CHILDHOOD EMOTIONAL AND BEHAVIORAL PROBLEMS AND PREDICTION OF DELINQUENCY: A LONGITUDINAL ASSESSMENT OF AN EMPIRICALLY-IDENTIFIED LATENT PROFILE

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The relationship between various emotional and behavioral problems and delinquency has taken on increased importance in recent years. Some posit that early identification of these problems can be effectively used to predict delinquent behavior and inform treatment strategy. This study presents a latent profile model of emotional and behavioral problems in childhood with a general population sample of youth (N=1389). This empirically-developed classification scheme is then assessed relative to early onset delinquency (violent, property, drug, and status offenses). The latent profile dummy variables are significant predictors in the overall delinquency and property offense models. Implications for policy and program development are discussed.

The relationship between early emotional and behavioral problems (EBP) and delinquent behavior has taken on increased importance in recent discussions of juvenile justice and community treatment issues. The New Freedom Commission on Mental Health (2003), for instance, noted that early mental health problems, if untreated, can lead to a "downward spiral" at later stages of development; negative consequences befitting such a label certainly might include delinquent behavior and substance use. Also, prevalence research in juvenile justice populations has found high levels of mental disorder at intake (e.g., Dembo & Schmeidler, 2003; Teplin,

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Abram, McClelland, Dulcan, & Mericle, 2002; Wasserman, Ko, & McReynolds, 2004), and more attention is being given to addressing the needs of these youth across multiple domains as a result.

Some have posited that future chronic offenders can be identified and treated in childhood to prevent later delinquency (e.g., Farrington, 1996; Loeber & Farrington, 1998; Lynam, 1996; Moffitt, 1997). Indeed, Loeber and Farrington (1998) suggest that early prevention is the most cost-effective approach to dealing with delinquent behavior and that earlier is better in addressing the difficulties of at-risk youth. Coupling this with findings related to the overall cost to society in dealing with youth who start offending early (see Cohen, 1998) and the likelihood that early starters will become chronic offenders (Loeber & Farrington, 1998; Patterson, DeBarshe, & Ramsey, 1989; Patterson & Yoerger, 1993), it is clear that addressing these issues as early as possible is warranted (for a recent, somewhat contrary discussion, see Laub & Sampson, 2003). To that end, the current study explores an empirical taxonomy of childhood emotional and behavioral problems and assesses its predictive validity with delinquent outcomes in early adolescence (10-12 year olds here). Although these youth are expected to display lower prevalence of early onset delinquency generally, it is important to focus on these youthful offenders as they typically will demonstrate a larger degree of persistent antisocial behavior later in life (see for example Loeber & Farrington, 2000; Moffitt, 1993). Indeed, Loeber and Farrington (2000) suggest that delinquency prior to age 13 doubles to triples the odds that a youth will become a serious, violent, or chronic offender. Thus, it is important to explore varied patterns of early emotional and behavioral problems as a means of developing and targeting appropriate interventions.

CONCEPTUAL FRAMEWORK

A number of developmental studies have found early emotional and behavioral problems to be predictive of later delinquency and/or drug use (Dishion, Capaldi, & Yoerger, 1999; Farrington, 1992; Huizinga, Loeber, Thornberry, & Cothern, 2000; Loeber, 1990; Loeber, Farrington, Stouthamer-Loeber, & Van Kammen,

1998; McCord, Widom, & Crowell, 2003; O'Donnell, Hawkins, & Abbott, 1995; Robins, 1978; Stouthamer-Loeber & Loeber, 2002; Wasserman et al., 2003). Often, antisocial behavior and emotional health problems in early childhood are markers for later delinquency (Wasserman et al., 2003). Diagnostic predictors include: conduct disorder, attention deficit hyperactivity disorder, major depressive disorder, and oppositional defiant disorder (McCord, Widom, & Crowell, 2003). Loeber (1990) indicates that hyperactivity and impulsivity, communication problems, negative cognitions, disobedience, negative mood, and verbal conduct problems are associated with delinquency at later developmental stages. Farrington (1992) specifically includes measures such as anger, disobedience, self-esteem, impulsivity, and selfishness in his theory of antisocial and delinquent behavior.

Numerous studies have focused specifically on behavioral problems in childhood and their links to later delinquency. Stouthamer-Loeber & Loeber (2002) found that persistent offenders often exhibited symptoms of disruptive behavior disorder well in advance of their contact with juvenile court. Also, Loeber and colleagues (1998) found that early externalizing problems (e.g., ADHD) were related to later delinquency. In studying antisocial behavior over time, Robins (1978) found that the presence of childhood behavioral problems was a robust predictor of later antisocial behavior. Dishion and colleagues (1999) similarly found that early behavioral problems were a strong predictor of the onset of substance use during adolescence. O'Donnell and colleagues (1995) found that early aggressive behavior puts youth at risk for later delinquent behavior and substance use. Tremblay and colleagues (1992) found that disruptive behavior in grade one was a significant predictor of delinquency at age 14. In a prospective, longitudinal study that followed child psychiatric patients through early adulthood, Elander and colleagues (2000) found that subjects who had symptoms of hyperactivity in childhood were more likely to be delinquent in late adolescence. The fact that a number of the key findings reviewed in this section come from samples of youth that are designed to be at least somewhat reflective of the general population (e.g., Denver and Pittsburgh Youth Studies) indicates that evidence

for the relationship between emotional and behavioral problems and delinquent behavior are not confined to restricted samples of youth in institutional and community treatment settings.

Considerable discussion of early prevention strategy has emerged in response to these and similar findings (e.g., Farrington, 1994, 2000; Loeber & Farrington, 1998; Tremblay & Craig, 1995; Yoshikawa, 1994). The potential benefits of early developmental prevention programs have been assessed and generally have been found to be worthwhile relative to their costs (Cohen, 1998; Greenwood, 1999; Tremblay & Craig, 1995). Nevertheless, more work remains in examining the effectiveness of these interventions and determining how they apply to youth with complex patterns of emotional and behavioral problems. The likelihood that appropriate youth can be identified and targeted for intervention is also uncertain. In fact, some have suggested that childhood risk factors are questionable in their ability to predict trajectories of later criminal behavior (Laub & Sampson, 2003). Nevertheless, it is important that empirical assessment and theory more fully account for the period of time prior to adolescence (Moffitt, 1997).

This study examines several subscales from the Behavior Problem Index (Peterson & Zill, 1986) that reflect some risk factors for delinquent behavior discussed above.[1] It is expected that specific configurations of these childhood problems may be identifiable and, subsequently, are worth examining with respect to predicting later delinquency. As noted above, early antisocial behavior and hyperactivity have been found to predict later delinquent behavior quite frequently. Although McCord and colleagues (2003) found, for instance, that depressive disorders were predictive of later delinquency, internalizing behaviors, like depression and anxiety, have not been examined as frequently in the risk factor literature. Further, it is unclear what their role may be, relative to other emotional and behavioral problems, in their prediction of early onset delinquency.

Rarely do youth have a single risk factor, and, as a result, the cumulative effects of multiple risk factors require study as well (Hawkins, Arthur, & Catalano, 1995). Dishion and colleagues (1999) note the difficulty of disentangling the effects of individual risk fac-

tors and note that risk and protection often come in a collection of difficulties. Research also points towards an interaction among risk factors to create a multiplicative effect, increasing the likelihood of negative outcomes (Elder, 1998; Shader, 2001). As there is evidence to suggest that youth exhibit a constellation of risk factors, as opposed to isolated problems, it is important to examine whether these items coalesce into distinguishable patterns that may be of use in predicting later behavior.

This study identifies an empirical classification of childhood emotional and behavioral problems using iterative latent class (profile) analysis (Muthén & Muthén, 1998-2004). Subsequently, its utility and predictive validity is examined in relation to delinquent behavior several years later. Bailey (1994) points out several advantages to the application of classification techniques in social science; including their utility as a descriptive technique and ability to group like cases together for subsequent analysis. These techniques also serve to reduce the complexity in a group of measures to clarify their relationships. Loeber (1996) suggested the importance of considering different classification schemes and assessing their predictive validity in longitudinal studies of delinquent behavior.

METHOD

Data from the National Longitudinal Study of Youth (NLSY), 1979 Child and Young Adult Cohort were utilized to examine the development of delinquent behavior in youth with early emotional and behavioral problems. Data were collected prospectively using two sources of information (mother and youth interviews) over several waves (Center for Human Resource Research, 2002). Although observed empirical relationships are sometimes attenuated in general populations of youth (Moffitt, 1997), Huizinga and colleagues (2000) suggest that it is important to understand the overlap of problem behaviors in broad samples.

Sample

The sample for the current study includes two cohorts of youth: those who were age four to six in either 1986 or 1988 (the first

two waves of the NLSY 79) (Center for Human Resource Research, 2002). Youth in the NLSY 79 Child and Young Adult Cohort were the children of women included in the initial NLSY 79 study. This initial age range was selected because it corresponds to the earliest collection of data on the key predictor variable (Behavior Problem Index). This group was then followed to the 1992 and 1994 measurement windows when they were ten to twelve. Based on these criteria, a total of 1,389 youth had complete data on the variables used in the current work.[2] This represents 72% of the total number of youth eligible based on the selection criteria (n=1931). The reduction in cases comes from both complete attrition (8%) and missing data on key variables (e.g., 17% for delinquency, 16% for peer influence).

Attrition analyses were conducted using bivariate comparisons among those who were in the final sample and those who were not (due either to attrition or missing data). Significant differences for race and gender were identified between those in the sample used in these analyses relative to those who were present in the first measurement wave but not retained. The relationship for gender was quite modest (Cramer's V=.04), with females represented at a slightly higher level in the data utilized here than they were in the initial sample. The relationship between race and attrition was more substantial (Cramer's V=.23) but, interestingly, showed that Whites, as opposed to Hispanics or Blacks, were not as well represented in the final sample. Most importantly, the Behavior Problem Index and HOME-SF measures, which are more substantively important in this study, were distributed similarly across those in the initial and final samples.

This pooled sample cohort from the first two years of data collection was selected to ensure sufficient follow-up time and also maximize the number of youth eligible for the present analysis. A similar approach to sample selection in the NLSY was utilized by McArdle and Hamagami (2001) who studied reading achievement and antisocial behavior beginning at ages 6 to 8. Although the 1986 and 1988 cohorts were pooled for these analyses, there were no initial differences on the key variable measured at that time (Behavior Problem Index), suggesting that they were roughly equivalent at the

outset. Overall, females make up slightly more than half of the sample (52%), while Black and Hispanic youth together comprise 56%. The mean age of youth at the second measurement period is 11 years (sd=.92).

Data Collection

This study utilizes data from two separate NLSY instruments: (a) *child self-administered supplement* (Center for Human Resources Research, 1998a) and (b) *supplemental mother interview* (Center for Human Resource Research, 1998b). Each instrument taps a number of domains relevant to the social and emotional development of these children, as well as sociodemographics and measures of problem behavior. A self-report instrument was given to youth between the ages of 10 and 14. This was a confidential questionnaire that included questions too sensitive to pursue in the other child interviewing formats (e.g., substance use, delinquency). Mothers were asked to provide information about the child's health and education and to respond to a variety of standardized assessment instruments, such as the Behavior Problem Index. The data collection procedure relied on self-administered and interviewer- and computer-assisted questionnaires. Interviewers received intensive training in preparation for the data collection process (Center for Human Resource Research, 2002).

Measures

The key independent and dependent study measures were the maternal-report Behavior Problem Index (for emotional and behavioral problems) and self-reported delinquency, respectively. The NLSY instruments incorporate items and validated scales used in previous longitudinal studies of youth and families (e.g., National Youth Study, National Household Survey of Drug Abuse) (Center for Human Resource Research, 2002).

Youth emotional and behavioral problems were measured between the ages of four and six in the mother supplement (Time 1). The Behavior Problem Index items do not represent diagnostic categories, but rather address a broad range of potential symptoms of emotional and/or behavioral difficulties. The Behavior Problem Index was developed by Peterson and Zill (1986) and comprises

a wide array of items (n=28) related to a youth's mood, behavior, and attitudes. The overall index covers six empirically-developed subscales: (a) *antisocial* (e.g., "He/She bullies or is cruel or mean to others"); (b) *anxiety/depression* (e.g., "He/She has sudden changes in mood or feeling"); (c) *dependent* (e.g., "He/She clings to adults"); (d) *headstrong* (e.g., "He/She argues too much"); (e) *hyperactivity* (e.g., "He/She is easily confused, seems to be in a fog"); and (f) *conflicts* (e.g., "He/She is not liked by other children"). Mothers were asked to respond to whether the statement was "often true," "sometimes true," or "not true" over the three months prior to the interview. This was later dichotomized to "true" or "not true" for the purpose of scale construction.

Each of the six summative, BPI subscale scores was used in the latent class analysis to create a taxonomic variable reflecting early emotional and behavioral problems (see Appendix). Certainly, while maternal assessments may reflect certain biases and expectations unrelated to actual behavior, some evidence has suggested that parental reports of emotional and behavioral problems in childhood can be quite valid and useful in clinical settings (e.g., Glascoe & Dworkin, 1995). Nevertheless, it must be noted that maternal reports, like all survey responses, may be filtered through a lens of social desirability that may affect the data utilized here.

The primary outcome measure for this study was self-reported delinquent behavior in late childhood/early adolescence (ages 10-12, Time 2). The use of early adolescent delinquency as an outcome is reflective of findings suggesting that youth who begin offending early are likely to continue doing so for quite some time (LeBlanc & Loeber, 1998; Loeber & LeBlanc, 1990). Youth were asked to respond "yes" or "no" to eight questions pertaining to engagement in any property (e.g., "stole from a store"), personal ("hurt someone bad enough to require a doctor"), or status offenses (e.g., "skipped a day of school") in the previous year. The instrument contained questions regarding substance use as well (e.g., marijuana, alcohol). The main dependent variable used here was a dichotomous delinquency measure based on any "yes" responses to these delinquent acts. This measure was also broken down into dichotomous (a) drug,

(b) violent, (c) property and (d) status offenses to examine the relationship of the latent profile measure to particular delinquency subtypes. Despite some general cautions against it (MacCallum, Zhang, Preacher, & Rucker, 2002), dichotomous variables were used primarily because of the relatively low prevalence of early onset delinquency in the sample and the desire to break the measure into subtypes (see Appendix).

Several control variables were included in the multivariate regression of early onset delinquency on the latent profile classes derived from the Behavior Problem Index subscales. These controls were: age, race (Hispanic and Black dummy variables contrasted with White), gender, family environment, and peer pressure. The family environment, age, and peer pressure variables were assessed at the early adolescent time period (Time 2). Gender is of particular import to the study of youth development and antisocial behavior. To be sure, boys typically demonstrate higher levels of delinquent behavior (see, for example, Snyder & Sickmund, 2006). Moffitt and colleagues (2001), for instance, highlight the importance of considering gender as a key variable in studies of this issue. While not the main focus here, it is important that gender is included as a control because delinquency is the main outcome. Mothers were asked to respond to a number of items from the Home Observation for Measurement of the Environment (HOME) Short-Form, which contains questions on parental discipline, supervision, relationship to the child, and family activity patterns (Bradley & Caldwell, 1979, 1984). A set of five questions in the child self-report assessed whether youth were pressured by their peers to behave in a delinquent manner, such as "feel pressure from your friends to skip school" and "feel pressure from your friends to try marijuana or other drugs." An additive peer pressure score based on the number of affirmative responses to these questions was constructed (α=.80) and used in the multivariate analyses as well.

Analytic Plan

The first-stage analytic approach was latent profile analysis, which allows for a model specification that places individuals into latent classes or categories based on their responses to relevant

items. The latent class model was estimated on the basis of the six emotional and behavioral problem (BPI) subscales described earlier. These models are regarded as useful in identifying typologies based on assumptions that there is an underlying grouping of subjects accounting for responses, and the specified latent classes explain the pattern observed across the response variables (Clogg, 1995; McCutcheon, 1987; Muthén, 2002; Vermunt & Magidson, 2003). While this procedure is, in some ways, analogous to factor analysis (i.e., data reduction, measurement focus), it is designed for classification of cases or people as opposed to variables. This technique is more appropriate to developing a typology than one utilizing factor analysis as a result. In many ways this approach is similar to cluster analysis techniques. Latent profile analysis is a model-based procedure, however, and has been found to better traditional cluster analysis in terms of scaling and setting formal criteria for making decisions about the appropriate number of latent classes (Magidson & Vermunt, 2002).[3]

Latent class models use a maximum likelihood estimator; in this case with the expectation maximization (EM) algorithm (Muthén & Muthén, 1998-2004). Several measures of fit are available with the latent class modeling approach. The Bayesian Information Criterion (BIC) is used to assess model fit and is calculated from the log-likelihood of the fitted model along with penalties associated with the number of parameters estimated and number of cases included in the analysis (Nyland, Asparouhov, & Muthén, 2006). Lower values on information criteria are indicative of superior fit. A second potential determinant is the "entropy" statistic which ranges from "0" to "1" with values closer to "1" suggesting clear placement of subjects into classes (Muthén, 1998-2004; Vermunt & Magidson, 2003). Third, the agreement between predicted and actual classification can be discerned by examining the average overlap of the two in each of the hypothesized latent classes. Lastly, the Lo-Mendell-Rubin test can be utilized in assessing a given "k" class model relative to one with "k-1" classes. Lower observed probability values associated with this test indicate that the "k-1" class model can be rejected in favor of the "k" class model (Lo, Mendell, & Rubin, 2001; Muthén & Muthén, 1998-2004).

The key estimates produced in this analysis are (a) latent class probabilities and (b) conditional or posterior probabilities. Latent class probabilities provide an indication of the number of classes and their sizes. Conditional probabilities or means, on the other hand, are similar to factor loadings and represent the within class mean on a given observed variable (Vermunt & Magidson, 2003). Like factor loadings, these estimates provide an indication of how different response patterns fit together. They demonstrate the degree of association between the observed variable responses and the latent classes specified in the model.

Following the initial development of the latent class structure, a two-pronged evaluation procedure was undertaken. This series of tests was similar to one identified by Bailey (1994) for use with empirically identified classifications created with cluster analysis. First, a split-half approach was used to evaluate the solution arrived at in the initial identification stage. This is particularly important given some of the difficulties inherent in assessing fit in steps based on models with more or fewer classes. Second, delinquent outcome variables were regressed on a set of measures derived from the latent classes to test the predictive validity of the classification scheme relative to a theoretically and empirically relevant criterion. These models included the full study sample (N=1389).

RESULTS

Descriptives

Table 1 presents the descriptives for the measures utilized in this study. The HOME SF used in these analyses was standardized (based on a normal distribution with a mean of 100 and standard deviation of 15). Its corresponding mean raw score is 19.34 (sd=4.2). The HOME-SF raw score ranged from 0 to 27; so the mean of 19 suggests that youth in this sample lived in generally positive home environments. On average, youth reported experiencing considerably less than one type of peer pressure in the year prior to their response in this NLSY wave (0.32, sd=.91). Overall, sample youth demonstrate low scores on the BPI subscales. For instance, the mean score for antisocial behavior (1.47, sd=1.31) suggests a fairly low

manifestation of these problems relative to the potential maximum of six. The mean anxiety/depression score indicates fewer than two problem behaviors (1.60, sd=1.31) out of a potential five. At the second wave of measurement, fewer than half of the youth in the sample engaged in delinquent behavior in the year prior to the administration of the NLSY interview (44.6%). The mean value on the initial score was 0.88 (st. dev=1.32), reflecting a high degree of censoring at zero (i.e., no delinquency responses). In the original measure, 24% of youth had one offense, 10% had two offenses, and roughly 11% had three or more offenses.

Table 1.
Descriptive Statistics for Key Study Measures and Control Variables (N=1389).

	Mean (sd) Percentage
Age	11.0 (.92)
%Female	52.0
Race	
%Black	36.0
%Hispanic	20.0
%White (Ref)	44.0
HOME-SF Score (Maternal Report)	19.34 (4.2)
Peer Pressure (Youth Report)	0.32 (0.91)
Behavior Problem Index (Maternal Report)	
Antisocial	1.47 (1.31)
Anxiety/Depression	1.60 (1.31)
Headstrong	2.40 (1.61)
Hyperactivity	2.23 (1.50)
Dependent	1.65 (1.26)
Conflicts	.45 (.74)
%Delinquency (Youth Report)	44.6
%Any Drug Use	20.3
%Any Violent Delinquent	21.7
%Any Status Offense	15.4
%Any Property Offense	15.5

Bivariate Correlations

Table 2 shows the bivariate correlations for key variables used in the current study. The table demonstrates fairly substantial,

statistically significant correlations (r=.26-.54, p<.05) among the items in the Behavior Problem Index subscales. Five out of six of those subscales demonstrate statistically significant, albeit weak, relationships (r=.06-.15, p<.05) with the early onset delinquency variable. Importantly, these bivariate results suggest that problem subtypes have slightly different relationships with later delinquency. The anxiety subscale, for instance, demonstrates a non-significant association with later delinquency. The antisocial (r=.15) and hy-

Table 2.
Pearson Correlations Among Controls, Behavioral Problem Subscales, and Delinquency (N=1389)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Age (1)	1.0												
Gender (2)	.01	1.0											
Black (3)	.02	.03	1.0										
Hispanic (4)	.04	-.01	-.38*	1.0									
Peer Pressure (5)	.10*	-.05	.05	.02	1.0								
Home-SF (6)	-.06*	.06*	-.27*	-.05*	-.09*	1.0							
BPI-Antisocial (7)	.02	-.13*	.05	.04	.10*	-.19*	1.0						
BPI-Anxiety (8)	.07*	.00	-.02	.01	.03	-.11*	.39*	1.0					
BPI-Headstrong (9)	-.02	-.05	-.12*	-.01	.02	-.08*	.49*	.54*	1.0				
BPI-Hyperactive (10)	.04	-.13*	.03	.00	.04	-.13*	.45*	.46*	.51*	1.0			
BPI-Dependent (11)	-.10*	.07*	.09*	.00	.07*	-.09*	.26*	.40*	.38*	.38*	1.0		
BPI-Conflicts (12)	.00	-.09*	.03	.02	.02	-.14*	.46*	.41*	.34*	.35*	.26*	1.0	
Delinquency (13)	.15*	-.12*	.05*	.01	.38*	-.18*	.15*	.04	.08*	.10*	.06*	.06*	1.0

*p<.05

peractivity (r=.10) measures have somewhat stronger relationships with delinquent behavior than other subscales.

Latent Profile Analyses

Table 3 shows the results of various model-level fit tests associated with the iterative latent profile analysis for the initial model development sample (n=717). The two-, three-, and four-class models appear to fit the data well. Entropy is above .80 in all three models, suggesting that they demonstrate fairly clear classifications of the observed data. Also, the mean probabilities for latent class membership typically reach .90, suggesting a high level of proper classification of individuals into latent classes based on the hypothesized model.

Clogg (1995) pointed out that the basic purpose of assessing fit in latent class models is to find the simplest model that is consist-

Table 3.
Comparative Model Fit Statistics for Iterative Latent Profile Analysis (Identification Sample, n=717)

Model	*Log Likelihood*	*Bayesian Information Criterion^*	*Entropy*	*Lo-Mendell-Rubin Adjusted Test*	*Mean LC Probabilities—Likely Class Membership*
2 Class	-6608.45	13281.49	0.80	----	.95, .92
3 Class	-6408.62	12905.64	0.83	283.05 (.004**)^^	.93, .90, .96
4 Class	-6361.51	12835.21	0.80	92.23 (.07)^^^	.90, .84, .85, .99
5 Class	-6338.50	12812.99	0.76	45.03 (.50)	.90, .79, .75, .80, .98

^Sample Size Adjusted, ^^H0: 2 Class best fit, ^^^H0: 3 Class best fit

ent with the data. It appears that the three-class model fills that role here. Based on the various fit indices, substantive interpretation of group membership, and the accuracy of classification—as indicated by entropy and the mean probabilities of likely latent class membership—the three-class model was selected for use in subsequent analyses. The model is fairly straightforward in terms of interpretation and maintains a solid level of entropy and likely class membership values. Also, the observed value and significance level in the Lo-Mendell-Rubin (LMR) Test for the four-class model indicates that the three-class model cannot be rejected. Further, the LMR test associated with the three-class model suggests that the two class solution can be rejected in favor of three classes. Consequently, the LMR tests associated with the three- and four-class model specifications triangulate around the solution identified here.

Figure 1 demonstrates the predicted probability of class membership based on the within-class mean scores of the six subscales for the initial half of the sample. The overall prevalence of class membership is noted in parentheses beside each class label. The bars in the chart represent the mean score on that variable for each identified class. Youth in class one, for instance, had a mean score slightly greater than "1" on the "dependent" subscale.

Class one can be designated as the "No Problem" class as they are well below the mean on all six subscales. As would be expected in a general population sample, these youth make up the largest proportion in terms of group membership (47%). The second identified class of youth (41%) is above average on each subscale, with the exception of the "conflicts" scale. These youth are designated as "Problem-Low Conflicts." They are higher on the headstrong and hyperactivity scales relative to their scores on other subscales. Those youth also demonstrate higher than average anxiety/depression and dependence, but not exceedingly so.

The third identified class comprises about 12% of the sample. The first distinguishing characteristic of this class is its high

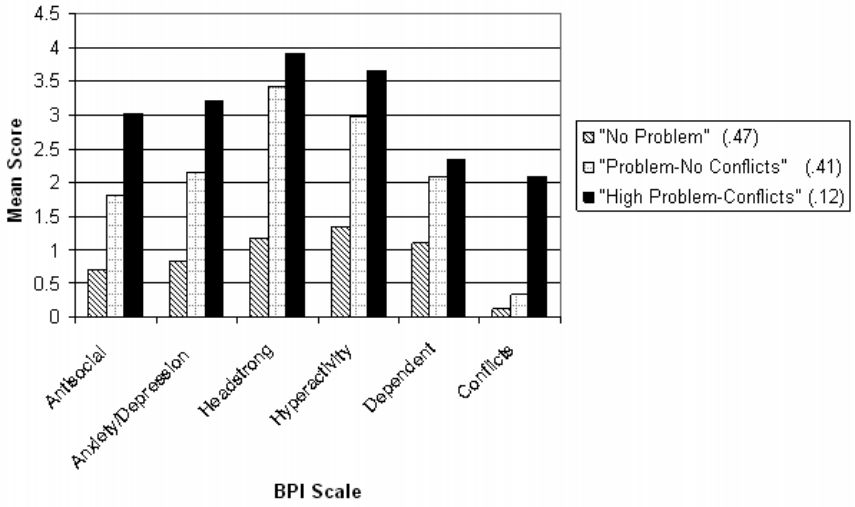

Figure 1.
Three-Class Latent Profile Analysis with Behavior Problem Index (Identification Sample, n=717).

mean value on each of the six subscales. Relative to the second class, this group is particularly high on the antisocial, anxiety/depression, and conflicts subscales. In terms of "conflicts," the within-class mean value is considerably greater than either of the other classes. This group is designated as the "High Problem-Conflicts" class based on its characteristics. Descriptive results of the second stage of a split-half model identification and validation approach (n=672) show similar results for fit, class distribution and composition (full results available upon request). In addition, a second stage of model confirmation was undertaken with data from another youth development study, the Project on Human Development in Chicago Neighborhoods (Earls, Brooks-Gunn, Raudenbush, & Sampson, 2002). The measure used in the confirmatory study was the Child Behavior Checklist (CBCL) (Achenbach & Edelbrock, 1981) from which a number of measures of the Behavior Problem Index were derived. The overall distribution of class membership was roughly comparable (52%, 37%, and 11% for Classes 1, 2, and 3, respectively). While the mean scores are not identical, there is a consist-

ency in magnitude across the three identified classes. The CBCL developed subscales do not perfectly reflect those from the NLSY 79 Behavior Problem Index, so attributions based on the mean scores are not fully verifiable. Also, all children in the Chicago study were assessed at age six, while youth in the current study were four to six years old. The overall patterns and fit are roughly similar, however, generally confirming the latent class structure identified in the main study analysis (results available from author upon request).

Multivariate Regression

In addition to their confirmation with the split-half sample, these classifications were examined with the full study sample to assess their relationship to a relevant outcome measure. This study included a late childhood/early adolescent delinquent behavior outcome, measured in terms of overall offending and subtype. Table 4 presents the logistic regression of delinquency on the emotional and behavioral problem latent class and control variables. Collectively, these variables had fairly low predictive power (Pseudo R2= 0.11). Among the controls, gender, age, Home Environment-SF, and peer pressure demonstrate significant effects. The set of dummy latent class variables (problem-low conflicts, high problem-conflicts) had significant effects on early onset delinquency as well; as is demonstrated by the change in χ^2 associated with their entry into the model (χ^2_{change}=9.06, p<.05). Interestingly, the "problem-low conflicts" class had a larger effect on early onset delinquency, as contrasted with the "no problem" youth, than the high problem-conflicts class. Youth in that class had 1.41 times greater odds of engaging in any delinquent activity, relative to their peers in the group with no emotional and behavioral problems between ages four and six. The odds ratio for the "high problem-conflicts" measure was close to one (exp [B]=1.03), indicating a similar predicted occurrence of delinquent behavior on the part of those youth and their peers in the "no problem" class.[4] The multivariate regression predicting delinquency was also run with the overall BPI score substituted for the latent class variables. That variable was not found to be significant.

In an effort to further examine the effects of the latent classification in relation to particular forms of delinquent behavior, the

Table 4.
Logistic Regression of Delinquency on Latent Classes and Controls (N=1389)

Covariates	*Controls*		*Full Model*	
	Logit (se)	Exp(B)	Logit (se)	exp(B)
Gender				
Female	-.328* (.11)	.72	-.313* (.11)	.73
Race				
Black	.165 (.13)	1.18	.195 (.13)	1.22
Hispanic	.035 (.15)	1.04	.045 (.15)	1.05
White (ref)				
Age at Early Adolescent Measurement	.166* (.06)	1.18	.163* (.06)	1.18
Early Adolescent-Home Environment	-.005* (.002)	.995	-.004* (.002)	1.00
Early Adolescent-Peer Pressure	.457* (.07)	1.58	.447* (.08)	1.56
Emotional-Behavior Problem Class				
Problem-Low Conflicts	--	--	.346* (.12)	1.41
High Problem-Conflicts	--	--	.034 (.19)	1.03
No Problem (ref)				
-2 Log Likelihood		1864.33		1855.27
Model χ^2		90.27*		99.33*
χ2 Change		--		9.06*
Nagelkerke R2		0.08		0.11

*p<.05

dependent variable was broken down into four subtypes. This also offered an opportunity to better understand the effects of the high problem-conflicts class in predicting early onset delinquency, since the previous analysis indicated that youth in that group were, generally, about equal with those in the "no problem" class in terms of their odds of delinquent behavior.

Table 5 presents the results of further examination of the effects of the latent profile dummy variables on early onset delinquency. All models were statistically significant, as measured by their χ^2 values. The violent delinquency model, however, shows a sharp contrast in pseudo R2 (.06) relative to the models predicting other early onset delinquency types.[5] The peer pressure score was the only variable that was consistently significant throughout the subtype models. Increases in deviant peer influence suggest higher odds of delinquency in all subtypes. On the other hand, in three of four models, the HOME-SF variable estimates suggest that positive family environment can protect against delinquent behavior. Not surprisingly, age, gender, and race had some significant effects in these models as well.

The empirically-developed profile variable appears to demonstrate limited influence in explaining subtypes of delinquent behavior. The change in χ^2 values and attendant hypothesis test results, which assess the effect of incorporating the latent profile dummy variables into the models with controls only, demonstrate significance in only the property offense model. Therefore, in general, across these subtypes, the addition of the key predictor variable did not contribute a great deal to the understanding of delinquent behavior—beyond the model composed of key controls. In the property offense model, youth in the "problem-low conflicts" group had 1.6 times greater odds of a self-reported property offense than those in the "no problem" reference category (exp [B]=1.59). Those fitting the "high problem-conflicts" profile had 2.5 times greater odds of property offending relative to youth in the reference group (exp [B]=2.49).

Table 5.
Logistic Regression of Delinquency Subtypes on Latent Classes and Controls (N=1389).^

Covariates	*Drug Use*		*Violent Delinquency*		*Property Offenses*		*Status Offense*	
	Logit (se)	Exp (B)	Logit (se)	Exp (B)	Logit (se)	Exp (B)	Logit (se)	Exp (B)
Gender								
Female	.107 (.15)	1.11	-.563* (.13)	.57	-.459* (.46)	.63	-.420* (.16)	.66
Race								
Black	-.488* (.17)	.61	.295 (.16)	1.34	.488* (.19)	1.63	.302 (.19)	1.35
Hispanic	-.586* (.20)	.56	.129 (.18)	1.14	.462* (.21)	1.59	.256 (.21)	1.29
White (ref)								
Age at Early Adolescent Measurement	.386* (.08)	1.47	-.058 (.07)	.94	.340* (.09)	1.41	.223* (.09)	1.25
Early Adolescent- Home Environment	-.008* (.002)	.99	.001 (.002)	1.00	-.007* (.002)	.99	-.009* (.002)	.99
Early Adolescent- Peer Pressure	.475* (.07)	1.61	.330* (.06)	1.39	.495* (.07)	1.64	.488* (.066)	1.63
Emotional-Behavior Problem Class								
Problem-Low Conflicts	.278 (.15)	1.32	.260 (.14)	1.30	.464* (.17)	1.59	.227 (.17)	1.25
High Problem-Conflicts	.078 (.24)	1.08	.102 (.23)	1.11	.912* (.24)	2.49	.126 (.26)	1.13
No Problem (ref)								
-2 Log Likelihood	1320.80		1429.83		1087.43		1106.03	
Model χ^2	115.89*		56.35*		137.75*		115.75*	
χ^2 Change	3.62		3.43		16.13*		1.87	
Nagelkerke R2	.12		.06		.16		.14	

^Only second stage models are shown. χ^2 Change indicates the change attributable to the addition of the emotional and behavioral problem latent profile variable. *p<.05

DISCUSSION

In reviewing the results presented here, some answers and further questions surrounding the prediction of early onset delinquency are offered. Validated instruments, such as the Behavior Problem Index, can be utilized to some benefit in predicting later delinquency. Clearly, it is useful to know a youth's score on the Behavior Problem Index (and its subscales) as a means of assessing the overall level of early problem behaviors (i.e., high or low).[6] A youth's score, however, might fall in between high and low poles, making a case more difficult to explain and treat. As an alternative, empirically identified subgroups may also demonstrate unique patterns of risk important in predicting early onset delinquency.

This study utilized latent profile analysis, which assumes an underlying categorical classification in the relationships between variables. Drawing from this perspective, the analyses considered how the relationships between BPI subscales could be used to develop a taxonomy and how that might be used to predict later delinquent behavior. Importantly, latent class modeling techniques can shed light on how youth with particular scores should be grouped, thereby more clearly identifying patterns of early emotional and behavioral problems representing individual constellations of risk. The potential utility of the approach is made clearer when considering the fact that the BPI measure itself was not significantly related to delinquent behavior, but the latent profiles were. While the change in predictive power was minimal, it was significant, suggesting that the profile added modestly to the prediction of later delinquency.

The latent profiles observed in the initial model development and confirmation process are fairly reflective of the distribution of problem behavior in a general population. Roughly half of the sample manifested "no" or low scores on the Behavior Problem Index subscales. We would expect that a sizeable number of youth develop in a prosocial manner, at least until adolescence when they might engage in some normative problem behavior (see Moffitt, 1993, 1997), and as such would fall into this group. At the high end, there was a group of roughly 10% who had fairly elevated problem levels across all six subscales. Again, this is consistent with studies that

have identified a small group of individuals who persistently engage in problem behavior from early ages well into adulthood (for a review see Moffitt, 1997). With the exception of the headstrong and hyperactive subscales, the middle class of youth (problem-low conflicts) demonstrated fairly low levels of emotional and behavioral problems; the probability distribution suggested that this group was quite large.

In terms of the composition of latent classes, this sample of youth demonstrates some interesting points. Aside from a generally higher level of problems overall, the "conflicts" subscale is the key differentiating force between the problem-no conflicts and high problem-conflicts classes. The conflicts subscale comprises some measures that are quite similar to antisocial behavior items (e.g., has trouble getting along with other children), but also a measure about whether or not the youth is withdrawn or not involved with others. This suggests that those individuals may have an element of antisocial personality beyond what was seen in other youth. These individuals may also be less apt to associate with others well, leading to less peer interaction. In that sense, they would conform to Moffitt's (1993) notion of the life-course persistent offender as someone with antisocial behavior born less of the social nature of adolescence than of enduring propensity. This is further evident in their relatively high mean scores on mood and antisocial subscales.

The logistic regression models provide a test of the predictive validity of the latent profiles developed at the previous stage of analysis. The effects of the latent profile dummy variables were significant in the main model used to predict "any" delinquent behavior between ages ten and twelve. Still, those results were unclear with respect to the effects of the individual latent class dummy variables on early onset delinquency. The high problem group, which one would expect to have the greatest odds of later delinquency, demonstrated a marginal effect. On the other hand, the middle group of "problem-low conflicts" youth demonstrated higher odds of early onset delinquency relative to the "no problem" group, perhaps indicating that the manifestation of hyperactivity and headstrong behavior is more salient than less frequently observed conflicts with others

in predicting delinquency. Hyperactivity is frequently implicated as a risk factor in studies of delinquency (Farrington, 1996; Lynam, 1996). Further, the items in the "headstrong" subscale (e.g., "He/She has a very strong temper and loses it easily," "He/She argues too much") are indicative of a difficult temperament, which is also a risk factor for delinquency (Loeber & Hay, 1997; Moffitt, 1993).

These explanations aside, the results of the delinquency models were counterintuitive. This may be due in part to the fact that the conflicts subscale taps notions of social withdrawal along with interpersonal conflict. Delinquency is measured at the early adolescent stage in this study and, at the same time, a great deal of the antisocial behavior observed there was influenced by peers. Consequently, youth with higher scores on the "conflicts" measure, despite their perception of peer pressure, may still have fewer opportunities for delinquent behavior. This might also clarify the high problem-conflicts class influence on property offenses, but not other forms of offending. This suggests a covert pattern of antisocial behavior (e.g., theft from a store) where most of the delinquent behaviors measured here might be construed as behaviors done in groups (e.g., skipping a day of school, using marijuana). All in all, the conflict portion of the latent classification may suggest a slightly different pattern of offenses or a degree of social withdrawal that precludes the peer interaction that typically accompanies delinquency (Warr, 2002).

The findings of the current study, coupled with some extant criticisms (e.g., Laub & Sampson, 2003), suggest that typologies and taxonomies of early emotional and behavioral problems may be somewhat limited in predicting later delinquent behavior. Reasons for this might include an incorrect classification scheme based on the data at hand or a general discontinuity in behavior and emotional state over time. While empirically-based classification is never perfect, it appears that the initial latent classification stage adequately characterized youth as to their patterns of emotional and behavior problems in early childhood. The discontinuity issue emerges in considering whether the classification and treatment of youth provides a means of preventing behavior that is likely to occur several years later. These results highlight the difficulty of

doing so. Assessing profiles identified via different approaches to determine their relative effects on later early onset delinquency is sorely needed to better identify what is useful and what is fleeting. Further work remains in identifying behaviors and emotional states that are, more or less, normative at particular ages and assessing whether the noise produced in measuring those problems may hinder attempts to classify youth and predict subsequent delinquency (Lynam, 1996, 1997).

The current study, despite its finding of limited predictive power, follows the suggestion that more individual-centered studies are needed in the developmental literature generally (e.g., Hart et al., 2003) and developmental, life-course criminology specifically (e.g., Farrington, 2005). These studies can help in classifying individuals and studying development over time as opposed to simply examining relationships through an aggregate, variable-focused approach. Further, this work can aid in determining the relative strengths of patterns of risk factors as predictors of later problem behavior. Varying constellations of risk and protection ultimately demand more individualized explanations of the development of delinquent behavior as well as appropriate matching of youth to treatment.

Additionally, efforts should be made to determine whether middle childhood is too early to assess and intervene with potentially at-risk youth. Although Loeber and Farrington (1998) express the position that early intervention is essential, Farrington (1996) has also pointed out that relationships between given risk factors and offending may vary depending on the age range at which they are assessed. As a result, it is difficult to know exactly when and how to intervene with youth who appear to be at-risk. Researchers and practitioners attempting to develop theoretical and empirical typologies of multi-problem youth must be cognizant of assessment thresholds utilized in identifying troubled youth and providing intervention. Depending on where the cut-off value is set, a great number of youth could require services. Some trade-off between false positives and intervention costs versus potential "damage done" in the future must be considered in making decisions about how the needs of at-risk youth are identified and addressed.

Limitations

Two identified limitations of classification are particularly salient in the current study. First, it is always possible that latent variables or classifications may be reified constructs without any real grounding in actual behavior (Bailey, 1994). Second, classification schemes walk the line between being too narrow to be of any value in terms of explanation and being too large and unwieldy to provide an improvement in organization relative to the presentation of the variables as single entities (Bailey, 1994). The multi-pronged evaluation and validation approach used here was intended to address this concern in some ways but cannot completely rule out this possibility. Also, an attempt was made to tie the observed typologies to some previously posited theory and empirical research to further ground these findings. Still, these remain concerns that warrant continued attention in studies of this nature.

The study design presents three potential problems in terms of valid interpretation of key relationships in the present work. First, this was not an intervention study and, as such, it is unclear if any of these youth received treatment or programming designed to address the problems observed in childhood. Certainly, knowledge of an intervention is crucial in understanding whether youth will go on to delinquent behavior several years later. For instance, it is possible that the counterintuitive effects of the high problem-conflicts group in the initial regression model could be attributed to the fact that their issues of interpersonal conflict rose to a level that provoked intervention on the part of their family or school. Unfortunately, this information was not available in the context of this study. Second, the early onset delinquency measure used here was rather constrained in scope and relies solely on self-reports from youth. A more varied set of items may have been helpful in better elucidating the hypothesized relationships between childhood problem classifications and subsequent delinquency. Furthermore, although the data collection procedure attempted to ensure that the self-reported information was as valid as possible, there is a potential for misreporting whenever this approach is used. A third problem that may prove a hindrance to appropriate inference is the lack of complete data on all cases at the second time point in the study. A fairly sizeable portion of the sam-

ple (28.1%) did not have complete data at the late childhood stage, which may have precluded a fuller understanding of the relationship between the predictors and early onset delinquency.[7] In general, it must be acknowledged that existing data, such as those drawn from the NLSY 79, must be used with care in answering research questions pertaining to the etiology of deviant behavior.

A final limitation stems from the fact that the classification used here is static in that it considers emotional and behavioral problems at only one developmental stage. As suggested by Loeber (1996), further analyses will focus on continuity and change over time in developing classification schemes for youth with early emotional and behavioral problems. Recent research has demonstrated the utility of dynamic approaches such as growth mixture models (Muthén, 2004) and latent class growth analysis (Nagin, 1999) for investigating appropriate groupings of problem behavior types as they manifest over time. Further, latent transition analyses can be utilized to examine the relative stability and or change of these classifications over time where probabilities associated with moving from or staying in a particular group can be identified (see Collins & Wugalter, 1992).

CONCLUSION

Typologies and taxonomies can be useful in organizing our understanding of emotional and behavioral problems in youth. Subsequently, they might be linked to and supplement theoretical formulations. This study highlights an empirically identified taxonomy that was modestly predictive of later delinquent behavior—even when more proximal risk factors were taken into account. Nevertheless, some of the findings presented here were somewhat unexpected based on prior knowledge of how groups placed in such classes should behave. More attention should be given to assessing patterns of early emotional and behavioral problems and how these factors are relevant to intervention efforts. Model-based clustering techniques, such as latent profile analysis, coupled with measures specifically designed to predict delinquency, offer one potential method for doing so. While it has been suggested that, "at-risk in-

dividuals can be identified with reasonable accuracy" (Farrington, 1996, p. 127) and this then calls for intervention as early as possible (Loeber & Farrington, 1998), continued inquiry in this area is essential in identifying who does (or does not) require resources and by what means programs can best effect change. It is also important that some determination is made with regard to where screening, assessment, and prediction procedures fit in this calculus. The current study highlights the inherent difficulty of predicting behavior over the long term, and that must be considered in research and program development related to early onset delinquency.

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APPENDIX

BEHAVIOR PROBLEM INDEX (α=.80)
Antisocial
He/She bullies or is cruel or mean to others
He/She is disobedient at school
He/She has trouble getting along with teachers
He/She cheats or tells lies
He/She breaks things on purpose or deliberately destroys his/her own or another's things
He/She does not seem to feel sorry after he/she misbehaves
Anxiety/Depression
He/She has sudden changes in mood or feeling
He/She is too fearful or anxious
He/She feels worthless or inferior
He/She feels or complains that no one loves him/her
He/She is unhappy, sad, or depressed
Headstrong
He/She is disobedient at home
He/She is stubborn, sullen, or irritable
He/She has a very strong temper and loses it easily
He/She argues too much
He/She is rather high strung, tense and nervous
Hyperactivity
He/She has difficulty concentrating, cannot pay attention for long
He/She is easily confused, seems to be in a fog
He/She is impulsive, or acts without thinking
He/She is restless or overly active, cannot sit still
He/She has a lot of difficulty getting his/her mind off certain thoughts (obsessions)
Dependent
He/She clings to adults
He/She cries too much
He/She demands a lot of attention
He/She is too dependent on others

BEHAVIOR PROBLEM INDEX (α=.80) (continued)
Conflicts
He/She has trouble getting along with other children
He/She is not liked by other children
He/She is withdrawn, does not get involved with others
EARLY ONSET DELINQUENCY (α=.67)
Drug
Ever smoked cigarettes
Ever drank alcohol—more than a sip
Ever used marijuana
Violent
Hurt someone bad enough for doctor
Property
Stole from a store
Intentionally damaged school property
Status Offenses
Skipped a full day of school
Stayed out all night w/out parental permission

ENDNOTES

1. More information on the Behavioral Problem Index is provided in the "Method" section under "measures."

2. Further information on overall sampling for the NLSY 79 Child and Young Adult study can be found in Center for Human Resource Research, 2002.

3. In addition to these extant criticisms of cluster analysis techniques, the approach was found to be inadequate in the current study as well. K-means cluster analysis was undertaken here in an attempt to examine its results relative to the latent profile analysis approach. The cluster analysis produced a taxonomy of emotional and behavioral problems that was less appealing intuitively (results available from author).

4. A supplementary model estimation procedure was undertaken because of the potential deflation of observed standard errors and attendant risk of Type I error associated with the use of dummy variables drawn from the predicted latent classes as predictors in the second stage regression model. Using a general linear model with the binomial distribution family and logit link function, bootstrap standard errors were estimated for the model statistics (Efron & Tibshirani, 1986) and similar findings emerged.

5. In fact, the "violent offense" variable consisted of only one question that simply asked whether the youth hurt another person badly enough that they required medical attention. As a result, it is subject to greater measurement error, and probably more problematic, than the other subgroup models presented in Table 4.

6. Further, ancillary predictive analyses were conducted with alternative approaches to classification. Respectively, the results of the K-means cluster analysis and a naïve quartile split based on the BPI score were utilized in creating three and four group taxonomies. Subsequently, they were entered into a logistic regression model comprised of the same variables used in the analyses presented here. Neither set of dummy variables derived from these procedures was a statistically significant predictor of delinquency at the later age period.

7. As discussed earlier, attrition analysis revealed only modest relationships between key variables and complete or non-complete data status. To further assess the missing data issue, an imputation procedure was utilized to enter values for the data points where information was missing. Schafer and Graham (2002) review a number of approaches to handling missing data (See also Allison, 2002). In this case the hot-deck imputation procedure associated with the LISREL Prelis program was used to create an imputed data set with the expectation maximization (EM) algorithm and 200 iterations (Sinharay, Stern, & Russell, 2001). This approach utilizes similar cases selected at random to impute values where needed. The missing data primarily lay with the Time 2 measures, so imputation was undertaken with the delinquency, peer pressure, and home environment measures,

and the Behavior Problem Index subscales. Key analyses were then repeated with this new data set. The latent class breakdown was virtually identical to what was presented here in terms of overall fit and also probability distributions. The full model logistic regression with the imputed data set revealed a comparable set of substantive findings as well. The tests of individual coefficients and the omnibus test for the latent class dummy variables remain significant. The one striking, and substantively important, difference is that the effect of the "high problem-conflicts" dummy variable is quite a bit larger in the current analysis (Exp[B]=1.43 vs. 1.03, in the listwise deletion model). Importantly, that variable does still have a lower odds ratio relative to the "no problem" group when compared to the "problem-low conflicts" class (Exp[B]=1.43 vs. 1.59). Again, the balance of the results are quite similar to those reported in Table 4. The results of this analysis are available from the author upon request.