

# Executive functioning, ecological and biological predictors: Longitudinal evidence

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## Background

- Certain skills are needed for children to be able to perform as successful adults. Specific attention is made to flexibility, creativity, self-control and discipline; all known to be parts of executive functioning- EF (Diamond & Lee, 2011). Executive control, broadly, is defined as an ensemble of higher order control operations that permits contextually sensitive, flexible responding (Miyake et al., 2000).
- Research indicates that having a higher level of executive control operations is related to better school outcomes (Bierman, Nix, Greenberg, Blair, & Domitrovich, 2008; Blair & Razza, 2007). However, longitudinal studies examining the predictors of this important cognitive ability are scarce.

## Aims

- The current study was designed to investigate the early predictors of executive functioning skills from birth to early school years by an analysis of data collected in the Longitudinal Study of Australian Children (LSAC).

## Method

- Participants were 3418 children from the Birth cohort of LSAC and their year one teachers. Data were selected from Waves 1 to 4 (2004 to 2010).
- Parent interviews, teachers' rating of child behaviour, and child assessment data were used in the current study.

- In many studies executive functioning is tested in a face-to-face interview with children. Testing involves playing several games with children which assess memory, attention, or control operations.

- In LSAC, however, because of time limitations, this type of assessment was not possible. Executive functioning was measured using a questionnaire that asked the classroom teacher to rate how often the child:

- Keeps belongings organised
- Shows eagerness to learn new things
- Works independently
- Pays attention well
- Persists in completing tasks
- Easily adapts to changes in routines

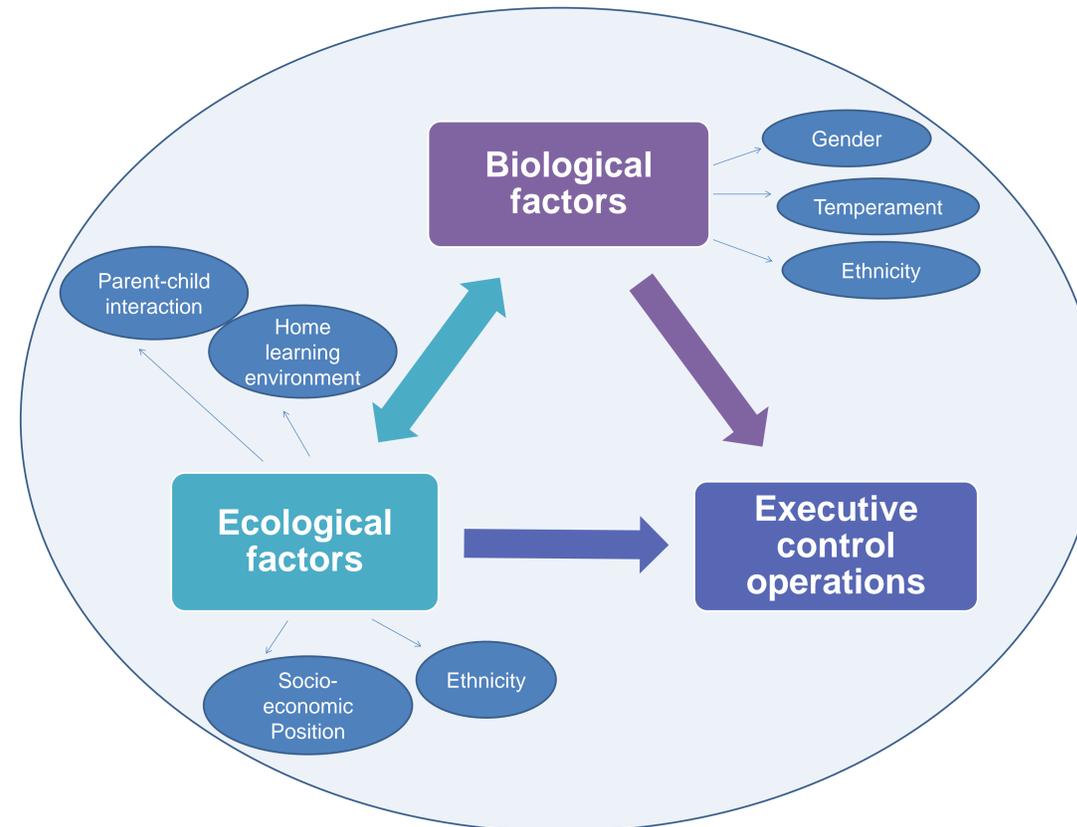
## EF Testing



## Design and Analysis

- We assessed the above model which proposes that child characteristics (Biological factors) and family environment (Ecological factors) predict children's executive control operation skills. Predictors were tested using regression analysis:

- Biological Factors:
  - Gender, Ethnicity, Temperament
- Ecological Factors:
  - Socio-economic position
  - Parent-child interaction (amount of time parent reads to the child)
  - Quality of home learning environment (number of books in the home)



## Results

- Results showed that child **gender**, family **socio-economic position**, and the quality of the **home learning environment** were significant predictors of **executive functioning** at school. Child temperament and ethnicity did not predict EF. In the final model 9.3% of variance in EF was explained by:
  - **Gender – Girls do better** ( $B = .241, p < .001$ )
  - **SES – Higher SES children do better** ( $B = .04, p < .05$ )
  - **Number of books at home** ( $B = .039, p < .05$ )
  - **Number of minutes the child enjoys being read to** ( $B = .39, p < .05$ )

## Implications

- **Boys and children from families with lower-SES background are at greater risks of developing poorer executive functioning skills in early childhood**
- **Reading books to children at home can lead to better executive control skills which in turn may bring about better academic outcomes and later life success**
- **Early intervention is needed to help children develop EF skills before starting school**

## Outcome

- Walker, S., Shahaeian, A., Harrison, L (July 2014), Abstract accepted for the 32rd Biennial Conference of the International Society for the Study of Behavioural Development (ISSBD), Shanghai, China.

## References

- Bierman, K. L., Nix, R. L., Greenberg, M. T., Blair, C., & Domitrovich, C. E. (2008). Executive functions and school readiness intervention: Impact, moderation, and mediation in the Head Start REDI program. *Development and Psychopathology, 20*(3), 821.
- Diamond, A., & Lee, K. (2011). Interventions shown to aid executive function development in children 4 to 12 years old. *Science, 333*(6045), 959-964
- Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The unity and diversity of executive functions and their contributions to complex "frontal lobe" tasks: A latent variable analysis. *Cognitive psychology, 41*(1), 49-100
- Blair, C., & Razza, R. P. (2007). Relating effortful control, executive function, and false belief understanding to emerging math and literacy ability in kindergarten. *Child Development, 78*(2), 647-663.

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