A Latent Variable Modeling Approach to Identifying Subtypes of Serious and Violent Female Juvenile Offenders

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Females have recently become an important population in research related to serious and violent juvenile offending. Although a small body of research exists on girls in the deep end of the system, very few studies have examined the degree of heterogeneity within high-risk female samples. This study applied latent class analysis (LCA) to identify subgroups of female juvenile offenders based on their self-report of offending profiles ($N = 133$). Results supported a three-class solution with subgroups characterized by patterns of 'violent and delinquent', 'delinquency only', and 'low' offending patterns. The LCA solution was replicated in an independent sample of high-risk females. The 'violent and delinquent' class was characterized by significantly higher rates of DSM-IV diagnoses for internalizing disorders, affect dysregulation, exposure to violence (within the home, school and neighborhood), and familial histories of criminality. Implications for future research, policy and clinical practice are discussed. Aggr. Behav. 33:339–352, 2007.   ©2007 Wiley-Liss, Inc.

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INTRODUCTION

Adolescent females have recently become a relevant population in the study of serious and violent offending. Rising rates of violent crime among girls [Puzzanchera et al., 2003], a decreasing gender gap in self-reported antisocial and aggressive behavior [Maguire and Pastore, 1999] and an increased focus on relational and alternative forms of aggression [Bjorkqvist, 2001; Crick, 1995; Underwood, 2003] have raised questions regarding whether separate theories of antisocial behavior are required for girls. A small, but significant, body of research is emerging regarding risk domains that are important to consider in understanding girls' involvement in antisocial behavior [for a review see Odgers and Moretti, 2002; Moretti et al., 2004; Pepler et al., 2005]. Advances have also been made in describing key childhood-origins, pathways and outcomes for girls who engage in antisocial and aggressive behavior [Moffitt et al., 2001]. Nonetheless, compared to research on boys and men, the field of girls' antisocial behavior is still in a rudimentary state. Even at the most fundamental level of defining and measuring antisocial behavior uncertainty exists regarding whether gender specific models and measurement schemes are required. The default within emerging research is no longer to exclude girls because they represent 'noise' in the analyses; instead, the rising tide of violence among girls is causing researchers to shine 'light into the dark place that is girls' violence [Underwood, 2004, p 239] and begin to explore important differences that exist *within* gender.

Rising Rates of Violence Among Girls

Violent crime is unquestionably more common among boys than girls. Recently, however, juvenile justice statistics have documented a significant increase in the rate of violent crime perpetrated by young women; a trend that has both alarmed and puzzled researchers, practitioners and social policy analysts. For example, between 1988 and 1998, the rate of violent crime more than doubled for girls (+127%) compared to a smaller increase for boys (+65%) in Canada [Savoie, 1999]. Furthermore, between 1996 and 2002, when a slight decrease was noted in the rate of violent crime committed by boys, a modest increase was observed for girls [Statistics Canada, 2004]. In both cases, the increase for girls was due to more frequent engagement in violent acts of a less serious nature (e.g., common assault). Parallel statistics are reported in the United States: overall the growth in person offense cases was greater for adolescent females (157%) than for males (71%) [Puzzanchera et al., 2003] and between 1993 and 2002, arrests for aggravated assault *decreased* 29% for males and *increased* 7% for girls. Outside North America, the picture is much the same: in the UK, between 1981 and 1999, there was a 23% *decrease* in juvenile male offenders and an 8% *increase* in female offenders, although in 1999 males still outnumbered females by 3:1–4:1 [East and Campbell, 1999]. This trend is mirrored in what girls report about their own behavior. According to the US Surgeon General's report (2001), studies of self-reported engagement in serious aggression show that the gap between adolescent girls and boys has shrunk by approximately 50%.

Subtypes of Female Offenders: Questioning a "One Size Fits All Approach"

Research with boys has demonstrated that differentiating between subtypes of juvenile offenders is helpful in building theoretical and etiological models [Vincent et al., 2003], identifying key predictors [Loeber and Farrington, 1998], and developing effective intervention strategies for offending behaviour [Lipsey and Wilson, 1998]. Decades of research in this area has isolated important subtypes of young male offenders. For example, the classic work of Wolfgang and others [Blumstein et al., 1986; Wolfgang et al., 1972] laid the groundwork for the intensive study of a small subgroup of offenders who were responsible for a disproportionate amount of crime and delinquency [Farrington, 1995]. The study of these "career criminals" provided the foundation for later researchers to begin building a

science that differentiated between life-course persistent and adolescence-limited antisocial subtypes [Moffitt, 1993; Moffitt and Caspi, 2001]. The need to address heterogeneity across development, therefore, is becoming widely accepted within both developmental criminology and psychology [Loeber and Stouthamer-Loeber, 1998].

Over the last decade, research generated by a developmental taxonomy of antisocial behavior [Moffitt, 1993] has refined our understanding of the unique developmental course, childhood origins, and adult prognosis for males on the life-course persistent versus adolescence-limited pathways [for a review see Moffitt, 2006]. Although few studies have tested whether predictions from the taxonomy hold for females, the theory is expected to account for the behavior of females as well as it does for males [Moffitt et al., 2001]. We still know very little, however, about the extension of the developmental taxonomy to females, with only a handful of studies that have applied trajectory modeling to prospectively map the course of antisocial behavior among females [Bongers et al., 2004; Broidy et al., 2003; Cote et al., 2002; Fergusson and Horwood, 2002].

Overall, the research has supported similar rates of continuity in aggression across males and females from childhood to adulthood [Huesmann et al., 1984; Huesmann and Moise, 1998], with new research from the Dunedin Study supporting the existence of similar developmental trajectories of antisocial behavior across sex [Odgers et al., in press] (Odgers et al., unpublished data). At the same time, there have been a number of thoughtful reviews and cross-sectional examinations of whether prominent classification systems validated primarily for male samples can be extended account for antisocial behavior in females [Gorman-Smith and Loeber, 2005; Hipwell et al., 2002; Silverthorn and Frick, 1999], with some researchers arguing that females may require a theory of their own [Silverthorn et al., 2001]. There is also a growing body of research related to relational or indirect forms of aggression that supports the consideration of alternative models of aggression among females. That is, research has consistently found that when girls engage in aggression they are more likely to participate in relational or indirect forms [Crick and Grotpeter, 1995; Crick et al., 2006; Underwood, 2003]. This finding has been replicated across cultures [Osterman et al., 1998] and has served as a catalyst for exploring alternative ways of conceptualizing and understanding girls' aggressive behavior before applying the conventional framework that has been applied historically among boys.

There are also compelling reasons to examine alternative models for girls within high-risk contexts. While normative theories (e.g., Moffitt's developmental taxonomy) have been instrumental in identifying the childhood origins and developmental course for antisocial subtypes within population-based samples, it has been difficult to extend these classification systems into high-risk contexts. More specifically, the absence of normative comparison groups and prospectively gathered data from childhood to adolescence does not allow for a straightforward extension of these taxonomic models into forensic contexts. As a result, there is a need to pursue alternative strategies for differentiating among individuals at the deep end of the system (the majority of whom may be life-course persistent offenders) to understand what can be done *within* these samples in terms of prevention and treatment. Moreover, the selection mechanisms that place girls versus boys into the juvenile justice system are believed to vary widely (discussed below), suggesting that sex-invariant models of antisocial behavior emerging within normative populations may not translate directly into high-risk settings.

In the absence of evidence that meaningful subtypes exist within female populations, the default has been to treat young women who engage in serious forms of aggression and antisocial behavior as a homogeneous group. This unfortunately leads to the conclusion that one theory, model, or program can be used to understand and respond to the needs of all young women in the juvenile justice system. Until recently, this has been an efficient strategy due to the low numbers of girls within high-risk samples. Low statistical power has not allowed for separate analyses by gender: females have been either excluded or included as a footnote or minor variation in the analyses performed on males [Hoyt and Scherer, 1998]. In cases where girls have been studied separately, the assumption has typically been homogeneity, and the results have included one set of parameter estimates to represent the importance of risk factors and outcomes. In fact, many juvenile justice studies have used gender as a grouping variable. Here, young women who engage in minor forms of antisocial behavior (i.e., shoplifting, truancy) are grouped together with female adolescents who are engaging in serious and violent criminal activities. Similar tactics are often adopted in defining violence among high-risk offenders. For example, a meta-analysis of 60 studies conducted my Simourd and Andrews [1994] highlights the tendency of most studies to ignore the distinction between minor forms of antisocial behavior (i.e., skipping school, drinking, lying, shoplifting) and more serious forms of aggression (i.e., physical fights, use of weapons, robbery) in their outcome measures. These studies also defined 'violent youth' as those who have engaged in one or more acts of violence, with little regard for the variability that exists with respect to the frequency and severity of such behavior.

Finally, the need to test for heterogeneity within high-risk samples seems especially important given evidence supporting the differential selection mechanisms that guide girls versus boys into the juvenile justice system. For example, criminologists have isolated patriarchal notions of social control and discrimination as the key determinants of who ends up in the juvenile justice system [Chesney-Lind, 1973; Reitsma-Street, 1991; Sarri, 1983]. Within psychology, researchers have put forward the notion of a gender paradox, where females who develop antisocial behaviour are believed to surpass a higher threshold of risk than their male counterparts and, by inference, must have been exposed to higher levels of risk or suffer from a more deviant manifestation of the disorder [Eme, 1992; Loeber and Keenan, 1994]. Still, others have argued that decisions to place girls within custody settings is the result of a desire to protect vulnerable young women from harmful street and family contexts [Corrado et al., 2000] with juvenile justice systems being (over) used to respond to the treatment and mental health needs [Grisso, 2004; Odgers et al., 2005]. Regardless of whether nature, nurture or systemic bias is the key determinant in the selection process, there is growing consensus surrounding the need to better understand the key differences among young women who end up within high-risk forensic contexts.

The primary aim of this study was to test for unique subgroups within a population of female juvenile offenders. The sample included virtually every female youth (~93%) sentenced to a correctional setting in a southeastern state over a 14-month period. First, we tested whether multiple subgroups could be identified based on observed profiles of self-reported offending. Second, findings were replicated in an independent sample to test whether the same number of classes and similar offending profiles emerged. Third, the relationships between class membership and key correlates of offending were examined. Specifically, we tested whether the offending subtypes could be differentiated based on:

(1) factors identified as being especially important to understanding girls' antisocial behavior (e.g., psychopathology and exposure to violence), and/or

(2) other individual (e.g., age at first offense, affect dysregulation), peer (e.g., delinquent peers) and family (e.g., parental criminality) correlates of offending that have emerged as reliable risk factors for antisocial behavior among males.

METHOD

Participants

Participants included 133 adolescent females incarcerated at a correctional facility in the southeastern US. The girls ranged from 13 to 19 years of age ($M = 16.3$, SD = 1.3). The majority belonged to an ethnic minority group, with 46% self-identifying as African American, 4% as Native American, 2% as Hispanic and 9% as 'Other'; the remaining 39% self-identified as Caucasian. Intellectually, the sample fell within the low average to borderline range of intellectual functioning, with an average full scale IQ of 85.5 (SD = 13.3). Based on computerized diagnostic assessments (DICA-R IV, Reich, 2000) a number of the girls met criteria for a mental health diagnosis: 16% current Attention Deficit Hyperactivity Disorder (ADHD), 28% past Major Depressive Disorder (MDD), 19% Generalized Anxiety (GAD), and 26% Post Traumatic Stress Disorder (PTSD)[1]. The majority of girls (55%) met criteria for two or more disorders.

Procedure

All female adolescents sentenced to custody during a 14-month period were approached to participate in the study. Approximately 93% of the girls participated in the research. Active voluntary consent was obtained from participants and active parental consent was obtained for all girls under the age of 18. A federal certificate of confidentiality was also obtained.

Each participant completed approximately 6–8 hr of individual assessments over the course of approximately four visits. Assessments included semi-structured clinical interviews, computerized diagnostic assessments, and a battery of self-report measures. Data from official files, including social history, psychological, institutional and educational reports were coded. Official psychological testing

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[1]PTSD estimates included re-experiencing symptoms *and* functional impairment; when functional impairment was not included in the diagnostic criteria prevalence rates of PTSD equaled 48%.

data and intake information from the Department of Juvenile Justice (DJJ) was also obtained for each participant. Following release from the institution, participants were tracked through the DJJ system and official police record checks.

Measures

SR0-R. Self Report of Offending-Revised was adapted based on the Self Report of Delinquency scale [SRD, Elliott and Huizinga, 1989]. The psychometric properties of the SRD have been widely studied [see Farrington et al., 1996; Huizinga and Elliot, 1986; Piquero et al., 2002]. Overall these studies have found acceptable levels of reliability and validity for research purposes [Jolliffe et al., 2003; Thornberry and Krohn, 2000]. A subset of SRO items were selected to maximize comparability with large-scale normative and high-risk samples. The SRO-R assesses lifetime and current involvement in delinquent and violent activities including—substance use, theft and violence. For each type of delinquent or violent act the participant was asked whether she had ever engaged in the act (yes/no), the age of first onset in the act, and how many times she had participated in the act in the past 6 months. The prevalence rates for each of the items in this sample are listed in Table I; item difficultly parameters for the SRO items have been established elsewhere [Piquero et al., 2001].

Lifetime scores indicating whether the individual had ever engaged in the act were used in the analyses (typically referred to as a 'diversity score'). Frequency scores, or how often individuals had participated in the act in the past 6 months, were not used due to the fact participants were unable to participate in majority of acts due to incarceration (e.g., driving while impaired). The use of diversity scores is informative here due to the fact that (1) diversity and frequency scores are highly correlated, that is, those who engage in the widest range of offences are also more likely to have a higher frequency of offending and (2) diversity scores are commonly used in population-based studies [see Ferguson and Horwood, 2000; Moffitt et al., 2001]. Thus, diversity scores provide one of the most comparable measures across samples.

Psychopathology

The *Youth Self Report* [*YSR*: Achenbach, 1991] measures general psychopathology and behavioral difficulties within youth ages 11–18. The YSR is a self-report measure that consists of 118 items anchored on a 3-point scale (0 = never or not true,

TABLE I. Frequency and Age of Onset for Self Report of Delinquency Items ($N = 133$)

SRO-R items	Label Figures 1 and 2	% of sample endorsing	Average age of onset, M (SD)	% early onset <11 yr	% early onset <13 yr
1. Driven while drunk or high	*dui*	42.9	13.9 (2.2)	0.8	6.4
2. Sold cannabis or hashish	*mj*	48.5	13.3 (2.1)	1.6	10.2
3. Sold hard drugs	*hard*	36.4	13.9 (2.1)	0.8	6.4
4. Stolen a vehicle	*theft*	35.6	13.6 (1.4)	0.8	4.8
5. Carried a gun		42.9	13.8 (2.2)	2.4	4.8
6. Used a weapon to get money/other things from people	*rob*	21.4	13.3 (3.1)	0.8	4.0
7. Used a weapon while fighting	*wea*	45.1	13.1 (2.4)	6.4	13.6
8. Participated in gang activity	*gang*	31.8	13.1 (1.7)	2.4	6.4
9. Been in a fistfight		93.9	11.1 (2.5)	35.2	56.8
10. Attacked someone with the idea of seriously hurting or killing that person	*attack*	40.6	12.8 (2.8)	5.6	12.0
11. Shot at someone		26.5	13.8 (2.3)	2.4	5.4

Note: items 1–4, 6–8, and 10 were used in the latent class analyses (see Figs. 1 and 2).

$1 =$ sometimes of somewhat true, $2 =$ often or very true). Participants reported on the basis of their behavior during the past 6 months. The two broadband subscales for internalizing and externalizing problems were used in this study. The psychometric properties of the YSR have been widely studied with acceptable levels of reliability and convergent validity [Achenbach, 1991].

Diagnostic Interview for Children and Adolescents [DICA-IV, Reich et al., 1997] is a semi-structured interview that includes the most frequent diagnostic categories in children and adolescents following DSM-IV definitions. The computer adapted adolescent version of the DICA was used to assess ADHD, depression, generalized anxiety disorder and post-traumatic stress disorder. Reich and colleagues [Reich, 2000; Welner et al., 1987] assessed the psychometric properties of the DICA and concluded that the DICA is a reliable tool for assessing psychiatric information in children and adolescents.

Exposure to Violence

The *Record of Maltreatment Experiences-Revised* [ROME: Wolfe and McGee, 1994] was used to assess lifetime occurrence and frequency of exposure to multiple forms of victimization (e.g., physical, sexual, domestic, neglect). The severity (e.g., mild, moderate, severe) and certainty (e.g., suspected, confirmed) of victimization was also coded. The ROME was coded by psychology graduate students (PH.D./M.A. level) based on case-file information (e.g., psychological assessment, social worker report, educational assessment, medical interview and results from 30-day intake assessment). Results are

presented for the presence of confirmed abuse ($0 =$ no, $1 =$ yes). McGee et al. [1995] have reported acceptable levels of inter-rater reliability for this rating scheme, ranging from 0.79 for neglect to 0.96 for sexual abuse.

The *Family Background Questionnaire* [FBQ; McGee et al., 1997] is a self-report version of the ROME and includes global severity ratings for multiple types of maltreatment experienced since childhood, including: psychological abuse, physical abuse, neglect and exposure to domestic violence. The psychological abuse scale was comprised of eight items including whether their parent engaged in the following acts: '…threatened to stop loving you', '…insulted you (for example, called you stupid, lazy, worthless) or called you names (for example, slut or bastard)'. The child physical abuse scale contained three items, including: '…hit, kicked or punched you' and '…threw you against something'. The child neglect scale contained five items, such as: '…fed you properly' and 'kept your home clean'. The exposure to domestic violence scale contained four items, such as: '…beat up her/his partner' and 'threatened her/his partner with a gun'. All items were answered on a 4-point scale indicating the frequency of each experience within the participant's relationships ($0 =$ never happened, $1 =$ happened a few times, $2 =$ happened sometimes, $3 =$ happened often of very often). Ratings were provided for both the primary maternal and paternal figure. McGee and colleagues [1997] reported retest reliabilities of 0.70 for this instrument.

The *Community Violence Measure* (CVM) assessed exposure to violence across three contexts (home, school, neighborhood) using a 3-point scale ($0 =$ never, $1 =$ sometimes, $3 =$ always). Eight items,

such as: 'I am afraid of being physically attacked', 'I feel like I have people I can talk to' and 'there are activities that I can participate in' were used to assess the overall quality of each context. An additional eight items were used to assess the frequency of exposure to antisocial behavior across the participants' home, school and neighborhood environments. Respondents reported how often they saw the following: 'people smoking drugs', 'drug deals', 'someone getting beat up', 'guns' 'gang activity', 'guns being shot', 'somebody getting stabbed or shot' or 'someone being arrested'.

Individual, Peer and Family Level Risk Factors

A set of risk factors was selected based on a recent review of the robust predictors of youth violence [see Hawkins et al., 2000; Lipsey and Derzon, 1998]. Factors selected included: individual (e.g., age of onset of offending behavior, IQ and affect dysregulation), peer (e.g., peer delinquency) and familial risk factors (e.g., parental criminality). Information on these risk factors was obtained through archival file reviews, self-report measures, and interviewer assessments. Details for each measure are provided below.

Age of onset of offending behavior was derived from the SRO-R. The lowest age of involvement across the items was used to index the onset of involvement in offending behavior.

IQ scores were derived based on standardized assessments (WISC; WAIS) conducted by psychologists during the 30-day intake assessment period.

Affect regulation was assessed through the Affect Regulation Construct (ARC). The ARC contains 12 items intended to map three subscales: 'dysregulation' (e.g., 'I have a hard time controlling my feelings'), 'reflection' (e.g., 'thinking about why I have different feelings helps me to learn about myself') and 'suppression' (e.g. 'I keep my feelings to myself'). Confirmatory factor analysis support the use of three subscales [RMSEA = 0.07, CFI = 0.94]. Results are presented for the affect dysregluation and suppression subscales.

Parental criminality was coded based on participant report of whether either of their parents had been 'arrested or convicted of a crime' (0 = yes, 1 = no, 2 = don't know). Responses were checked against information included in the participants' case file.

Peer delinquency was measured via an eight item scale that indexed how many of the participants' friends routinely engaged in delinquent acts, such as 'sold drugs', 'got into physical fights' or 'used

alcohol'. Responses were coded on a 4-point scale (0 = none of them, 1 = very few of them, 2 = some of them, 3 = most of them, 4 = all of them).

Analyses

Latent class analysis [LCA, Lazarsfeld and Henry, 1968] was applied to test whether multiple subgroups of girls could be identified based on SRO profiles. LCA can be understood as a specific type of latent variable mixture model or 'finite mixture model' [Muthén, 2004] where the observed distribution is assumed to be comprised of *mixtures* of two or more underlying distributions [Muthén, 2001]. As such, the objective of this analysis was to infer group membership from the observed data by identifying unique subgroups that are 'mixed' within the population. In this case, the assumption was that each of the latent classes has distinct parameter values—or profiles of involvement in offending. A more comprehensive review and the technical details of LCA can be found elsewhere [Muthén, 2004].

The data consisted of the eight SRO items[2]; four items tapped into delinquent behavior (e.g., driving while impaired, using marijuana, selling drugs, and theft) and four items tapped into violent behavior (robbery, fighting with a weapon, gang activity, attacking someone with the intent to seriously harm them). Responses to the items were binary (yes/no) and indicated whether the participant had ever engaged in the act.

Models were fitted within a structural equation modeling framework using Mplus version 3.12 [Muthén and Muthén, 2003]. Evaluations of relative model fit were made using the fit criteria included in Table II and findings were replicated within an independent sample. Next, standard techniques for between-group comparisons were applied to test whether the subgroups differed on hypothesized risk factors. The final set of analyses aided the substantive interpretation of the subgroups and provided an external means of validating the solution. Three sets of covariates were used: psychopathology (diagnostic categories and symptom scales), exposure to violence and a set of previously identified individual, peer and familial level risk factors.

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[2]The item 'gets into fights' was not included due to a lack of variance (94% reported lifetime involvement in a fist fight). Items involving weapons, 'carried a gun' and 'shot at someone', were not included due differences in firearm use across Canada and the US. When items involving weapons were included, the same three subgroups were identified (in Sample 1). As such, the 8-item solutions are reported here to aid comparisons across samples, however, details for the 11-item solutions are available upon request.

TABLE II. Fit Statistics for Latent Class Analysis ($N = 133$)

Number of classes	Log likelihood	No. of participants	BIC	AIC	Entropy	LMR-LRT
1 class	−850.0	10	1718.1	1720.9		
2 classes	−717.6	21	1471.5	1477.3	0.91	<0.00
3 classes	−693.4	32	1442.1	1450.8	0.93	<0.01
4 classes	−676.6	43	1427.6	1439.3	0.85	0.28
5 classes	−665.2	54	1423.8	1438.5	0.87	0.78

Note: BIC, Bayesian information criteria [Raftery, 1995; Schwartz, 1978]; AIC, Akaike information criterion [Akaike, 1974]. BIC and AIC balance model complexity and goodness of fit to the sample data with smaller values representing a better fit. Entropy refers to the average classification accuracy when assigning participants to trajectory-classes with values closer to 1 indicating greater precision (range = 0–1). LMR-LRT, Lo-Mendell-Rubin likelihood-ratio test [Lo et al., 2001] provides a direct test between two models; a low *P*-value indicates that a *k*-1 class model should be rejected in favor of a model with at least *k* classes. Parameter values were obtained through maximum-likelihood (ML) estimation. Missing data were handled through full information maximum likelihood (FIML) [Arbucle, 1996; Enders, 2001; Raykov, 2005].

RESULTS

Prevalence of Offending: Self Report of Delinquency

Table I illustrates the prevalence and age of onset for each delinquent and violent act. Virtually all participants (93.9%) reported being involved in a 'fist fight'; over half (56.8%) reported fighting before age 13 and 35% reported fighting before age 11. Due to the high rates of participation in minor forms of violence (fist fights) only the more serious violent acts (e.g., robbery, use of a weapon while fighting, participation in gang activity, and attacking someone with the idea of seriously hurting them) were used to identify unique subgroups. As shown in Table I, serious forms of violence were endorsed frequently with, for example, 45.1% reporting the 'use of a weapon in a fight' and 26.5% of the sample reporting 'shooting at someone'.

Identification of Latent Subgroups

A three-class solution provided the best overall fit to the data (see Table II). The significant LMR-LRT value ($P < 0.01$) for a three-class solution indicated that *at least* three classes (versus two-classes) were required to characterize the data, while the four-class solution did not represent an improvement in model fit ($P = 0.28$). The three-class model also had the highest classification accuracy (entropy) and the decreasing BIC and AIC values favored the selection of a three-class model.

Individuals were assigned into the three-class based on their most likely class membership. As shown in Figure 1, the three subgroups demonstrated unique profiles of offending behavior. A small subgroup (13% of the sample) of 'violent and

delinquent' (VAD) offenders emerged. Individuals classified as VAD fit a profile of serious and chronic offending that has been described elsewhere for boys [Loeber and Farrington, 1998]. The VAD class had a high likelihood (>0.70) of being involved in each type of offending behavior. The second subgroup of individuals comprised 28% of the sample and had a high probability of engaging in *delinquent acts only* (probabilities ranged from 0.58 to 0.99). This 'Delinquency Only' (DEL) subgroup was unique in that although they engaged in a wide range of delinquent behaviors they had not escalated into serious forms of violent offending. The final group of individuals (59%) was characterized by a low probability (<0.30) of being involved in both serious forms of violence and delinquent offending.

Replication of LCA Solution in an Independent Sample of High Risk Females

The current sample is part of a multi-site study, therefore, the LCA results could be replicated within an independent sample of high-risk females (Sample 2, $N = 70$). Participants from Sample 2 were drawn from forensic and mental-health centers in Western Canada as part of a multi-site Gender and Aggression Project. Given the standardization across sites, the procedure and measures administered in Sample 2 were identical to those described above. As shown in Figure 2, although the percentage of girls classified within each group differed in the replication sample, the classification patterns and optimal number of groups (VAD, DEL, and LOW) remained invariant. Again, a three-class solution represented the best fit to the data; the LMR-LRT value indicated that a three-class model was preferable to a two-class model
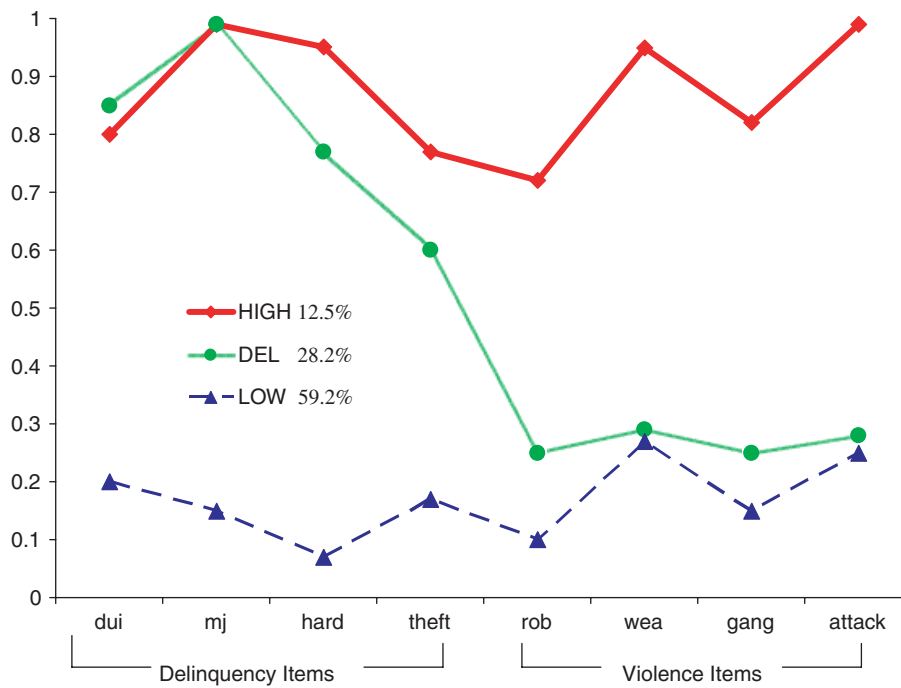
Fig. 1. Estimated probabilities for latent subgroups, (Sample 1, $N = 133$).
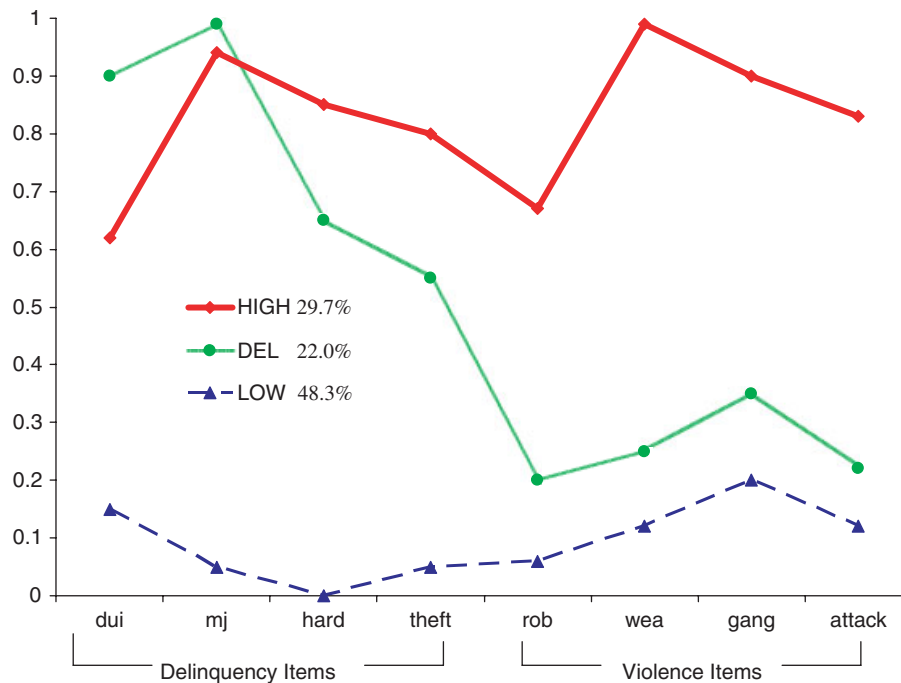

Fig. 2. Estimated probabilities for latent subgroups (Sample 2, $N = 70$).

($P < 0.01$), but there was no evidence to support the addition of a four-class model ($P = 0.32$). The entropy value for the three-class solution was also high (0.94; versus 0.91 for two-class solution and 0.89 for a four-class solution).

Relation of Class Membership to Psychopathology

Standard analyses appropriate for testing group differences were conducted (ANOVAs, χ^2 tests) to

test whether the subgroups varied across the three sets of covariates. These analyses served as check of external validity and provided a theoretically meaningful way to evaluate the subgroups. Due to the small number of participants in Sample 2 ($N = 70$), group differences are reported for Sample 1 ($N = 133$) only.

Table III provides the relationship between psychopathology and class membership. Results from this table convey two main findings. First, girls in the VAD class had the highest scores on both internalizing ($P = 0.08$) and externalizing ($P < 0.01$) symptoms; post-hoc analyses indicated significant differences when compared to the LOWs on internalizing symptoms ($P = 0.03$) and when compared to both the LOW and DEL subgroups on externalizing symptoms. Second, girls in the VAD class had the highest prevalence rates of psychiatric diagnoses including: ADHD, depression, anxiety and PTSD. Planned group comparisons revealed that those in the VAD class were 4.6 times more likely to have met diagnostic criteria for anxiety and for depression than their LOW counterparts.

Relation of Class Membership to Exposure to Violence

Table IV presents the relationship between exposure to violence and class membership. Results

TABLE III. Relationship Between Psychopathology and Class Membership ($N = 133$)

	Violent and delinquent (VAD)	Delinquent only (DEL)	LOW		Planned comparisons	
	M (SD)	M (SD)	M (SD)	Overall test of group differences	VAD vs. LOW	VAD vs. DEL
Psychiatric symptoms						
Internalizing	23.4 (10.3)	18.5 (8.3)	17.0 (9.8)	$F = 2.6$, $df = 110$, $P = 0.08$	**$P = 0.02$**	**$P = 0.12$**
Externalizing	28.2 (10.6)	23.9 (10.2)	18.3 (9.0)	$F = 8.2$, $df = 119$, $P < 0.01$	**$P < 0.001$**	**$P = 0.01$**
	%	%	%		OR (CI)	OR (CI)
Psychiatric diagnosis						
ADHD	27.3	13.8	14.5	$\chi^2 = 1.2$, $df = 2$, $P = 0.53$	2.0 (0.4–8.8)	1.8 (0.3–9.6)
Depression	53.8	28.6	20.3	$\chi^2 = 6.1$, $df = 2$, $P = 0.04$	**4.6 (1.3–16.1)**	2.7 (0.7–10.9)
Anxiety	38.5	25.0	11.9	$\chi^2 = 5.9$, $df = 2$, $P = 0.05$	**4.6 (1.2–18.2)**	1.8 (0.5–7.7)
PTSD	38.5	14.3	27.1	$\chi^2 = 3.1$, $df = 2$, $P = 0.21$	1.7 (0.5–5.9)	3.8 (0.8–17.5)

Note: statistically significant differences at the $P < 0.05$ level are in **bold** type. OR, odds ratio; CI, confidence intervals.

TABLE IV. Relationship Between Exposure to Violence and Class Membership ($N = 133$)

	Violent and delinquent (VAD)	Delinquent only (DEL)	LOW		Planned comparisons	
	M (SD)	M (SD)	M (SD)	Overall test of group differences	VAD vs. LOW	VAD vs. DEL
Psychological abuse[a]	1.0 (0.9)	0.7 (0.5)	0.6 (0.6)	$F = 1.5$, $df = 101$, $P = 0.18$	$P = 0.07$	$P = 0.15$
Physical abuse[a]	0.8 (0.8)	0.5 (0.7)	0.5 (0.6)	$F = 1.2$, $df = 103$, $P = 0.30$	$P = 0.12$	$P = 0.19$
Neglect[a]	1.7 (0.5)	2.0 (0.4)	2.1 (0.4)	$F = 3.9$, $df = 103$, $P = 0.02$	**$P < 0.01$**	$P = 0.06$
Exposure to domestic violence[a]	1.0 (1.0)	0.3 (0.5)	0.4 (0.6)	$F = 5.5$, $df = 101$, $P < 0.01$	**$P < 0.01$**	**$P < 0.01$**
	%	%	%		OR (CI)	OR (CI)
Sexual abuse[b]	69.2	23.1	48.3	$\chi^2 = 8.4$, $df = 2$, $P = 0.02$	2.4 (0.7–8.7)	7.5 (1.7–33.2)
Physical abuse[b]	57.1	33.3	55.7	$\chi^2 = 4.1$, $df = 2$, $P = 0.13$	1.0 (0.3–3.4)	2.7 (0.7–10.1)
School violence[c]	57.1	36.7	23.2	$\chi^2 = 6.9$, $df = 2$, $P = 0.03$	**4.4 (1.3–14.6)**	2.3 (0.6–8.3)
Neighborhood violence[c]	100.0	72.4	57.1	$\chi^2 = 10.2$, $df = 2$, $P < 0.01$	NA	NA

Note: statistically significant differences at the $P < 0.05$ level are in **bold** type; OR, odds ratio; CI, confidence intervals. Legends for abuse include: [a]self report (0 = never 1 = sometimes 2 = always), [b]archival information from file, [c]self report, observed someone being stabbed or shot; NA, odds ratio cannot be computed due to 100% of individuals in the violent and delinquent class being exposed to neighborhood violence. For neglect lower scores are associated with higher levels of neglect (reverse coding in relation to other items).

from this table convey two main findings. First, the VAD class had the highest rates across all measures of violence exposure (8 of 8) and were significantly more likely than their LOW counterparts to have experienced neglect, domestic violence and school violence (witnessing individuals being stabbed or shot). Second, when compared to the delinquency only (DEL) class, the VAD class was more likely to have experienced domestic violence ($P < 0.01$) and were 7.5 times more likely to have experienced sexual abuse.

Relation of Class Membership to Individual, Peer and Family-Level Factors

Table V presents the relationship between individual, peer and family level factors by class membership. Results from this table convey three main findings. First, no differences were observed across subgroups based on age, IQ or ethnic minority status. Second, those in the VAD class had the earliest age of onset for offending; statistically significant differences were found for age of onset when compared to the delinquency only class ($P = 0.04$). Third, the VAD class also demonstrated the most problems with affect (dysregulation and suppression), involvement with antisocial peers and had the highest rates of familial criminality. Differences between the VAD and LOW classes reached statistical significance on measures of affect dysregulation, affect suppression, antisocial-peer involvement and parental criminality. Notably, the VAD class was 4.5 times more likely than the LOW class and 3.9 times more likely than the Delinquency

only class to have a mother with a criminal history; 100% of the VAD class had a father with a criminal history.

To summarize the results, we created an index of the number of psychiatric disorders (ADHD, depression, generalized anxiety, PTSD), types of violence exposure (sexual abuse, physical abuse, school violence, neighborhood violence) and familial risk (parental criminality). The means and corresponding effect sizes (Cohen's d) by subgroup indicated that those in the VAD group had the highest level of cumulative risk ($M = 5.8$, SD = 2.0) followed by the 'delinquency only' ($M = 3.2$, SD = 1.6) and low groups ($M = 3.0$, SD = 1.7). Differences between the VAD and other two subgroups were characterized by a *large* effect sizes (Cohen's d: VAD versus LOW = 1.52, VAD versus DEL = 1.48).

DISCUSSION

Much of the previous work with serious and violent female juvenile offenders has adopted a 'one-size fits all' approach to understanding the factors that contribute to involvement in criminal behavior. Arguably, grouping samples by gender alone has obscured the differences that exist within high-risk populations of young women and, as a result, there have been few attempts to understand the heterogeneity within these samples. The current study utilized a latent variable approach to classification that allowed for greater sensitivity in the detection of subgroups among female juvenile offenders. This

TABLE V. Relationship Between Individual, Peer and Family-Level Factors and Class Membership ($N = 133$)

	Violent and delinquent (VAD)	Delinquent only (DEL)	LOW		Planned comparisons	
	M (SD)	M (SD)	M (SD)	Overall test of group differences	VAD vs. LOW	VAD vs. DEL
Demographic						
Age	16.0 (1.1)	16.5 (1.1)	16.1 (1.3)	$F = 1.0$, $df = 117$, $P = 0.36$	$P = 0.70$	$P = 0.23$
Ethnic minority	46.7	67.7	63.9	$\chi^2 = 2.0$, $df = 2$, $P = 0.36$	0.5 (0.2–1.5)	$P = 0.4$ (0.1–1.5)
Individual						
Age of onset (offending)	11.5 (2.4)	13.4 (1.5)	12.8 (3.2)	$F = 2.1$, $df = 73$, $P = 0.14$	$P = 0.13$	**$P = 0.04$**
IQ	86.4 (7.8)	87.1 (13.1)	84.4 (13.9)	$F = 0.5$, $df = 105$, $P = 0.60$	$P = 0.53$	$P = 0.95$
Affect dysregulation	6.4 (1.3)	4.2 (2.3)	4.1 (2.3)	$F = 6.7$, $df = 115$, $P < 0.01$	**$P < 0.001$**	**$P < 0.01$**
Affect suppression	6.2 (2.7)	4.3 (2.3)	4.4 (2.5)	$F = 3.5$, $df = 115$, $P = 0.03$	**$P = 0.01$**	**$P = 0.02$**
Peer						
Antisocial peers	3.3 (0.5)	2.1 (0.8)	1.6 (1.0)	$F = 22.2$, $df = 105$, $P < 0.01$	**$P < 0.01$**	**$P < 0.01$**
Family						
Criminal history (father)	100.0	64.0	62.5	$\chi^2 = 7.6$, $df = 2$, $P = 0.02$	NA	NA
Criminal history (mother)	69.2	36.7	33.3	$\chi^2 = 6.0$, $df = 2$, $P = 0.05$	**4.5 (1.3–16.3)**	3.9 (1.0–15.6)
Criminal history (sibling)	92.3	76.9	66.0	$\chi^2 = 3.9$, $df = 2$, $P = 0.14$	6.2 (0.7–51.3)	3.6 (0.4–33.6)

Note: Statistically significant differences in **bold** type; NA, odds ratio cannot be computed as 100% of fathers of youth in the 'violent and delinquent class' had a criminal record.

type of approach represents an important departure from previous research with girls in that we began working from the assumption that important differences existed *within* this population and then applied methods that were designed to isolate subgroups with distinct offending profiles.

Results from this study have three main implications for our understanding of serious and violent female offenders. First, we identified unique subgroups within an incarcerated sample of females. This solution was replicated in an independent sample of high-risk females and provided three conceptually clear profiles of offending behavior: a subgroup with a high probability of engaging in both violent and delinquent offences (VAD), those that engaged in delinquency only (DEL) and a low class. These subgroups were then differentiated based a wide range of factors including: psychopathology, exposure to violence, affect regulation, antisocial peers, and familial criminality. Individuals in the VAD class presented the most compromised profiles and had the highest cumulative scores of risk suggesting that girls with the greatest diversity in their offending patterns are also likely to have accumulated the greatest risk. Our findings also suggest that there is not a 'sub-type' of girls that specialize in *serious* forms of violence only. Thus, while it is virtually normative for girls within high-risk contexts to report engagement in 'fistfights', indeed 94% of this sample had been in a fight, exclusive involvement in more serious forms of violence (e.g., attacking someone with the idea of seriously hurting or injuring them, or using a weapon while fighting) was not supported. Thus, when the threshold for violence is set above 'fighting' there does not appear to be a subgroup of strictly violent girls. In contrast, over a quarter of the girls (28%) engaged in delinquent offending only; these girls specialized in theft, drug use and related behaviors. Although further replication is required, these findings support the existence of at least three meaningful subgroups of girls in the deep-end of the juvenile justice system.

Second, the majority of our sample was experiencing mental health problems, with 55% of girls meeting criteria for two or more of the four disorders examined. These results are consistent with large-scale epidemiological studies of juvenile offenders in custody within the United States, where Teplin and colleagues (2002) report that 56.5% of females and 45.9% of males meet diagnostic criteria for two or more psychiatric disorders. While the levels and co-morbidity of psychopathology are well documented among females in the juvenile justice system, our results demonstrate that *psychiatric disorders are not distributed equally throughout this population of high-risk females*. Rather, VAD girls have the highest rates of psychiatric disorder and are significantly more likely to be diagnosed with both depression and generalized anxiety disorder.

Third, consistent with previous work [Bergsmann, 1989; Calhoun et al., 1993; Moretti et al., 2001] rates of abuse, neglect and exposure to violence were also high within this sample. Again, our results identified a subgroup of offenders who surpass the remarkably high rates of exposure to violence that are typically reported. Results indicated that VAD girls are more likely to suffer from child neglect, exposure to domestic violence, sexual abuse, physical abuse *and* witnessing violence within their schools and communities; with exposure rates reaching 100% when neighborhood violence is considered and 69% for sexual abuse. These findings reaffirm the importance of understanding girls within the justice system as both offenders and victims, *with a strong and positive relationship between offending diversity and levels of violence exposure*. Although a relatively small percentage of girls (12.5% in Sample 1 and 29.7% in Sample 2) fell into the violent and delinquent subgroup, our findings underscore the complexity of their victimization experiences and mental health issues. These girls, although small in number, were involved in a wide variety of offending behaviors, including involvement in the most serious violent acts and are likely to require the most intensive treatment programs due to their cumulative risk indices.

This study has clear limitations. First, this was a cross sectional study and we were not yet able to test the predictive validity of our classification using future measures of antisocial behavior. The expectation is that as we follow our sample into young adulthood higher rates of antisocial behavior and related social problems will emerge among the VAD class. Similar to Moffitt's expectations regarding the life-course persistent class, this subgroup of young women has acquired a cumulative burden of deficits that is expected to prevent their successful transition into adulthood.

Second, although attempts were made to collect information on risk factors and offending behavior via multiple methods (e.g., extensive reviews of social service, probation, medical and educational reports) the majority of the measures were self-report. Future research using official and observational data is required to address whether shared method variance contributed to the observed relationship between risk factors and class membership.

Third, this sample included females only and as such we could not test for sex differences with respect to subgroups or key risk factors. Although previous work with males supports the existence of similar offending subtypes we were not able to directly test for differences across sex. To address this issue, replication of these findings in a sample that contains both males and females is required.

With these limitations in mind, implications for clinical practice and prevention can be noted. Our findings demonstrate the considerable diversity that exists among girls in the juvenile justice system. Admittedly, these findings are novel and require further replication; nonetheless, they point to the need to recognize that not all girls who become involved in the juvenile justice system are the same—both in terms of their offending profiles and associated risk profiles. This may seem like an obvious statement; however, despite the fact that girls now have a place within the violence research arena, gender is typically their defining feature with very little attention paid to individual differences. There is a need to move beyond classifying young women within high-risk contexts based solely on their gender and/or engagement in one type of offending behavior. In contrast to the classic distinctions which would have resulted in the default classification of our sample as 'violent offenders', our results suggest that a small, yet identifiable, percentage of these girls have experienced extreme forms of victimization and suffer from very serious mental health issues. The failure to acknowledge heterogeneity within these samples may distort our ability to understand the mechanisms that propel girls into the deep-end of the criminal justice system and carry them through the dimly lit corridors of girls' serious and violent offending.

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