

How Genes Shape Environments

Jenae M. Neiderhiser

Department of Psychology
The Pennsylvania State University

The Role of Genetic and Environmental Factors across the Lifecourse:
Improving the Rigor of Causal Inference. Chicago, September 2011

Questions for Session 4 – Psycho-Socio-Biological Linkages across the Lifespan

- What is the contribution of genetic and environmental factors to health and ageing?
- Do people make their own environments? Do they react to them? How robust is the evidence across research strategies?

This presentation...

Focus on gene-environment interplay

- Genotype-environment correlation
- Genotype x environment interaction

Use of twin, sibling and adoption designs

Examination of family relationships and
impact on child, adolescent & adult
adjustment

Acknowledging three teams of researchers in the US & Sweden

Twin and Offspring Study in Sweden (TOSS)

Cohort I: David Reiss, PI; Cohort II: JMN, PI – Supported by NIMH

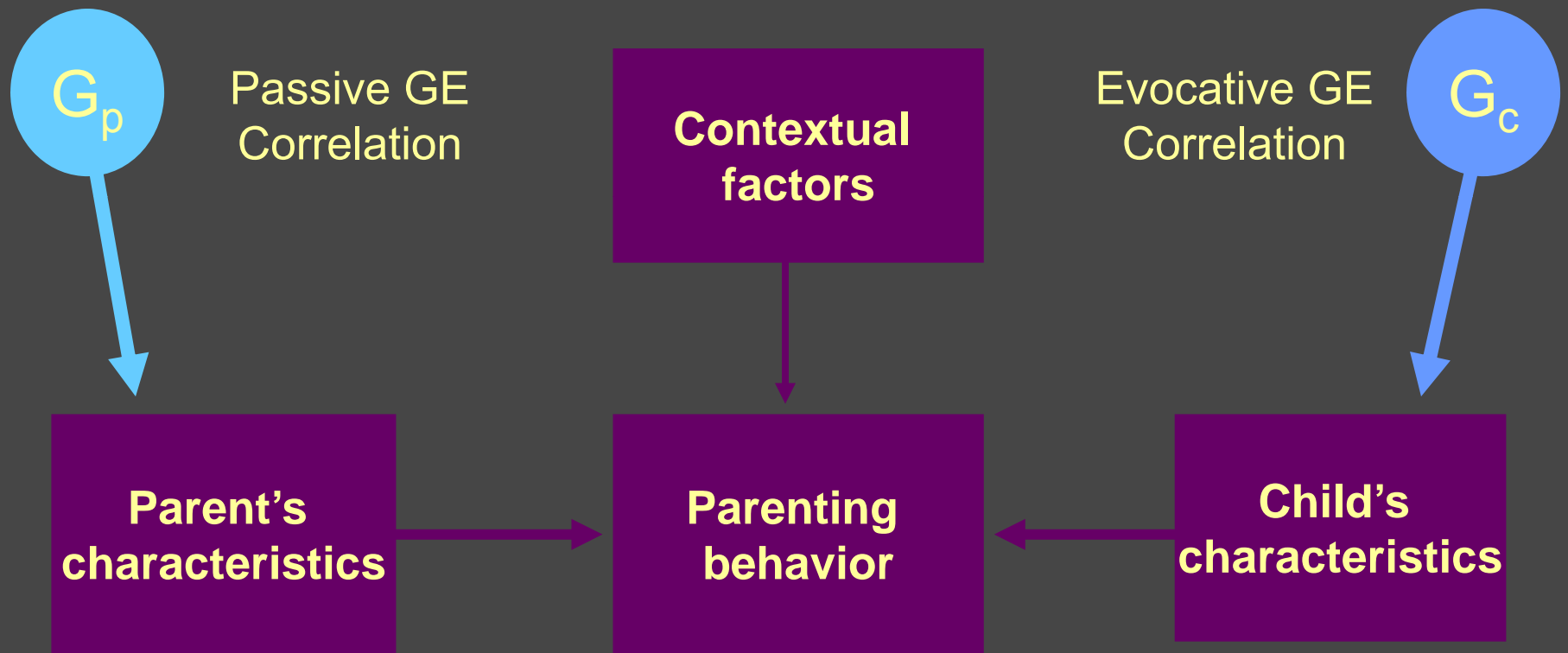
Co-Investigators: Erica Spotts (NIA), Jody Ganiban (GWU), Nancy Pedersen & Paul Lichtenstein (KI), Marianne Cederblad & Kjell Hansson (Lund University)

Early Growth Development Study (EGDS)

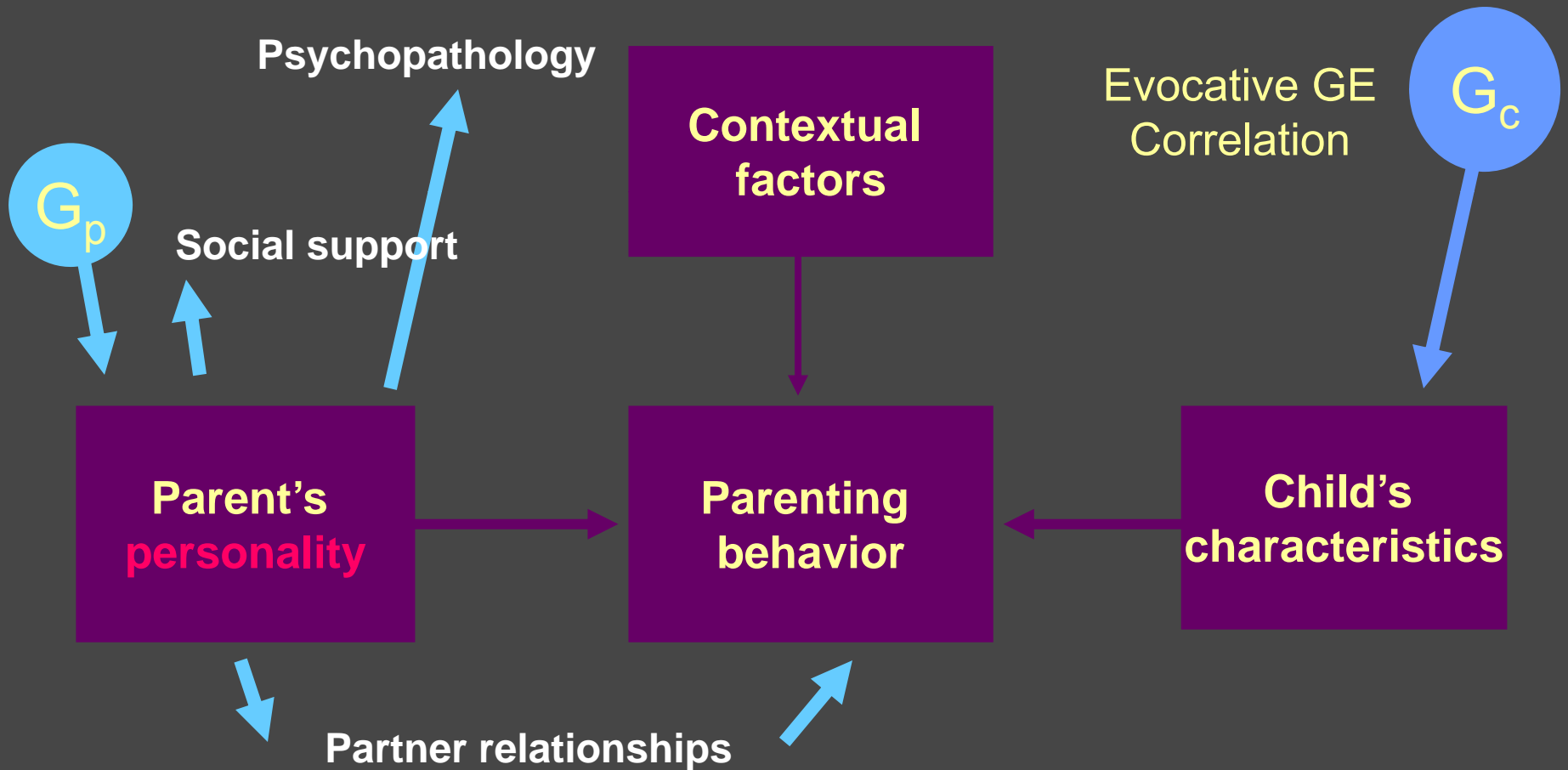
Cohort I, Toddlers: David Reiss, PI; Cohort I, School: Leslie Leve, PI; Cohort II: Neiderhiser, PI; EGDS-Mental Health: Neiderhiser & Leve, PIs; EGDS-Health: Ganiban, PI – supported by NICHD, NIDA, NIMH, OBSSR & NIDDK

Co-Investigators: Daniel Shaw (Pitt), Xiaojia Ge (UMN), Laura Scaramella (UNO), John Reid (OSLC), Rand Conger (UCD), Misaki Natsuaki (UCR), Phil Fisher (OSLC)

Mechanisms of Parenting



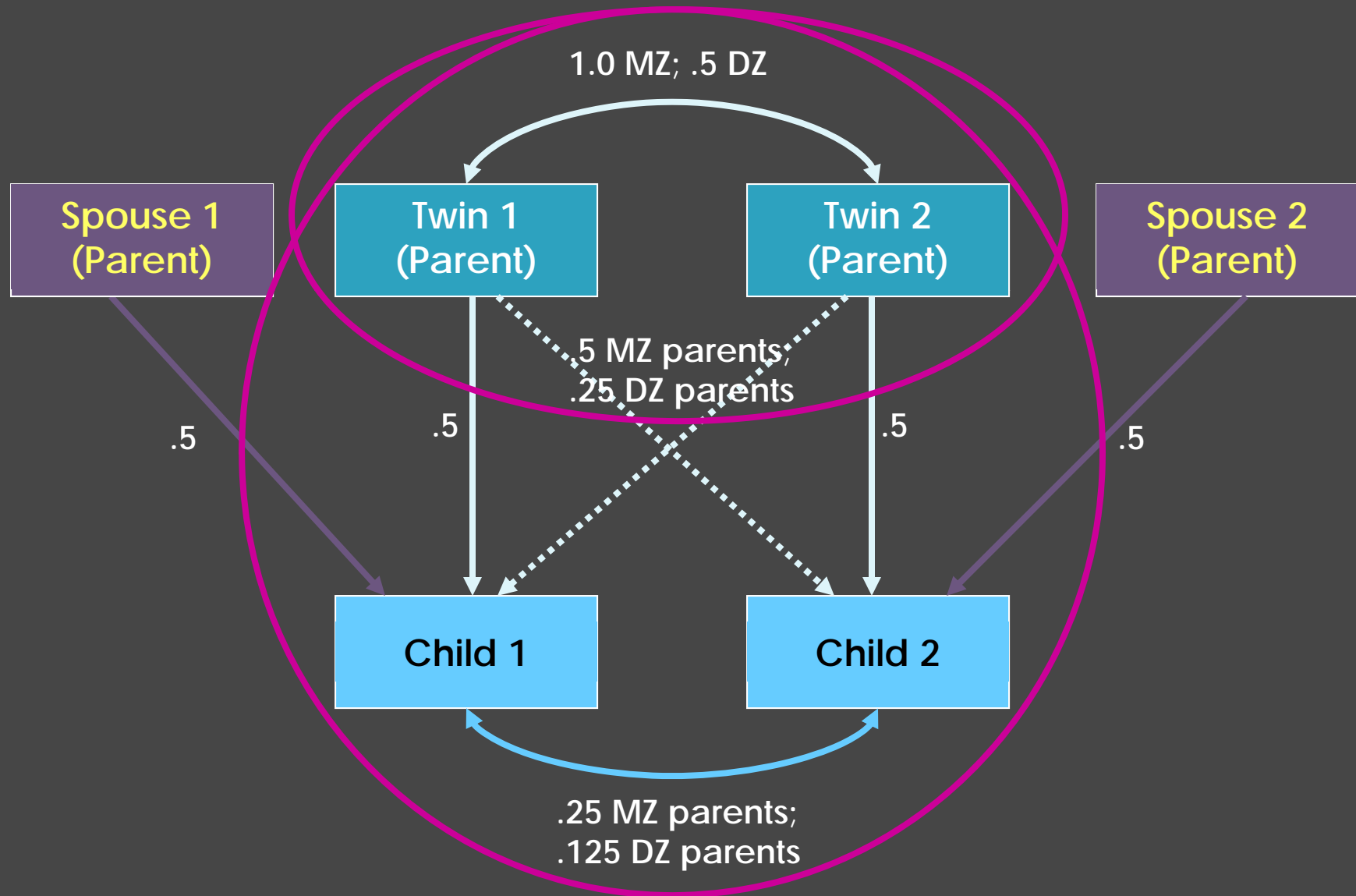
Mechanisms of Parenting



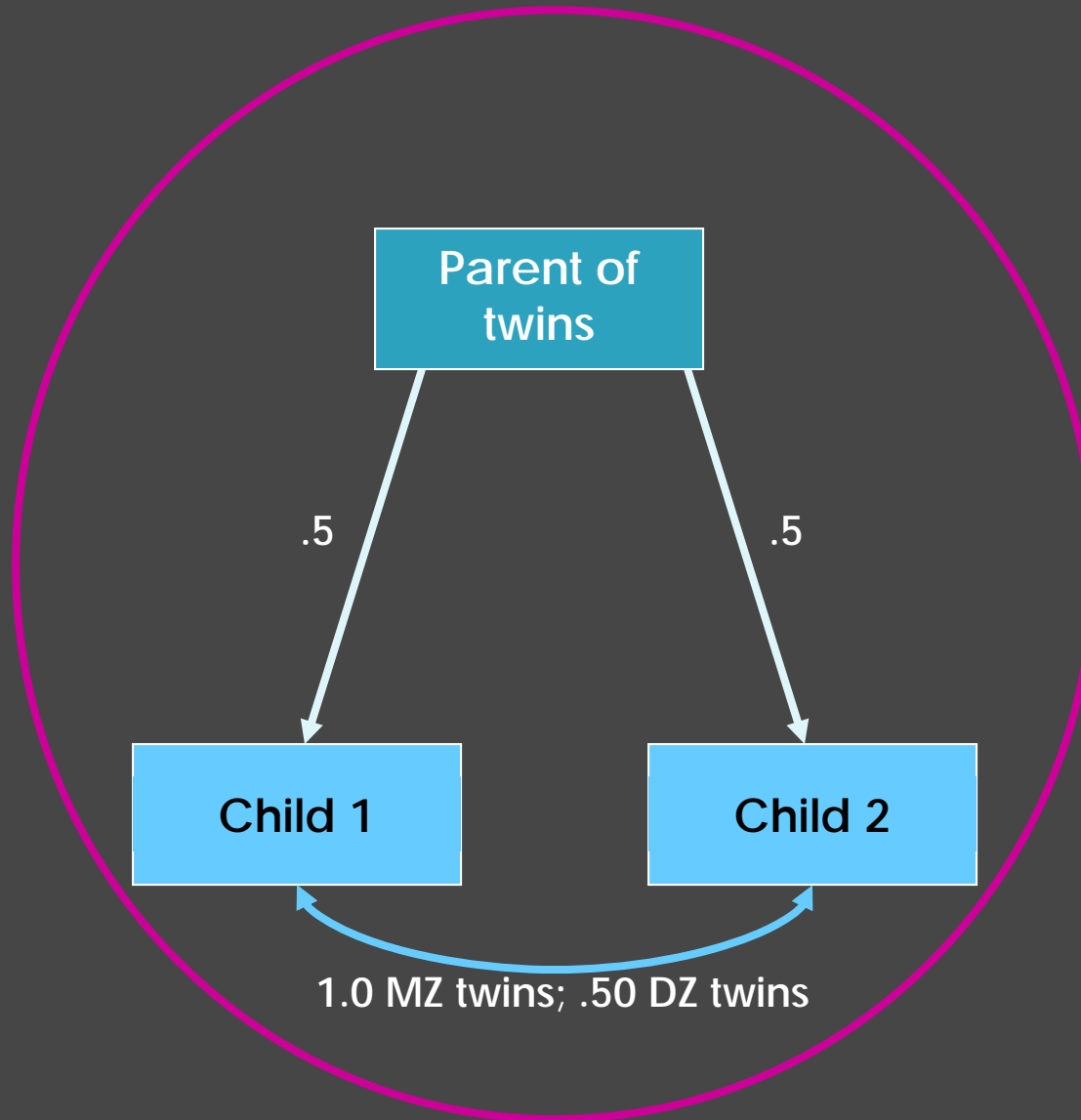
Examining links between parenting & adolescent adjustment

- Combine parent-based and child-based designs
- Examine both samples within same model (rather than comparing)
- Focus on adolescent adjustment

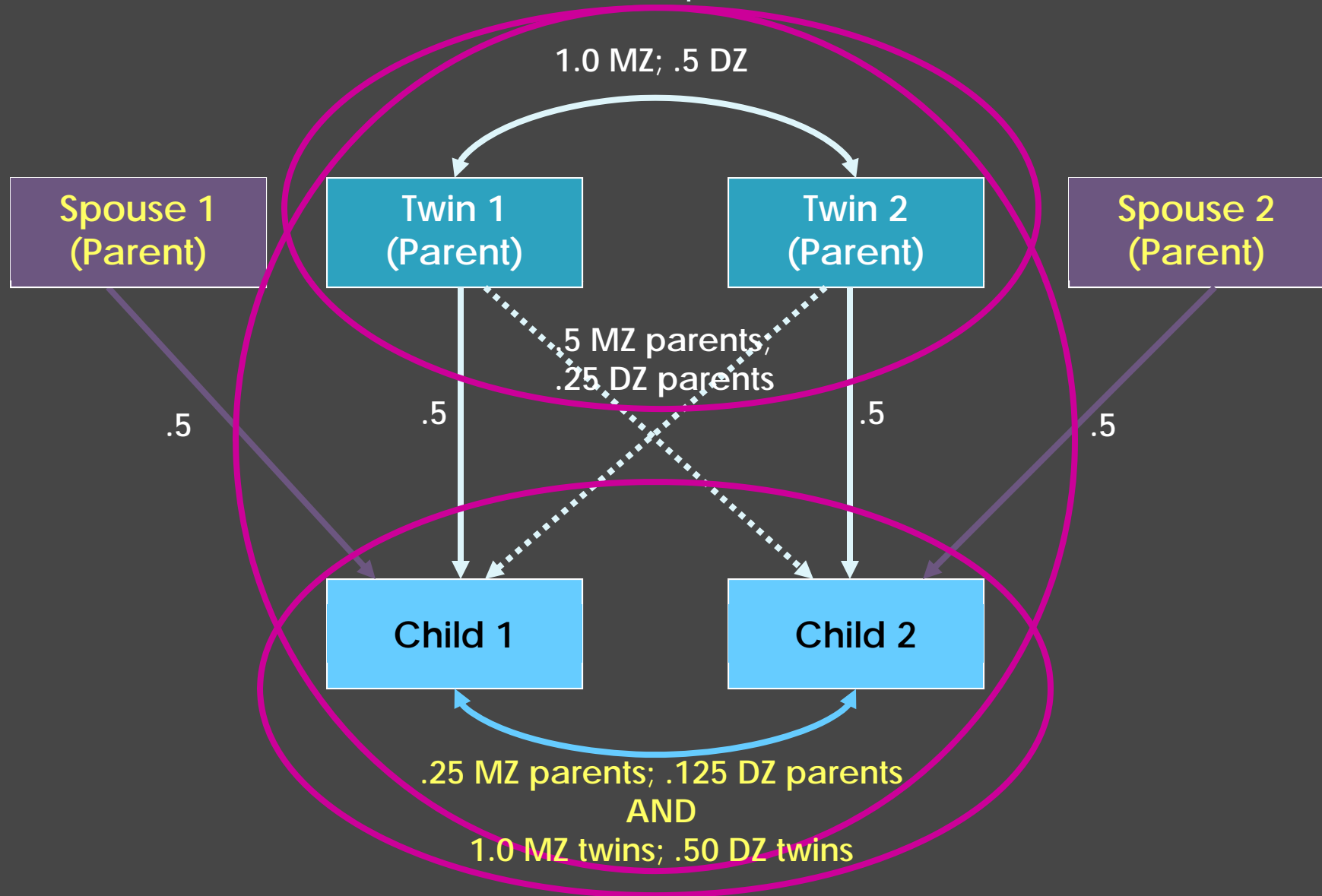
Children Of Twins Design (conceptual)



Child Twin Design



Extended Children Of Twins Design (conceptual)



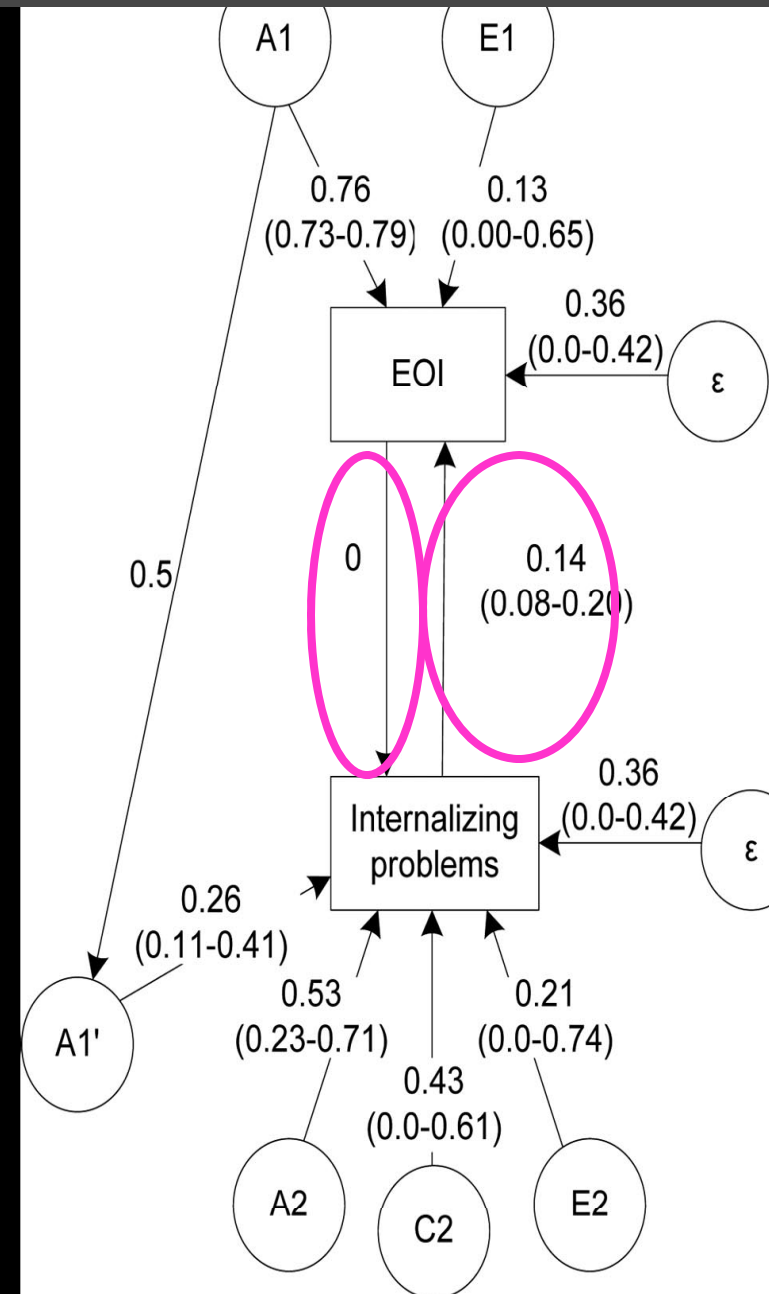
Findings from ECoT

Study 1 (Narusyte et al 2008):

- Mother reports of maternal overinvolvement & adolescent internalizing problems
- No passive rGE
- No direct environmental effects
- Significant EVOCATIVE rGE

Study 2 (Narusyte et al 2011):

- Parental criticism and adolescent externalizing problems
- Similar pattern of findings - **evocative GE correlation for mothers**
- **Direct environmental influences only for fathers**



Interpretation

- Children are eliciting parenting behaviors
- Differential patterns of findings for mothers and fathers

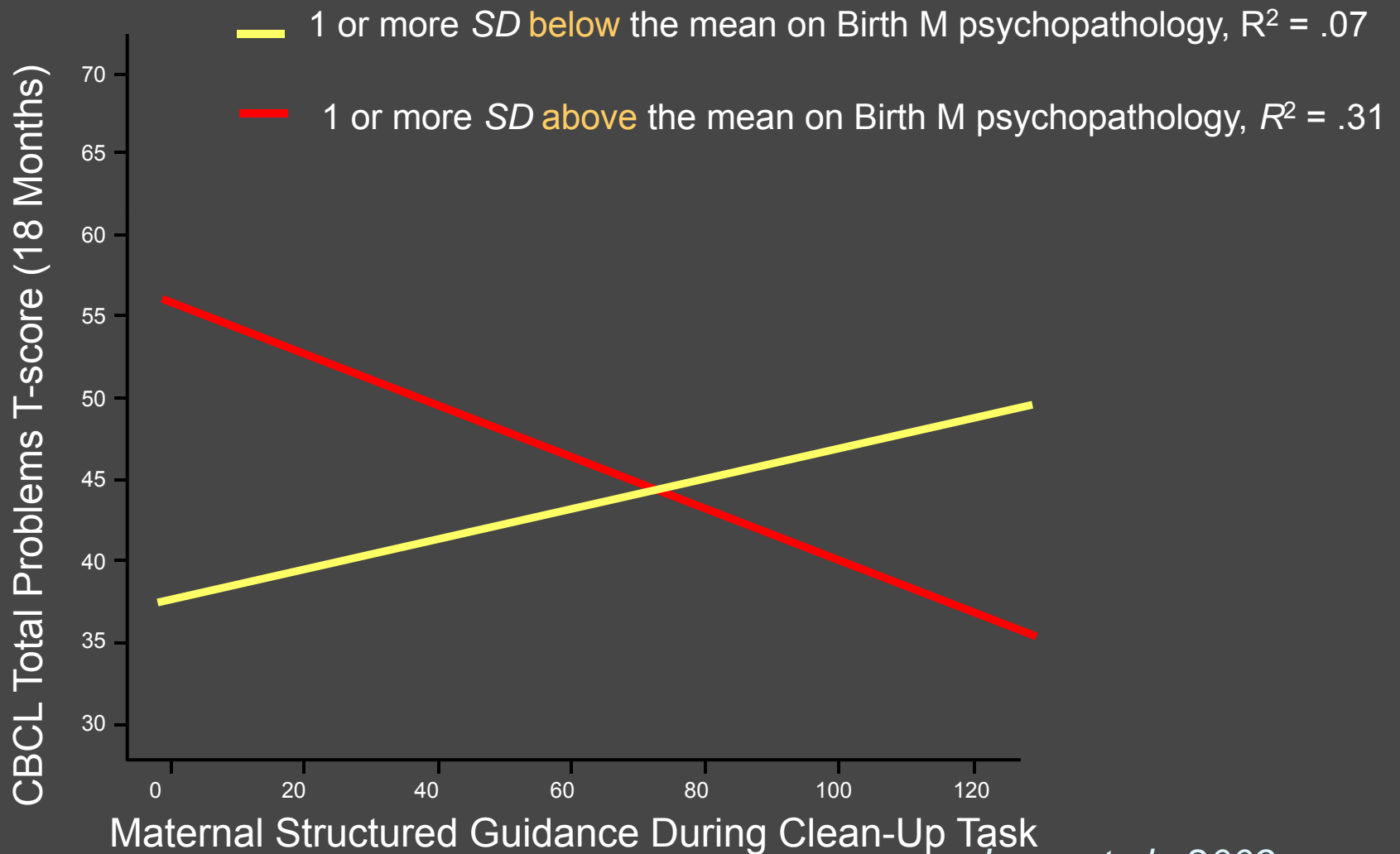
Removing parents' genes from the equation...

- Findings from combined approaches underscore importance of parents genes
- Only in an adoption design is parenting/rearing environment free of effects of correlations between parent and child genes

Clarifying G-E Interplay

- Sensitivity to environment
- Mechanisms of effects
- Effects of parental depression

Birth mother psychopathology increases sensitivity of child to rearing environment

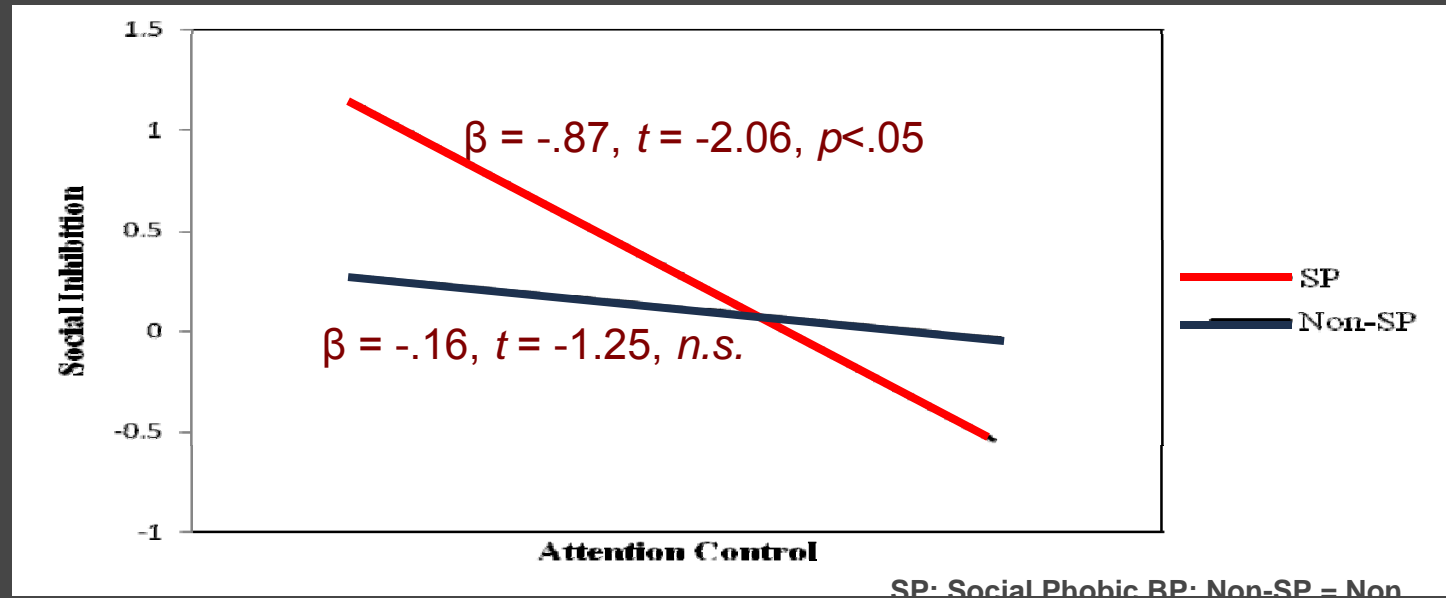


Leve et al., 2009

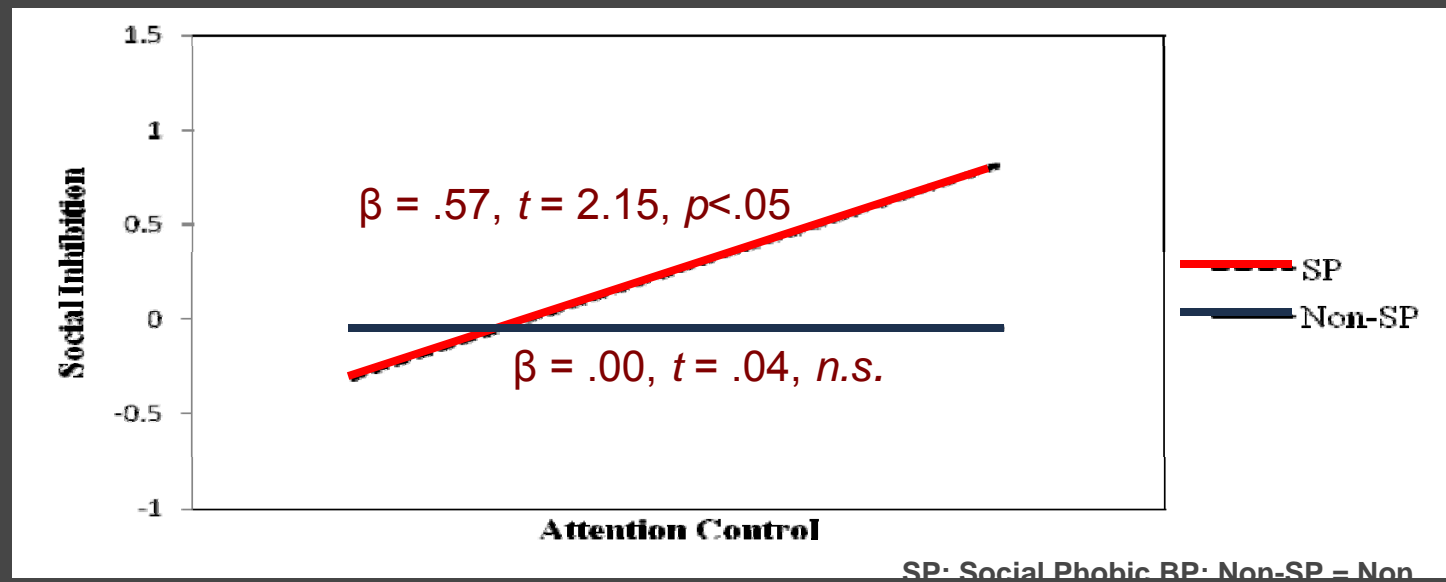
- In other words – genetic factors influence the impact of the environment on development

G x E x Child Behavior interaction

Low adoptive parent anxiety symptoms



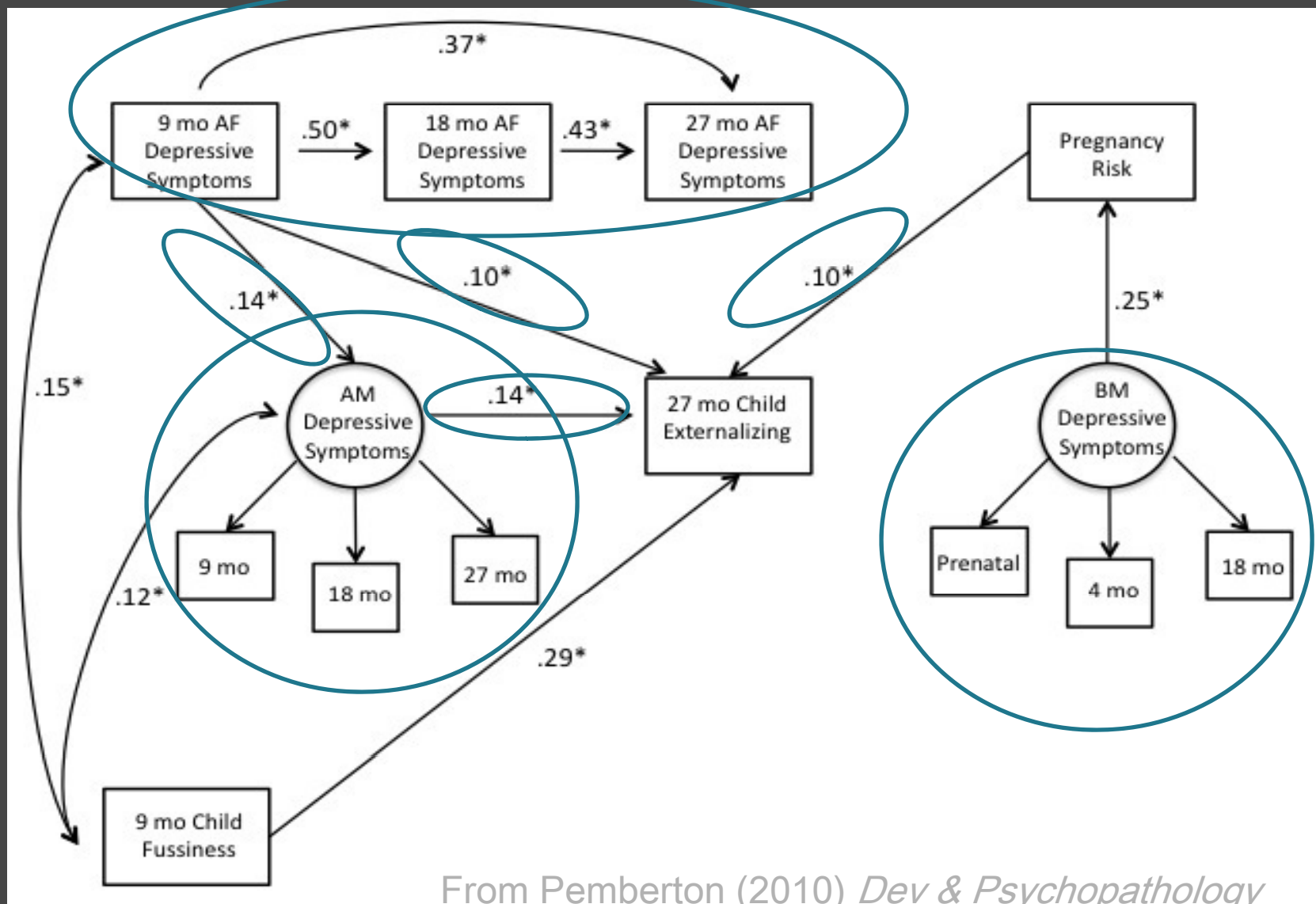
High adoptive parent anxiety symptoms



Interpretation

- Genetic influences do not have a direct effect on infant's early risk behaviors for anxiety (social inhibition)
- Attentional control appears to be a mechanism through which genetic influences are moderated by environmental factors
- Individual and *modifiable* characteristics are the route through which risk is translated to behavioral outcome

Influence of parent depression on toddler adjustment



From Pemberton (2010) *Dev & Psychopathology*

Summary

- Impact of genetic and prenatal influences was masked before including environmental factors (adoptive parent depressive symptoms) in the model
- Found no specific timing effects for adoptive mothers' depressive symptoms
- Early adoptive father depressive symptoms matter most
 - Directly influence later childhood problems
 - Indirectly operate through adoptive mothers

What does this mean?

- Even traditional “environmental” influences may be confounded by genetic influences (rGE)
- Genetic influences are not only risk or only protective
- To a certain extent individuals do make their own environments via their genetically influenced characteristics
- Findings do seem to replicate across multiple samples and studies and there is now more evidence at different points in the lifespan