The role of language skills in the development of executive function

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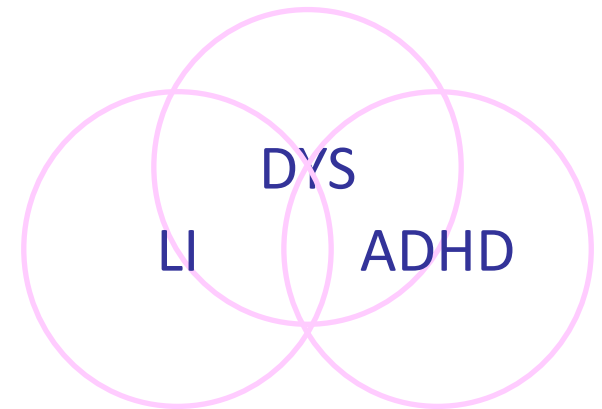
BDA 2014

Executive function

- Controlled and deliberate goal orientated actions; higher order thinking and reasoning

- Umbrella term rather than a single construct
  - Attention control
  - Inhibition
  - Working memory
  - Planning
  - Set shifting

- Core deficit in ADHD / impaired by frontal lobe lesions

- Unity and diversity of EF (Miyake et al., 2000)
  - Common EF factor important in predicting individual differences in clinical outcome (Miyake & Friedman, 2012)
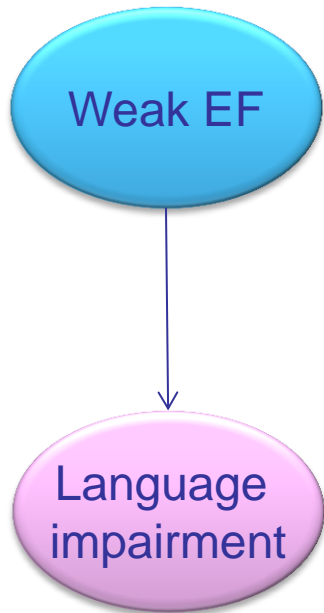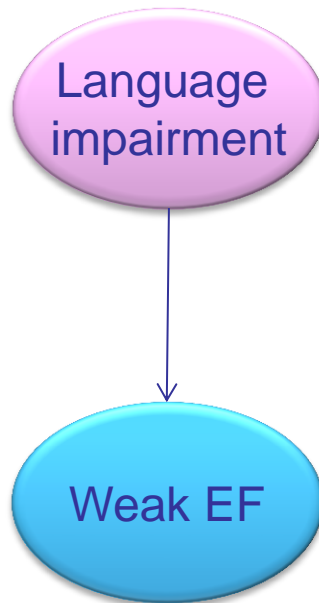
EF and language skills

- Are they related?
  - Post stroke patients performance on EF tasks correlates with performance on lexical-semantic tasks e.g. picture naming
  - EF deficits have been reported in children with LI (Henry et al. 2012; Wittke et al., 2013)
  - Frequent comorbidity between ADHD (core deficit in EF) and both dyslexia and LI

    DYS

    LI   ADHD

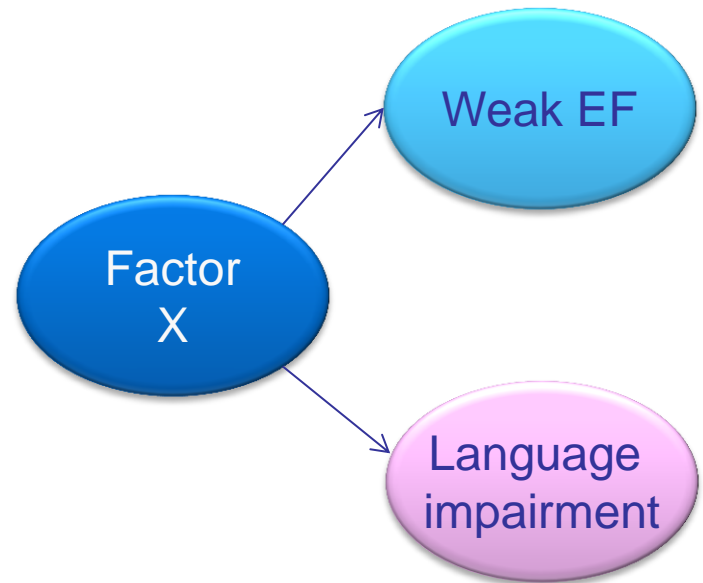 - EF important for school readiness (Bierman et al 2008; Shaul & Schwartz 2013))

Causal models

Weak EF → Language impairment

Model A

Language impairment → Weak EF

Model B

Factor X → Weak EF
Factor X → Language impairment

Model C

Bishop, Nation & Patterson (2014)

The study

- Longitudinal study of children at family risk of dyslexia (FR; N =116), children with language impairment (LI; N=30) and typically developing controls (TD; N=73)

- 26% FR also met criteria for LI (FRLI: N=30); their language profile was similar to those with LI so these two groups have been combined

- Children are aged ~4.5 years at T2 (preschool), ~5 years at T3 and ~6 years at T4 (school aged)
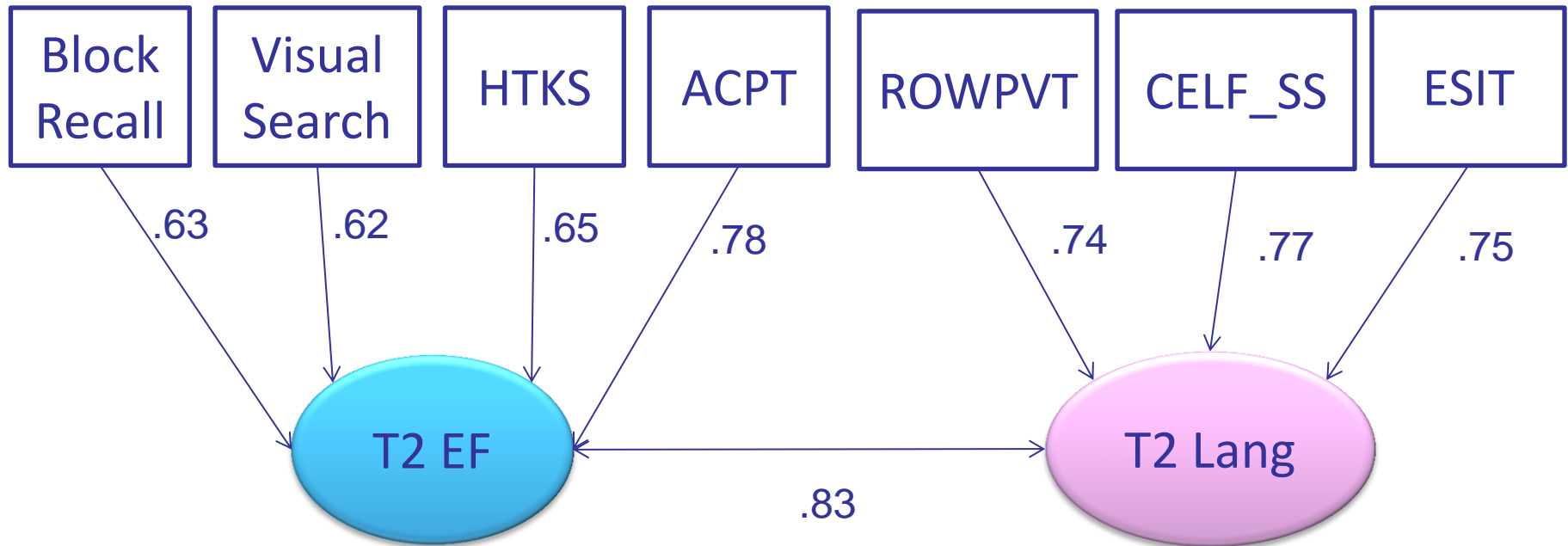
Assessment

- **EF assessment T2 & T3**
  - Block recall (visual spatial memory)
  - Apples task (selective attention)
  - HTKS task (complex inhibition)
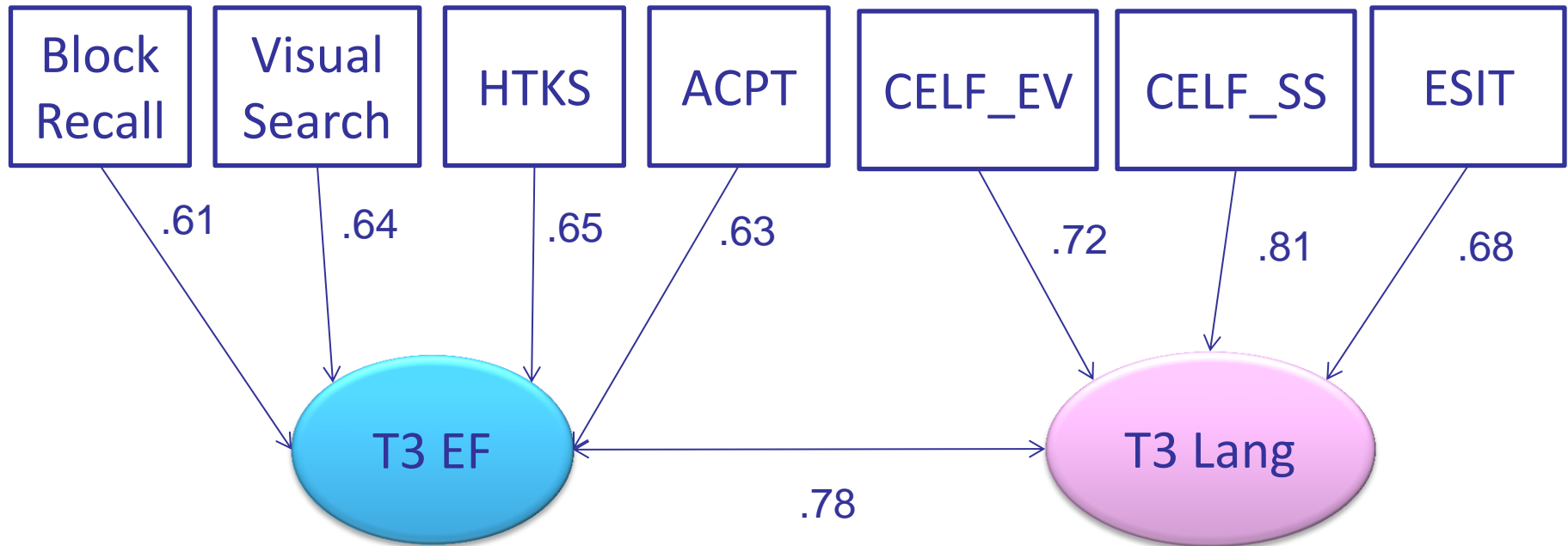 - ACPT (sustained attention)

- **Behavioural outcomes T4**
  - SWAN parent or teacher ratings
  - GONOGO commission errors (complex inhibition)

T2 EF and Language CFA

Chi2 (13) = 10.361 ,p= 0.664; RMSEA = 0.000; CFI = 1.000; TLI = 1.009
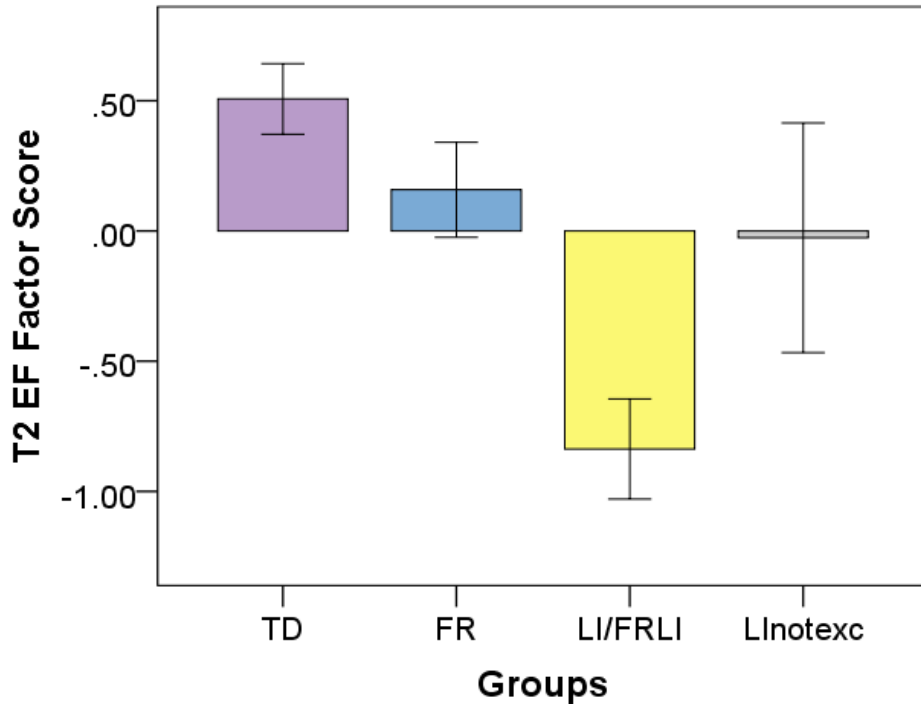
T3 EF and Language CFA

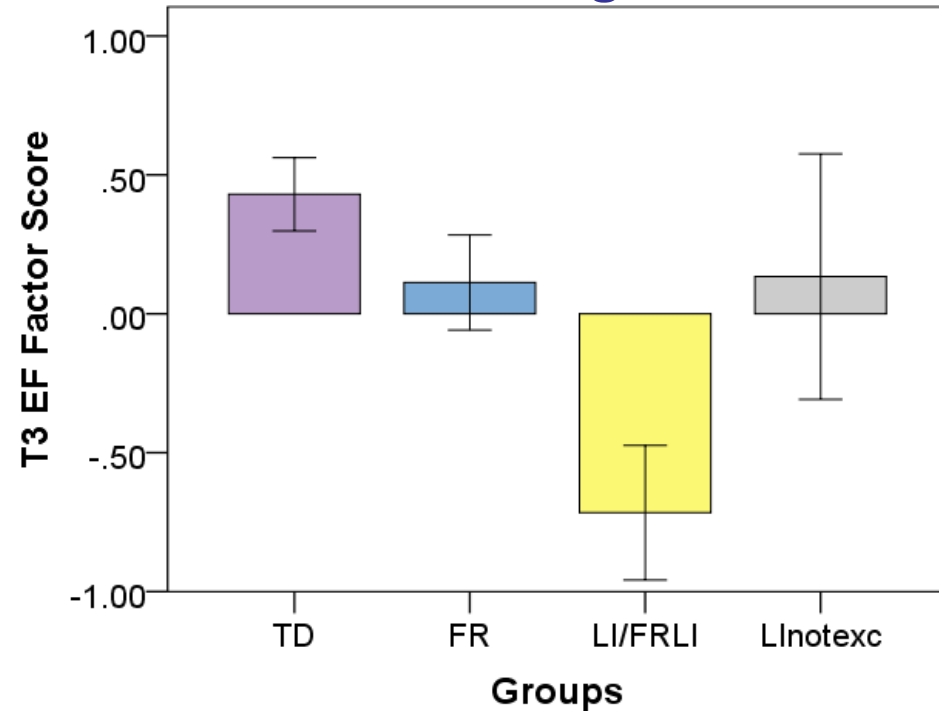Chi2 (13) = 10.729 ,p= 0.633; RMSEA = 0.000; CFI = 1.000; TLI = 1.008

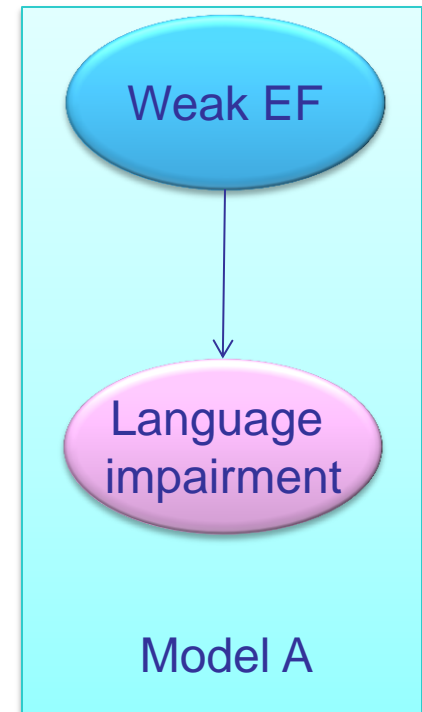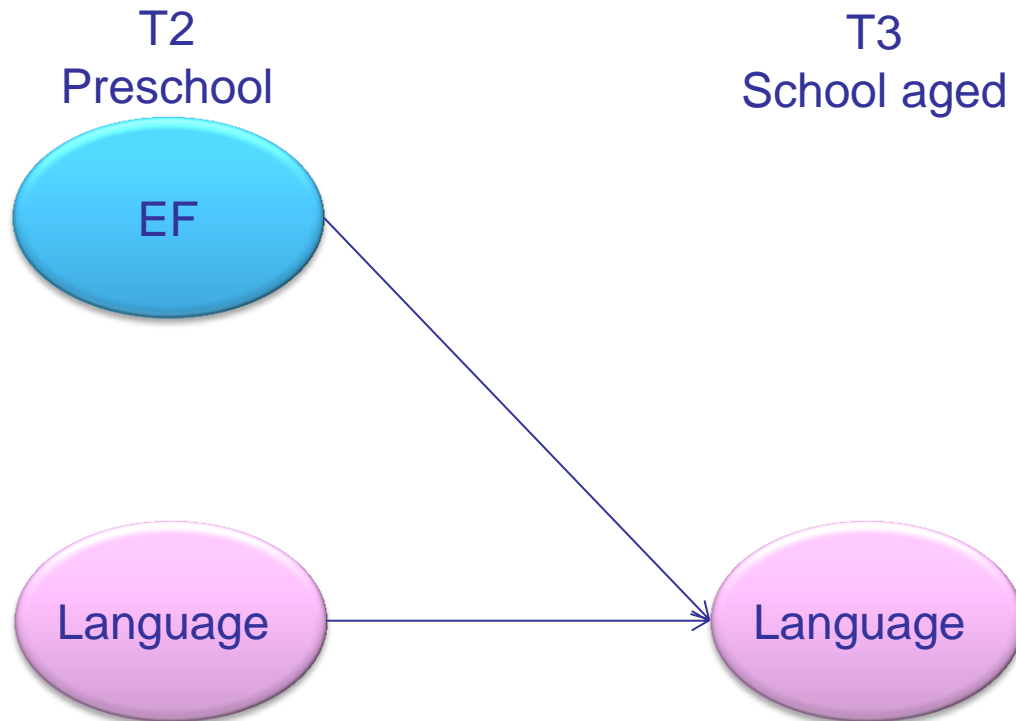# Q1: Do children with LI have EF deficits?

T2
Preschool

T3
School aged
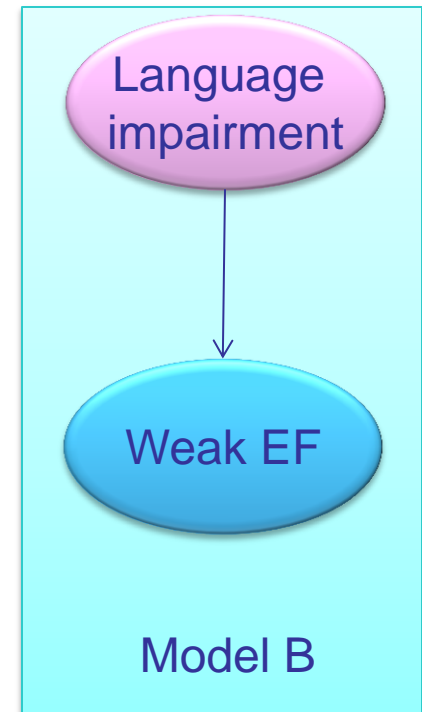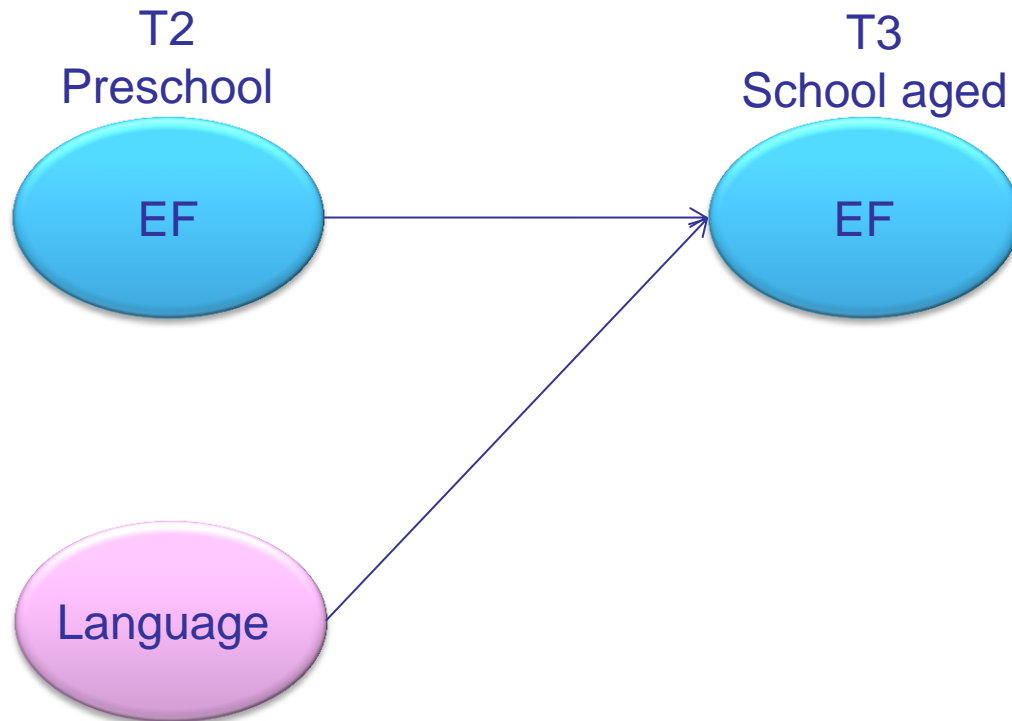
TD > FR > LI

Q2: Do variations in executive function predict variations in language skills?

T2
Preschool

T3
School aged

EF

Language → Language

Weak EF

↓

Language impairment

Model A

Q3: Do variations in language skills predict variations in executive function?

Cross-lagged panel model
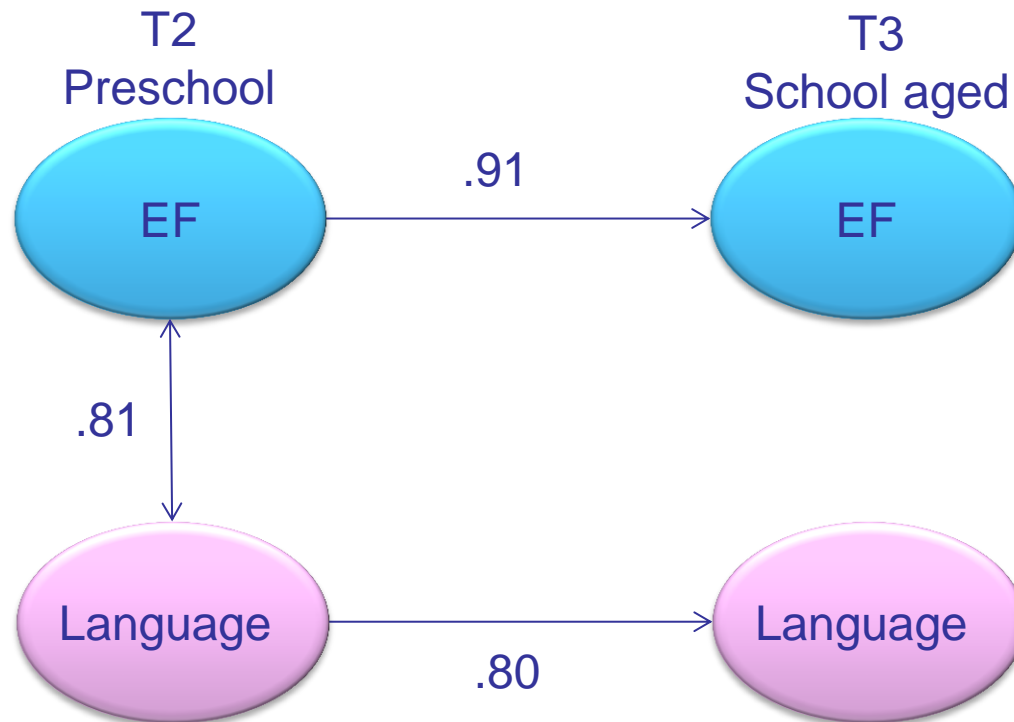
Cross-lagged panel model
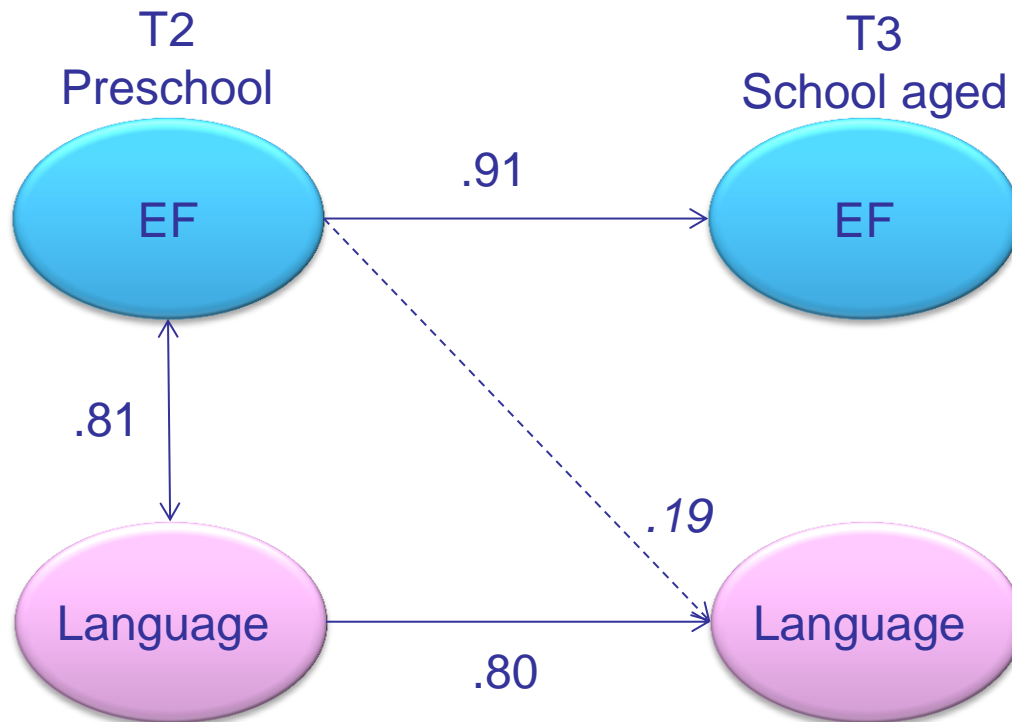
Cross-lagged panel model

Chi2 (68) = 55.965 ,p= 0.851; RMSEA = 0.000; CFI = 1.000; TLI = 1.012
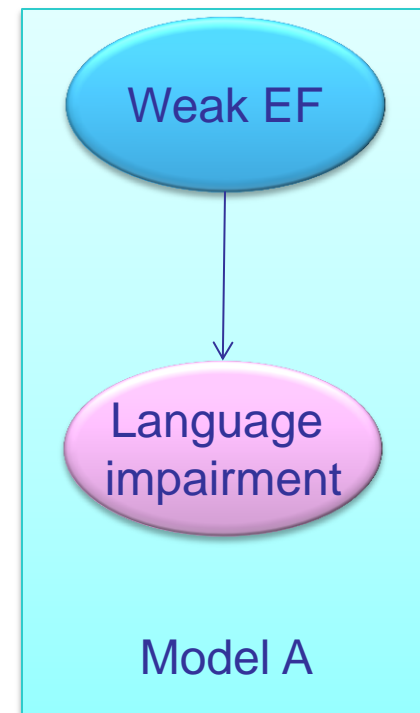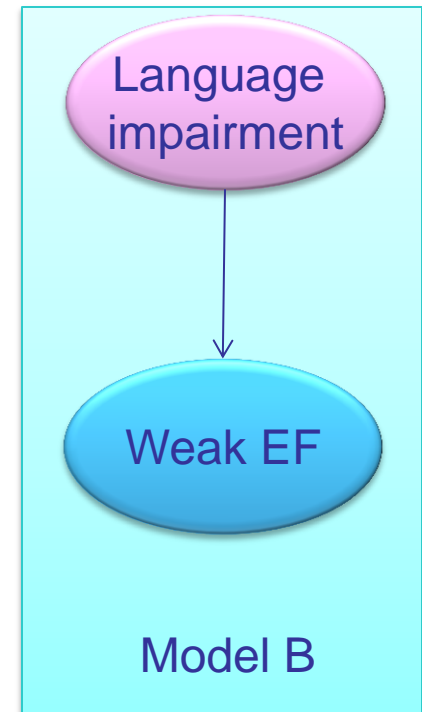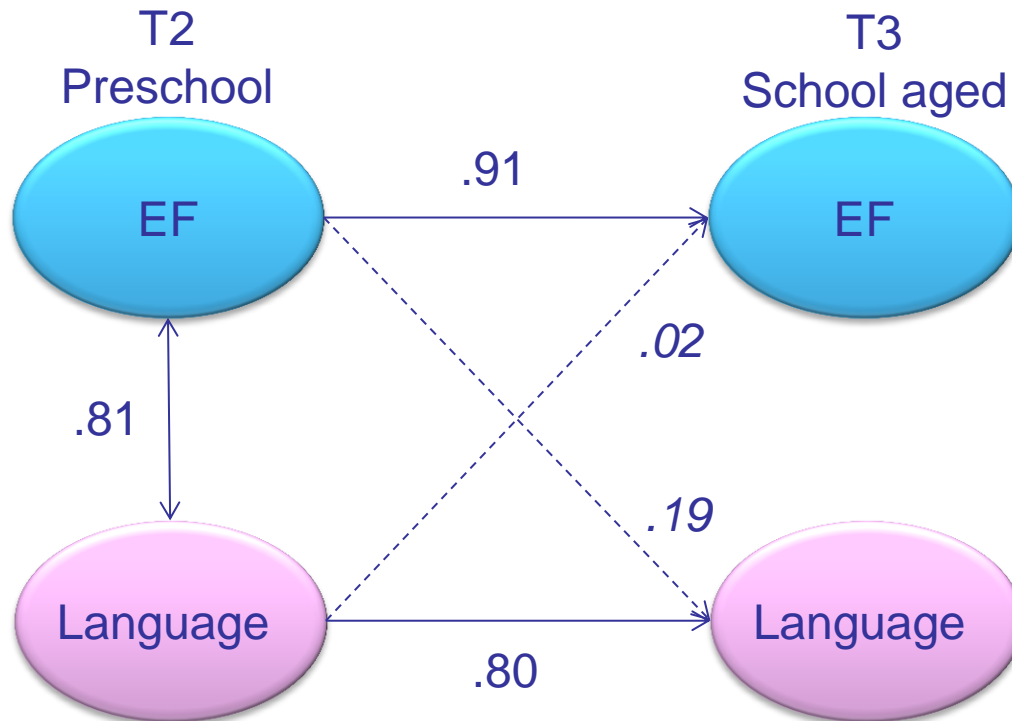
Predicting children's outcomes

T2
Preschool

T3
School aged

T4

EF → EF → SWAN/GONOGO

Language → Language → Literacy outcomes
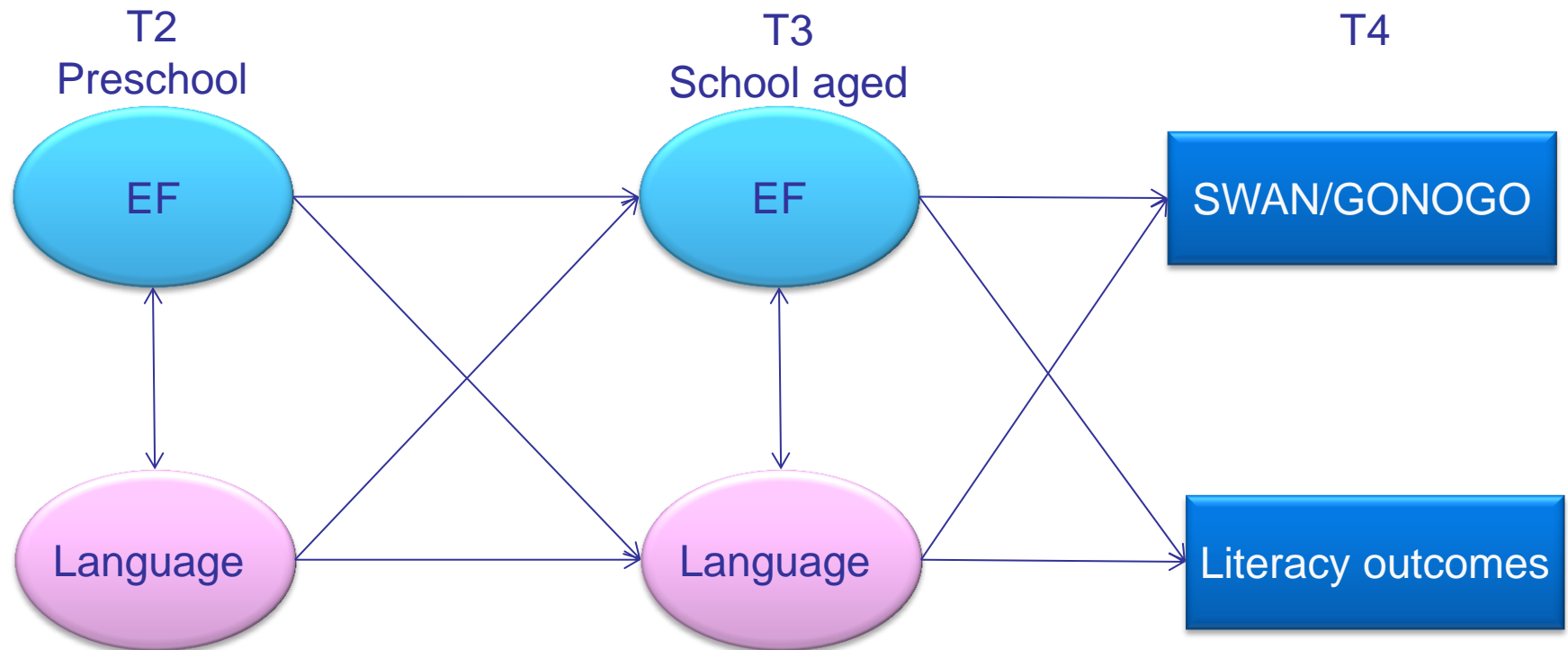
Do children with LI have symptoms of ADHD?
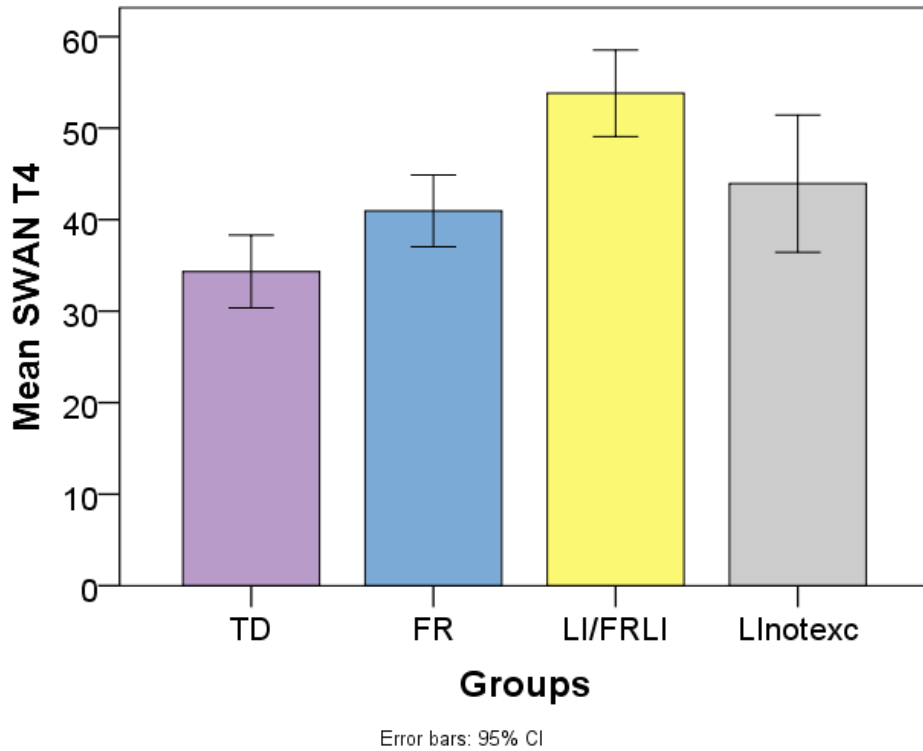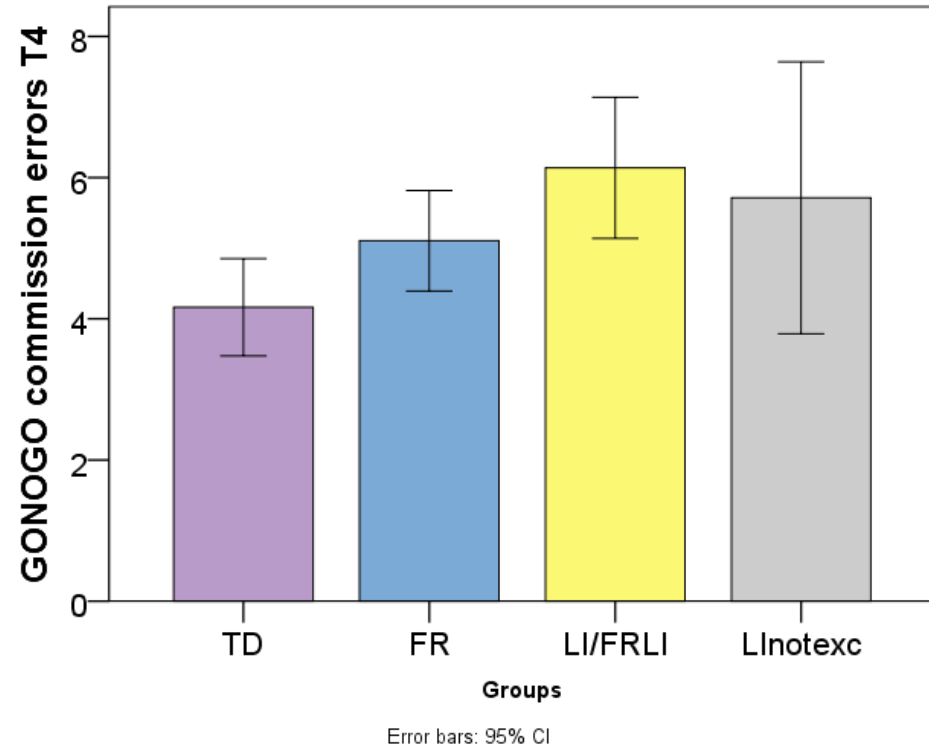
LI>TD=FR   LI>TD

Conclusions

- As a group children with LI have pervasive and persistent EF deficits (T1, T2, T3 and T4)
  - TD>FR>LI=FRLI

- Strong concurrent relationship between children's language skills and EF skills

- BUT no evidence that EF skills predict later language skills (model A) or visa-versa (model B)
  - 3rd factor ?

Weak EF

Factor X

Language impairment

Model C

http://crl-research.org/
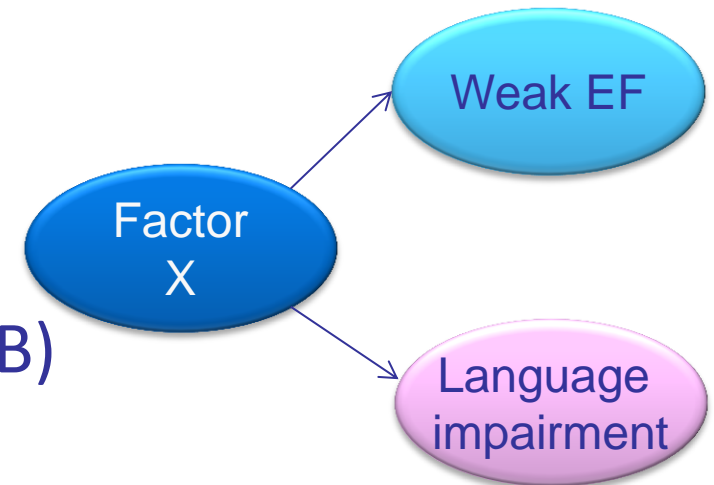
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Thank you for listening

Thank you to the families

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Future directions

- To look at how growth of EF predicts children's outcomes

- To explore the relationships between language and EF skills and children's later literacy attainment
  - Are children with multiple risk factors most at risk of literacy difficulties?
  - Do EF deficits affect profile of literacy impairment?

- To look at the early language profiles of children who have significant symptoms of ADHD

Do children with LI have EF deficits?

Task	TD (73)	FR (86)	LI (30)	FRLI (30)	LI_NOT (14)
Block Recall	16.86 (3.38)	15.56 (4.28)	15.00 (3.45)	14.32 (3.68)	15.21 (3.89)
Visual Search	.18 (.05)	.17 (.07)	.12 (.07)	.13 (.07)	.16 (.07)
HTKS	25.89 (9.70)	22.50 (11.35)	9.63 (11.81)	9.96 (8.23)	22.15 (11.87)
ACPT	24.72 (4.11)	22.86 (6.70)	21.33 (7.57)	19.73 (8.30)	22.10 (7.14)
T2 EF factor	**.51 (.58)**	**.16 (.85)**	**-.89 (.84)**	**-.79 (.65)**	**-.03 (.76)**
Block Recall	20.37 (3.74)	19.13 (3.42)	16.40 (3.73)	17.80 (3.42)	20.57 (3.32)
Visual Search	.22 (.04)	.21 (.06)	.18 (.06)	.19 (.05)	.20 (.05)
HTKS	30.99 (7.53)	29.22 (9.49)	21.21 (12.62)	25.17 (9.56)	26.57 (11.08)
ACPT	18.22 (2.15)	17.37 (2.78)	16.08 (4.46)	16.11 (2.76)	18.06 (2.37)
T3 EF factor	**.43 (.56)**	**.11 (.80)**	**-.85 (1.07)**	**-.58 (.78)**	**.13 (.77)**