

Genotype-Environment Correlation and Novel Approaches to Twin and Sibling Research



Jenae M. Neiderhiser, Ph.D.

Center for Family Research
Department of Psychiatry & Behavioral
Sciences
George Washington University



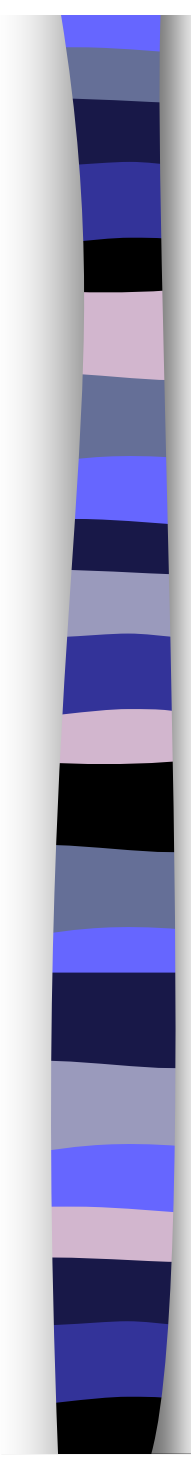
Genetic Tools & Prevention Mechanisms

- Major risk and protective factors are genetically influenced
- Genetic influences are **MODERATED** and **MEDIATED** by the environment
- Interventions can be **targeted** on these mediating and moderating environments



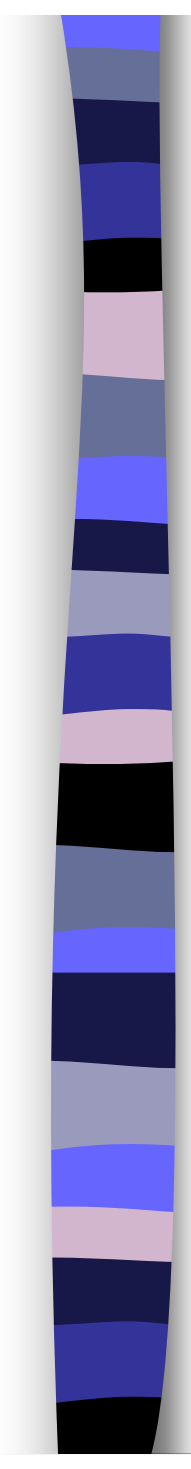
Risk & Protective Factors That Show Genetic Influences

- Temperament & Personality
- Psychopathology & Addiction
- IQ & Academic Functioning
- Parent-Child Relationships
- Self-Worth & Competence

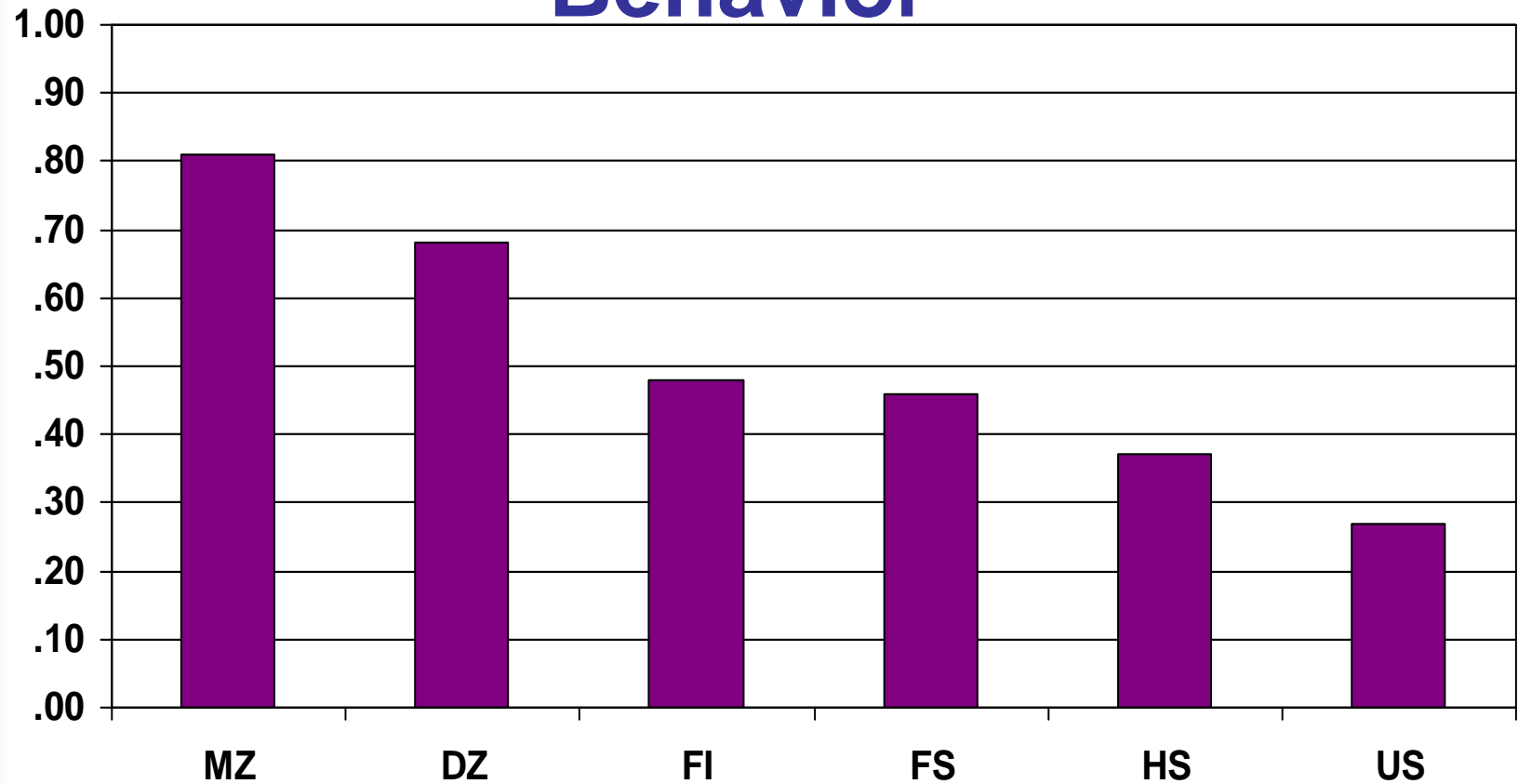


How are genetic influences estimated?

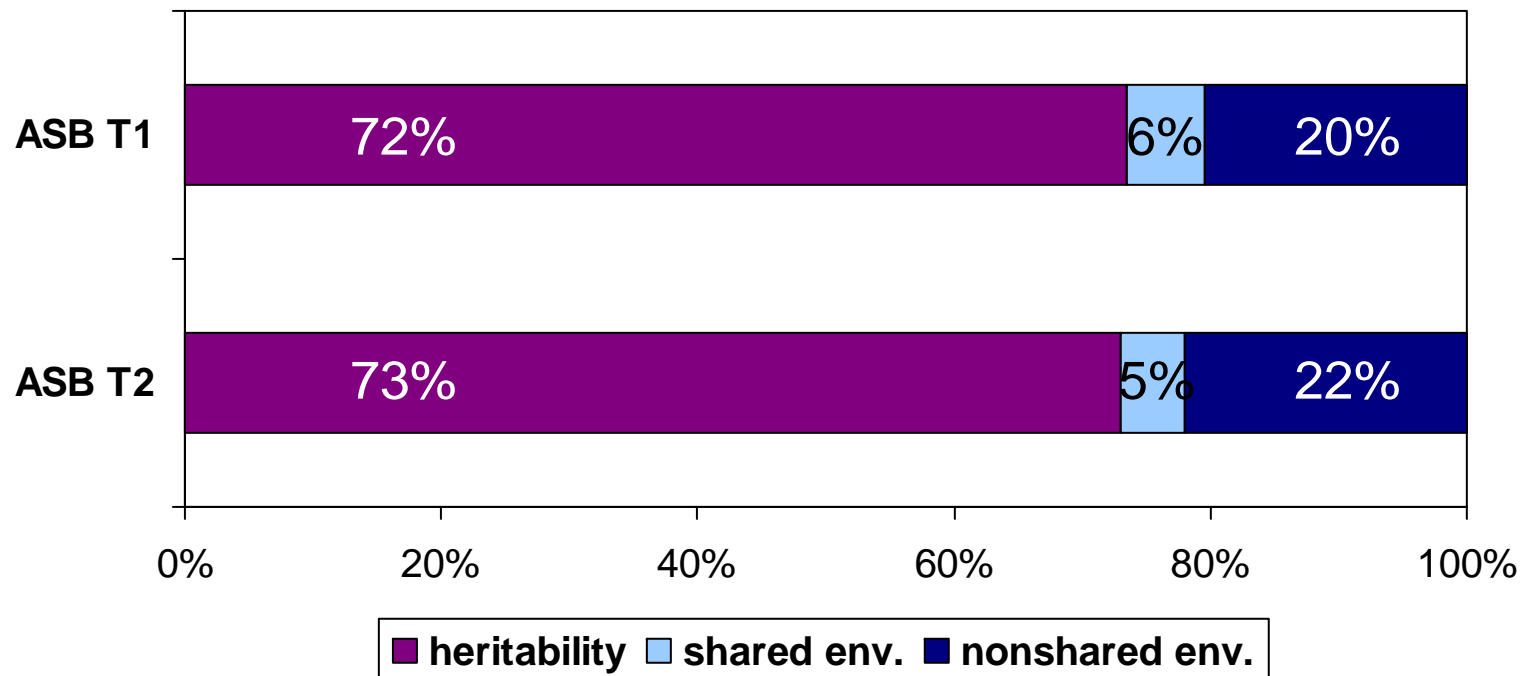
- Examine **family members** who differ in degree of genetic relatedness
 - e.g. identical twins, fraternal twins, parent-biological child, adoptive parent-adoptive child
- **Compare similarity** in family members (correlations)

- 
- **Genetic influences**
 - Indicated by increased similarity for increased genetic relatedness
 - MZ twins > DZ twins > adopted sibs
 - **Shared environmental influences**
 - Indicated by within family similarity
 - ANY similarity in adopted sibs
 - **Nonshared environmental influences**
 - Indicated by differences in family members
 - ANY differences between MZ twins

Twin and Sibling Correlations for Antisocial Behavior



Genetic & Environmental Influences on Antisocial Behavior



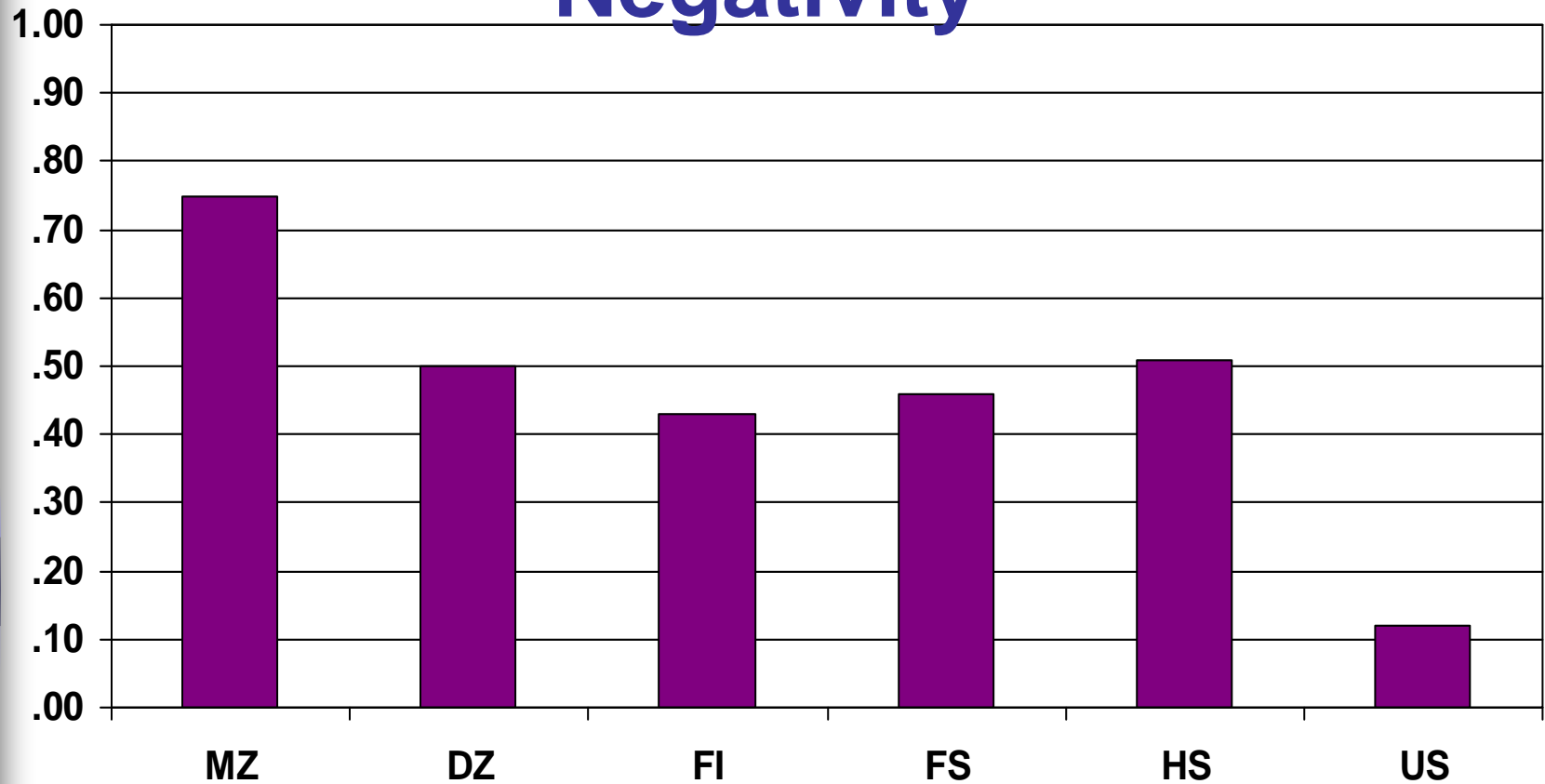
*from Reiss, Neiderhiser, Hetherington & Plomin (2000) *The Relationship Code*



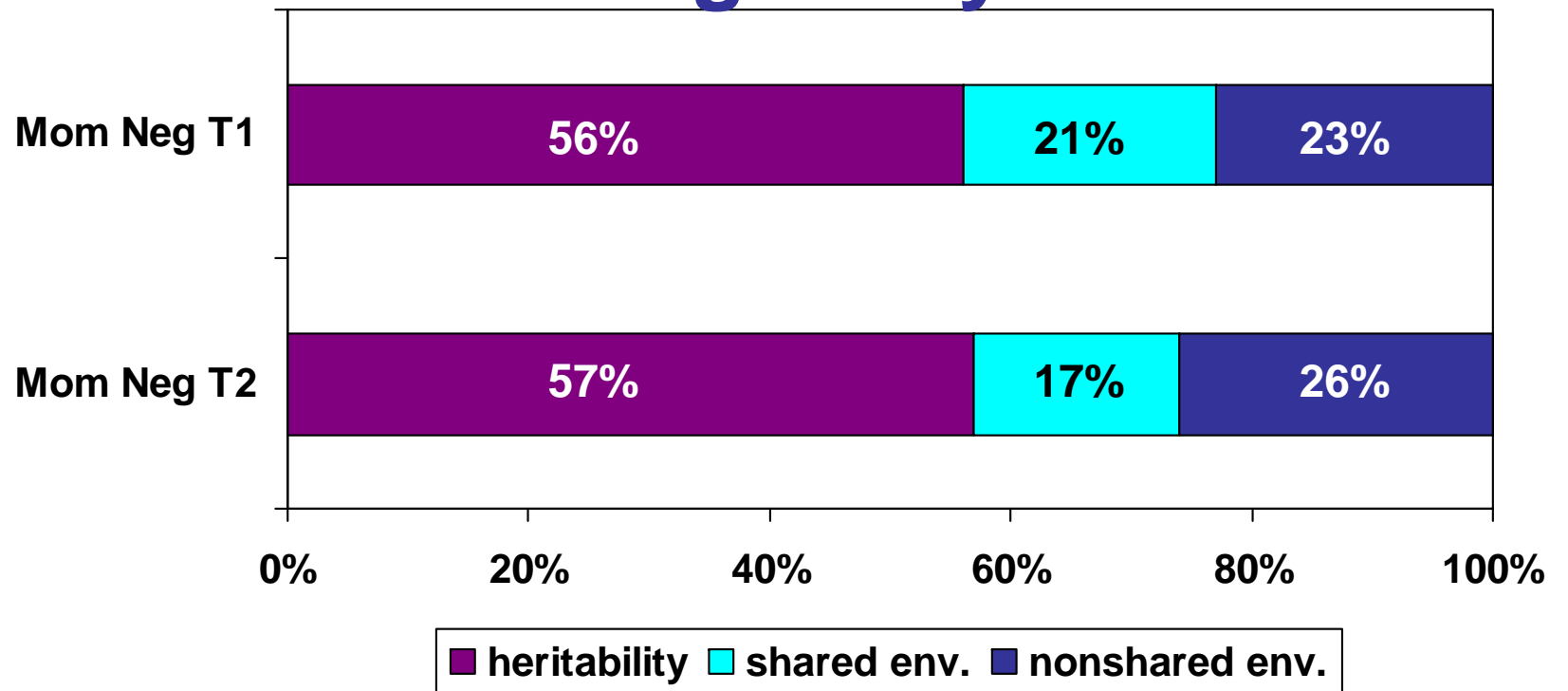
Risk & Protective Factors That Show Genetic Influences

- Temperament & Personality
- Psychopathology & Addiction
- IQ & Academic Functioning
- **Parent-Child Relationships**
- Self-Worth & Competence

Twin and Sibling Correlations for Mother's Negativity



Genetic and Environmental Influences on Mother's Negativity





Genetic Influences on Parenting

General Trends

- Warmth/Support & Conflict/Negativity
 - Tend to show *genetic influences*
- Monitoring & Control
 - Tend to show *shared environmental influences*



Possible Explanation of Genetic Influences on Parenting

Genotype-Environment Correlation

- **Passive:** parents & children share genes & share environments
- **Evocative:** parents respond to genetically influenced characteristics of children
- **Active:** children seek out environments correlated with their genotype



Why does it matter?

- 1) Helps to understand ***process***
- 2) If GE correlations are primarily ***passive*** change may be **harder**
- 3) If GE correlations are primarily ***evocative*** then **changing parental response** is more likely to **change the child's outcome**



How can types of GE correlation be disentangled?

Most BG studies of parenting have been *child-based* twin or sibling designs

Cannot disentangle *passive* from *evocative* GE correlation

Parent-based twin or sibling designs provide additional information about process



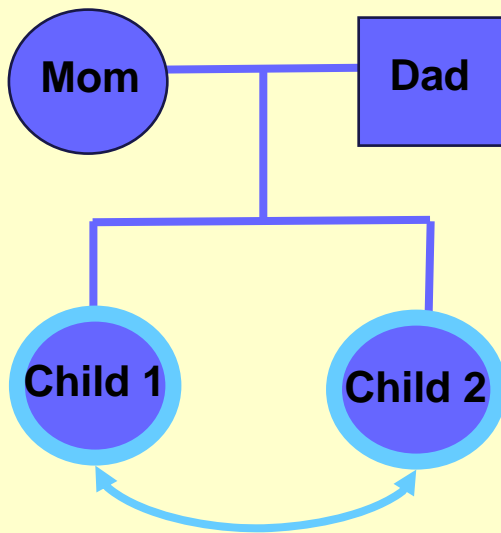
Comparison of Two Studies

Child-based study of adolescent siblings and parents – NEAD, Nonshared Environment in Adolescent Development study (Reiss et al., 2000)

Parent-based study of twin women and their adolescent child – TM, Twin Moms study (Reiss et al., 2001)

NEAD and TOSS Designs

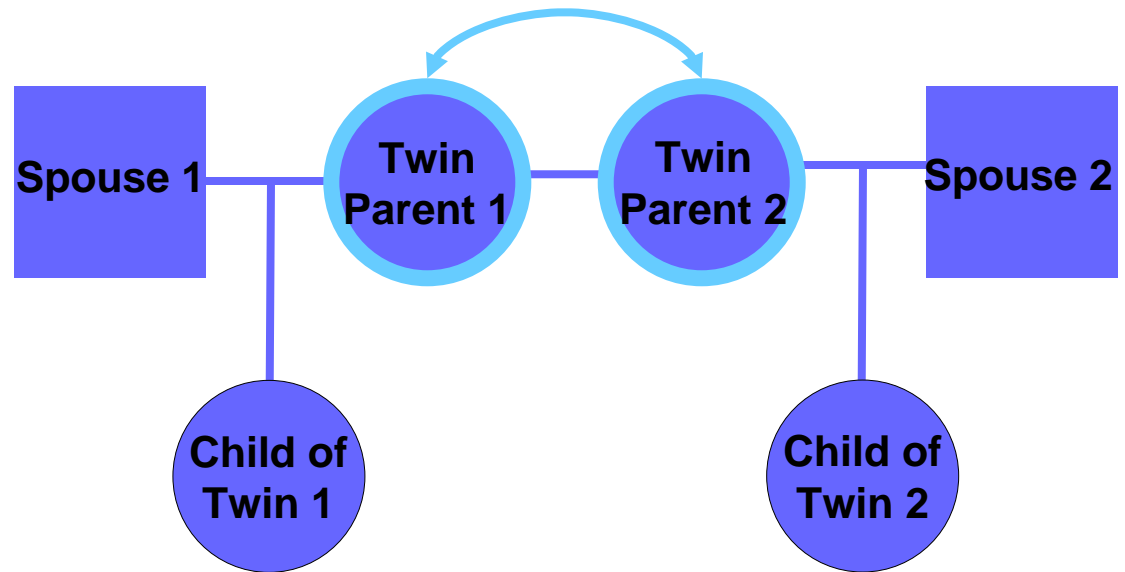
NEAD



1.0=MZ twins; .50=DZ twins
& full siblings; .25=half
siblings; 0=step siblings

TOSS

1.0=MZ twin parents;
.50=DZ twin parents



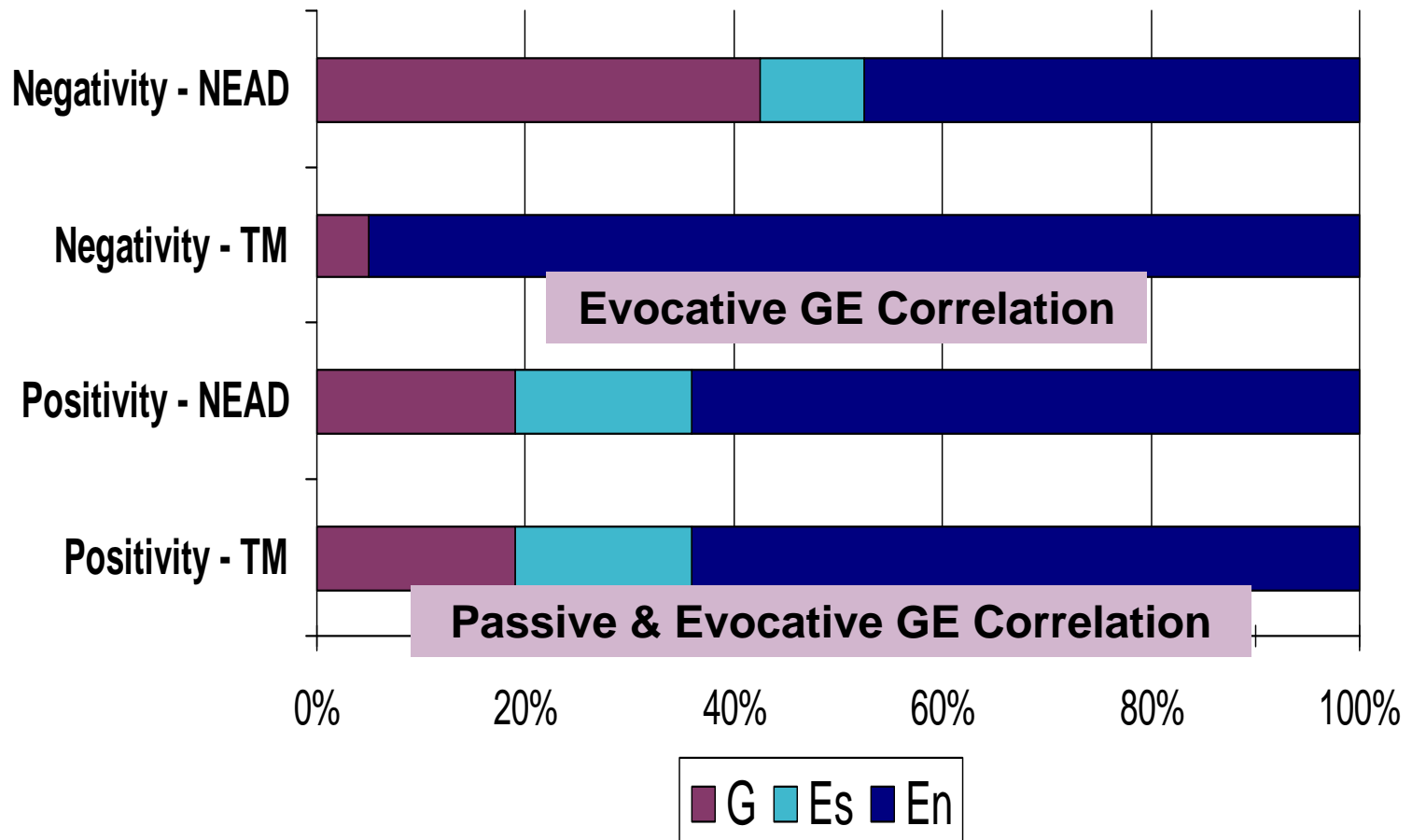
.25=children of MZ twin
parents; .125=children of
DZ twin parents



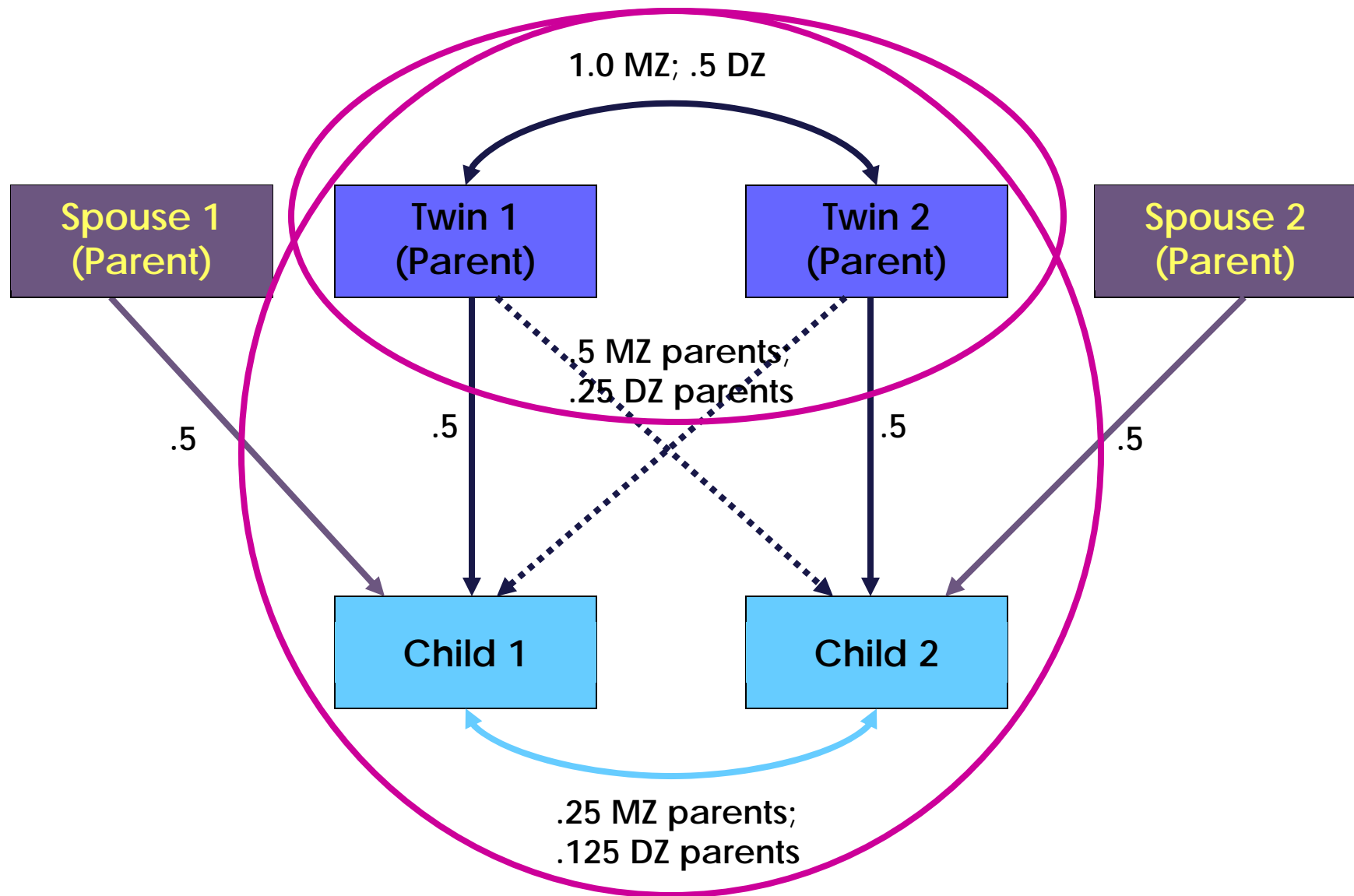
Expectations and Interpretation

	Child-based	Parent-based
Passive GE Corr	Shared Env	Genetic
Evocative GE Corr	Genetic	Shared and/or Nonshared Env
No GE Corr	Shared and/or Nonshared Env	Shared and/or Nonshared Env

G & E Influences on Mother's Behavior



Children Of Twins Design (conceptual)

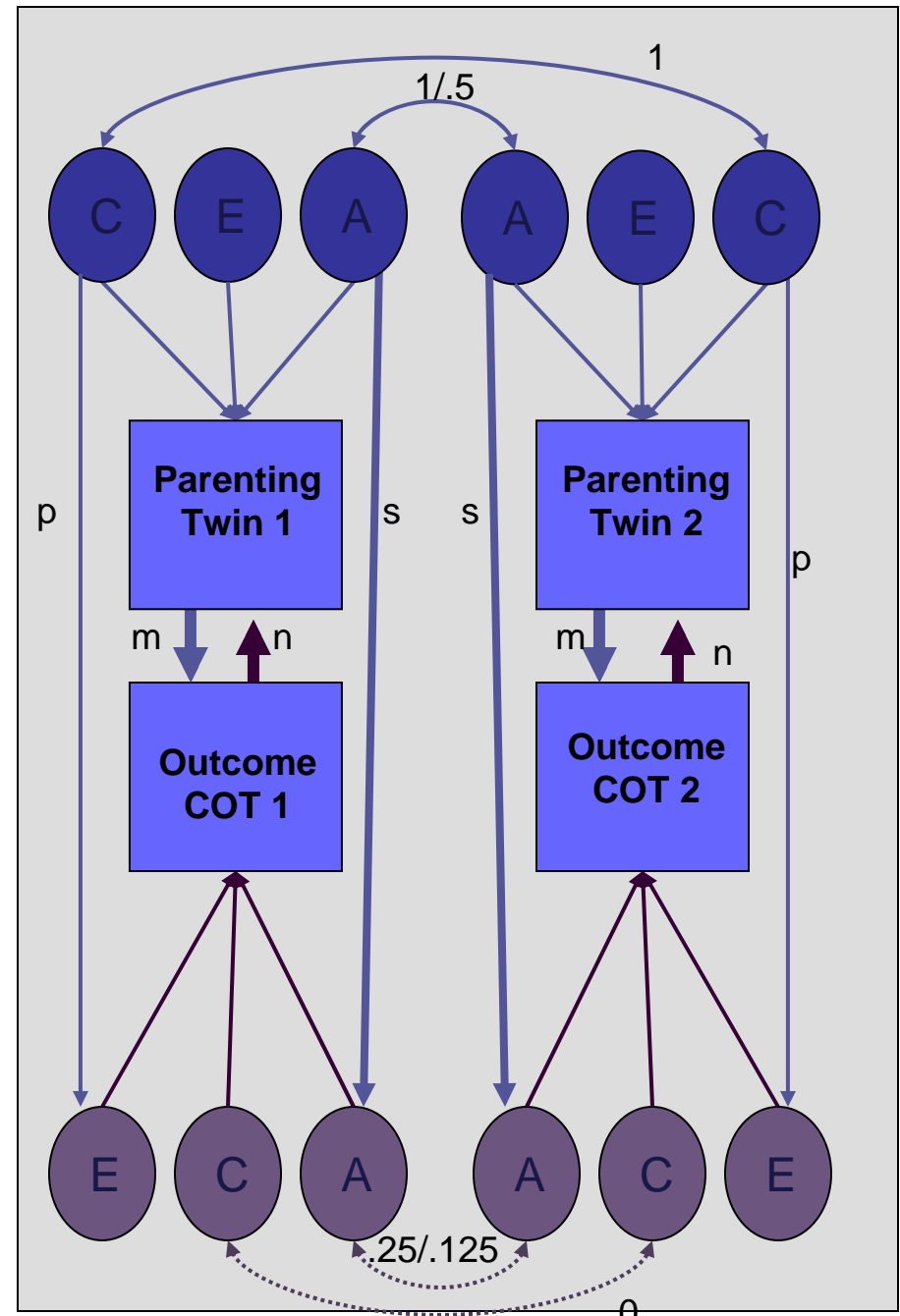


Children of Twins Model

(conceptual)

- testing for GE correlation
- incorporating child-based sample

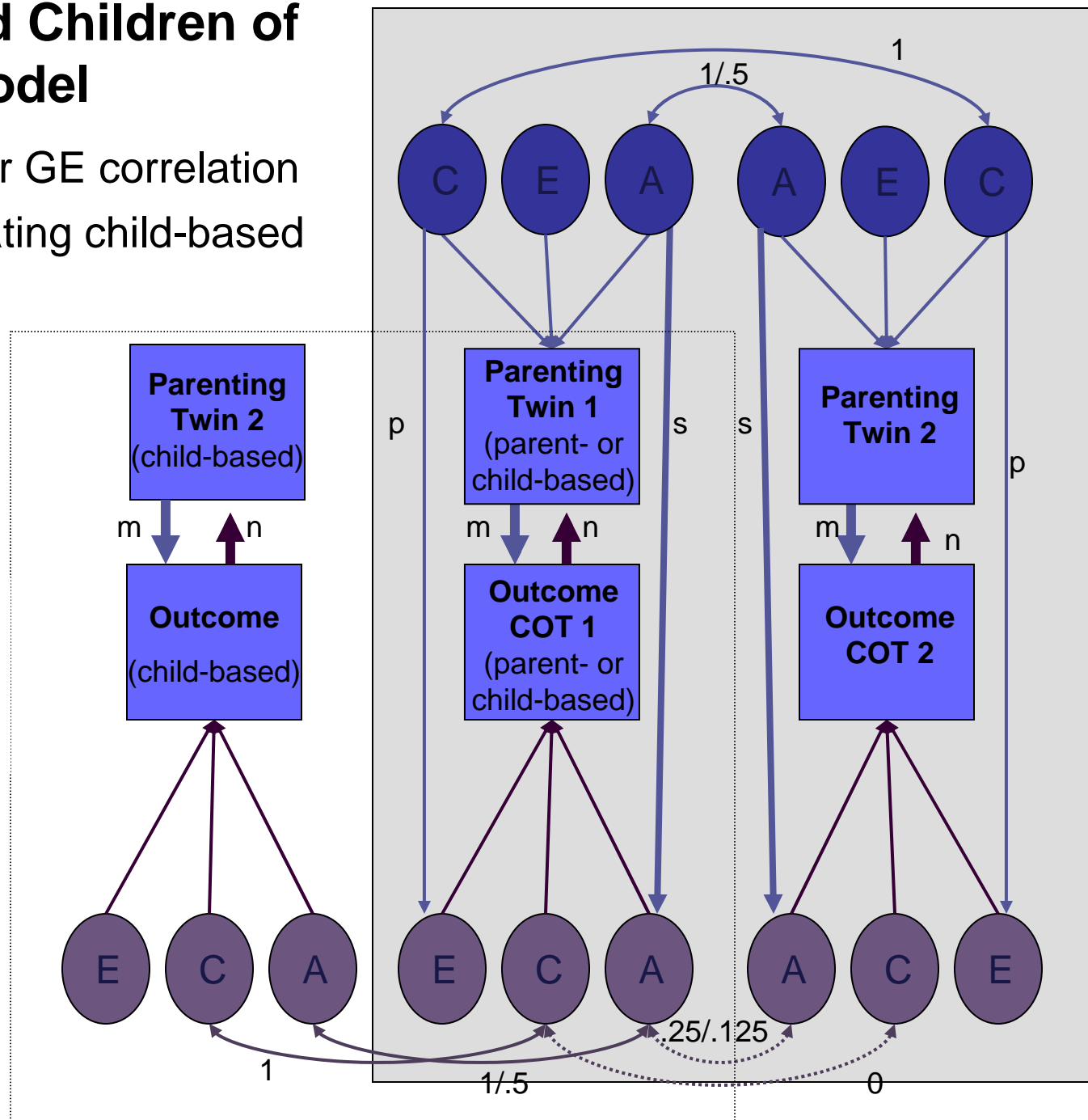
p=cultural inheritance
 m=direct effect of parenting
 s=passive ge-corr
 n=evocative ge-corr



Extended Children of Twins Model

- testing for GE correlation
- incorporating child-based sample

p =cultural inheritance
 m =direct effect of parenting
 s =passive ge-corr
 n =evocative ge-corr



First test of ECoT

Measures:

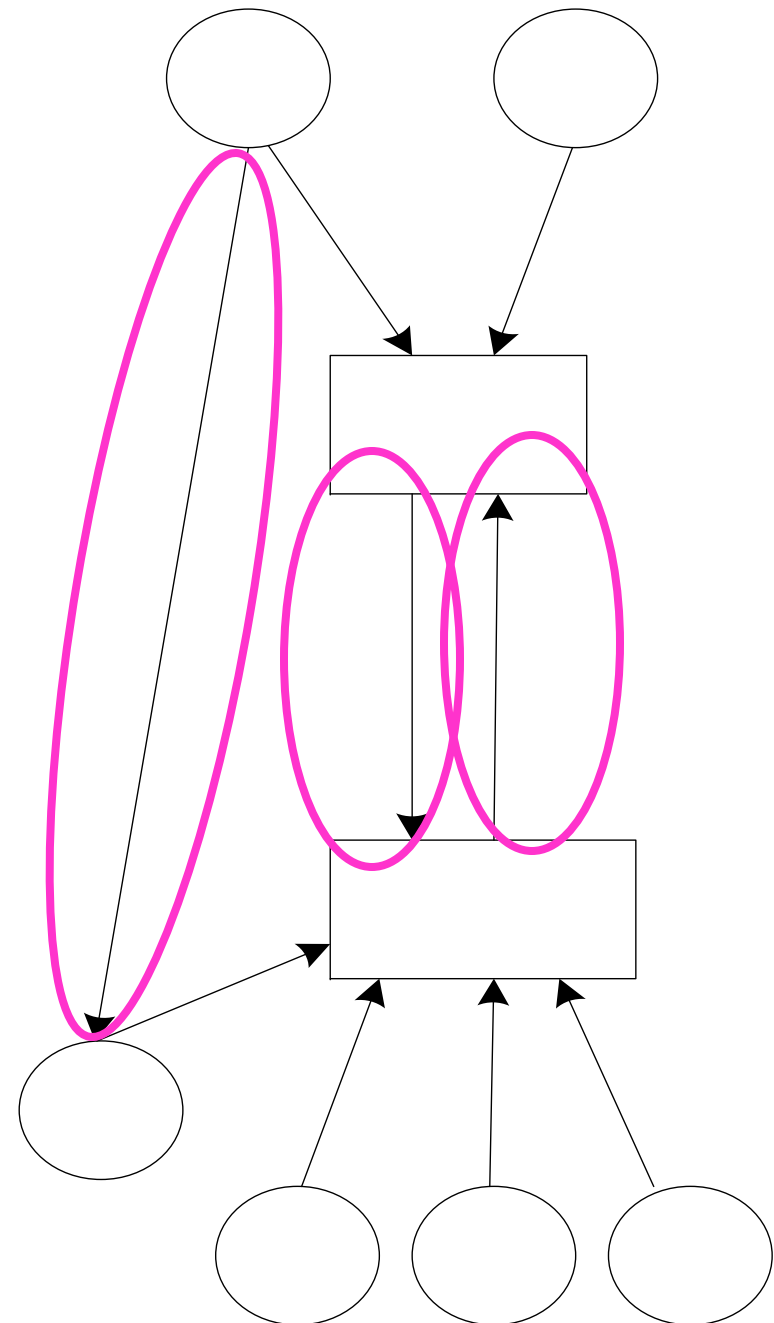
- Mother reports of maternal overinvolvement
- Youth Self-Report on the Child Behavior Checklist

Findings & interpretation:

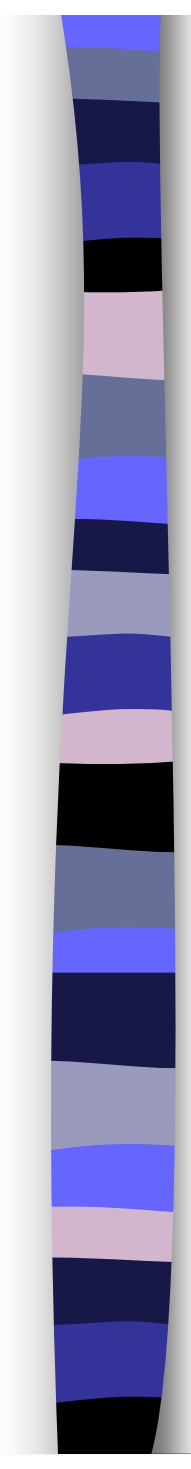
- No GE correlation
- Direct environmental effects of maternal overinvolvement on adolescent internalizing problems

Second test of ECoT:

- Currently underway
- Parental criticism and adolescent externalizing problems
- Preliminary findings suggest evocative GE correlation



From Narusyte et al. (submitted).



How can genetic research inform prevention?

- Emphasizes the importance of *targeted interventions*
- Emphasizes important role of the *family* in shaping genetically influenced behaviors
- Provides an experimental design to *test the causal role* of genetic influences



How Can Genetic Research Be Informed by Prevention and Family-based Designs?

- Acknowledge *distinct roles* of each family member in shaping behavior
- Molecular genetics may be focusing on “wrong” genes – genetic influences on *positive characteristics* are likely to prove more fruitful