The Costs and Benefits of Using Lousy Measures of the Environment

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Variance Components by SES
Can SES be Decomposed?

- Environmental or genetic?

- Assuming it’s environmental…. 
  - What does it consist of?
  - Can we identify the components of environment that are most important to change?

- No
The Nonshared Environment Project
Three Laws of Behavior Genetics

1. Everything is heritable
2. Families contribute a relatively small portion of the variability in genetically informed studies

3. Most variability in human behavior cannot be predicted from genes or environment.
The Non-shared Environment is the Paradigmatic Problem in Human Scientific Psychology
Three step research program
(Plomin and Daniels)

1) Quantify Within Family Environment
2) Identify Specific Within Family Variables
3) Causal Associations between Within Family E and Behavior
Meta-analysis

- Studies including measured nonshared environmental variable.
- Median $R^2$ about .02
- **Conclusion**: Measured nonshared effects do not add up to variance component.
The NEAD Study

- Families with pairs of MZ and DZ twin, sibling, half sibling and unrelated children
- What makes them different?
- Nothing
Why?
Big Environmental Cause Model

Toilet Training → Personality
Complex Environmental Causation Model

Environment

- Toilet Training
- Peers
- Reinforcement
- Parenting
- Birth Order

Personality
*Complex Environmental Causation

Environment

Toilet Training

Peers

Reinforcement

Parenting

Birth Order

Human Development

Variance Component?

Specific correlations?

Personality

*Complex Environmental Causation*

Environment: Toilet Training, Peers, Reinforcement, Parenting, Birth Order -> Human Development

Variance Component? -> Specific correlations?

The best scientific model for the molecular genetics of complex behavior comes from the non-shared environment
Nonshared Environment
Three step research program

1) Quantify Within Family Environment
2) Identify Specific Within Family Variables
3) Causal Associations between Within Family Environment and Behavior
Three step research program

1) Quantify Heritability
2) Identify Specific Within Family Variables
3) Causal Associations between Within Family E and Behavior
Three step research program

1) Quantify Heritability
2) Identify Specific QTLs
3) Causal Associations between Within Family E and Behavior
Three step research program

1) Quantify Heritability
2) Identify Specific QTLs
3) Causal Associations between Within Family E and Behavior
The Human Genome Project

1) Quantify Heritability
2) Identify Specific QTLs
3) Causal Associations between QTLs and Behavior
Big Environmental Cause Model

Toilet Training → Personality
One Gene One Disorder (OGOD) Model

Single Major Locus → OCEAN
Complex Environmental Causation Model

Environment

- Toilet Training
- Peers
- Reinforcement
- Parenting
- Birth Order

Personality
Complex Genetic Cause (QTL) Model

Genotype

Locus 1
Locus 2
Locus 3
Locus 4
Locus 5

Personality
*Complex Environmental Causation

Environment

- Toilet Training
- Peers
- Reinforcement
- Parenting
- Birth Order

Variance Component?
Specific correlations?

Personality

Human Development
*Complex Genetic Causation*

Genotype

Locus 1
Locus 2
Locus 3

Environment

Peers
Reinforcement
Parenting
Birth Order

Association/Linkage

Personality

h^2

C^2
Conclusion

- Environmental and genetic causation are more alike than different
- Both are detectable when measured coarsely
  - Twins; SES
- Both are hard to detect when measured well
The Gloomy Prospect is True

One gloomy prospect is that the salient environment might be unsystematic, idiosyncratic, or serendipitous events such as accidents, illnesses, or other traumas...

Such capricious events, however, are likely to prove a dead end for research. More interesting heuristically are possible systematic sources of differences between families. (Plomin & Daniels, p. 8)
Rowe’s Rule

- If small genetic associations are inevitable, not surprising

- How will we know when we are getting somewhere?
  - When the prediction of behavior from allelic data approaches prediction from parental phenotypes