

Genetic and Environmental Links Between Parenting and Child Outcome in Toddlers

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Abstract

The present study explored links between parenting behaviors and child outcome in a sample of 313 2-year-old twin pairs. There was significant genetic overlap between negative parenting and hyperactivity, conduct problems, and prosocial behaviors. However, positive parenting was genetically associated with only conduct problems. Links between positive parenting and prosocial behavior and hyperactivity were largely due to shared environmental influences. The findings hint to a possible differential direction of effects for child behaviors and negative and positive parenting.

Introduction

- Prior research has found that parenting behavior is genetically influenced and that genetic factors mediate the association between parenting and child behavior problems (e.g., Deater-Deckard, 2000; O'Connor et al., 1998).
- Little is known, however, about the links between parenting behavior and developmental outcomes in toddlers.
- Moreover, although research finds that negative and positive parenting behaviors are substantially correlated (e.g., Dadds et al., 2003; Deater-Deckard, 2000; O'Connor et al., 1998), the sources of this covariance have not been examined.

Methods

- Sample**
 - MZ=145; DZ=168 twin pairs participating in the Boston University Twin Project.
- Zygosity was determined via DNA analyses using DNA obtained from cheek swab samples.
- Approximately equal numbers of males and females.
- Twins were assessed within approximately 2 weeks of their 2nd birthday.

Parenting Measures

- Positive and negative affect toward each twin was assessed using the **Parent Feelings Questionnaire** (PFQ; Deater-Deckard, 1996).
- Parents reported on discipline strategies used with each twin on a questionnaire adapted from a semi-structured interview (Deater-Deckard, 2000).
- 2nd order factor analyses of PFQ and discipline subscales yielded two factors representing overall positivity and negativity.
- Positivity** included positive emotions and feelings (e.g., happy, proud, amused) toward the child and positive discipline strategies (i.e., reasoning).
- Negativity** included negative emotions and feelings (e.g., angry, frustrated, sad) and negative discipline strategies (e.g., spanking and arguing).

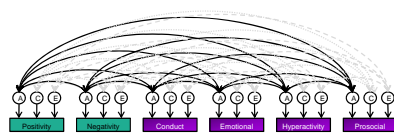
Behavior Problem Measure

- Parents rated twins' behavior problems on the **Revised Rutter Parent Scale for Preschool Children** (Hogg, Rutter & Richman, 1997).
- This brief parent-report questionnaire has an emphasis on child strengths as well as weaknesses and yields a measure of prosocial behavior in addition to emotional difficulties, conduct difficulties, and hyperactivity.

Model-fitting Analyses

- To estimate genetic and environmental sources of variance for each measure and sources of covariance between the two parenting styles and between parenting and behavioral outcomes, a 6-variable correlated factors model was fit to raw data using Mx structural equation modeling software (see Figure 1).

Figure 1. Correlated Factors Model



- The phenotypic variances of each measure are represented by the rectangles. A, C, and E are the respective latent genetic, shared environment, and nonshared environment variables that influence each measure. Double-headed curved paths depict the genetic and environmental correlations between the latent variables.
- Using this model, estimates of genetic and environmental variances for each measure, and genetic and environmental correlations between measures can be obtained. These correlations indicate the extent to which genetic and environmental effects overlap across measures.

Results

Phenotypic Correlations (Table 1)

- Consistent with prior research, parent positivity and negativity were significantly associated.

- Both types of parenting were associated with child behavior problems and prosocial behavior. Twins with more behavior problems received more negative parenting and less positive parenting. The reverse was true for child prosocial behaviors.

Table 1. Phenotypic Correlations

	Positivity	Negativity
Negativity	-.37	
Conduct Problems	-.25	.41
Emotion Problems	-.16	.20
Hyperactivity	-.20	.36
Prosocial Behaviors	.34	-.17

Note. All correlations are significant at $p < .01$

Twin Correlations (Table 2)

- With the exception of emotional problems, intraclass correlations suggest genetic influences on all variables (i.e., MZ > DZ).
- Shared environmental influences are also suggested for parenting, emotional problems and possibly conduct problems and prosocial behaviors (i.e., DZ > 1/2 MZ).
- Cross correlations indicate that genetic factors contribute to the covariance between positivity and conduct problems and negativity and conduct problems and hyperactivity.
- Shared environmental covariance is suggested between parent positivity and negativity; positivity and prosocial behaviors, emotional problems and hyperactivity; and negativity, conduct problems and emotional problems.

Table 2. Twin Correlations

	Intraclass r		Cross r Positivity		Cross r Negativity	
	MZ	DZ	MZ	DZ	MZ	DZ
Positivity	.86	.79				
Negativity	.86	.67	-.34	-.28		
Conduct Problems	.71	.46	-.27	-.15	.39	.23
Emotional Problems	.43	.37	-.14	-.16	.19	.16
Hyperactivity	.67	.22	-.16	-.21	.37	.19
Prosocial Behaviors	.77	.43	.31	.29	-.12	.04

Note. Bold text denotes significant correlations ($p < .05$).

Variance Components (Table 3)

- As suggested by the pattern of correlations, with the exception of emotional problems, all variables were significantly heritable.
- There were also significant shared environmental influences on all variables.
- Similar to Knafo and Plomin's (2006) findings, shared environmental influences were more important, and genetic influences less important, for positive parenting than for negative parenting.

Table 3. Variance Components

	a^2 (95% CI)	c^2 (95% CI)	e^2 (95% CI)
Positivity	.10 (.02-.21)	.75 (.65-.83)	.15 (.11-.19)
Negativity	.42 (.28-.59)	.45 (.28-.59)	.13 (.10-.17)
Conduct Problems	.44 (.22-.62)	.27 (.11-.45)	.29 (.22-.37)
Emotional Problems	.12 (.00-.36)	.32 (.11-.46)	.56 (.46-.67)
Hyperactivity	.57 (.41-.69)	.09 (.02-.20)	.34 (.26-.45)
Prosocial Behaviors	.61 (.40-.71)	.15 (.07-.34)	.24 (.18-.31)

Note. a^2 =genetic variance, c^2 =shared environmental variance, e^2 =nonshared environmental variance. Significant estimates are in bold text.

Covariance Between Positive and Negative Parenting

- Although parent positivity and negativity differed in the magnitude of genetic variance, there was substantial genetic overlap between the genetic effects on both parenting variables.
 - $r_G = .78$ (CI: .71-.80)
- Shared and nonshared environmental effects also correlated across parenting behaviors, but to a lesser extent.
 - $r_C = .33$ (CI: .20-.50)
 - $r_E = .19$ (CI: .04-.33)
- Nonetheless, shared environments accounted for 50% of the phenotypic correlation, with genetic factors accounting for 43%.

Table 4. Genetic and Environmental Correlations (95% CI) Between Parenting and Behavioral Outcomes

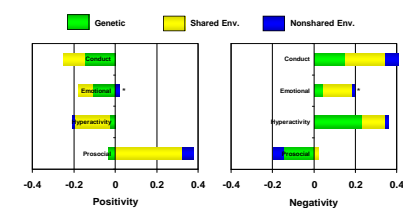
	Conduct Problems	Emotional Problems	Hyperactivity	Prosocial Behaviors
Positivity				
r_G	-.70 (-1.0;-.19)	-1.0 (-1.0;.03)	-.11 (-.72;.47)	-.12 (-.86;.32)
r_C	-.22 (-.82;.68)	-.13 (-.36;.5)	-.67 (-1.0;-.17)	.87 (.55-1.0)
r_E	.00 (-.16;.16)	.05 (-.07;.21)	-.05 (-.22;.13)	.27 (.12;.41)
Negativity				
r_G	.35 (.05;.61)	.20 (-1.0;.1)	.47 (.20;.76)	-.29 (-.53;-.03)
r_C	.56 (.19;.95)	.37 (-.04;.77)	.58 (-.18;1.0)	.09 (-.42;.74)
r_E	-.32 (-1.0;.37)	.05 (-.12;.23)	.06 (-.12;.23)	-.26 (-.40;-.10)

Note. r_G =genetic correlation, r_C =shared environmental correlation, r_E =nonshared environmental correlation. Significant estimates are in bold text.

Covariance Between Parenting and Behavioral Outcomes (Table 4 & Figure 2)

- Links between parent positivity and child behaviors were largely due to overlapping environmental effects. Only conduct problems were genetically associated with positivity.
- In contrast, parent negativity was genetically associated with conduct problems, hyperactivity and prosocial behavior. Only conduct problems displayed shared environmental covariance with negativity.

Figure 2. Decomposed Phenotypic Correlations Between Parenting and Behavioral Outcome



* No significant sources of covariance.

Conclusions

- The substantial shared environmental influence for parent positivity suggests that this aspect of parenting is largely a family-wide influence.
- The shared environmental covariance between positivity and hyperactivity and prosocial behaviors suggests that positive parenting may influence these behaviors in the child.
- In contrast, the substantial genetic influences for negativity indicates that negative parenting in part reflects some aspects of the child.
- The genetic correlations between negativity and conduct problems, hyperactivity, and prosocial behavior provide evidence that to some extent, child behaviors influence negative parenting.

Acknowledgments

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