The Structure of Problem Behavior in a Sample of Maltreated Youths

Sara E. Culhane and Heather N. Taussig

Studies of adolescent community samples suggest that substance use, risky sexual behavior, delinquency, and other problem behaviors can be explained in part by a single, underlying factor or syndrome. Of current interest is the generalizability of these findings to subgroups or special populations of youths who may be at high risk for problem behavior. Studies suggest that maltreated youths are at significantly elevated risk for involvement in multiple problem behaviors, but little is known about the structure of problem behavior in this high-risk population. This study used confirmatory factor analysis to examine the structure of problem behavior (that is, delinquency, substance use, and risky sexual behavior) in a sample of 149 youths with a history of abuse and neglect. It also extended current research by including a measure of self-destructive behavior. Findings indicated that a single-factor model provided a close fit for these data and compared favorably with three competing two-factor models. The single factor explained 54% of the variance in the four measures of problem behavior. Multigroup confirmatory factor analysis indicated that delinquency and substance use had consistently high loadings for both male and female youths, whereas the loadings for sexual and self-destructive behaviors differed by gender.

Key Words: adolescence; gender differences; maltreatment; risk behaviors; structural equation modeling

Adolescent problem behaviors such as delinquency, substance use, and risky sexual behavior continue to be serious social problems that are associated with significant costs to individual youths and to society as a whole. These problems have been well researched in general samples of American adolescents, from whom much has been learned about the structure of problem behavior as well as its antecedents and consequences. Of interest is whether findings from the general population also describe the structure of problem behavior for different subgroups of the population, especially subgroups at high risk for involvement in problem behavior (Weden & Zabin, 2005).

Youths who have been maltreated are a subgroup at high risk for problem behavior. Preliminary findings indicate that maltreated youths are more likely than their nonabused peers to engage in a number of risky behaviors and do so at an earlier age and with greater frequency. Maltreated youths are more likely to engage in risky sexual behaviors (Krahe, Scheinberger-Olwig, Waizenhofer, & Kolpin, 1999; Rotheram-Borus, Mahler, Koopman, & Langabeer, 1996; Silbert & Pines, 1981; Thompson, Potter, Sanderson, & Maibach, 1997), to report use of alcohol and other drugs (Dembo, Dertke, Borders, Washburn, & Schmeidler, 1988; Rotheram-Borus et al., 1996; Smith, Ireland, & Thornberry, 2005), and to engage in delinquent or criminal behavior (Bank & Burraston, 2001; Smith et al., 2005; Widom, 1989, 1994). Although maltreated children are at elevated risk for problem behavior, little is known about the structure of problem behavior in this high-risk population. In her 1994 review of the literature, Widom highlighted the need for research that examines the structure of problem behavior among maltreated youths, but we are unaware of any subsequent studies that have done so.

In general adolescent samples, robust correlations have been observed among a variety of problem behaviors (Barone et al., 1995; Donovan & Jessor, 1985; Farrell, Danish, & Howard, 1992; Flisher et al., 2000). These correlations have led some researchers to argue that individual risk behaviors constitute a problem behavior syndrome (Jessor & Jessor, 1977). Others have argued that individual risk behaviors must be examined individually, as distinct (albeit correlated) problems with unique etiologies and sequelae (Osgood, Johnston, O’Malley, & Bachman, 1988). Each perspective finds some support from the results of confirmatory factor analyses, which indicate that a single underlying factor can...
explain some, but not all, of the covariation among risk behaviors in population-based samples of adolescents and young adults (Donovan & Jessor, 1985; Donovan, Jessor, & Costa, 1988; Osgood et al., 1988).

In their benchmark article published in 1985, Donovan and Jessor reported the results of three studies that assessed the structure of problem behavior in general samples of high school students, college students, and young adults. In each of the studies, the authors measured alcohol use, drug use, sexual experience, and general deviance. They used confirmatory factor analysis to analyze data from multiple cohorts and for each gender separately. In 23 of 24 analyses, goodness-of-fit indices suggested that a single-factor model adequately described the covariation among measures of problem behavior, with the single underlying factor accounting for between 23% and 52% (M = 37%) of the variance in the four measures of risk behavior. In a replication of these studies using data collected from a general sample of high school students 13 years later, Donovan et al. (1988) found that a single factor explained 47% of the variance in problem behavior for male students and 37% of the variance in problem behavior for female students.

In the studies conducted by Donovan and colleagues (Donovan & Jessor, 1985; Donovan et al., 1988), a single factor explained less than 50% of the variance in problem behavior in all but one trial, leading some to hypothesize that problem behavior should be described by reference to both general and specific factors (see, for example, Osgood et al., 1988). This hypothesis finds support in tests of models that define problem behavior by reference to multiple, problem-specific first-order factors that are themselves explained by a single second-order factor. When tested, these models generally provide a good fit for the data (Cooper, Wood, Orcutt, & Albino, 2003; Farrell, Kung, White, & Valois, 2000; McGee & Newcomb, 1992; Zhang, Welte, & Wieczorek, 2002). In at least one study, however, a second-order factor structure did not describe the covariation among multiple indicators of problem behaviors (Welte, Barnes, & Hoffman, 2004).

Studies examining the structure of problem behavior by gender have found that single-factor models describe a significant portion of the variance for both male and female participants, but the factor loadings for specific problem behaviors appear to differ by gender (Donovan & Jessor, 1985; Donovan et al., 1988; Farrell et al., 1992; Mitchell & Beals, 1997). Using multigroup confirmatory factor analyses, Mitchell and Beals (1997) found that the factor loadings for sexual behavior were larger for male than for female adolescents, but Farrell and colleagues (2000) found that the factor loadings did not differ by gender.

Common factors also account for a substantial portion of the variance in problem behavior for different samples of racial and ethnic minorities. In a study of inner-city, African American preadolescents, Resnicow, Ross-Gaddy, and Vaughan (1995) found that a “general deviance” construct explained 57% of the variance in measures of minor deviance, school problems, and high deviance. In an inner-city, school-based sample of predominantly African American adolescents, a single factor explained between 50% and 67% of the variance in four first-order factors representing sexual behavior, antisocial behavior, marijuana use, and alcohol use.

Another study used confirmatory factor analysis to examine the structure of problem behavior in a sample of pregnant adolescents (Gillmore, Spencer, Larson, Tran, & Gilchrist, 1998). Gillmore and colleagues found that their data could be described by two statistically interchangeable models: a model comprising four correlated factors, each representing one of four types of problem behavior, and a model comprising four first-order factors, each explained by a second-order latent construct. Standardized factor loadings suggested that the second-order factor explained 52% of the variance in the four first-order factors.

These findings suggest that a common factor can explain a large portion of the variance in problem behavior for a variety of subgroups, including both genders, inner-city African American youths, Native American youths, and a high-risk sample of pregnant adolescents. The current study was designed to determine whether a single factor accounts for a similar portion of the variance in problem behavior among a high-risk subgroup of adolescents—maltreated youths.

This study was also designed to extend current knowledge by including a measure of self-destructive
behavior. Findings indicate that self-destructive behavior is particularly salient for maltreated youths, who appear to engage in self-mutilating and suicidal behaviors with greater frequency than do their nonabused peers (Boudewyn & Liem, 1995; Brown, Cohen, Johnson, & Smailes, 1999). Furthermore, research suggests that self-destructive and suicidal behaviors are associated with other forms of problem behavior in school-based samples of American youths (Borowsky, Ireland, & Resnick, 2001; Burge, Felts, Chenier, & Parrillo, 1995; Flisher et al., 2000; Garrison, McKeown, Valois, & Vincent, 1993; Rosenberg et al., 2005). Suicidal behavior and other acts of self-harm also fit the definition of problem behavior as advanced by problem behavior theory (Jessor & Jessor, 1977). That is, self-destructive acts are norm-violating behaviors that typically “elicit some kind of social control response” (Jessor & Jessor, 1977, p. 33). All of these considerations suggest that some of the variation in self-destructive behavior might also be explained by a factor common to other forms of risk behavior. To date, however, studies of problem behavior have not included measures of self-destructive behavior.

The current study used data from a sample of 149 youths with a history of abuse, neglect, or both. Confirmatory factor analyses were used to determine what portion of the variance in measures of problem behavior might be explained by a common underlying factor; to determine whether the variance in a measure of self-destructive behavior might also be explained by a factor common to other forms of risk behavior. To date, however, studies of problem behavior have not included measures of self-destructive behavior.

METHOD
Data were collected as part of a longitudinal study of maltreated children, ranging in age from seven to 12 years, who were assessed six months following initial placement in foster care (time 1). The youths were reinterviewed an average of 5.4 years following the first assessments (time 2).

Time 1 Sample
The time 1 participants included youths enrolled in the Screening Impact on Services and Costs for Foster Children (SISC) study (Landsverk, Litrownik, Newton, Ganger, & Remmer, 1996). All seven- to 12-year-old children who entered the San Diego foster care system between May 1990 and October 1991 were recruited if they also met the following criteria: They were newly referred to the child welfare system, they became legal dependents of the court as a result of maltreatment, and they were placed and remained in foster care for at least five months. Of the 287 youths who met these criteria, 214 (74.6%) completed the time 1 assessment. Those who completed the time 1 assessment did not differ from the 73 eligible participants who were not recruited on age, sex, ethnicity, or type of maltreatment.

Time 2 Sample
Of the 214 youths interviewed at time 1, 149 were reinterviewed at time 2. Fourteen participants were ineligible for the time 2 study because they had missing time 1 data (n = 3), resided outside of the United States (n = 6), or had significant developmental delays (n = 5). Forty-two of the remaining 200 eligible participants could not be located, and nine refused to participate. The 149 participants in the time 2 study did not differ from the 51 eligible youths who did not participate at time 2 on any of 25 variables assessed at time 1 (for example, demographic factors, maltreatment types, foster care placement characteristics, psychosocial variables), with one exception: Youths interviewed at time 2 were more likely to have cases currently open with child welfare, reflecting the fact that it was easier to locate youths with open cases (Taussig, Clyman, & Landsverk, 2001).

Demographic information for the time 2 sample indicated that 57.0% of the sample was female, 43.0% was white, 31.5% was African American, and 20.1% was Hispanic. The time 2 participants ranged in age from 13 to 17 years (M = 15.13, SD
and chart abstraction indicated that 59.1% of the sample had been neglected, 28.2% had been physically abused, 18.1% had been sexually abused, and 8.1% had been emotionally abused (nonexclusive categorization) (Garland, Landsverk, Hough, & Ellis-MacLeod, 1996).

Measures of Risk Behavior

Delinquency, sexual behavior, self-destructive behavior, and substance use were assessed at time 2 with the project–designed Adolescent Risk Behavior Survey (ARBS). The ARBS is a self-report measure that consists of items from three adolescent risk behavior measures that have been shown to have adequate reliability and validity: (1) the National and Denver Youth Surveys (Huizinga & Esbensen, 1990), (2) the Problem Behavior Survey (Jessor, Donovan, & Costa, 1992), and (3) the National Adolescent Student Health Survey (American School Health Association, 1989).

The ARBS includes Sexual Behavior, Delinquency, Substance Use, and Self-Destructive Behavior subscales, which assess past-year involvement in these risk behaviors. The seven items of the Sexual Behavior scale (α = .82) ask questions about number of sexual partners, frequency of intercourse, and use of contraception. The 17 items of the Delinquency scale (α = .77) ask about the frequency of involvement in activities ranging in severity from truancy and shoplifting to stealing a motor vehicle and using a weapon to attack someone. The 11 items of the Substance Use scale (α = .76) ask about the use of various illicit drugs, ranging from marijuana to cocaine and heroin. The three items of the Self-Destructive Behavior scale (α = .70) ask about the frequency of acts leading to self-harm without suicidal intent, planning for suicide, and suicide attempts.

Scale scores were created for each participant by adding item scores within the four risk behavior scales. Item scores were based on the frequency of each behavior. Each item score was ranked and then standardized to a mean of 0 to ameliorate the undue influence of outliers and to reflect the severity of behaviors relative to this cohort’s norms (Taussig, 2002).

Plan for Analyses

A number of statistical procedures were used to describe the structure of problem behavior for this sample of maltreated youths. First, confirmatory factor analysis was used to test a single-factor model in which the Delinquency, Substance Use, Sexual Behavior, and Self-Destructive Behavior subscales served as indicators for a common latent factor. Next, factor loadings were used to estimate the amount of variance explained by the common factor, using the formula proposed by Fornell and Larcker (1981). Confirmatory factor analysis was also used to estimate three competing two-factor models and to compare each of these models with the single-factor model. Finally, multigroup confirmatory factor analysis was used to determine whether the factor structure was invariant across gender.

All analyses were carried out using the LISREL statistical package (Joreskog & Sorbom, 2000). Parameters were estimated using a maximum-likelihood procedure, which assumes normality in the distribution of continuous variables. Although measures of risk behavior are often not normally distributed, the measures of risk behavior in this study (as transformed in the manner already described) met the standards set forth by Kline (1998) for univariate normality. As summarized in Table 1, estimates of skewness for all four variables fell below the recommended cutoff of 3, and estimates of kurtosis fell below the recommended cutoff of 10.

The overall fit of each model was evaluated using several goodness-of-fit indices: the chi-square test, the comparative fit index (CFI) (Bentler, 1989),

<table>
<thead>
<tr>
<th>Variable</th>
<th>Skew</th>
<th>Kurtosis</th>
<th>Delinquency</th>
<th>Sexual Behavior</th>
<th>Substance Use</th>
<th>Self-Destructive Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delinquency</td>
<td>1.85</td>
<td>4.03</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Sexual behavior</td>
<td>1.75</td>
<td>4.72</td>
<td>.58***</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Substance use</td>
<td>2.63</td>
<td>6.54</td>
<td>.74***</td>
<td>.57***</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Self-destructive behavior</td>
<td>2.85</td>
<td>7.88</td>
<td>.41***</td>
<td>.34***</td>
<td>.39***</td>
<td>—</td>
</tr>
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</table>

*** p < .0001.
and the nonnormed fit index (NNFI) (Bentler & Bonett, 1980). The chi-square test is the only statistical procedure for evaluating model fit. It assesses the extent to which the observed covariance matrix differs from the model-implied covariance matrix. A nonsignificant chi square provides evidence of model fit. The CFI measures the amount of covariance in the observed covariance matrix that is predicted by the model-implied covariance matrix. The NNFI compares the hypothesized model to a null model in which covariances among observed variables are assumed to be 0. We use the CFI and NNFI because they appear to be less biased in small samples (Bentler, 1989). The CFI ranges in value from 0 to 1, whereas the NNFI has a lower limit of 0 but can exceed 1. These fit indices do not have associated tests of significance, but Monte Carlo simulation studies suggest that indices in excess of 0.9 generally indicate close fit (Gerbing & Anderson, 1993).

RESULTS

Correlations among the four measures of risk behavior are provided in Table 1 for the full sample and in Table 2 for each gender. Delinquency, substance use, and sexual behavior were all highly correlated, and each was moderately correlated with self-destructive behavior.

Full-Sample Confirmatory Factor Analyses

Confirmatory factor analysis was used to estimate a model in which each of the risk behavior variables loaded on a single latent factor (single-factor model). Following common practice, the variance of the latent factor was fixed at 1.0 to fully identify the model and set the measurement scale. As summarized in Table 3, the goodness-of-fit indices for the single-factor model indicated that the model provided an exceptionally good fit for these data. The chi-square statistic was nonsignificant; the CFI and NNFI were well above the 0.9 cutoff. The standardized parameter estimates for the single-factor model are depicted in Figure 1. All factor loadings were reliable. In particular, factor loadings for delinquency (.87), sexual behavior (.67), and substance use (.85) were high, whereas the somewhat lower factor loading for self-destructive behavior (.47) reflected its more modest correlations with the other observed variables. Using these standardized factor loadings, we calculated that the common factor accounted for 54% of the variance in the four risk behavior variables.

Because the best test of any model involves its comparison with other models, we compared the single-factor model with all possible two-factor models: a model in which delinquency and substance use loaded on one factor, and sexual behavior and self-destructive behavior loaded on a second factor (model 2); a model in which delinquency and sexual behavior loaded on one factor, and substance use and self-destructive behavior loaded on a second factor (model 3); and a model in which delinquency and self-destructive behavior loaded on one factor, and substance use and sexual behavior loaded on a second factor (model 4). As summarized in Table 3, the goodness-of-fit indices indicated that each of these competing models also provided a good fit for these data. However, chi-square difference tests indicated that none of these models described the data better than did the more parsimonious single-factor model.

Multigroup Confirmatory Factor Analysis

Having established the utility of the single-factor model for the total sample, we next used multigroup confirmatory factor analysis to explore any differences in the model’s factor structure that might exist across gender. In these analyses, the factor loading for delinquency was set at 1 to fully identify the model.
and to set the scale for measurement. When specifying multigroup models, it is customary to fix one factor loading for each factor. The factor variances are not fixed as in full sample confirmatory factor analysis, because this method of model identification has the unwanted effect of standardizing parameter estimates separately for each group, thus not permitting comparisons across groups.

Results of the multigroup confirmatory factor analysis indicated that the factor structure of the single-factor model was not invariant across gender \(\chi^2(8, N = 149) = 33.52, p = .00, \text{CFI} = .89, \text{NNFI} = .84\). Lagrange multiplier modification indices suggested that the data would be better described by a model that allowed factor loadings for sexual behavior and self-destructive behavior to vary by gender. Goodness-of-fit indices \(\chi^2(6, N = 149) = 12.33, p = .06, \text{CFI} = .97, \text{NNFI} = .95\) were acceptable for the resulting model, which is depicted in Figure 2. Delinquency and substance use had high factor loadings for both male and female participants, but the factor loading for sexual behavior was much larger for male than for female participants, whereas the factor loading for self-destructive behavior was much larger for female than for male participants.

**DISCUSSION**

In this sample of 149 maltreated youths, a single-factor model of problem behavior provided a close fit for our measures of delinquency, substance use, sexual behavior, and self-destructive behavior. The single-factor model explained 54% of the variance in these measures, a value that is somewhat higher than values found when first-order, single-factor models are tested with general samples of American youths (Donovan & Jessor, 1985; Donovan et al., 1988) and one that is comparable to those found when first- and second-order models are tested with subsamples of youths at elevated risk for problem behavior: inner-city youths (Farrell et al., 1992; Resnicow et al., 1995) and pregnant adolescents (Gillmore et al., 1998).

Given that a common factor explained over half of the variance in problem behavior among maltreated youths, it is possible that interventions may be successful in targeting multiple problem behaviors in this high-risk population. As our field begins to design and evaluate interventions that target problem behaviors in maltreated youths, researchers should evaluate the success of interventions in preventing multiple problems. Alternatively, studies of problem-specific interventions should assess intervention effectiveness in preventing and treating multiple behavior problems. For example, skills training appears to be an effective intervention for diverse behavioral and mental health problems. To the extent that interventions are successful in preventing multiple risk behaviors, they are likely to result in significant cost savings. Funds available for prevention may consequently reach greater numbers of at-risk youths.

In this study, multigroup confirmatory factor analysis suggested that the structure of problem behavior among maltreated youths may differ by gender. Although delinquency and substance use loaded highly on the problem behavior factor for both genders, self-destructive behavior loaded more highly for female participants, whereas sexual behavior loaded more highly for male participants. The finding that self-destructive behavior is more salient for female youths may reflect the fact that female youths report more suicidal behavior than do male youths (Burge et al., 1995; Garrison et al., 1993). The finding that sexual behavior is more salient for male youths is consistent with another study using multigroup confirmatory factor analysis (Mitchell & Beals, 1997).

The success of the single-factor model also suggests that self-destructive behavior may be partially explained by a factor common to other problem
behaviors. Although the factor loading for self-destructive behavior was smaller for male than for female participants, it was statistically significant for both genders. This finding suggests that both male and female youths who engage in the more traditionally defined risk behaviors are at elevated risk of suicidal and other self-destructive behaviors. Furthermore, suicidal and self-destructive behaviors may not occur in isolation. Both male and female youths who present with suicidal or self-destructive behaviors at entry to the child welfare system may be at elevated risk, and they should be screened for involvement in delinquency, substance use, and risky sexual behaviors as well. Similarly, youths who present with delinquency, substance use, or sexual behavior problems may be at elevated risk of suicidal or other self-destructive behaviors. Measures of self-destructive behavior should also be included in subsequent research concerning problem behaviors among maltreated youths. Furthermore, given that associations between self-destructive and other problem behaviors have been observed in the general population (Borowsky et al., 2001; Burge et al., 1995; Garrison et al., 1993), attempts should be made to replicate these findings in general adolescent samples.

Replication is necessary given this study’s limitations. First, the sample was a select sample of maltreated children—namely, those placed in foster care who also remained in foster care for at least five months following placement. Consequently, the findings reported here may not generalize to all youths with a history of abuse, neglect, or both. Second, the sample was interviewed more than 10 years ago, and the findings may not generalize to today’s youths. Third, this study was based solely on self-report data. Although reliance on self-report data is typical of studies that use confirmatory factor analysis to describe the structure of problem behavior, it raises the possibility that observed correlations among variables may be attributable to shared-method variance rather than true shared variance. However, self-report measures of problem behavior may be more reliable than third-party reports, especially given that adolescent problem behavior is not always known by third-party informants. Finally, this study’s small sample size made it impossible to examine whether the factor structure of problem behavior depends on other important characteristics (for example, age, ethnicity, type of maltreatment). The small sample size also made it impossible to test a second-order factor model.

Despite these limitations, the current findings provide some support, albeit preliminary, for the existence of a problem behavior syndrome in maltreated children, and they suggest the need for further research conducted with representative samples of maltreated children and with samples large enough to test the generalizability of the findings across ethnicity and type of maltreatment. Larger samples could provide more robust evidence for the existence of a problem behavior syndrome among maltreated youths.
could also accommodate the number of parameters estimated in second-order factor models.

Replications of the current findings would have important implications for the study, prevention, and treatment of those problem behaviors with which maltreated youths present. For example, replication of our findings would suggest the need for longitudinal research to identify those individual and environmental factors that overlap in increasing risk for multiple problem behaviors among maltreated youths. Replication would also suggest the need to prioritize funding for the development, implementation, and evaluation of prevention programs that target those factors having etiological significance in the development of co-occurring problem behaviors. Finally, efforts would be needed to educate child welfare workers about the co-occurrence of these problem behaviors so that those in the field could accurately assess the presenting problems of maltreated children as they enter the child welfare system. Youth presenting with one type of behavior problem would need to be evaluated (and periodically re-evaluated) for involvement in other types of problem behaviors to ensure their safety and well being.

REFERENCES


