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Cain, K., Hogan, T., Pentimonti, J., & LARRC. Reading and listening comprehension from 6 to 9 years: Is working memory equally important for both? Paper presented at British Psychology Society Developmental Section Annual Conference, Glasgow, September, 2012.

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## Reading and listening comprehension from 6 to 9 years: is working memory equally important for both?

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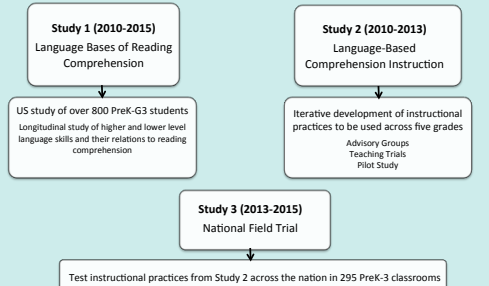
## Acknowledgements

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Mindy Bridges



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## Longitudinal design

	P	K	1	2	3
Yr 1	400	120	120	120	120
Yr 2		400	120	120	120
Yr 3			400	120	120
Yr 4				400	120
Yr 5					400
Total	400	420	640	760	880

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## Focus of this talk

- **Background**
  - Overview of text comprehension
  - How do reading and listening comprehension differ?
  - Which aspects of memory are important to comprehension and why?
- **Current study**
  - Research Questions
  - Results
  - Conclusions

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## Text comprehension

Molly was carrying the glass of juice.  
 She tripped on the step.  
 Her eyes filled with tears.  
 Mum fetched the mop.  
*"Don't worry darling," said Mum, "there's  
 no use crying over spilt milk."*

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## Text comprehension

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## Text comprehension

Outcome of skilled comprehension is the construction of a coherent and integrated memory-based representation of the state of affairs (or situation) described in the text – a *Mental Model* or *Situation Model*

(Gernsbacher, 1990; Johnson-Laird, 1983; Kintsch, 1998)

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## Comprehension: modality differences

- **Written text**
  - visual: need to decode word strings
  - permanent
  - can re-read/check for answers to questions
  - self-paced
- **Spoken text**
  - aural
  - temporary
  - no opportunities to re-listen
  - experimenter-paced

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## Comprehension: modality differences

- **Few comparisons of reading and listening comprehension skills**
  - Reading may be better than listening comprehension for children with memory and attention difficulties.
- Children with Down Syndrome show much greater difference between listening (poorer) and reading comprehension than typicals and the difference is a function of memory (forwards and backwards digit span).

(Aaron et al., 2002)

(Roch et al., 2012)

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### Reading, comprehension & memory

- **Short-term storage**
  - accurate storage of (phonological) representations
  - forward digit span
  - related to word reading ability
- **Working memory**
  - storage *and* processing
  - backward digit span, sentence span, updating tasks
  - related to reading and listening comprehension in children and adults

(Seigneuric et al., 2006; Shah & Miyake, 1996)

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### Research questions

- Does working memory make a greater contribution to listening than to reading comprehension?
  - Are any differences consistent across grade?
- Do measures of short-term and working memory make different contributions to comprehension?
  - Are any differences consistent across grade?
- Does memory contribute to reading comprehension outcomes over and above word reading level?

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### Sample characteristics

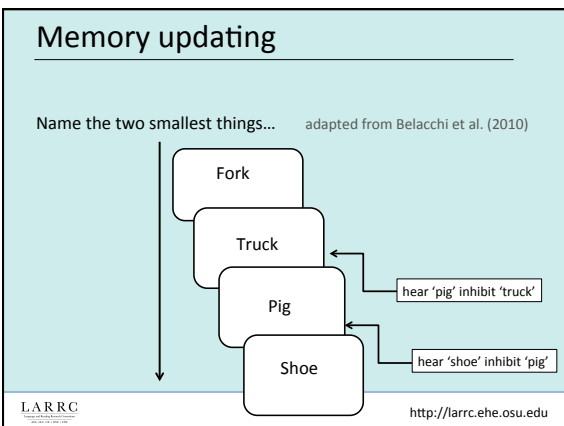
Grade	Age months	KBit (NV IQ)
Grade 1 (N=125; 54 males)	83.13 6;11	23.97 (5.94)
Grade 2 (N=123, 64 males)	94.82 7;10	27.47 (5.83)
Grade 3 (N=123, 57 males)	107.37 8;11	30.30 (6.25)

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### Measures

- **Comprehension**
  - QRI reading and listening comprehension (*open-ended q's*)
  - Woodcock Reading Mastery Test (*cloze passage comprehension*)
  - Gates-MacGinitie (*multiple choice reading comprehension*)
- **Word reading**
  - TOWRE (*timed word and nonword reading*)
  - WRMT (*nonword and real word reading accuracy*)
  - FAIR (*passage oral reading fluency*)
- **Memory**
  - Forward digit span
  - Backward digit span
  - Memory updating

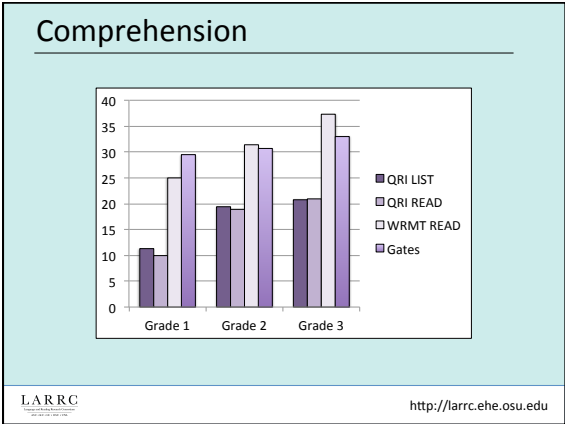
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### Results: overview

- Descriptives and correlations for each construct
- Intercorrelations between constructs
- Multiple regressions to predict reading and listening comprehension
- Preliminary findings: *not all participants have data on all measures, so N varies across these analyses*

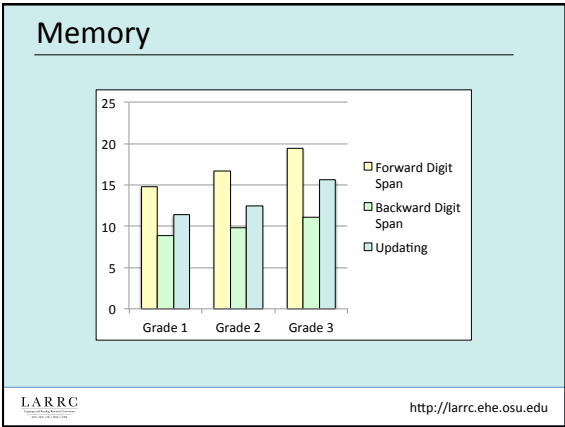
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### Comprehension: partial (age) correlations

Grade 1	QRI listening comp	QRI reading comp	WRMT reading comp
QRI reading comp	.530***		
WRMT Read comp	.458***	.568***	
Gates reading comp	.410***	.528***	.752***

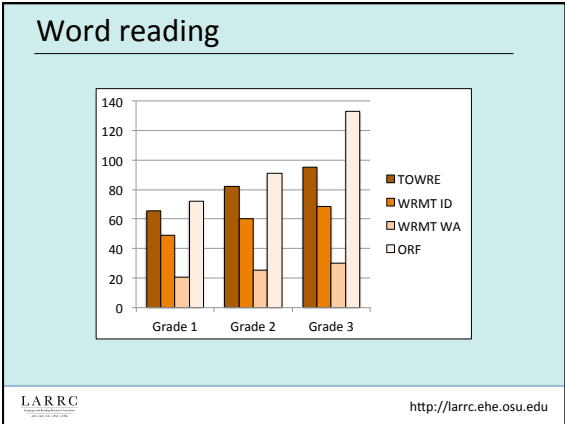
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### Memory: partial (age) correlations

Grade 1	Forward digit	Backward digit
Backward digit span (BDS)	.419***	
Memory updating (UPD)	.459***	.295***

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### Word reading: partial (age) correlations

Grade 1	TOWRE	WRMT word attack	WRMT word ID
WRMT word attack	.722***		
WRMT word ID	.898***	.820***	
Oral Reading Fluency	.886***	.653***	.862***

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### Intercorrelations: Grade 1 (partial age)

	QRI list	QRI read	WMRT	Gates	FDS	BDS	UPD
QRI read	.530***						
WMRT	.458***	.568***					
Gates	.410***	.528***	.752***				
FDS	.470***	.369***	.455***	.450***			
BDS	.280***	.314***	.509***	.448***	.419***		
UPD	.449***	.265***	.354***	.400***	.459***	.295**	
Word read	.382***	.522***	.865***	.735***	.438***	.492***	.410***

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### Intercorrelations: Grade 2 (partial age)

	QRI list	QRI read	WMRT	Gates	FDS	BDS	UPD
QRI read	.661***						
WMRT	.542***	.612***					
Gates	.561***	.617***	.709***				
FDS	.421***	.399***	.389***	.279***			
BDS	.329***	.307***	.435***	.354***	.414***		
UPD	.152***	.130**	.198***	.117	.302**	.208***	
Word read	.388***	.438***	.730***	.622***	.276***	.417***	.219***

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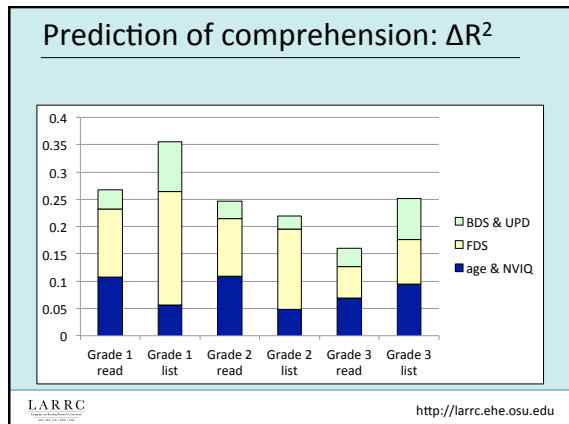
### Intercorrelations: Grade 3 (partial age)

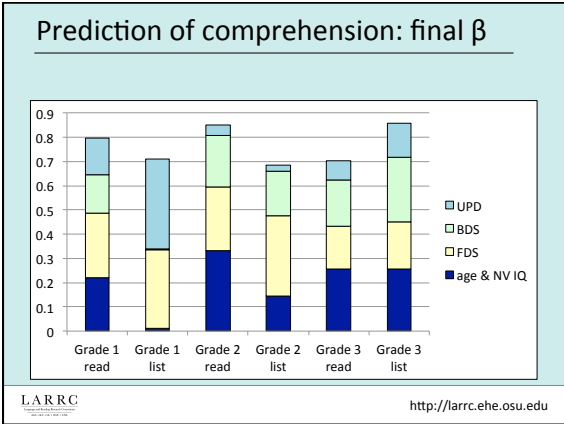
	QRI list	QRI read	WMRT	Gates	FDS	BDS	UPD
QRI read	.516***						
WMRT	.399***	.431***					
Gates	.638***	.669***	.706***				
FDS	.382***	.335***	.374***	.435***			
BDS	.390***	.312***	.496***	.481***	.500***		
UPD	.292***	.261**	.384***	.362***	.275**	.318**	
Word read	.361***	.495***	.684***	.624***	.421***	.436***	.214***

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- ### Results: correlations summary
- Performance on all measures improved with age
  - Measures of the same construct were correlated within each grade
    - correlations between measures of word reading/decoding were the strongest;
    - correlations between measures of memory were the weakest
  - Most measures of memory were significantly related to all measures of comprehension in all grades (*exception was updating and Gates in G2*)
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- ### Research questions
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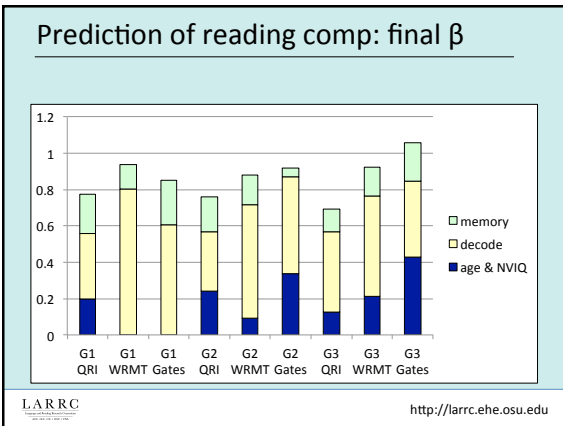
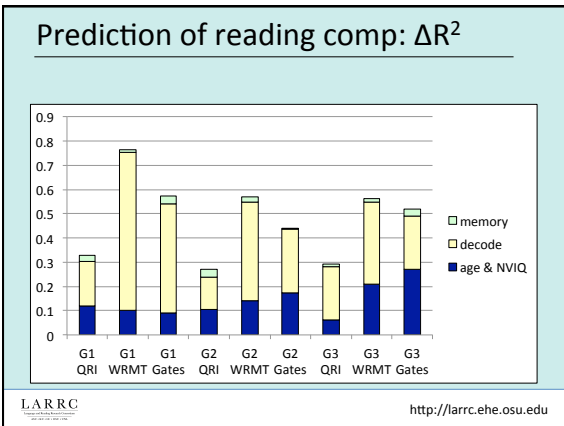




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### Summary and conclusions

- Memory explains unique variance in reading and listening comprehension between 6 and 9 years:**
  - critically, measures of memory with a low semantic load (Forwards and Backwards digit span) predict outcomes.
- Not all comprehension measures, nor memory measures, are equal:**
  - important to take multiple measures of a construct and to examine the task used to assess that construct when interpreting educational outcomes.

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### Summary and conclusions

- Memory supports comprehension in both modalities:**
  - some indication that memory explained a greater proportion of variance in listening than in reading comprehension
    - further analyses are required to explore this
  - Importance of memory is not simply due to presence (or absence) of text during question answering
    - memory critical for constructing meaning: not just for checking (or finding) answers.
  - Memory is related to *comprehension* processes
    - predicts variance in reading comprehension over and above decoding.

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*For more information:*

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