Influence of Adult Domestic Violence on Children's Internalizing and Externalizing Problems: An Environmentally Informative Twin Study

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ABSTRACT

Objective: Externalizing and internalizing problems may aggregate in families because (1) siblings share genetic risks for problem behaviors or (2) siblings are exposed to similar environmental risks. A genetically sensitive design was used to determine whether domestic violence accounted significantly for the variation and covariation of externalizing and internalizing problems, independent of additive genetic effects on these behavior problems. **Method:** Using the Achenbach family of instruments, mothers and teachers reported internalizing and externalizing problems for 1,116 monozygotic and dizygotic 5-year-old twin pairs in the United Kingdom (93% response rate). Mothers reported their experiences of domestic violence in the previous 5 years. Structural equation models were tested to determine the effect of mothers' experiences of domestic violence on children's emotional and conduct problems, controlling for latent genetic and environmental effects on these behaviors. **Results:** A multivariate model showed that adult domestic violence accounted for 2% and 5% of the variation in children's internalizing and externalizing problems, respectively, independent of genetic effects. The co-occurrence of externalizing and internalizing scores was accounted for by genetic (62.6%) and shared environmental (29.2%) factors and by domestic violence (8%). **Conclusions:** Because domestic violence affects children's behavior problems beyond genetic influences, programs that successfully reduce domestic violence should also prevent children's psychopathology. *J. Am. Acad. Child Adolesc. Psychiatry*, 2002, 41(9):1095–1103. **Key Words:** behavioral genetics, domestic violence, comorbidity, Child Behavior Checklist.

When parents engage in frequent, intense, and poorly resolved conflicts, their children are likely to suffer from elevated levels of both internalizing and externalizing problems (Buehler et al., 1997; Cummings and Davies, 1994; Grych and Fincham, 1990; 2001; Holden et al., 1998). Children may be at greatest risk when interparental conflicts become physically violent (Margolin and Gordis, 2000). Domestic violence is common, with more than 10 million children in the United States witnessing violence between their parents each year (Straus, 1992). Domestic violence is most common among couples in their twenties, so very young children of inexperienced parents are at particularly high risk of exposure (Bureau of Justice Statistics, 1995). Moreover, violence in the family of origin has been implicated in a cycle of abuse that is transmitted across generations (Reitzel-Jaffe and Wolfe, 2001; Widom, 1989).

It is widely assumed that the effects of domestic violence on children's behavior problems are environmentally mediated. For example, the experience of being exposed to domestic violence is hypothesized to lead children to model their parents' aggression or to heighten children's emotional insecurity (Davies and Cummings, 1998; Fincham et al., 1994; Grych et al., 2000). Behavioral geneticists have offered a provocative alternative expla-

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nation: children whose parents experience domestic violence may instead be at *genetic* risk for behavior problems (DiLalla and Gottesman, 1991). That is, adults who meet diagnostic criteria for psychiatric disorders (including antisocial personality disorder, substance use, and depression) are at greater risk of becoming involved in violent intimate relationships (Danielson et al., 1998). Because these disorders are moderately heritable (Gershon and Cloninger, 1994), it is possible that domestic violence is simply a marker for a genetic predisposition to behavioral and emotional problems that parents will transmit to their children. In this study, we harnessed the power of an environmentally informative genetic design to test whether domestic violence affects young children's mental health beyond a genetic liability to mental health problems.

Twin studies are of particular value in testing hypotheses about whether behaviors aggregate in families because siblings share genetic versus environmental risk factors. The twin method is a natural experiment that relies on the different level of genetic relatedness between monozygotic (MZ) and dizygotic (DZ) twin pairs to estimate the contribution of genetic and environmental factors to individual differences in a phenotype of interest. Population variance on any behavioral phenotype may be partialed into an additive genetic component and two types of environmental components: a shared or family-wide environmental effect that serves to make children growing up in the same family similar to each other and a nonshared or child-specific environmental effect that impinges exclusively on one child and so serves to make children different from their siblings. Both genetic and environmental influences have been implicated in the etiology of children's internalizing and externalizing problems (Gjone and Stevenson, 1997; Rutter et al., 1999; Schmitz et al., 1994; Van den Oord et al., 2000). However, few twin studies have specified which aspects of the environment (or which genes) are involved. The specification of environmental risk variables is necessary to inform etiological theories and treatment efforts. The few twin studies that have measured putative environmental risks have been able to identify specific environmental risk factors against a background effect of family environment (Caspi et al., 2000; Kendler et al., 1992) and to more effectively disentangle environmental from genetic sources of influence (Kendler et al., 1996; Meyer et al., 2000). Thus the first goal of this study is to test whether domestic violence accounts for the familial aggregation of behavior problems beyond genetic influences on behavior problems.

Whereas univariate behavioral genetic studies decompose variation in a single disorder into that which can be accounted for by genetic and environmental influences, multivariate behavioral genetic studies of comorbidity decompose the *covariation between* disorders into that which can be accounted for by genetic and environmental influences. This allows researchers to test whether disorders co-occur because of shared genetic or environmental causes (Neale and Kendler, 1995). Comorbidity—the tendency for disorders to co-occur at greater than chance levels—is the rule rather than the exception among children in clinic and community samples (Angold et al., 1999; Verhulst and van der Ende, 1993). Comorbidity in children has worse implications for prognosis, treatment response, and social role impairment, and it has been associated with distinct environmental and biological risk factors (Angold et al., 1999). Thus the second goal of this study is to test whether domestic violence, which has been associated with children's externalizing and internalizing problems in previous research, is also linked to children's comorbid symptom presentation, while controlling for genetic effects on comorbidity.

METHOD

Participants

Participants are members of the Environmental Risk (E-risk) Longitudinal Twin Study, which investigates how genetic and environmental factors shape children's development. The E-risk sampling frame comprised two consecutive birth cohorts (1994 and 1995) in the Twins' Early Development Study, a birth register of twins born in England and Wales (Dale et al., 1998). Of the 15,906 twin pairs born in 1994–1995, 71% joined the register. Our sampling frame excluded opposite-sex twin pairs and began with the 73% of families in the register who had same-sex twins.

A list of 1,210 families, a 10% oversampling to allow for nonparticipation, was drawn from the register to target for home visits. The probability sample was drawn by using a high-risk stratification sampling frame. High-risk families were those in which the mother had her first child when she was 20 years of age or younger. Early first childbearing was used as the risk stratification variable because information on mother's age at first birth was present for virtually all families in the register, it is relatively free of measurement error, and it is a known risk factor for children's problem behaviors (Maynard, 1997; Moffitt and E-Risk Study Team, 2002). In the final sample, two thirds of the mothers accurately represented all mothers (aged 15–48 at first birth) in the general population in England and Wales in 1994–1995 and one third of the mothers constituted a 160% oversampling of young mothers (aged 15–20 at first birth) (Office for National Statistics, 1998).

Of the 1,210 families targeted, seven were ineligible for inclusion because the twins had moved overseas, did not speak English, were being raised by neither biological parent, or were opposite-sex. Of the 1,203 eligible families, 1,116 (93%) participated in home-visit assessments in 1999 and 2000 when the twins were 5 years old, 4% of families refused, and 3% were lost to tracing or could not be reached after

many attempts. The sample included 56% MZ and 44% DZ twin pairs. Sex was evenly distributed across zygosity (49% male).

Data were collected within 60 days of the twins' fifth birthday for 80% of families and within 120 days for all families. Research workers, in teams of two, visited each home for 2.5 to 3 hours. While one research worker interviewed the mother, the other tested the twins in sequence in a different part of the house. Research workers were blind to the zygosity of the twins. Each research worker completed a formal 15-day training program on either the mother interview or the child assessment protocol to attain certification to a rigorous reliability standard. With a parent's permission, questionnaires were sent to the children's teachers, and teachers returned questionnaires for 94% of cohort children. Families were compensated for their participation.

Measures

Adult Domestic Violence. Adult domestic violence was assessed by inquiring about 12 acts of physical violence, including all 9 items from the Conflict Tactics Scale, Form R (Straus, 1990), plus an additional 3 items describing other physically abusive behaviors (pushed/grabbed/shoved; slapped; shaken; thrown an object; kicked/bit/hit with fist; hit with something; twisted arm; thrown bodily; beat up; choked/strangled; threatened with knife/gun; and used knife/gun). Thirty-two percent of children lived in families in which the mothers reported at least one incident of domestic violence. For example, 16% of mothers had been pushed, grabbed, or shoved by a partner, and 4% had been beaten up with multiple blows. Mothers were asked about their own violence toward any partner and about any partners' violence toward them during the 5 years since the twins' birth, responding "not true" (coded 0) or "true" (coded 2). Another response option, "somewhat true" (coded 1), was available for women who felt uncertain about their responses, but it was virtually unused by the women. The domestic violence measure represents the variety of acts of violence mothers had experienced as both victims and perpetrators. Scores were summed (range = 0–40, mean = 2.75, SD = 5.67). The internal consistency reliability of the physical abuse scale was 0.89. Additional methodological research shows that interpartner agreement for this measure is very high (latent correlation = 0.77) (Moffitt et al., 1997). Moreover, this variety scale is a strong predictor of which couples in the population experience clinically significant violence involving injury or official agency intervention (Moffitt et al., 2001).

Externalizing and Internalizing Problems. Children's externalizing and internalizing problems were assessed with the Child Behavior Checklist (Achenbach, 1991a) and the Teacher's Report Form (Achenbach, 1991b). The externalizing syndrome reported in this article was the sum of items in the Delinquent Behavior and Aggressive Behavior scales; the internal consistency reliabilities of the parents' and the teachers' reports of externalizing problems were 0.89 and 0.94, respectively. The internalizing syndrome reported in this article was the sum of items in the Withdrawn, Somatic Complaints, and Anxious/Depressed scales; the internal consistency reliabilities of the parents' and the teachers' reports of internalizing problems were both 0.85. The mothers' and teachers' reports of children's externalizing and internalizing problems correlated 0.30 and 0.17, respectively, $p \leq .001$ for both. Correlations of this magnitude are typical in studies of children's behavioral and emotional problems (Achenbach et al., 1987). Analyses of the mothers' and the teachers' reports of children's antisocial behavior in this sample found that they loaded on a single common factor, and this model fit significantly better than one in which rater bias effects were also estimated. That the mothers' and the teachers' reports correlated only to a moderate degree suggests that mothers and teachers provide unique information about children's behavior (van der Ende, 1999). Because simple combinatorial rules work as well, if not better, than more complicated ones (Bird et al., 1992; Piacentini et al., 1992), the mothers' and the teachers' reports were averaged to create composite measures of internalizing and externalizing behavior.

Statistical Methods

We used maximum likelihood estimation techniques to test univariate and bivariate models of children's externalizing and internalizing problems (Neale and Cardon, 1992). In the univariate case, these models decompose the variance in children's externalizing or internalizing problems into that which can be accounted for by latent additive genetic (A), shared environmental (C), and nonshared environmental factors (E), plus domestic violence (measured variable). Because the latent variables are unmeasured, they do not have a natural scale and must be assigned a variance. Thus the variances of the latent variables are fixed at 1.0, and the variance of the measured variable (domestic violence) is freely estimated.

In the bivariate case, we tested a biometric model of the comorbidity of children's externalizing and internalizing problems (Neale and Cardon, 1992). The biometric model posits that the variance and covariance in children's externalizing and internalizing problems is accounted for by (1) latent additive genetic, shared environmental, and nonshared environmental factors that are specific to each phenotype and (2) latent additive genetic, shared environmental, and nonshared environmental factors that are common to both phenotypes. As an extension of the model, we included a measured variable, domestic violence, to test whether it accounted for the covariance of children's behavior problems. For this model to be identified, the paths from the common latent factors to the phenotypes are constrained to be equal (standardized paths differ slightly because the variances of the externalizing and internalizing phenotypes differ).

The goal of fitting different structural equations to twin data is to account for the observed covariance structure by using the most parsimonious number of parameters. To compare the fit of different models, we used three model-selection statistics. The first was the χ^2 goodness-of-fit statistic. Large values indicate poor model fit to the observed covariance structure. When two models are nested (i.e., identical with the exception of constraints placed on the submodel), the difference in fit between them can be evaluated with the χ^2 difference, using as its degrees of freedom the *df* difference from the two models. When the χ^2 difference is not statistically significant, the more parsimonious model is selected, as the test indicates that additional constraints do not improve the model fit. The second model-selection statistic was the root mean square error of approximation, which is an index of the model discrepancy, per degree of freedom, from the observed covariance structure (MacCallum et al., 1996). Values less than 0.05 indicate a close fit and values less than 0.08 indicate a fair fit to the data (Browne and Cudeck, 1993). The third model-selection statistic was the Bayesian Information Criterion, in which increasingly negative values correspond to increasingly better-fitting models. In comparing two models, differences in the Bayesian Information Criterion larger than 10 represent strong evidence in favor of the model with the smaller value (Raftery, 1995). Before proceeding with analyses, the domestic violence variable was square root–transformed to normalize its distribution. To correct for sex differences in the means and variances of the behavior problems scores, these were standardized within sex. Mplus software was used to weight all statistics to the proportion of young mothers in the U.K. population so as to provide unbiased estimates (Muthén and Muthén, 1998).

RESULTS

Table 1 reports descriptive statistics for the domestic violence, externalizing, and internalizing measures. The MZ and DZ correlations provide rough estimates of the

TABLE 1
Descriptive Statistics for Behavior Problem Scores and Domestic Violence for MZ and DZ Twins (Raw Scores)

	Twin 1		Twin 2		Domestic Violence
	Externalizing	Internalizing	Externalizing	Internalizing	
MZ twins (n = 609)					
Twin 1					
Externalizing	1.00				
Internalizing	0.37***	1.00			
Twin 2					
Externalizing	0.75***	0.38***	1.00		
Internalizing	0.29***	0.55***	0.39***	1.00	
Domestic violence	0.21***	0.13***	0.23***	0.15***	1.00
Means (SD)	8.77 (7.14)	6.87 (4.83)	8.50 (6.70)	6.91[a] (4.79)	2.85 (5.79)
DZ twins (n = 494)					
Twin 1					
Externalizing	1.00				
Internalizing	0.31***	1.00			
Twin 2					
Externalizing	0.31***	0.30***	1.00		
Internalizing	0.24***	0.32***	0.31***	1.00	
Domestic violence	0.15***	0.18***	0.17***	0.12**	1.00
Means (SD)	9.01 (6.58)	7.25 (4.90)	8.16 (6.34)	7.68[a] (5.17)	2.64 (5.53)

Note: N = 1,103 because six families were missing information on zygosity and seven families were missing information on domestic violence. MZ = monozygotic; DZ = dizygotic.
[a] Mean scores differ significantly.
** $p \leq .01$; *** $p \leq .001$.

extent to which genetic factors account for individual differences in children's behavior problems. The heritability estimate is derived by 2(rMZ – rDZ), where r = phenotypic correlation (Plomin et al., 2001). As shown in Table 1, the DZ correlations for externalizing and internalizing problems were approximately half the size of the MZ correlations, suggesting substantial additive genetic effects on individual differences in these problems. The pattern of MZ–DZ cross-twin, cross-phenotype correlations (e.g., twin 1's externalizing score with twin 2's internalizing score) was informative with respect to decomposing the covariation between internalizing and externalizing problems. The DZ cross-twin correlations were more than half the magnitude of the MZ cross-twin correlations, indicating genetic but also shared environmental effects on the covariation between externalizing and internalizing problems.

At the phenotypic level, domestic violence predicts children's behavior problems. Figure 1 displays mean externalizing and internalizing scores for boys and girls as a function of whether their mothers experienced domestic violence. Ordinary least-squares regression models (using the sandwich variance estimator to correct for the nonindependence of twin observations) (StataCorp, 1999) showed that children living in homes with domestic violence had significantly elevated levels of externalizing (b = .23, $p \leq .001$) and internalizing problems (b = .12, $p \leq .001$), controlling for sex. A test of the interaction between sex and domestic violence showed that the effect of domestic violence on externalizing or internalizing problems did not differ significantly for boys and girls (b = –.04, not significant [NS], and b = –.07, NS, respectively).

Does Domestic Violence Account for the Familial Aggregation of Children's Externalizing and Internalizing Problems?

To test the significance of genetic, shared and nonshared environmental, and domestic violence effects on children's externalizing and internalizing problems, these paths were dropped (i.e., set to zero), one at a time, from the full MACE model (where M refers to "measured environment" and A, C, and E refer to latent additive genetic, shared environmental, and nonshared environmental effects, respectively). The best-fitting models indicated substantial additive genetic and nonshared environmental effects and effects of domestic violence on externalizing and internalizing problems (Table 2, MAE models). A model in which shared environmental effects were freely estimated did not fit significantly better than one in which

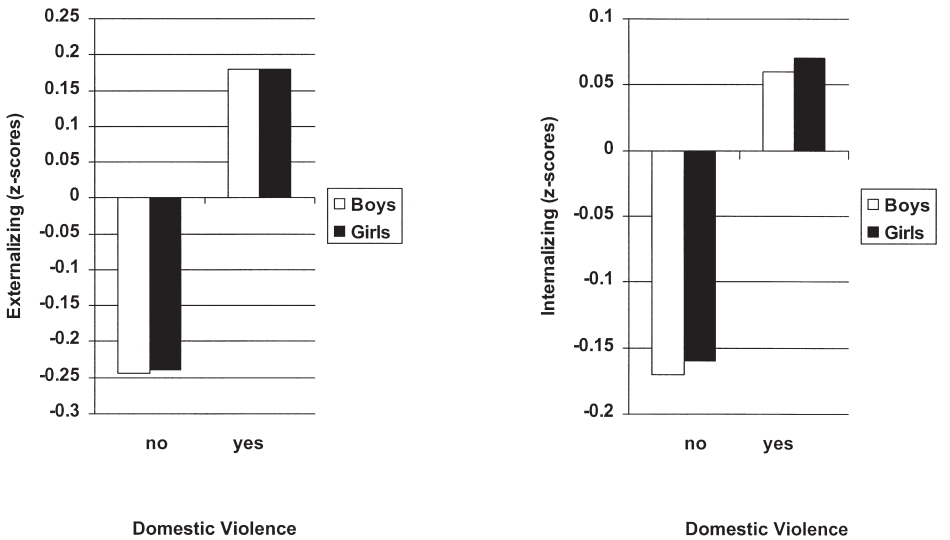

Fig. 1 Mean scores (standardized within sex) on externalizing and internalizing problems for boys and girls as a function of mothers' experiences of domestic violence.

these effects were fixed at zero, indicating that this path could be dropped without compromising the model fit to the observed data. The variance in behavior problems that is accounted for by each parameter in the model can be derived by squaring the standardized parameter estimate. Thus domestic violence accounted for approximately 5% of the variance in children's externalizing problems and 2% of the variance in children's internalizing problems, with the remainder accounted for by additive genetic and nonshared environmental factors. A model in which domestic violence was hypothesized to have no effect on externalizing and internalizing problems (Table 2, AE model) fit significantly worse than a model in which this path was freely estimated (χ^2_{diff} [1] = 70.03, $p \leq .001$, and χ^2_{diff} [1] = 35.21, $p \leq .001$, respectively), indicating that the effect of domestic violence on internalizing and externalizing problems was significant. For both externalizing and internalizing problems, a model in which the parameter estimates were permitted to vary for boys and girls did not fit significantly better than the more parsimonious model in which the parameter estimates were constrained to be equal for both sexes (χ^2_{diff} [5] = 7.32, NS, and χ^2_{diff} [5] = 2.88, NS, respectively), indicating that the pattern of effects did not differ for boys and girls.

TABLE 2
Standardized Parameter Estimates for Univariate Measured ACE (MACE) Models for Externalizing and Internalizing Problems

	A	C	E	Domestic Violence	χ^2	*df*	BIC[a]	RMSEA (CI)
Externalizing								
MACE	0.81	0.00	0.54	0.22	12.71	7	–36.33	0.038 (0.00,0.072)
MAE[b]	0.81	—	0.54	0.22	12.71	8	–43.34	0.033 (0.00,0.065)
AE	0.84	—	0.54	—	82.74*	9	19.69	0.122 (0.099,0.147)
Internalizing								
MACE	0.73	0.14	0.66	0.15	5.57	7	–43.47	0.000 (0.00,0.045)
MAE[b]	0.74	—	0.66	0.15	5.63	8	–50.42	0.000 (0.00,0.039)
AE	0.76	—	0.65	—	40.84*	9	–22.21	0.080 (0.056,0.106)

Note: M = measured variable (domestic violence); A = latent additive genetic factors; C = shared environmental factors; E = nonshared environmental factors; BIC = Bayesian Information Criterion; RMSEA = root mean square error of approximation; CI = confidence interval.

[a] BIC is estimated as $\chi^2 - df(\log n)$ (Raftery, 1995).

[b] Best-fitting models.

* $p \leq .05$.

Does Domestic Violence Account for Comorbidity in Children's Externalizing and Internalizing Problems?

The best-fitting model (Table 3, MaeAC) showed significant effects of additive genetic and nonshared factors that were *unique* to each phenotype and significant effects of additive genetic and shared environmental factors that were *common* to both phenotypes. The fit of the model did not deteriorate significantly if the common nonshared environmental and the specific shared environmental pathways were constrained to be zero. The fit of the model deteriorated significantly if domestic violence was hypothesized to have no effect on externalizing or internalizing problems (χ^2_{diff} [2] = 76.16, $p \leq .001$). Figure 2 shows the biometric model of comorbidity of externalizing and internalizing problems. The biometric model is presented for one twin only and would be identical for the second twin.

The phenotypic correlation between children's externalizing and internalizing problems ($r = 0.35$, $p \leq .001$) indexes the comorbidity of children's behavior problems. The correlation of 0.35 is derived by multiplying and summing the paths that connect the externalizing and internalizing phenotypes (Fig. 2). The common genetic and shared environmental factors accounted for 62.6% and 29.2%, respectively, of the correlation between children's externalizing and internalizing problems. Domestic violence accounted for 8% of the co-occurrence, independent of genetic effects on children's behavior problems.

TABLE 3
Standardized Parameter Estimates for the Bivariate Measured ACE (MaceACE)[a] Model of Comorbid Behavior Problems

	Specific ace						Common ACE[b]						Domestic Violence					
	Externalizing			Internalizing			Externalizing			Internalizing								
	a	c	e	a	c	e	A	C	E	A	C	E	Ext	Int	χ^2	*df*	BIC[c]	RMSEA (CI)
MaceACE	0.59	0.00	0.53	0.47	0.00	0.66	0.44	0.34	0.14	0.43	0.34	0.14	0.22	0.15	56.94*	18	–69.16	0.063 (0.045,0.081)
MaeACE	0.59	—	0.53	0.47	—	0.66	0.44	0.34	0.14	0.43	0.34	0.14	0.22	0.15	56.94*	20	–83.18	0.056 (0.041,0.076)
MaeAC[d]	0.57	—	0.55	0.45	—	0.67	0.47	0.32	—	0.46	0.32	—	0.22	0.15	58.84*	21	–88.28	0.057 (0.04,0.075)
MaeA	0.58	—	0.55	0.46	—	0.67	0.57	—	—	0.56	—	—	0.22	0.15	63.31*	22	–90.82	0.058 (0.042,0.075)
MaeC	0.60	—	0.56	0.46	—	0.70	—	0.53	—	—	0.53	—	0.22	0.15	87.99*	22	–66.14	0.074 (0.058,0.09)
aeAC	0.59	—	0.55	0.44	—	0.68	0.47	0.37	—	0.46	0.37	—	—	—	135.00*	23	–26.13	0.094 (0.079,0.11)

Note: M = measured variable (domestic violence); a, A = latent additive genetic factors; c, C = shared environmental factors; e, E = nonshared environmental factors; BIC = Bayesian Information Criterion; RMSEA = root mean square error of approximation; CI = confidence interval.

[a] The first "ace" refers to phenotype-specific genetic and environmental effects, and the second "ACE" refers to common genetic and environmental effects.

[b] The paths from the latent factors to the phenotypes were constrained to be equal, but the standardized estimates differ because of variance differences in the phenotypes.

[c] BIC is estimated as $\chi^2 - df(\log n)$ (Raftery, 1995).

[d] Best-fitting model.

* $p < .05$.

DISCUSSION

In recent years, much socialization research (including research on family violence) has come under fire for ignoring the potential influence of genes on behavior (DiLalla and Gottesman, 1991; Rowe, 1994). To our knowledge, the present study is the first to show that domestic violence has an environmental effect on children's behavior problems independent of genetic effects. Our findings highlight the importance of including *measured* environmental risk factors in genetically sensitive designs. Doing so provides opportunities to identify potentially modifiable environmental risks in the etiology of behavioral disorders.

In the classical twin design, sample sizes of more than 1,000 twin pairs are needed for statistical power to detect a shared environmental effect that accounts for even 10% to 15% of the variation in a moderately heritable trait (Martin et al., 1978). The power to discern environmental effects increases markedly when aspects of the environ-

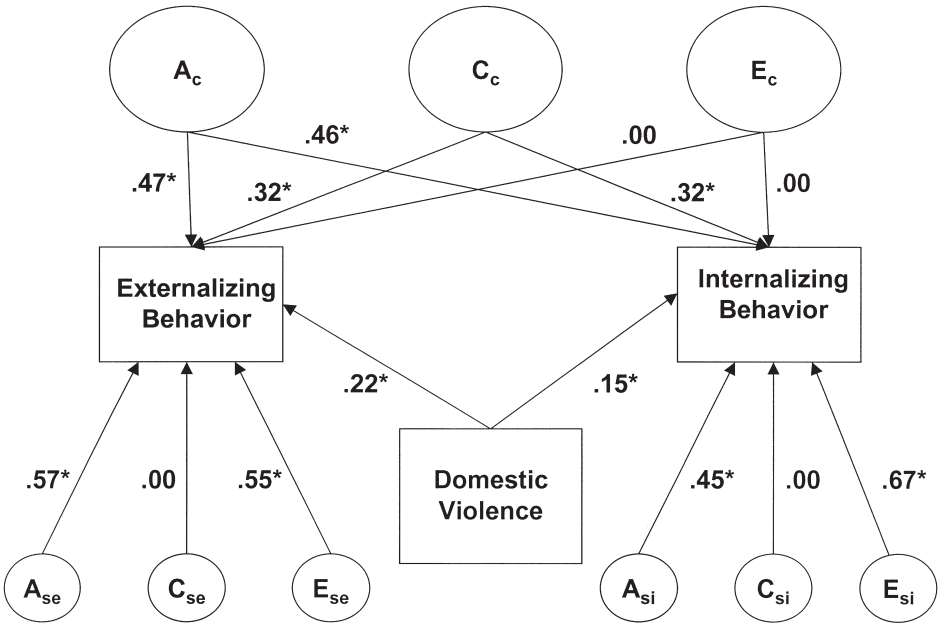

Fig. 2 Standardized parameter estimates from the best-fitting biometric model. A_{se}, C_{se}, and E_{se} refer to specific genetic, shared environmental, and nonshared environmental influences on externalizing problems. A_{si}, C_{si}, and E_{si} refer to specific genetic and environmental influences on internalizing problems. A_c, C_c, and E_c refer to common genetic, shared environmental, and nonshared environmental influences on externalizing and internalizing problems. The model is displayed for twin 1 only; the model for twin 2 would look identical. Although the common parameters were constrained to be equal for externalizing and internalizing problems, slight variance differences in the two measures create differences in the standardized values. The variances of the latent variables are fixed at 1 and the variance of the measured variable (domestic violence) is freely estimated. To determine how much of the variance in externalizing and internalizing problems is accounted for by the latent and measured factors, the parameter estimates are squared (e.g., A_c accounts for 22% of the variance in externalizing problems). $^*p \leq .05$.

ment are measured and estimated separately from a latent "black box" environmental component. In the present study, this was illustrated in our separate analyses of externalizing and internalizing problems, where shared environmental effects (estimated as latent components) were undetectable but the effect of domestic violence was statistically significant, accounting for 2% to 5% of the variance in externalizing and internalizing problems. In addition, shared environmental influences accounted for 29% of the *comorbid* symptom presentation, with domestic violence accounting for 13.5% of this effect. Our findings also replicate research showing that genetic influences account for both variation and covariation in children's externalizing and internalizing problems (O'Connor et al., 1998; Van den Oord et al., 2000).

Limitations

This study has several limitations. The first concerns whether findings from twins can generalize to singletons in terms of (1) mean levels of children's behavior problems, (2) children's risk of exposure to domestic violence, and (3) the effect of domestic violence on children's behavior problems. With respect to these issues, twins and singletons do not differ significantly in terms of emotional or conduct problems (Moilanen et al., 1999) and the association between domestic violence and children's behavior problems in our twin sample is similar to that observed in singleton samples (Margolin and Gordis, 2000). Nevertheless, future research is needed to determine whether twins are at greater risk of exposure to domestic violence than singletons.

Second, we did not examine whether the twins were present when their mothers experienced violence. However, the practical constraints of raising young twins suggest that the twins were seldom far from their mothers and would have been exposed to most of their mothers' experiences. A separate issue is that adult domestic violence is correlated with child abuse (Margolin and Gordis, 2000). Because abused children also experience both internalizing and externalizing problems, children's victimization, as opposed to parents' domestic violence, might explain our findings.

Third, our results do not discount the possibility that the effect of domestic violence may be partially genetically mediated. A sufficient test of this hypothesis would require twin-specific data on exposure to domestic violence or phenotypic data on parents' externalizing and internalizing problems in order to model the correlation between genetic influences on domestic violence and genetic influences on children's emotional and conduct problems.

Clinical Implications

Serious behavioral and emotional problems that emerge in early childhood are of concern to clinicians because they predict a range of adverse outcomes across the life course. Because a substantial portion of the variation and covariation in children's externalizing and internalizing problems was accounted for by genetic influences, clinicians should not assume that behavior problems evident among children who have witnessed domestic violence are entirely environmentally induced. However, strong genetic effects do not preclude the possibility that domestic violence or other aspects of the environment may mediate genetic influences on behavior. For example, genetically vulnerable children may be the most susceptible to the effects of domestic violence. Therapists should thoroughly assess the extent to which domestic violence may be a causal or maintaining factor in children's behavioral and emotional problems, while feeding this information back to parents. Treatment strategies should work at multiple levels by (1) addressing children's emotional insecurity, perceptions of threat, or attributions of self-blame (Davies and Cummings, 1998; Fincham et al., 1994; Grych et al., 2000); (2) improving child management techniques at the level of the parent–child relationship (Jouriles et al., 2001); and (3) offering couples therapy, which may facilitate children's treatment gains. Our findings imply that reducing rates of adult domestic violence should reap the added benefit of reducing children's comorbid externalizing and internalizing problems.

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