Kohnert, 2004; Wong-Fillmore, 2000;

SES: Calvo & Bialystok, 2014; Chiat et al., 2013; Fuller et al, 2015; Gatt & O'Toole, 2013; Oller & Eilers, 2002; Stadthagen-González et al., 2013

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   - **SES**

   and, for EF tasks, **Language proficiency**

Studies on EF in bilinguals in Wales
(Gathercole, et al., 2010, 2013)

Included

BPVS (Dunn, Dunn, & Whetton, 1982)
PGC (Gathercole & Thomas, 2007)
E Grammar (13 structures)
W Grammar (13 structures)

McCarthy Scales of Children's Abilities (McCarthy, 1972) [up to age 8]
Raven's Coloured Progressive Matrices (Raven, Court, & Raven, 1983) [from age 7]

McCarthy:
Sub-sections:

pictorial memory,
block building,
puzzle making,
tapping sequence,
number questions,
numerical memory,
numerical memory reversal,
and
counting and sorting

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pictorial memory [Verbal Scale]
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pictorial memory [Verbal Scale]
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puzzle making, Performance Scale]
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McCarthy:

Sub-sections:

pictorial memory [Verbal Scale]
block building, [Perceptual-
puzzle making, Performance Scale]
tapping sequence,
number questions, [Quanti-
numerical memory, tative]
numerical memory reversal,
and
counting and sorting

McCarthy:

Sub-sections:

pictorial memory [Verbal Scale, Memory]
block building, [Perceptual-
puzzle making, Performance Scale]
tapping sequence, -- [Memory]
number questions,
numerical memory, [Quanti- [Mem]
numerical memory reversal, tative]
and
counting and sorting

Participants:

Mon E
Bil: OEH, WEH, OWH [~ exposure, balance]

Ages: 3, 4, 5, Primary (7-8), Teens (12-15),
Younger Adults (20-40), Older Adults (60+)

Q 1:

Does **general cognitive** ability influence **language** proficiency?

- **Correlations** Cognitive ~ Linguistic Perform.
- **Regression** analyses, Linguistic/EF Perform

  Variables:

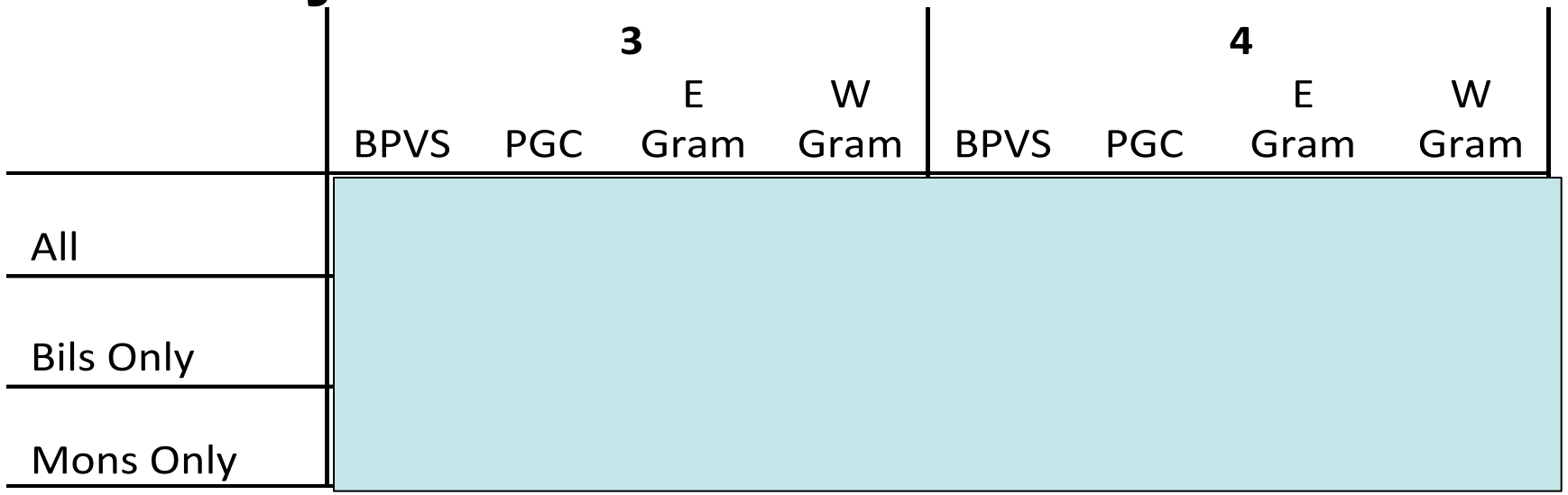
  Cognitive performance

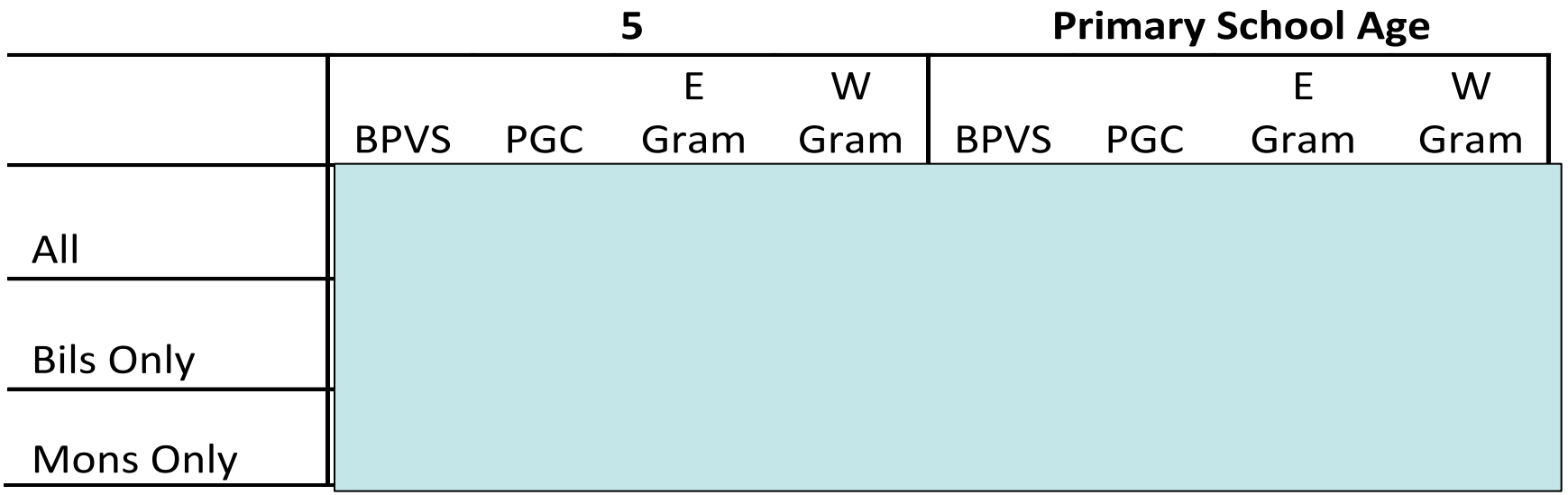
  Home Language [~ Exposure]

  SES [M's, F's professions and education]

  and, for EF, **Language** and **Mon/Bil**

McCarthy – TOT Score:





*p<.05 **p<.01 ***p<.001

McCarthy – TOT Score:

	3				4			
	BPVS	PGC	E Gram	W Gram	BPVS	PGC	E Gram	W Gram
All	.515 ***	.330 **	.322 *					
Bils Only	.425 ***	.330 **						
Mons Only			.626 *					

	5				Primary School Age			
	BPVS	PGC	E Gram	W Gram	BPVS	PGC	E Gram	W Gram
All								
Bils Only								
Mons Only								

*p<.05 **p<.01 ***p<.001

McCarthy – TOT Score:

	3				4			
	BPVS	PGC	E Gram	W Gram	BPVS	PGC	E Gram	W Gram
All	.515 ***	.330 **	.322 *		.384 ***		.311 *	.310 *
Bils Only	.425 ***	.330 **			.335 *	.270 *		.310 *
Mons Only			.626 *		.740 ***		.593 ***	

	5				Primary School Age			
	BPVS	PGC	E Gram	W Gram	BPVS	PGC	E Gram	W Gram
All	.429 ***		.345 **		.492 ***			
Bils Only	.367 **				.424 ***			
Mons Only	.605 **		.578 **		.672 ***		.531 *	

*p<.05 **p<.01 ***p<.001

Raven's:

	Primary School Age				Teens			
	BPVS	PGC	E Gram	W Gram	BPVS	PGC	E Gram	W Gram
All								
Bils Only								
Mons Only								

	Younger Adults				Older Adults			
	BPVS	PGC	E Gram	W Gram	BPVS	PGC	E Gram	W Gram
All								
Bils Only								
Mons Only								

*p<.05 **p<.01 ***p<.001

Raven's:

	Primary School Age				Teens			
	BPVS	PGC	E Gram	W Gram	BPVS	PGC	E Gram	W Gram
All	.452 ***	.326 *	.251 *					
Bils Only	.409 ***	.326 *	.271 *					
Mons Only	.688 ***		.544 *					

	Younger Adults				Older Adults			
	BPVS	PGC	E Gram	W Gram	BPVS	PGC	E Gram	W Gram
All								
Bils Only								
Mons Only								

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Raven's:

	Primary School Age				Teens			
	BPVS	PGC	E Gram	W Gram	BPVS	PGC	E Gram	W Gram
All	.452 ***	.326 *	.251 *		.332 ***	.255 *		
Bils Only	.409 ***	.326 *	.271 *		.332 ***	.255 *		
Mons Only	.688 ***		.544 *					

	Younger Adults				Older Adults			
	BPVS	PGC	E Gram	W Gram	BPVS	PGC	E Gram	W Gram
All	.402 ***		.215 *		.409 ***		.396 ***	.536 ***
Bils Only	.428 ***		.200 *		.481 ***		.383 ***	.536 ***
Mons Only					.517 **		.454 *	

*p<.05 **p<.01 ***p<.001

REGRESSIONS, BPVS

Each Age Group:

BPVS (E Vocabulary)

Predictor Variables:

REGRESSIONS, BPVS

Each Age Group:

BPVS (E Vocabulary)

Predictor Variables:

- Age (months)
- HL
- McCarthy / Raven's
- SES

REGRESSIONS, BPVS

AGE	Model	df	Variable	*t*	*p*	β
3						
4						
5						
Primary						

REGRESSIONS, BPVS

AGE	Model	df	Variable	*t*	*p*	β
3	III	66	Age	2.75	.008	.239
			HL	7.436	.000	.573
			McCarthy	3.71	.000	.322
4						
5						
Primary						

REGRESSIONS, BPVS

AGE	Model	df	Variable	*t*	*p*	β
3	III	66	Age	2.75	.008	.239
			HL	7.436	.000	.573
			McCarthy	3.71	.000	.322
4	IV	64	HL	3.68	.000	.390
			McCarthy	2.251	.028	.299
			SES	2.082	.041	.220
5						
Primary						

REGRESSIONS, BPVS

AGE	Model	df	Variable	*t*	*p*	β
3	III	66	Age	2.75	.008	.239
			HL	7.436	.000	.573
			McCarthy	3.71	.000	.322
4	IV	64	HL	3.68	.000	.390
			McCarthy	2.251	.028	.299
			SES	2.082	.041	.220
5	IV	63	HL	5.464	.000	.522
			McCarthy	3.471	.001	.347
			SES	3.189	.002	.317
Primary						

REGRESSIONS, BPVS

AGE	Model	df	Variable	*t*	*p*	β
3	III	66	Age	2.75	.008	.239
			HL	7.436	.000	.573
			McCarthy	3.71	.000	.322
4	IV	64	HL	3.68	.000	.390
			McCarthy	2.251	.028	.299
			SES	2.082	.041	.220
5	IV	63	HL	5.464	.000	.522
			McCarthy	3.471	.001	.347
			SES	3.189	.002	.317
Primary	III	52	HL	2.77	.008	.338
			McCarthy	2.259	.028	.292

REGRESSIONS, BPVS

AGE	Model	df	Variable	*t*	*p*	β
Primary						
Teens						
Younger Adults						
Older Adults						

REGRESSIONS, BPVS

AGE	Model	df	Variable	*t*	*p*	β
Primary	III	54	Raven's	3.05	.004	.366
			HL	2.62	.011	.310
Teens						
Younger Adults						
Older Adults						

REGRESSIONS, BPVS

AGE	Model	df	Variable	*t*	*p*	β
Primary	III	54	Raven's	3.05	.004	.366
			HL	2.62	.011	.310
Teens	IV	78	HL	2.95	.004	.287
			SES	2.83	.006	.276
			Raven's	2.36	.021	.239
Younger Adults						
Older Adults						

REGRESSIONS, BPVS

AGE	Model	df	Variable	*t*	*p*	β
Primary	III	54	Raven's	3.05	.004	.366
			HL	2.62	.011	.310
Teens	IV	78	HL	2.95	.004	.287
			SES	2.83	.006	.276
			Raven's	2.36	.021	.239
Younger Adults	IV	105	Age	4.992	.000	.403
			HL	3.95	.000	.312
			SES	2.14	.035	.166
			Raven's	2.03	.045	.169
Older Adults						

REGRESSIONS, BPVS

AGE	Model	df	Variable	*t*	*p*	β
Primary	III	54	Raven's	3.05	.004	.366
			HL	2.62	.011	.310
Teens	IV	78	HL	2.95	.004	.287
			SES	2.83	.006	.276
			Raven's	2.36	.021	.239
Younger Adults	IV	105	Age	4.992	.000	.403
			HL	3.95	.000	.312
			SES	2.14	.035	.166
			Raven's	2.03	.045	.169
Older Adults	III	86	Raven's	4.12	.000	.407
			SES	2.37	.020	.227

REGRESSIONS, SIMON

Each Age Group:

SIMON [Teens, Younger and Older Adults]
[Cong: Acc, RT; Incong: Acc, RT]

Predictor Variables:

REGRESSIONS, SIMON

Each Age Group:

SIMON [Teens, Younger and Older Adults]

[Cong: Acc, RT; Incong: Acc, RT]

Predictor Variables:

Age (months),

Mon/Bil [or HL]

BPVS

Raven's

SES

REGRESSIONS, SIMON

AGE	Variable	Cong. Acc.	Cong. RT	Incong. Acc.	Incong. RT
Teens	Age				
	Mon/Bil				
	BPVS				
	Raven's				
	SES				
Younger Ads	Age				
	Mon/Bil				
	BPVS				
	Raven's				
	SES				
Older Ads	Age				
	Mon/Bil				
	BPVS				
	Raven's				
	SES				

REGRESSIONS, SIMON

AGE	Variable	Cong. Acc.	Cong. RT	Incong. Acc.	Incong. RT
Teens	Age				
	Mon/Bil		t (75) = 2.05* β = .297		
	BPVS				
	Raven's				
	SES				
Younger Ads	Age				
	Mon/Bil				
	BPVS				
	Raven's				
	SES				
Older Ads	Age				
	Mon/Bil				
	BPVS				
	Raven's				
	SES				

REGRESSIONS, SIMON

AGE	Variable	Cong. Acc.	Cong. RT	Incong. Acc.	Incong. RT
Teens	Age				$t(76) = 2.17^*$ $\beta = .241$
	Mon/Bil		$t\ (75) = 2.05^*$ $\beta = .297$		
	BPVS			$t(75) = 2.07^*$ $\beta = .234$	
	Raven's				$t(75) = 2.22^*$ $\beta = .255$
	SES				
Younger Ads	Age				
	Mon/Bil				
	BPVS				
	Raven's				
	SES				
Older Ads	Age				
	Mon/Bil				
	BPVS				
	Raven's				
	SES				

REGRESSIONS, SIMON

AGE	Variable	Cong. Acc.	Cong. RT	Incong. Acc.	Incong. RT
Teens	Age				$t(76) = 2.17^{*}$ $\beta = .241$
	Mon/Bil		$t\ (75) = 2.05^{*}$ $\beta = .297$		
	BPVS			$t(75) = 2.07^{*}$ $\beta = .234$	
	Raven's				$t(75) = 2.22^{*}$ $\beta = .255$
	SES				
Younger Ads	Age			$t(67) = 2.76^{**}$ $\beta = .319$	$t(66) = 2.24^{*}$ $\beta = .249$
	Mon/Bil				
	BPVS				
	Raven's	$t(66) = 2.52^{*}$ $\beta = .303$	$t(66) = 2.40^{*}$ $\beta = .297$		$t(66) = 4.76^{***}$ $\beta = .529$
	SES				
Older Ads	Age				
	Mon/Bil				
	BPVS				
	Raven's				
	SES				

REGRESSIONS, SIMON

AGE	Variable	Cong. Acc.	Cong. RT	Incong. Acc.	Incong. RT
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	BPVS			$t(75) = 2.07^{*}$ $\beta = .234$	
	Raven's				$t(75) = 2.22^{*}$ $\beta = .255$
	SES				
Younger Ads	Age			$t(67) = 2.76^{**}$ $\beta = .319$	$t(66) = 2.24^{*}$ $\beta = .249$
	Mon/Bil				
	BPVS				
	Raven's	$t(66) = 2.52^{*}$ $\beta = .303$	$t(66) = 2.40^{*}$ $\beta = .297$		$t(66) = 4.76^{***}$ $\beta = .529$
	SES				
Older Ads	Age				
	Mon/Bil	$t\ (67)^{***}$ $\beta = .380$		$t\ (67)^{***}$ $\beta = .478$	
	BPVS		$t(67) = 2.34^{*}$ $\beta = .271$		
	Raven's				
	SES				

CONCLUSIONS

These studies provide a valuable addition to our knowledge concerning the factors that influence performance
- both on **linguistic** forms and **EF** tasks:

CONCLUSIONS

Linguistic:

- Exposure
- Language balance
- Age of Acquisition
- 2L1, L2
- Relation between the 2 languages
- Processing
- Interaction between Inhibition and Integration
- SES
- General Cognitive level

CONCLUSIONS

EF:

- Language proficiency
- SES
- General Cognitive level
- Bilingualism
- 2L1, L2

CONCLUSIONS

These factors are often **highly correlated**, but their relative contributions seem to vary considerable across distinct **ages** and on distinct **task types.**

The present studies have gone a considerable distance in contributing to these debates.

We need to take seriously the importance of multiple factors in influencing performance in bilinguals.


THANK
GRACIAS