

Explanatory Diversity Among Female Delinquents: Examining Taxonomic Heterogeneity

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1. Introduction

This chapter addresses the unresolved issue of different explanatory “types” or “etiological patterns” among female delinquents. Only a handful of studies have examined explanatory typologies of female offenders. Currently there is a serious lack of knowledge regarding the main “fault lines” that may differentiate categories of female delinquents. The chapter is structured as follows. First, several contentious issues are examined regarding whether “types” even exist, given the anti-typological views held by several major theorists in criminology. Second, I briefly review the prior literature on female typologies, with particular reference to explanatory taxonomies. Third, following a discussion of this prior research I identify several “common or recurring” female offender types that appear to have consistently emerged in this body of research. The fourth section consists of an empirical taxonomic analysis of a large sample (N = 1175) of female delinquents. This produced seven well-replicated female offender. These are described and linked to the relevant prior literature. Finally, I explore the theoretical and practical implications of these taxonomic findings. In terms of proving the existence of these female types I invoke the maxim of a “damn strange coincidence” when highly similar empirical structures re-emerge across diverse mathematical approaches, different falsification tests and different studies (Meehl 1992).

This chapter addresses five inter-related goals as follows:

1. Do distinct explanatory types exist among female offenders? This requires examining the strength of typological structure among female delinquents to clarify whether replicable explanatory types.

2. How many female delinquent explanatory types can be reliably discerned? This involves examining the hierarchical taxonomic structure of subtypes and the boundary conditions between types.

3. Providing more precise descriptive profiles of each female type: Prior female studies have provided inconsistent profiles of female offenders. Thus, the third

goal is to identify comprehensive profiles of each of the seven replicated types. These are presented in the results section.

4. Do the different types reflect distinct theoretical explanations? Can the different female types be interpreted in terms of different causal theories? Do specific patterns of explanatory factors, characterize and explain the delinquency of each type? Following each empirical profile I offer a tentative theoretical interpretation of each female delinquency type.

5. Do the present types match those from prior taxonomic studies? The results of this study will be compared to prior taxonomic studies of boy and girl delinquents to identify replicated types from prior studies.

2. Background

A controversy over the “Generality” of Delinquency vs. Types

The dominant paradigm in theoretical criminology tends to deny the existence of types of offenders – of either criminal behaviors or explanatory patterns. This paradigm assumes that a single causal process underlies all forms of delinquency and that distinct etiological types do not exist. The “anti-typological” stance among criminologists is reflected in a tendency to deny or ignore the existence of types. Hirschi and Gottfredson (1994) starkly dismiss taxonomic heterogeneity and ascribe most criminal behavior to a single “persistent underlying trait.” Sampson and Laub (1993, 2004) reject the typological approach partly because of methodological difficulties and partly because of their belief that the fundamental causes of delinquency are the same for everyone, leading to relatively continuous distributions across explanatory factors. The main goal of many prominent criminologists is to develop “universal or general” theories to explain ALL delinquency in one parsimonious model. Examples of general explanations include the low self-control theory of Gottfredson and Hirschi (1990), Sampson and Laub’s age-graded theory of social-control (1993), Agnew’s general strain theory (1997) and several “integrated theories” (Catalano and Hawkins, 1996; Farrington, 2003; Elliott, Ageton and Cantor, 1984). David Farrington (2003) underlined the dominance of this global theory paradigm in a presidential address to the American Society of Criminology, noting that

most recent theoretical developments, with the exception of Moffitt's (1993) taxonomic theory, do not support the idea of types.

Taxonomic research makes different assumptions and has re-emerged - not without controversy - in the last decade (Osgood 2005). It embraces a stronger form of explanatory complexity by assuming the possibility of heterogeneous or differentiated offender categories, with multiple causal pathways. It argues that the dominant criminological paradigm of most global or general theories mistakenly tries to “force fit” all forms of delinquency into single causal structures. It rejects the idea that any single universal law or global model applies to all delinquents. At the empirical level this controversy will hinge on whether differentiated explanatory offender types can be reliably identified. If an empirically based explanatory taxonomy can be found that demonstrates robust reliability and sufficiently heterogeneous explanatory patterns this would challenge general theories as misleading, oversimplified and, in fact, overly general.

Lykken (1995), in proposing a theoretical taxonomy of antisocial offenders, argued against the global paradigm as follows:

“There seems to be an almost irresistible tendency for criminological theorists to oversimplify the causes of crime, to underestimate the variety of psychological peculiarities that can contribute to the underlying dispositions for criminal behavior” (1995, p 17).

Lykken argued that the complexity of multiple interactions among socialization, environmental, genetic and learning processes that underlie delinquency is likely to result in substantial structural heterogeneity with quite differentiated patterns among types of delinquent youth. He suggested that the laws describing the functioning of various delinquent types – including forms of female delinquency - may be sufficiently different that comparing them is like comparing apples and oranges. This is consistent with the possibility of gender-specific patterns among delinquents

(Belnap, 2006). Ultimately, the controversy may only be decided by clarifying the strength of these type-patterns i.e. whether the data distribution is continuous or categorical (Osgood 2005).

The re-emergence of taxonomic research in delinquency

The last decade has seen the following important developments in taxonomic research in delinquency:

1. Three influential theoretical taxonomies have converged on broadly similar explanatory types (Moffitt, 1993; Lykken 1995; Mealey, 1995). Lykken identified four major categories: 1) psychopathic types, 2) psychological-neurotic types, 3) sociopathic types and 4) normal (situational-accidental) offenders – with several subtypes nested within each of these. Mealey’s (1995) bio-social taxonomy overlaps with Lykken’s psychopathic and sociopathic types, but uses different theoretical arguments and naming conventions. Moffitt proposed two developmental types: 1) A life-course persistent offender (LCP) with serious chronic delinquency, early onset, multiple risk factors and a pattern similar to antisocial personality disorder; and 2) An adolescent limited offender (AL) whose more minor delinquency shows later onset, peaks during adolescence and then desists precipitously by early adulthood and who have fewer personal or family risk factors.

2. A growing body of empirical taxonomic research is building support for the existence of delinquent typologies (Huizinga *et al.*, 1991; Jefferson and Johnson, 1991; Mezzich *et al.*, 1991; Sorensen and Johnson, 1996; Jones and Harris, 1999; Harris and Jones, 1999; Aalsma and Lapsley, 2001; Skilling *et al.*, 2001; Potter and Jenson, 2003; Stefurak, Calhoun and Glaser, 2004). Unfortunately, most of this work largely ignores female offenders.

3. The use of “categories” has emerged as central to studies of criminal careers (Osgood 2005). This research area has also partially supported Moffitt’s AL and LCP categories. Again, only a few of these studies examine female offenders (e.g. White

and Piquero, 2002; D'Unger *et al.*, 2002). A recurring finding is that Moffitt's dual taxonomy appears oversimplified and that additional latent sub-types exist.

Prior research on explanatory types among female delinquents

Only a handful of studies have specifically examined female offender typologies (Butler and Adams 1966, Widom 1978, Aalsma and Lapsley 2001, Moffitt et al 2001, Silverthorn and Frick 1999, Stefurak and Calhoun 2006). However, since these studies used different methods, different theoretical orientations, different sets of explanatory variables and small samples it is hard to integrate findings between them. Yet, several broad conclusions may be offered:

1. *Heterogeneous patterns exist among female offenders:* These studies strongly suggest heterogeneous patterns of female delinquents. Analogues of Moffitt's AL and LCP are consistently found (Widom 1978, Aalsma and Lapsley 2001 and Stefurak and Calhoun 2006). These studies also identify additional subtypes that partially verify each other and that are missing from Moffitt's taxonomy (see also Silverthorn and Frick, 1999). Criminal career studies of female offenders confirm this heterogeneity (D'Unger *et al.*, 2002; White and Piquero, 2004; Fergusson and Horwood, 2002).
2. *Certain type patterns appear to be recurrently discovered:* Certain female patterns, although described by different factors and given different names have sufficient similarity to suggest recurrent discovery (see below).
3. *No consensus on prevalence or numbers of each type:* Different studies report quite different prevalence for apparently similar sub-types (e.g. AL or LCP categories). However, the typically small samples do not provide a firm basis for prevalence estimations. However, the various analogues of the LCP category are much less frequent among females than males - perhaps 1% in general female community samples (Moffitt *et al.*, 2001).
4. *No consensus on the basic structure of each female type pattern:* This lack of consensus on the basic "descriptive profiles" stems from the fact that the available studies are sufficiently different from one another in samples,

variables and taxonomic method, and do not provide a reliable basis on which to integrate comprehensive profiles of the major female offender types.

Weaknesses in prior research on explanatory typologies of female delinquents

Point 4 (above) results from the fact that any attempt to integrate findings across prior taxonomic studies faces certain limitations in this prior research. The following characteristics of the past studies render their conclusions somewhat tentative:

1. Small or inadequate samples of females: Most prior studies of female offender taxonomies used very small sample sizes. Moffitt *et al.* (2001) based their LCP and AL profiles on only 6 and 78 cases respectively (p. 216); Widom (1978) had only 66 cases; Aalsma and Lapsley (2001) had 73 females, and Stefurak and Calhoun (2006) had 101 delinquent girls. Taxonomic studies require larger samples for adequate reliability (Milligan 1996).

2. Inadequate coverage of explanatory factors: This problem can undermine the ability to identify, differentiate or fully describe the structure of any explanatory pattern. A comprehensive coverage of risk and need factors is needed when identifying or describing explanatory patterns (Belnap 2006).

3. Inadequate taxonomic methods: Prior studies often used deficient taxonomic methods - e.g. clinical description, inverse factor analysis, or a single cluster analysis without cross-validation. However, some recent studies use more reliable methods (Aalsma and Lapsley, 2001; Stefurak and Calhoun, 2006).

4. Imposition of artificial cross-classifications that prevent the discovery of natural types: Another hazard, particularly in tests of Moffitt's taxonomy, is the imposition of a simple cross-classification of age of onset against selected measures of criminal offending. Instead of discovering natural patterns this may actually mask the natural diversity among female offenders. Francis *et al.* (2004) discuss the hazards of this approach.

5. *Inadequate knowledge of the key differentiating factors among female offender patterns*: Given our limited knowledge of latent types or of the main differentiating factors among female offenders, it is hazardous to over-emphasize any single factor (e.g. age of onset) in defining types. Many key dimensions have been suggested (Steffensmeier and Allen 1998; Belnap 2006) and comprehensive coverage is advisable at this stage.

6. *Category contamination and distortion if latent undiscovered types exist*: If undiscovered types exist, they are likely to be falsely merged into the discovered classes, and may thus distort the resultant type descriptions. If the verification studies of Moffitt's categories (AL and LCP) have not sufficiently identified other latent subtypes, then the descriptions of these two main categories may be watered-down or distorted.

7. *Absence of operational "matching" procedures*: Prior studies mostly fail to provide operational methods to identify "matches" to their types. Thus, matching can only proceed by "eyeballing" the feature similarities of type profiles across studies.

Given the above it is no surprise that prior studies of female delinquent taxonomies present their findings tentatively with pleas for replication (D'Unger *et al.* 2002).

Expectations of common female offender types

However, using the collective similarities of female types across most available prior studies, the following "common type patterns" are tentatively identified. These types - if they truly exist - may be expected to recur in any large female delinquency sample:

1. *Normal or Situational Female Offenders*: This pattern is usually described as having few risk factors, few relationship problems, later onset and psychologically normal (Butler and Adams, 1966; Aalsma and Lapsley, 2001; Stefurak and Calhoun, 2006; Widom, 1978). This pattern also recurs among male delinquents (Lykken, 1995; Harris and Jones, 1999). A controversy is whether some of these youth are "faking good" or in denial (Widom, 1978; Harris and Jones, 1999).

2. *Adolescent Limited (AL)*: This category is similar to the above normal category of mostly well-socialized low risk youth. However these girls are expected to strongly associate with or mimic delinquent peers for a limited time (Moffitt, 1993; Lykken, 1995) and largely avoid serious or violent offences. A controversy concerns the existence of certain subtypes within this broad category (D'Unger, 2002, Fergusson and Horwood 2002).

3. *Internalizing Female Delinquents - Abused and Victimized*: This internalizing pattern exhibits social withdrawal, mistrust and depression e.g. Aalsma and Lapsley's (2001) "internalizing cluster"; Stefurak and Calhoun's (2006) "depressed cluster". This pattern has been linked to sexual victimization and abuse (Widom, 1989). A controversy exists over the reliability of this type since this type is missing from both Widom (1978) and Moffitt's (1993) taxonomies.

4. *Chronic Serious Delinquents – Early Onset, Multiple Risk Factors and Low Self-Control*: A serious chronic delinquent – perhaps psychopathic or LCP type - appears in several female taxonomies (Widom 1978, Stefurak and Calhoun 2006, Moffitt *et al.* 2001). Widom describes them as hostile, impulsive and unsocialized, naming them as "primary psychopaths". Stefurak and Calhoun's (2006) "externalizing impulsive" female cluster also exemplifies this type. A similar low self-control, hostile, APD-like profile occurs in male taxonomies (e.g. Lykken's primary psychopath, 1995; Mealey's primary sociopath, 1995; Quay's unsocialized psychopaths, 1987; Frick, 2004; Skilling *et al.*, 2001). There have been so few of this type in prior female offender studies that any conclusions regarding it's profile elements must remain tentative.

5. *Sociopathic, Sub-cultural and Socially Marginalized Offenders*: A socially marginalized, often weakly socialized, female type emerges in some studies (Widom, 1978; Felice and Offord, 1971; Butler and Adams, 1966) but not others (Aalsma and Lapsley, 2001; Stefurak and Calhoun, 2006; Moffitt, 1993). Social deprivation is

associated with with crime in both genders (Chesney-Lind and Shelden, 1994; Steffensmeier, 1996, 1998; Belnap, 2006). A similar type appears among male offenders: Lykken's (1995) "common sociopath," Warren's (1971) "sub-cultural identifier"; Miller's (1958) "lower class gang delinquent." Impaired socialization, disorganized families, incompetent parents and criminal peers are also expected features (Lykken, 1995). The inconsistent identification of this type in prior studies suggests a need for more precise identification.

6. Hybrid and Unclassifiable Types with Multiple Co-Occurring Processes: While most prior taxonomic studies "force" all female offenders into categories, it seems clear that certain offenders may represent complex unique "outlier" profiles that don't fit any pattern. Lykken (1995) suggests there are many hybrid or unclassifiable cases with multiple co-occurring features. Thus, currently, we have little knowledge of the proportions of such hybrids and outliers among female offenders.

I now briefly describe the methods and female offender samples that were used. Readers who are disinterested in statistical procedures could skip this section.

3. Methods

Sample: A sample of 1175 female offenders from three state juvenile justice systems was used. The average age was 15.5 years (standard deviation = 1.22). The racial/ethnic breakdown was 40% Caucasian, 45% African-American, 7% Hispanic, 4% American-Indian and a small number of other groups. The average number of arrests and detentions was 2.4 and 1.7 respectively.

Measures and Classification Factors: This study used a set of classification features that was comprehensive, theoretically guided and relevant for girls. Each factor had demonstrated relevance from prior taxonomic studies and prior reviews of female delinquency (Warren, 1971; Moffitt, 1993; Mealey, 1995; Giordano and Cerkovitch,

1997; Steffensmeier, 1998). The main instrument, the Youth COMPAS, contains 32 assessment scales addressing several traditional theories (control, strain and personality theory); as well as key factors from family school, peer, leisure, neighborhood and demographics (Brennan and Dieterich, 2003).

Table 1 lists all scales, their number of items, scale means, standard deviations and Cronbach alphas. The average Cronbach's alpha for all scales is .78. For each scale a high score indicates a more serious risk and a low score the absence of the problem, and in some cases a protective factor (See Tables 2,3, and 4).

TABLE 1 ABOUT HERE

Pattern Discovery, Replication and Validation

It is beyond the scope of this chapter to fully describe all the various methods used for pattern recognition. Full mathematical descriptions are given in the cited references.

However, the following three steps were used:

1. *Pattern discovery and replication*: Three separate pattern discovery methods were applied to the sample. The methods were: 1) Standard K-means, 2) Bagged K-means (bootstrapped aggregation with 1000 replications) and 3) a Semi-Supervised Learning technique. These methods are described in the R-Statistical package, in Zhou *et al.*, (2004) and in well known texts such as Hubert and Arabie (1996). These analyses were repeated before and after the removal of outlier cases to provide additional replication tests.
2. *Examining pattern consistency and replication*: Consistency of pattern recovery across methods (internal validation) was examined using Kappa and Contingency Coefficients – both of which assess agreements between classifications.
3. *Examining External validation*: This examines whether the different type patterns vary in external variables such criminal history and behaviors. We

used one-way ANOVA's and contingency tables to examine differences in criminal behaviors across type patterns.

5. Results

Evidence for selecting the “number” of patterns (K) is first given, following by internal validation results (cross method verification) and then external validation.

How many different types? Hierarchical structure: Preliminary analyses suggested strong pattern structure at both 5 and 7 cluster levels (using Ward's hierarchical method). This suggested a hierarchy of 5 broad patterns with 7 more specific sub-patterns nested within these broader types. Contingency coefficients for solutions from different methods ranged between 0.84 and 0.85 across the 5 and 7 cluster levels indicated strong verification. Figure 1 shows this hierarchical taxonomy of female patterns (with prevalence levels given for each type pattern). Criminological interpretations of the most highly replicated seven female solutions are given below.

(Figure 1 about here)

Internal Validation (Cross-Method Verification): Each pattern seeking methods identified highly similar female clusters. All comparisons at K = 5 and 7 levels had kappa coefficients above .70 and contingency coefficients ranging from 0.82 to 0.89 across hierarchical solutions indicating strong nesting. Since the 7-type solution was both stable and interpretable, it was chosen for detailed interpretation and further validation tests.

However, in comparing different pattern solutions we discovered that only about 62% of the female offenders were consistently and reliably classified into the same types across the different pattern analysis methods. This is consistent with kappa coefficients in the range of .70 suggesting that while most female delinquents can be reliably identified - with stable core members – there is a residue of hybrid or outlier

cases that do not fit well into any class, so that boundaries between classes are fuzzy or somewhat unstable. This is a critical finding (see discussion section).

External Validation: The comparison of the seven types on criminal histories and external criterion variables using one-way ANOVA's (with Sheffe post hoc tests), indicated significant differences on several criminal history variables e.g. age at first adjudication ($F = 7.5, p < .0001$); total adjudications ($F = 8.2, p < .0001$), and total detentions ($F = 6.8, p < .0001$). Most of these specific differences (from post hoc tests) between clusters were consistent with expectations from the prior literature. For example clusters 2 and 5 (with the highest risk patterns) had significantly higher adjudications, earlier age at first adjudications and higher total detentions than the other types.

Criminological Profiles of 7 Female Delinquent Types

On the basis of it's strong matching to all other solutions I selected the most replicated taxonomy for detailed interpretation (viz. the bagged K-means 7-cluster solution). Tables (2, 3 and 4) provide the patterns of standard scores (Z-scores) for the seven female offender types that were reliably identified. In the following narratives a Z-score > 0.30 is taken to represent a diagnostic feature admissible as a type-defining characteristic (see Costa *et al.*, 2002).

(Footnote: In these narratives the Z-scores (in parenthesis) were standardized using the totalsample of both boys and girls ($N = 5045$) and can thus indicate whether a specific female type is higher or lower than the male average scores. This z-standardization - across both boys and girls - thus allows this analyses to be sensitive to gender differences, while the pattern discovery analyses (using only girls) identifies female-specific patterns.)

In the following descriptions I first provide the un-interpreted standard score profile for each pattern, followed by a brief theoretical interpretation. This is followed by an

examination of consistency with the prior female taxonomic studies and comment on controversial issues.

(Tables 2,3 and 4 - ABOUT HERE)

Type 1 (156 = 13.3%) Internalizing, isolated and hostile, with Low self-control

Personality: This internalizing and low self-control type is impulsive (.58), manipulative (.69), lacking in empathy, with little remorse for their offences (.65). They exhibit hostility (.86) and tolerate violence as a way to resolve interpersonal problems (.94).

Family and Community: Parenting features are average. The families are relatively stable (-.32), with no clear evidence of poverty, parental crime/drugs or serious violence between parents. However, emotional bonds to parents are poor (.44), rebellion is high (.79) and sexual abuse is close to the overall female average (.35).

Peers and Lifestyle: These internalizing girls avoid organized pro-social activities and tend to be socially isolated (.25), socially anxious or mistrustful (.55). They avoid drugs and show no tendency towards sexual promiscuity.

School: While grades are not problematic (-.20) they appear disruptive at school (.31).

Criminal History: Cross validation against criminal history indicates an early first arrest (13.5), an average number of adjudications but few detentions or felony adjudications (suggesting minor offences).

Theoretical interpretation: Several theoretical constructs co-occur in this type i.e. an internalizing socially withdrawn pattern, low self-control and weak social bonding. Weak bonds are suggested by social anxiety and withdrawal, poor relations with parents, hostility and disrupted relations at school. Their social anxiety may explain the relative avoidance of both structured and unstructured peer activities, which in turn may reduce affiliations to delinquent peers. This may reduce opportunities for anti-social activities and their relatively low scores for both drugs and promiscuity. Their parents may also

constitute an additional protective factor since they appear reasonably competent, caring, stable and non-violent.

Potential replications from the prior taxonomic literature: Possible matches among prior female taxonomic studies include Stefurak and Calhoun's (2006) "depressed interpersonally ambivalent" and Aalsma and Lapsley's (2001) "internalizing" cluster. Both have similar patterns of conflicted peer relations, negative relations with parents and internalizing problems. Widom (1978) describes a "neurotic or secondary psychopath" with a similar combination of social anxiety, depression and low self-control. Among males a neurotic internalizing cluster is reported (Harris and Jones 1999; Warren 1971; and Van Voorhis 1994).

Cluster 2 (107 = 9.1%) Serious delinquency and Low Self-Control: Delinquent Peers, Drugs, Promiscuity and parental abuse

Personality: A pattern of low self-control is indicated by: impulsivity (.63), manipulative dominance (.84), aggression (.69), tolerance of violence (.77), lack of empathy (.29) and low remorse (.72).

Family and Community: Abusive family characteristics appear critical e.g. family disorganization (.55), parental conflict/violence (1.00), poverty (.71), parental crime/drugs (1.01), weak discipline (.99), poor supervision (.87), neglect (.74), and extreme physical (.99) and sexual abuse (1.17). Emotional bonds between parent and child are broken (.56), and these girls are in open rebellion (1.16).

Peers and Lifestyle: These girls strongly affiliate with criminal peers (1.20), follow an unsupervised high-risk lifestyle (1.09) with few pro-social activities (.59), extreme hard drug use (1.8) and promiscuity (.81). They also show an internalizing pattern of social isolation (.85) and anxiety/low trust in social relations (.89) suggesting they receive little emotional comfort from peer relations.

School: This type has low grades (.35), attention problems (.49) and disruptive behavior at school (.57).

Criminal History: The official criminal history coheres with this pattern, showing an early age at first adjudication, the highest total adjudications and felonies and a significantly high detention rate.

Theoretical interpretation: This profile strongly reflects Moffitt's LCP type with multiple risk factors straddling personality, family, community and school; early and serious delinquency and failed socialization. Failed family socialization is reflected by family disorganization, emotional rejection, parental neglect, inadequate discipline, weak supervision; and parents with drug and crime problems who are unlikely to offer positive role models. These co-exist with physical and sexual victimization. Criminal opportunity is reflected by: an unsupervised risky lifestyle, criminal peers, drugs and promiscuity all occurring in high crime neighborhood.

Continuities with prior taxonomic literature: Aside from Moffitt's LCP, several prior taxonomies describe a similar female cluster: Widom's (1978) "primary psychopath"; Stefurak and Calhoun's (2006) "Externalizing Acting out"; Aalsma and Lapsley's (2001) "anti-social externalizing" and Butler and Adams (1966) "Impulsive aggressive" offenders. These all include low self-control, dysfunctional parents, serious delinquency, drugs, promiscuity, abuse and rebellious acting out. A similar male pattern often recurs (Moffitt et al 2001; Mealey's (1995) "primary sociopath"; Alterman et al's (1998) "psychopathic" cluster; Sorenson and Johnson's (1996) "distressed type"); Warren (1971) and Van Voorhis (1994).

Cluster 3 (201 = 17%) Internalizing/Anxious - but with positive parenting and adequate Self and Social controls

Personality: This second internalizing pattern also reflects social withdrawal (.45), anxious mistrust (.59) and hostility (.32) but in a context of adequate self-control (-.57) and remorse (-.73).

Family and Community: Although the parents appear poor (.27) and somewhat unstable (.37) they appear to provide emotional support (-.38), consistent discipline (-

.48) and supervision (-.49) with no indications of extreme physical or sexual abuse (i.e. about average for girls).

Peers and Lifestyle: These socially anxious girls also avoid criminal peers (-.41), unsupervised peer activities (-.60), drugs (-.42) and promiscuity (-.22). They maintain participation in supervised pro-social activities (-.41).

School: They report average grades, few attention problems, few disruptive instances and positive educational goals (-.33).

Criminal History: Although exhibiting an early first adjudication (13.4 years) these girls have relatively few total adjudications, felony adjudications or detentions. This lower delinquency coheres with their low risk scores regarding peers, school, drugs, sexual promiscuity, personality factors and relatively supportive parenting.

Theoretical interpretation: This internalizing profile - like Type 1 - shows social anxiety, social withdrawal and hostility. However, several protective factors differentiate it from type 1 and may explain their relatively low delinquency, drugs and promiscuity. First, these girls have higher self-control (weaker personality propensity) than type 1. Second, they have more positive parenting i.e. emotional relations, parental discipline and supervision all appear higher than average. Thirdly, social controls appear stronger i.e. more positive parent relations, stronger school aspirations, more pro-social activities and more positive school engagements. Fourth - like type 1 - their social withdrawal appears to constrain criminal opportunity since they mostly avoid anti-social peers and unstructured peer activities. Given the relative absence of risk factors in the home, school or peer contexts, it seems that the internalizing pattern (mental health problems?) is the main source of behavioral problems.

Continuities with prior taxonomic literature: An internalizing depressed female type, often with mental health problems, is recurrently identified in prior studies e.g. Stefurak and Calhoun's (2006) "depressed/socially ambivalent" and Aasma and Lapsley's (2001) "internalizing" cluster. Moffitt's more recent empirical work with Raine et al. (2005) reports an internalizing psychologically conflicted cluster. Yet, all these studies are constrained by the small number (K) of sub-types they identify and thus may

be unable to differentiate the full heterogeneity among internalizing female delinquents. The present results suggest at least two variants of a socially withdrawn or internalizing female offender. Among males Lykken's (1995) "neurotic offender" offers a striking match to this pattern with the same pattern of anxiety and social isolation in a context of positive parenting and normal socialization (see also Warren, 1971; Van Voorhis, 1994).

Cluster 4 (230 = 19.6%) Normal Youth: Low Needs and Low Delinquency

Personality: These girls show no evidence of low self-control personality or of internalizing features.

Family and Community: Their families appear stable, competent and caring, with no suggestions of poverty.

School: Educational scales are all positive.

Peers and Lifestyle: They have relatively pro-social peers, a low risk lifestyle and some pro-social activities. They mostly avoid drugs and promiscuity.

Criminal History: The official criminal history is highly consistent with this profile showing significantly lower total adjudications and detentions and a relatively later age of onset. However, one anomaly was that their "average" score for felony adjudications suggests that some of these youth have committed a serious felony offence. This reflects an inconsistency between this very low risk profile and a serious felony offence (for perhaps some of these youth).

Theoretical interpretation: This low risk cluster has almost no high risk factors and appears to reflect normal positive youth development. Their official record generally supports the cluster's validity by confirming a significantly lower criminal involvement and later onset than other types. Thus this profile offers no systematic theoretical explanation or reason for any involvement in criminal justice. It may represent Lykken's concept of a normal "accidental or situational" explanation of offending.

Continuities with prior taxonomic research: This low risk "normal" female cluster has been repeatedly identified in the prior taxonomic literature e.g. the "well adjusted" female offender (Aalsma and Lapsley (2001); "normal female criminals" (Widom (1978)

and “pro-social anxious” of Stefurak and Calhoun (2006). Moffitt (1993) does not report this type, however, such youth are likely to be hidden (submerged) within Moffitt’s AL category. A similar male pattern is described with broadly normal temperament, reasonably good socialization and competent parents (Lykken 1995 Simourd et al. (1994); Harris and Jones (1999). However, our results indicating that some members of this apparently benign cluster may have prior felonies or a serious violent offence is clearly also replicated in the prior literature: e.g. Widom’s (1978) low risk “normal criminals” are described as having no obvious pathology but who score highly on her Lie test. She suggested they were faking good or in denial. This is similar to the “covert manipulators” of Butler and Adams 1966). Additionally, Harris and Jones (1999) describe a “low risk/normal” cluster they view as perplexing since it lacked any clear explanation for delinquent offences. The emergence of this anomaly in the present study and suggests that, aside from situational factors, some of these girls may lying, in denial or underreporting their risks.

Cluster 5 (153 = 13%) Socially marginalized and sexually abused with a hostile internalizing pattern (Mental Health?)

Personality: Low self-control is partially present in this type since moderate scores for empathy and remorse tend to balance their above average impulsivity .51, manipulation .38 and hostility .51.

Family and Community: Highly abusive parents and social deprivation are shown by the highest sexual (1.55) and physical abuse (1.35), extreme neglect (1.23), ineffective supervision and discipline, emotional rejection (.85) and family conflict/violence (.86). These families are disorganized (.84), poor (.74), live in high crime areas and exhibit parental crime/drugs (.68). These girls are openly rebellious.

Peers and Lifestyle: They exhibit a strong internalizing pattern of social isolation (.60) and extreme social anxiety/mistrust (.90). In contrast to the two other internalizing groups, this female type shows above average criminal associates (.35) and promiscuity (.55), but avoid serious drug use.

School: The school profile is about average.

Criminal History: Criminal history shows an early first adjudication, somewhat above average adjudications and the highest rate for secure detention.

Theoretical Interpretation: This female type illustrates a complex interaction of several explanatory themes: social deprivation and ineffective socialization, sexual abuse and victimization and an internalizing pattern of withdrawal and social anxiety (perhaps with other mental health issues). Control theory is illustrated in impaired social control bonds and elements of impulsive low self-control. The pattern also illustrates the impaired socialization and ineffective parenting that underlie the sociopathy arguments of Lykken 1995 and Mealey 1995; as well as arguments on the impact of sexual victimization and family oppression offered by Belnap (2006).

Continuities with prior taxonomic research: This pattern has only partial matches in prior female research. Stefurak and Calhoun's (2006) "depressed/internally ambivalent" type is again generally similar in terms of depression, anxiety, family abuse and victimization. Felice and Offord (1972) describe a type characterized by social deprivation, dysfunctional abusive families and psychological damage as key explanatory features, but omit personality factors. Widom's (1978) "secondary psychopath" also reflects anxiety, depression and hostility coupled to low self-control, but make no mention of social deprivation or sexual abuse. Again, the problem with all of these above studies is that they allowed their analyses to identify only 3 or 4 type patterns and may fail to differentiate the full heterogeneity of the present sub-types. Among males, Lykken's (1995) "secondary psychopath" has an almost identical profile of low self-control, social introversion/anxiety and hostile aggression in the context of extremely negative parenting and abuse. This type is unidentified in Moffitt's taxonomy.

Cluster 6 (173 = 14.7%) Abused but Resilient: Low Delinquency and Later Onset

Personality: This type has no tendencies toward low self-control or tolerating violence to resolve interpersonal problems (-.64).

Family and Community: Family abuse is very serious: emotional rejection (.82), ineffective discipline (.78), extreme neglect (.93) and physical (.56) and sexual abuse (.87) with high conflict and violence between parents (.67).

Peers and Lifestyle: These girls report a low risk lifestyle, avoiding antisocial peers (-.46), unstructured or high-risk peer activities (-.45) and maintaining average engagement in pro-social activities. They show no tendency to social isolation or negative social cognitions. Promiscuity is about average.

School: All school factors are average or better than the overall mean.

Criminal History: Since these girls mostly avoid antisocial peers, unsupervised peer activities and drugs and cope reasonably in school, one may expect low delinquency. Their official criminal history is consistent with these factors indicating the fewest adjudications and a later age at first adjudication.

Theoretical Interpretation: The key explanatory factors in this pattern include: parental rejection, physical and sexual abuse and family conflict. Yet, these girls appear resilient - as suggested by relative school success, avoidance of criminal peers, drugs and high-risk situations; fairly late onset of delinquency and low official delinquency. Their personality pattern (few low self-control or internalizing tendencies) may partially explain this resiliency. However, this simply displaces the explanatory question to the sources of their personality and social orientations. A second explanation is that the relative absence of poverty, parental crime/drugs or high crime neighborhood (in contrast to clusters 2 and 5) may simply reflect middle class families that may provide sufficient social resources and protective socialization to partially mitigate the effects of the abuse. Finally, the existence of this pattern is counter to Gottfredson and Hirschi's (1990) theoretical claim that poor parenting "generally" leads to low self-control. Clearly, while these parents are dysfunctional and abusive, these girls do not exhibit low self-control. The obvious implication is that the "general theory of crime" is not as general as these theorists claim. On the other hand cluster 2 clearly does support the link from poor parenting to low self-control.

Continuities with prior taxonomic research: This resilient pattern is not identified in prior taxonomic studies of female offenders. However, it clearly supports the association of sexual abuse and delinquency (Belnap 2006, Chesney-Lind & Rodriguez, 1983; Gaarder & Belknap, 2003). However, the presence of three distinct patterns of sexually abused girls (see also clusters 2 and 5) underscores the heterogeneity of this link. These three distinct type patterns - all sexually abused at high rates - have not been unraveled or identified in prior studies. This may stem from the fact that most prior studies omit adequate measures of family and coping factors and so could not clearly identify these distinctions. The present type likely is hidden within Moffitt's broad AL category because of their relatively minor delinquency and late onset.

Cluster 7 (155 = 13.2%) Drugs, Sex and Peers: Impulsive Hedonists

Personality: These girls are impulsive (.54) and somewhat manipulative (.25), yet their high empathy (-.41) and other personality scores do not suggest the full set of low self-control features.

Family and Community: Their families show less poverty (-.55) and live in safer neighborhoods (-.58) than most clusters. They show no tendencies toward neglect, poor supervision, weak discipline, physical abuse, parental conflict/violence or extreme parental rejection. Yet, these girls are rebellious (.66). Like clusters 1 and 3 their sexual abuse score (.55) is about average for girls.

School: The school profile indicates average scores.

Peers and Lifestyle: A defining pattern includes their attraction to antisocial peers (.80), a hedonistic risky unsupervised lifestyle (.92), serious drug use (.95) and sexual promiscuity (.64). They show little social isolation or social anxiety.

Criminal History: Official criminal records indicate a relatively late onset at first adjudication. While adjudication and felony rates are about average, the justice system deals harshly with these girls as indicated by relatively high detention rates.

Theoretical interpretation: Moffitt's mimic AL explanation seems to fit this type with a strong attraction to anti-social peers, a high opportunity impulsive hedonistic lifestyle and high scores for drugs and promiscuity. Their impulsive manipulative

personality, social confidence, hedonism and rebellion may explain the conflict with their mostly middle class parents. Parenting style does not appear explanatory, since these families appear stable and reasonably affluent, with consistent discipline and supervision and few indications of physical abuse. This cluster scores slightly above average for sexual abuse – but at rates far less than the highly abused clusters 2,5 and 6.

Continuities with prior taxonomic research: This cluster matches Moffitt's (1993) mimic AL type in their attraction to anti-social peers and offences involving drugs, sex and rebellious autonomy. Widom's (1978) "normal offender" type is also described as non-pathological with affiliations to a criminal or delinquent sub-culture. This type exhibits a danger - predicted by Moffitt - that their risky behaviors (e.g. drugs, sexual behavior) may act as "snares" to potentially limit their social development and extend their criminal careers. Among males Lykken (1995) describes an almost identical type within his "dysocial sociopath" as bored middle class and psychologically "normal" offenders engaged in a rebellious search for meaning and excitement often involving drugs and sex (see also the "average normal" type of Harris and Jones 1999).

6. Discussion

In this section I address the main goals set out as key themes for this chapter.

The first goal was to investigate whether reliable and distinct explanatory types exist among delinquent girls. This requires estimating the strength of typological structure in this analysis. The debate over the "reality" of delinquent types rarely discusses the structural aspects of taxonomic findings (Bryant, 2000; Rosch, 1978). Most prior typological studies typically focus only on theoretical and substantive discussions. This omission escalates the dangers of reification of unreliable findings (Osgood 2005) and suggests that participants in this debate may have quite different ideas on what constitutes a "distinct" type, what structural criteria to use, or how they would even recognize a type

if they saw one. A broad conclusion is that the present results support a substantial typological structure among female delinquents - although certain qualifications are required.

1. Recurrent and stable core prototype patterns of female offenders

The stability and replication of these seven patterns is suggested by their repeated discovery across different mathematical pattern seeking methods and different score transformations. The range of Kappa coefficients between solutions (around 0.70) suggest that the various methods all converge on similar prototypes. Secondly, the similarity of narrative interpretations of the different prototypes across different analyses was striking. The z-score patterns (which determine the explanatory narratives) remained largely similar before and after the removal of hybrid and peripheral cases, underscoring the stability of the identified central prototypes.

2. Unstable or fuzzy boundaries: Hybrids and Outlier cases

However, the claim of “distinct types” is challenged by finding that only about 61.5% % of these female delinquents were identified as “core cases” that were reliably classified by different methods into only one of the seven patterns. Kappa coefficients (around 0.70) while indicating cluster stability also indicate that cluster boundaries were not identical across analyses. A finding of fuzzy boundaries with some “unclassifiable cases” implies we cannot yet claim these seven types are clearly “discrete”. This fairly large “unclassified” group and the kappa values both suggest fuzzy or unstable boundaries. These finding of stable replication and narrative interpretations, but fuzzy boundaries - recalls an argument by Brewer (1993) that natural classes are defined not by boundary lines, but by their central cases; not by what is excluded, but by what is most strongly included. Rosch (1978) similarly argued that the “core meanings” of natural categories are shown by the central exemplars or core cases, while acknowledging these may be surrounded by cases of decreasing similarity. This structure of stable cores, fuzzy boundaries and some inconsistently classified cases are no surprise. Lykken (1995) suggested that given the complexity of criminal behavior, even an ideal criminal

taxonomy may only offer fuzzy overlapping types with a proportion of offenders having mixed etiologies and located at the borderlines between types.

These structural findings imply a “family resemblance” form of categories; also known as Roschian or polythetic categories (Bryant, 2000; Rosch, 1978). This approach argues that natural categories have dense cores of mutually similar exemplar cases and less typical cases extending probabilistically toward poorly fitting cases at the boundaries. This approach also does not assume fixed necessary and sufficient features, discrete boundaries or complete internal homogeneity of category members. It may be contrasted to the classical Aristotelian categories that demand fixed necessary and sufficient features, discrete boundaries and complete internal homogeneity (Brewer, 1993).

Finally, the stability of these patterns implies that the data on these female delinquents has several stable dense modes or “clumps” that are reliably identified, with most females consistently assigned to one of seven prototypical patterns. Each pattern - with the exception of Type 4 - has an understandable narrative that coherently links their risk factor patterns to delinquency in a manner consistent with several current delinquency theories.

3. How many types are there? Hierarchical structure: Broad versus fine-grained sub-classes

The next goal is to examine “how many patterns” are needed to match the heterogeneity of female offenders. This required examining the vertical structure of the taxonomy and whether an optimal or “basic level” exists (Rosch 1978, 1999). The “basic level” of any taxonomy is the level that captures the most useful distinctions in the fewest categories. In prior studies, Moffitt (1993) suggested only two broad types. Warren (1971) proposed three broad types with multiple sub-types nested within these. Lykken (1995) proposed four global “genera” (sociopathic, psychopathic, neurotic and normal) with numerous fine-grained sub-types nested within them. The various female taxonomic studies reviewed earlier limited their search to between 3 and 4 broad categories.

The present study suggests a hierarchy of 5 broad categories with 7 finer grained subordinate types (Figure 1). While the 5-category level may be selected on grounds of parsimony, the 7-category level is preferred because of its more precise descriptive patterns, stable replications and clear links to prior female taxonomies. However, this choice is tentative given the unresolved methodological problems in choosing a basic level (Milligan and Cooper, 1985; Raftery and Nema, 2004).

4. Matching the present types to prior female taxonomies: Replications, extensions and “Damn Strange Coincidences”

The goal of linking these types to the prior literature was difficult. The earlier matching is tentative for several reasons. Some prior studies provide only sparse type descriptions and few classification factors (e.g. personality, social factors, etc). Some limit the number of types they identify and thus do not allow the full heterogeneity to emerge. Thus, it is perhaps unreasonable to expect strong confirmatory matching across studies that use different measures and theories, different samples, diverse classification methods and that lack explicit procedures for type identification.

However, given the present results it is hard to resist invoking one of Paul Meehl’s (1990) arguments for building trust in a proposed taxonomic or theoretical conjecture when certain findings occur. He refers to Salmon’s (1984) criterion of a “damn strange coincidence” when considering the possible corroboration of a scientific conjectures or theory. Essentially if - in the absence of theory - a converging result is found, and if it passes several “stiff tests” of falsification this may build confidence that it is not just a strange coincidence but there is truly “something there” (Meehl 1990). Given the recurrent convergence of different methods on similar prototypical structures - when there were strong opportunities for different results to occur (given the multidimensionality of this data) - we seem to be facing a “damn strange coincidence”. The coincidences become stronger given the close analogues between the present results and some prior “common” offender types identified by Van Voorhis (1995) and in other recent taxonomic studies.

The following potential potentially corroborating findings are noted:

1) Normal or situational offenders: Cluster 4 clearly represents this prototype with few risk factors and minor delinquency. Another coincidence is the presence of a "subset" of girls who may be lying or "faking good". This fascinating and unexpected replication emerges in at least three prior studies.

2) Adolescent Limited: Cluster 7 reflects this prototype with mostly middle class teenage rebellion, a social learning or "mimic" approach and mainly non-violent delinquency.

3) Chronic/Serious – Moffitt's LCP or a psychopathic type?: Cluster 2 is a good match to this prototype with low self control, multiple risk factors in home, school, and community settings and serious habitual official delinquency.

4) Socially marginalized, abused and sub-cultural offenders: This prototype from the prior literature appears matched to Cluster 5 in reflecting socially deprived youth, criminal peers, poverty, high crime areas and abusive criminal parents.

5) Internalizing /depressed/neurotic female offenders: Clusters 1 and 3 offer two variants of this internalizing prototype. Their consistent replication suggests legitimate distinctions that may be sharpened in future research.

6) Sexually abused female offenders: Three seriously sexually abused types were identified (Clusters 2,5 and 6). Clusters 2 and 5 exhibit more serious delinquency, multiple risk factors and extreme deprivation. Cluster 6 appears more resilient, less socially deprived with only minor delinquency and later onset.

5. Implications for theory

A major goal was to assess whether these taxonomic findings have any theoretical relevance for female delinquency? The following comments may be pertinent:

The need for analytical categories for female delinquents: Taxonomic research - in any field of science - aims to produce analytical categories that reflect some natural classes or coherent process. These categories may become starting points for more precise explanatory or theoretical questions to clarify, define or explicate the explanatory structure underlying the category (Bryant 2000, Thagard 1992). Recently, Belnap (2006)

argues that criminology has not yet established appropriate analytical categories for delinquency explanations of either boys or girls. Explanations - in virtually any discipline - must start with specification of some relatively homogeneous classes of events or structures to be explained. Belnap implies that much theorizing in delinquency is premature since the preliminary taxonomic work of establishing basic categories of delinquency has been neglected. More than two decades ago Cernkovich and Giordano (1979) similarly complained about criminological theorists rushing into print with causal models of delinquency before knowing what it is they are explaining. Yet the anti-taxonomic paradigm discussed earlier has continued to ignore basic taxonomic work and has consistently emphasized the search for global theory. The present study addresses this deficit by tackling two early phases of taxonomic research i.e. discovery (identification) and description of basic delinquency categories. Future research will determine whether any of these seven female categories have sufficient replicability, internal coherence and causal homogeneity to offer “starting points” to meet Belnap’s plea for more precise analytical categories to support theorizing about both female and male delinquency.

How do classic theories combine? Complexity and Co-occurring risk factors:
Another theoretical challenge is how the main causal theories of delinquency (e.g. social control, strain, social learning, routine activities, etc) are combined. Do they act independently or in specific structured combinations (Messner et al 1989). The present taxonomy suggests that certain combinations tend to occur. These specific combinations are illustrated by the co-occurring patterns of risk factors of each prototype. This existence of “complex mixtures” of theoretical processes has been recognized in recent work (Thornberry 2005; Farrington 2003). Similarly, Nagin and Paternoster (2000), in discussing theories of population heterogeneity and state dependence, also imply that different causal processes can interact to produce complex causal patterns.

The present taxonomy illustrates seven specific mixtures of theoretical components. For example, cluster 2 clearly exemplifies Gottfredson and Hirschi’s “General Theory of Crime” in its pattern of dysfunctional parenting, weak socialization, low self-control, high opportunity and weak social control bonds. However, this theory is

only one component of a more complex explanatory process that also includes sexual victimization, social deprivation and a social learning component. Similarly, the internalizing patterns (clusters 1 and 3) and rebellious middle class hedonistic girls (cluster 7) offer sufficiently diverse causal structures that they may reflect the “structural heterogeneity” alluded to by Lykken (1995). However, further theoretical refinement of these seven categories is needed to further close the gap between theory and data (Osgood 2005).

6. Implications of this taxonomy for treatment and case management

What are the practical implications of this explanatory taxonomy of female offenders? A simple maxim is that to fix something, it helps first to understand what has gone wrong. This taxonomy may help in this task by unraveling these diverse processes. Most current offender assessments in criminology and corrections, with their limited coverage of explanatory factors and oversimplified fixation on some global theory mostly lack the necessary explanatory depth to guide practical decision-making (Harris and Jones 1999). The present taxonomy, by incorporating broader range of criminological theories appears to have identified most of the commonly recurring offender types (Van Voorhis 1994). Thus, it should offer decision makers a more complete mapping of the causal complexity underlying delinquency. The following practical issues may be noted:

Case conceptualization to support decision-making: Throughout criminal justice decision-making caseworkers must often reach a basic understanding or “case conceptualization” of each youth before reaching intervention conclusions (Meier 2003). The growing literature on “case conceptualization” stresses this need to reach an understanding of each case prior to either selecting or justifying interventions. This cognitive task typically requires the integration of disparate data elements and risk factors into a coherent case formulation or conceptualization (i.e. connecting the dots). These integrative formulations are critical in guiding and justifying placement, sentencing or treatment decisions (Meier 2003).

Traditionally, risk assessments and treatment-relevant classifications have provided the foundation for both case formulation and matching to specific interventions

(Warren 1971; Megargee and Bohn 1980; Palmer 1993, Harris and Jones 1999, and others). Unfortunately, the deficiencies of most prior classifications undermined their effectiveness (e.g. weak explanatory power, unreliable assignment procedures, poor predictive validity, etc) so that the promise of classification was rarely fulfilled (Van Voorhis 1994). Given the relative prevailing inattention to female classification the hope of this study is to strengthen the explanatory power and practical utility of female offender classification so that it comes closer to fulfilling its promise of supporting correctional decision makers.

Differential responsivity and classification: The fact that different offender types may respond differently to various treatments has been labeled as “responsivity”. This problem highlights the need to correctly match offenders to appropriate treatments. From a treatment perspective each of the seven female prototype categories may be linked to an appropriate “default” treatment plan. These default plans could then be individualized to take account of the more unique risk/need patterns of each individual female offender. This two-stage individualizing process reflects the way most diagnostic systems are now used in mental health and in psychotherapy (Meier 2003) .

The specific responsivity concept also emphasizes the need to understand how different kinds of offenders interact with various treatment interventions. Andrews et al (2006) view research on responsivity as a critical high-priority area. However, addressing responsivity obviously depends on being able to correctly and reliably differentiate homogeneous “types” of offenders. Identifying gender-specific interventions will thus also depend on developing a valid taxonomy of kinds of female offenders.

Responsivity and the need for matching of offenders to treatments are also critical in the “what works” philosophy and the various Risk-Needs-Responsivity (RNR) principles of Andrews et al 2006). Andrews and colleagues also acknowledge that specific responsivity and differential matching is the least explored of all the RNR principles. Evidence based practice (EBP) research is also undermined - especially for female offenders - by the continuing absence of an effective female explanatory offender taxonomy. Such evaluation studies require appropriate and homogeneous target populations (experimental and control groups) to guide differential assignment of

offenders to programs in EBP studies. The prevailing random allocation of mixtures of offender types to any treatment program may simply create a situation where the program being evaluated works with some types but not others. Unless these unknown mixtures of offenders are unraveled any evaluative statement will be a hodge-podge of effects, while the critical type-by-treatments interactions remain hidden – so that the evaluation findings are meaningless. The basic question is not "what works?" but “what works, for what specific kinds of offender? under what conditions?”

In conclusion, we are only at early stages in developing a female offender taxonomy that has sufficient explanatory power to guide correctional decisions. The present work clearly has some limitations and much further development work is being conducted. Additional replication studies using different samples are in progress. Further explication of the explanatory structures implicit within each type may clarify differential treatment implications. The proportion of “poorly classified” and hybrid cases is also a challenge. Improved pattern seeking and classifier techniques may provide crisper boundary conditions to allow more cases to be accurately classified. However, this effort may simply confront the intrinsic complexity of female offending so that Lykken’s (1995) suggestion may hold true i.e. that even an ideal taxonomy of offenders may contain only “fuzzy” clusters with many hybrid or outlying cases. Finally, to help practitioners and other researchers utilize this female delinquent taxonomy a computer program has been written that assigns each new female delinquent to their “best fitting” class.

Appendix 1 – Classification factors and Psychometric scales in Youth COMPAS

The following section briefly describes the Youth COMPAS domains and scales. Factor loadings are provided, where appropriate, in parenthesis to indicate defining items of each scale.

Criminal history: The Youth COMPAS has criminal history and current offense fields that are completed by agency staff using official delinquency records. These fields cover arrest, adjudication, detention, probation and noncompliance histories, including levels of offense seriousness.

Peer relations and lifestyle: This domain consists of seven scales. *Antisocial opportunity* (unstructured high risk lifestyle) is based on Osgood *et al.* (1996). It assesses time spent by youth in unstructured and unsupervised activities. *Prosocial engagement* (Osgood *et al.*, 1996) assesses participation in activities such as church, sports, music/hobbies, reading and study. The *antisocial peers* scale is defined by items such as friends use drugs (.75), friends arrested (.70), and friends dropped out (.65). *Social isolation* is adapted from the short form of the UCLA loneliness scale (Russell, 1996) and defines items including has trouble making friends (.77) and has no close friends (.62). *Substance abuse* has three factors: conventional drugs, hard or illegal drugs and vulnerability/loss of judgment when using drugs. The *soft (conventional) drugs* scale is defined mainly by alcohol use (.81) and marijuana use (.78). The *hard drugs* scale includes has used cocaine (.72), has used heroin (.62) and has injected (.48). The final scale of *substance abuse trouble*, which assesses the vulnerability of some youth to a loss of judgment when high or drunk, is based on Elliot *et al.* (1985) and Giordano and Cernkovich (1987). The *sexual promiscuity* scale primarily focuses on frequency of intercourse (.78) and number of partners (.68).

Personality: This domain contains four scales. *Impulsivity*, derived from Eysenck and Eysenck (1978), is mainly defined by taking risks (.64), making quick decisions (.76) and being perceived as reckless (.73). *Manipulative-dominance* addresses glib, verbally facile features and a tendency to lie and manipulate others. Defining items include good at talking one's way out of trouble (.67), can easily lie and get away with things (.73) and can dominate/threaten others (.55). The *empathy* scale is adapted from Eysenck and Eysenck (1978) and Bandura *et al.* (1996). The dominant item is feeling sad when seeing other people cry. *Aggression-anger*, adapted from the hostility instrument of Buss and Perry (1992), includes items such as has a quick temper (.79), has a history of fights (.66) and stays calm in arguments (.53).

Attitudes and cognitions: This domain has three scales. The *tolerance of violence* scale is based on the Normative Beliefs About Aggression scale (Huesmann *et al.*, 1992). The *lack of remorse* scale assesses distress or regret for crimes and includes items such as blames others/situation (.72) and does not express regret (.63). *Negative social cognitions* is also adapted from the Normative Beliefs About Aggression scale by

Huesmann *et al.* (1992) and assesses a tendency toward negative interpretation of social signals (Dodge *et al.*, 1986). Defining items include kids put you down (.78) and few kids can be trusted (.63).

Education and school: This domain contains four scales. *Academic failure/success* is primarily defined by usual grades (.79), number of classes failed (.80) and number of grades repeated (.57). *Attention problems/hyperactivity* is defined by trouble paying attention (.85) and easily bored (.71). *Educational aspirations* (Hawkins *et al.*, 1998) is mainly defined by intends to graduate (.72) and views education as important for future success (.81). *School behavior* includes items such as suspensions (.72), argues/fights with students (.67) and has conflicts with teachers (.74).

Family and neighborhood: This domain consists of 12 scales. *Family discontinuity* assesses disruption of the family unit. Defining items include had multiple caretakers (.64), was separated from natural parent (.61) and has history of multiple placements (.72). *Social class/poverty* is defined by social assistance/subsidized housing (.68), parent have unstable/low wage employment (.81) and have difficulty paying bills (.87).

Family criminality is a 16-item scale that measures mother, father and siblings' history of drugs, crime and mental health. Key items include mother ever arrested (.62), father ever jailed (.60) and sibling drug use (.51). The *criminal neighborhood* scale is primarily defined by friends or family assaulted (.73), drug sales in neighborhood (.84) and fights/gunfire (.87). *Parental conflict/domestic violence* have been linked to delinquency and aggression (Giordano and Cernkovich, 1987; Borum, 2000). This scale is primarily defined by parents threaten each other (.84), parents yell/fight (.78) and parents attack each other (.82).

Parental supervision and *parental discipline* are two separate parenting dimensions. Inconsistent discipline is defined by absence of clear rules (.72), perceived fairness (.72) and providing reasons for punishments (.75). Inadequate supervision is defined by parents check when youth returns home (.84), parents check on youth's friends (.65) and parents monitor youth's activities (.85).

Emotional bonding assesses closeness and support between youth and family members. Defining items include feels close to mother (.73), close to father (.51) and feels close to sibling (.70). *Parental neglect* is mainly defined by youth feels neglected (.80), parents show no interest (.71) and parents rarely talk to youth (.79). The *physical abuse* scale is mainly defined by youth is scared of being hurt (.86), parents violent when high/drunk (.78) and youth removed from home because of abuse (.73). The *sexual abuse* scale is defined by sexually abused by family member (.81) and removed from home because of sexual abuse (.74). The *youth rebellion* scale focuses on rebellious, aggressive and oppositional-defiant behavior. Defining items include intimidates parent/caretakers (.65) and openly defies parents/caretakers (.82).

Appendix 2 – Statistical Procedures

The following provides some of the specific analytical details of the pattern recognition procedures used in this research.

Preliminary Transformations: Two sets of input data were created using raw scale scores and Z-transformed scores on all 32 scales. This allows a comparison of pairs of typological solutions for these two input approaches across all methods (Milligan, 1996).

Preliminary Estimation of the Number of Types (K): Using a two-stage clustering, we conducted preliminary analyses on several random samples of $N = 300$ using Ward's hierarchical clustering. These used all 32 scales as inputs to examine the overall taxonomic hierarchical structure. In these analyses Ward's error graph had noticeable upward breaks at levels $K=7$ and $K = 5$, suggesting a nested hierarchy of types. For all further analyses we focus only on these two hierarchical levels.

Standard K-Means Analyses: We applied standard K-means to the total sample ($N = 1175$) at both $K = 5$ and 7 , using raw and then Z-transforms for all scales. We then used two additional pattern-seeking methods to address two weaknesses of standard K-means: a vulnerability to outliers and a tendency to impose “shape” constraints on clusters.

Bagged K-Means Analyses: Using the K-means implementation of bagging in R (R Development Core Team, 2004), we produced 1000 replicated classification models from random bootstrap replication samples of the training set – using bootstrap sampling with replacement from the entire dataset ($N = 1175$) following Breiman (1996) and Dolnicar and Leisch (2000). In these analyses no outliers were removed. The resulting cluster profiles were then re-clustered with a final K-means. This sequence was repeated at $K = 5$ and 7 , with and without Z transforms of the scales, producing a total of four typological solutions.

Semi-Supervised Clustering: A further check on cross method, used a semi-supervised pattern-seeking method on the total sample of 1175 cases – again with no outliers removed. Descriptions of this method are found in Zhou *et al.* (2004). We used the final centers from our bagged K-means as initial seed points to create pairs of solutions at the 5 and 7 levels. The advantage of this method is its sensitivity to the intrinsic natural “shape” of clusters or types. It places less constraint on pattern shape than K-means, so it may more accurately detect natural clusters.

Internal Validation – Comparing classifications across verifications: Ideally, the discovered patterns should replicate irrespective of method and scale transformations. To compare typologies from the different analyses and examine cross-method verification, we assess the Kappa Coefficient and Contingency Coefficients. Having multiple solutions allows cases that “consistently match” across clusters to be identified. These may be viewed as the core or prototypical cases of each pattern,

while non-matching less consistent cases may be seen as poor exemplars, hybrid cases or located at the boundaries of clusters.

External Validation: External validation was examined using a series of one-way ANOVAS between the final typology and several independent criminal history variables excluded from the pattern discovery phase of these analyses.

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Table 1: Mean and Standard Deviations for all classification factors and Cronbach's Alpha reliability coefficients for Girls and Boys. (N = 5041)

Scale	# Items	Girls Mean	Girls SD	Boys Mean	Boys SD	Alpha (Girls)	Alpha (Boys)
Criminal Associates	6	1.98	.76	1.98	.76	0.85	0.86
Criminal Opportunity	6	2.16	.65	2.17	.62	0.78	0.78
Low Pro-social	5	3.15	.64	3.11	.65	0.79	0.78
Impulsivity	5	3.62	1.03	3.54	1.04	0.80	0.79
Low Empathy	4	2.18	1.10	2.58	1.13	0.65	0.63
Low Remorse	5	2.31	1.01	2.36	1.00	0.75	0.76
Manipulative	5	3.16	1.01	3.09	1.00	0.70	0.73
Aggression	5	3.52	1.00	3.35	1.03	0.77	0.75
Violence Tolerance	5	2.80	1.20	2.80	1.17	0.85	0.84
Social Isolation	5	2.30	1.09	2.10	1.01	0.84	0.84
Negative Cognitions	5	3.04	1.13	2.67	1.05	0.79	0.77
Common Drugs	3	2.24	1.04	2.26	1.00	0.73	0.69
Hard Drugs	7	1.14	.33	1.09	.26	0.71	0.68
Substance Trouble	4	2.15	1.29	2.15	1.28	0.89	0.88
Promiscuity	6	2.60	.84	2.45	.80	0.67	0.66
Academic Failure	3	2.83	1.08	3.06	1.07	0.51	0.48
Low Goals	4	1.71	.95	1.93	1.11	0.84	0.84
Attention Problems	4	2.97	1.19	3.16	1.19	0.81	0.81
School Behavior	5	3.11	.97	3.27	.97	0.57	0.56
Family Discontinuity	5	3.28	1.13	3.08	1.18	0.62	0.62
Socioeconomic	4	2.73	1.27	2.70	1.27	0.87	0.88
Family Crime Drugs	15	2.43	.94	2.28	.92	0.82	0.82
Emotional Bonds	4	2.03	.61	1.84	.59	0.70	0.70
Inconsistent Discipline	4	2.43	1.14	2.23	1.07	0.87	0.91
Poor Supervision	5	2.23	1.04	2.20	1.02	0.88	0.87
Neglect	4	2.32	1.10	2.04	.99	0.80	0.81
Physical Abuse	4	2.16	1.22	1.79	1.00	0.83	0.84
Sexual Abuse	4	2.12	1.23	1.36	.69	0.82	0.91
Parental Conflict	4	2.62	1.32	2.27	1.23	0.92	0.92
Neighborhood	5	2.24	1.22	2.53	1.30	0.88	0.89
Emotional Support	4	2.44	.99	2.12	.92	0.71	0.74
Youth Rebellion	5	3.10	1.05	2.58	1.00	0.76	0.76

Table 2 Mean z-score profiles for seven female delinquency clusters – Family Characteristics

Scale	Cluster						
	1	2	3	4	5	6	7
Family Discontinuity	-.321	.549	.374	-.405	.843	.220	-.044
Low SES	-.246	.713	.265	-.550	.738	.185	-.551
Family Crime Drugs Psych	-.278	1.077	.269	-.386	.679	.094	-.033
Low Emotional Bonds	.445	.557	-.380	-.193	.853	.645	.194
Inconsistent Discipline	.191	.988	-.478	-.599	.994	.777	-.132
Poor Supervision	.049	.867	-.489	-.685	.851	.290	-.013
Neglect	.038	.737	-.075	-.589	1.229	.925	-.232
Physical Abuse	.165	.990	.073	-.507	1.347	.563	-.115
Sexual Abuse	.350	1.167	.574	-.047	1.546	.871	.552
Parental Conflict	-.251	1.009	.148	-.433	.858	.667	.027
Low Emotional Support	.153	.879	-.140	-.566	1.282	.823	.043
Youth Rebellion	.785	1.156	.031	-.423	1.002	.258	.655

Table 3 Mean z-score profiles for seven female delinquency clusters – Personality factors

Scale	Cluster						
	1	2	3	4	5	6	7
Impulsivity	.581	.632	.145	-.771	.514	-.583	.540
Low Empathy	.536	.293	-.572	-.712	-.076	-.498	-.407
Low Remorse	.655	.726	-.373	-.554	.189	-.148	-.140
Manipulative	.689	.839	.021	-.602	.378	-.584	.249
Aggressive	.862	.698	.325	-.664	.507	-.298	.004
Violence Tolerance	.935	.765	.189	-.790	.365	-.635	-.197
Social Isolation	.249	.848	.451	-.459	.597	.061	-.229
Negative Cognitions	.547	.893	.589	-.533	.902	.102	-.150
School Attention Problems	.221	.498	.009	-.641	.015	-.452	-.051

Table 4 Mean z-score profiles for seven female delinquency clusters – Peers relations and Educational factors

Scale	Cluster						
	1	2	3	4	5	6	7
Criminal Associates	-.087	1.197	-.414	-.558	.353	-.463	.798
Criminal Opportunity	-.007	1.087	-.599	-.306	-.059	-.445	.924
Low Prosocial Activities	.300	.589	-.408	-.177	.196	.035	.240
Common Drug Use	-.371	1.463	-.417	-.480	-.138	-.337	1.005
Hard Drug Use	-.211	1.811	-.252	-.182	-.127	-.097	.946
Substance Use Trouble	-.326	1.477	-.472	-.475	-.004	-.325	.969
Promiscuity	.047	.808	-.222	-.402	.554	.139	.635
Academic Failure	-.197	.346	-.172	-.524	-.078	-.173	-.007
Low Goals Aspirations	.016	.178	-.331	-.402	.068	-.203	-.127
School Behavior	.311	.569	.106	-.818	.141	-.632	-.054
Unsafe Neighborhood	.074	.158	-.067	-.721	.631	-.309	-.583

Figure (1) Hierarchical taxonomy of female delinquent explanatory patterns
 (Bootstrapped Aggregation Solutions with Z scores)

