

Criminal Specialization Revisited: A Simultaneous Quantile Regression Approach

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Abstract Whether criminals are specialized or versatile in their offending is a long-standing research area that has been recently revitalized by a paradigm that recognizes that both specialization and versatility characterize offending careers. Based on data from an enriched sample of 500 adult habitual criminals, the current study introduces a measure of relative specialization—the offense specialization coefficient—and a novel analytical technique called simultaneous quantile regression to further the study of

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specialization. Although offenders committed a mix of offenses, there was considerable and at times pronounced evidence of specialization. Age, sex, and arrest onset had differential predictive validity of specialization for eight crimes at the 75th and 95th quantiles. Implications and suggestions for future research are offered.

Keywords Specialization · Versatility · Criminal careers · Career criminal · Typologies

Introduction

Whether criminal offenders are versatile or specialized in their offending behavior is a perennial issue in criminology and one with important theoretical and public policy implications (Blumstein et al. 1988a; Gibbons 1975; Greenwood and Turner 1987; Hanson and Harris 2000; Piper 1985; Veneziano and Veneziano 2002; Wolfgang et al. 1972). To the degree that offenders are versatile—where their antisocial behaviors occur across contexts and across offense types (e.g., violent, property, drug, etc.)—theory and research should aim to develop general perspectives which devise a construct or set of constructs that predict generalized criminal behavior. From this perspective, antisocial behavior and antisociality itself are syndromic (DeLisi 2005; Gottfredson and Hirschi 1990; Jessor and Jessor 1977; Rowe et al. 1990). To the degree that offenders are specialized—where their antisocial behaviors are discrete and influenced by opportunity structures and social contexts—theory and research should aim to develop offense-specific or typological perspectives which ascertain the traits, characteristics, and situations which give rise to a particular “type” of offender. From this perspective, antisocial behavior can be viewed as either idiosyncratic (American Psychiatric Association 2000; Gibbons and Garrity 1962; Robertiello and Terry 2007) or structured by life-circumstances (Guerette et al. 2005; Paternoster and Brame 1998; Sampson and Laub 1993; Shover 1996).

The study of criminal specialization had stalled based on the preponderance of evidence suggesting that most offenders are versatile in their offending; however, a flurry of recent research has brought fresh life to the debate. Overall, contemporary research is more balanced and recognizes that both trends, specialization and versatility, typify offending careers. According to McGloin et al. (2009), “Some readers may initially think that the study of offense specialization has been exhausted, that it is an issue that has been studied repeatedly only to generate the same conclusion: limited specialization, great versatility. We would like to instill some caution into this premature observation, if only to point out that there are indications that some offenders do specialize in the short term, and some preliminary evidence of transitioning among categories exists” (p. 17). In this regard, the current study explores the specialization debate with a unique dataset of habitual criminals, a new measure of specialization, and a novel analytical technique.

Versatility

Arguably the most forceful critics of criminal specialization are Gottfredson and Hirschi (1990; Hirschi and Gottfredson 1994) who suggested that “in spite of years

of tireless research motivated by a belief in specialization, no credible evidence of specialization has been reported” (1990, p. 91). Their critique appeared to be based on two arguments. First, the bulk of research on the topic indicates that criminals rarely specialize in narrow forms of crime, but instead dabble in different types of offending. In this way, serious offenders will have arrest records littered with violent crimes, property crimes, traffic violations, drug offenses, public-order crimes, and noncompliance with the justice system. Second, the notion of specialization conflicts with the idea that a general construct predicts crime and analogous behaviors. The link between self-control and generality was explicated by DeLisi (2003a):

“Part and parcel of the consistently disadvantaged situations that persons with low self-control place themselves is the idea of criminal versatility or generality. Gottfredson and Hirschi (1990) purport that self-control is a stable, enduring tendency (akin to criminal propensity) that manifests in different expressions of behavior depending on social circumstances. These behaviors are quick and relatively easy ways to satisfy some immediate desire, whether normative or criminal. They include sleeping through the morning alarm, cutting in line, choosing to skip appointments, silencing an annoying person, in short, following one’s id. There is no rhyme or reason to the nature of the offense committed. Persons simply choose to commit violent, property, white-collar, nuisance, drug, or victimless crimes depending on their mood and immediate wants, the presence of suitable victims or objects of desire, the likelihood of easy gain, and the absence of police or other sanctioning agents. Consequently, aggravated assault, burglary, embezzlement, disorderly conduct, marijuana smoking, and prostitution are similar because they are borne from the same animus” (pp. 26–27).

Empirically, Britt (1994) analyzed data from three sources—the Uniform Crime Reports, Bail Decision-Making Study, and Seattle Youth Survey—using graphical analyses, logistic regression, and latent class models to assess evidence of specialization. None was found. Britt concluded that the findings posed serious problems for the idea that criminals specialize in their offending behavior.

The balance of findings from criminal career research is that there is modest evidence of specialization and ample evidence of versatility in offending (Bursik 1980; Chaiken and Chaiken 1982; Greenwood and Turner 1987; Miller et al. 1982; Piquero et al. 2007; Wolfgang et al. 1972). For instance, Blumstein and Cohen’s (1979) analyses of the adult arrest histories of a national sample of 5,338 offenders including nearly 33,000 arrests indicated that it was difficult to identify types of offenders based on their arrest history. Those classified as burglars also had high larceny rates. Larcenists also committed multiple burglaries and narcotics offenders committed drug, larceny, and burglary with great frequency. They concluded that “little specialization in crime types; instead, offenders tend to engage in many different crime types” (p. 585). Using data from the Pittsburgh Youth Study (PYS), van Wijk et al. (2005a) compared ($n=39$) violent male sex offenders to ($n=430$) violent nonsex offenders on 66 demographic and psychosocial characteristics. They found that sex offenders—presumably a specialized offender type—resembled nonsex offenders on 54 of the 66 study variables and for only two variables (age and living in poor housing) were there significant statistical differences at the $p<.01$

level. This suggests that putatively specialized offenders are remarkably similar to garden-variety offenders in the PYS.¹

Armstrong and Britt (2004) examined data from ($n=2,294$) offenders supervised by the California Youth Authority and found evidence of criminal specialization; however, these effects were spurious once offender characteristics, such as race, drug and alcohol use history, violence history, school discipline history, family control, and gang association were specified. In their review of predictors of sexual recidivism, Craig et al. (2005) concluded, “due to the heterogeneous nature of this group of offenders, there is no current consistent profile of the sex offender” (p. 79). In sum, a mix of studies utilizing diverse data sources, analytical methods, research questions, and research designs similarly found that offenders even those characterized as burglars (Vaughn et al. 2008), juvenile male sex offenders (Vandiver 2006), drug addicts (Farabee et al. 2001), sexual homicide offenders (Hill et al. 2008), homicide offenders (Vaughn et al. 2009; Wright et al. 2008), rapists (Lussier et al. 2005a, b), sex offenders (Miethe et al. 2006), white-collar criminals (Weisburd et al. 1990), auto thieves (Copes and Cherbonneau 2006), or nonviolent drug offenders (DeLisi 2003b) were versatile.

Specialization

Even in the midst of versatility, investigators have also fairly consistently produced evidence of specialization. According to Blumstein et al. (1988b), “In the traditional view of criminal careers, the offender ‘samples’ a fairly wide variety of offenses, during the early phases and then converges on those that he finds most appropriate to his taste and skills. This would suggest fairly general switching among crime types through the first few arrests...with later arrests becoming more specialized in particular crime types” (p. 317). Empirically, Blumstein et al. (1988b) found that specialization was highest for drug offending and fraud among white offenders and specialization in auto theft among black offenders. Older offenders also demonstrated more specialization. Brennan et al. (1989) examined arrest records of a Danish birth cohort of 28,884 males and found evidence for specialization in violence and property offending and that these effects were stronger among males with more extensive records. Based on data from the National Longitudinal Study of Adolescent Health, Deane et al. (2005) used marginal logit modeling to produce evidence of both nonviolent and violent specialization in offending among a nationally representative sample of youth.²

¹ There might be important cross-cultural differences between juvenile sex offenders and other serious nonsex juvenile offenders. For instance, a similar study using data from juvenile offenders in The Netherlands found multiple differences between juvenile sex offenders and nonsex offenders in terms of problem behaviors, personality traits, and demographic characteristics (van Wijk et al. 2005b). Lussier et al. (2005a) also found evidence of specialization among convicted child molesters using data from offenders in Canada.

² The substantive basis that offenders specialize in violence has been questioned. Britt (1994) indicated that only 20 violent specialists existed in the Danish cohort of nearly 29,000 males (Brennan et al. 1989). Similarly, Piquero (2000) found no evidence of violence specialization based on data from the Philadelphia Collaborative Perinatal Project (also see, Piquero and Buka 2002; Piquero et al. 2007).

Sullivan et al. (2006) advised that prior research likely inflated the magnitude of versatility because entire careers were often studied and this measurement aggregation bias likely obscured specialization that more refined analysis could show. Indeed, based on data from a cohort of male prisoners, Sullivan et al. (2006) produced compelling evidence of specialization when criminal careers were studied monthly. Osgood and Schreck (2007) analyzed data on subjects from the Monitoring the Future, Montreal Study, and Gang Resistance Education and Training (G.R.E.A. T.) to evaluate specialization in violence. They found evidence of violence specialization in all three samples. Soothill et al. (2008) recently examined large samples of offenders convicted of arson ($n=45,915$), blackmail ($n=5,774$), kidnapping ($n=7,291$), and threats to kill ($n=9,816$) in England and Wales between 1979 and 2001. They found that those initially convicted of arson were the most likely to specialize and were four times more likely to subsequently be convicted of arson. In contrast, those initially convicted of kidnapping, blackmail, or threats to kill were between two and four times more likely to be considered generalists.

Lindberg et al. (2005) examined specialization in a forensic psychiatric sample of Finnish arsonists. They found evidence of pure arsonists defined as offenders whose only criminal behavior involved fire setting. This entirely specialized group was characterized by having diagnoses for psychotic disorders and mental retardation. Lindberg et al. (2005) also found three offenders who met diagnostic criteria for pyromania, which is a clinical disorder characterized by tension or affective arousal before setting fire, fascination with, interest in, curiosity about, or attraction to fire and its situational contexts, pleasure, gratification, or relief when setting fires, and witnessing or participating in the aftermath of fire (American Psychiatric Association 2000).³ Investigators have also produced evidence of specialization in disparate forms of crime including burglary (Schwaner 2000), property crime (Shover 1996; Tunnell 2006), fencing (Steffensmeier and Ulmer 2005), intimate partner abuse (Bouffard et al. 2008; Moffitt et al. 2000), drug offenders (Armstrong 2008a), and violent interpersonal offending (Schwaner 1998).

Method

Participants and Procedures

From 1995 to 2000, the senior author was employed as a pretrial services officer or bond commissioner at a large urban jail located in Colorado. In this jurisdiction, bond commissioners served as judicial officers and worked in conjunction with sheriff deputies within the county jail. Their function was to interview all criminal defendants brought to the jail and to obtain employment, residency, and criminal history for setting bond. Bond commissioners had the authority to release eligible defendants on recognizance bonds. This work experience permitted constant access

³ Although it is outside the purview of mainstream criminological research on specialization, there is ample evidence of specialization or compulsive, repetitive antisocial behavior in psychiatry (American Psychiatric Association 2000). These include what is effectively clinical specialization in arson (pyromania), assault (intermittent explosive disorder), larceny (kleptomania), and even extraordinarily specific forms of crime, such as assaultive eye injury and enucleation (Bukhanovsky et al. 1999).

(the bond commissioner unit was staffed around the clock) to all arrestees who were brought to the jail during this period.

In this jurisdiction, the bond commissioner unit conducted a pilot study to identify the most recidivistic offenders to determine their eligibility for various social service policies (e.g., a program designed to meet the needs of indigent, transient offenders) and prosecutorial efforts (e.g., selective prosecution using habitual offender statutes). Approximately 50 offenders comprised the original “frequent offender” roster, and their criminal histories contained an average of thirty arrest charges. Based on this selection criterion, any offender whose record contained thirty arrest charges was classified as a frequent offender upon approval from the chief district judge and district attorney’s office. Frequent offenders, because of their habitual criminal conduct, were precluded from receiving personal recognizance bonds. From 1995 to 2000, the bond commissioner unit processed 25,640 defendants, 500 of whom (less than 2%) qualified for frequent/habitual offender status. These 500 offenders were, in effect, the population of a 6-year census of official criminal offenders processed in this jurisdiction. Importantly, although the offenders were processed at one facility, their criminal activity can and did occur in multiple jurisdictions.

Data and Measures

During bond interviews which were legal proceedings conducted under oath, defendants self-reported their criminal history, including all police contacts, arrests, court actions, and sentences. Self-reports can yield arrests and other criminal activities that do not appear on official records, arguably rendering them a more accurate reflection of an individual’s true criminal past (Dunford and Elliott 1984; Elliott et al. 1986). The self-report method is problematic with career criminals, however. The most serious career criminals have offending careers that include potentially hundreds of arrests, convictions, and various punishments. Their careers often span decades and chronicle events when defendants were frequently intoxicated on alcohol and illicit substances. For these and other reasons, the validity and internal consistency of self-reports from the worst offenders may be the least reliable (DeLisi 2001, 2002; Simon 1999). Therefore, self-reported criminal histories were supplemented with official records from the Interstate Identification Index (III) system. Under the III system, the FBI maintains an automated criminal record containing an FBI number and state identification number (SID) for each state holding criminal history information on an individual. The III records are accessed using the National Crime Information Center (NCIC) telecommunications lines that retrieve criminal records from automated repositories. The NCIC was founded in 1967 and criminal history information for offenders in the current sample date to 1948. As of October 2008, all 50 states and the District of Columbia participate in the III system which has 80,665,300 criminal history files of which 73,615,700 or 91% are automated (Bureau of Justice Statistics 2008).

Increasingly, criminal career researchers are using both official and self-reported measures of criminal offending (Brame et al. 2004; Geerken 1994; Hochstetler et al. 2007; Lynam et al. 2004). In addition to filling the gaps produced by missing data, the use of both self-report and official records increases the concurrent validity and reliability of the criminal career information. For instance, Farrington et al. (2003, p. 953) advised, “There

was a significant overlap between chronic offenders identified in court referrals and chronic offenders identified in self-reports. Therefore, to a considerable extent, self-reports and court referrals identified the same people as the worst offenders.”⁴

Twenty-seven offenses were included which correspond to Part I and Part II Index offenses from the Uniform Crime Reports (with the exception of kidnapping which was also included). Descriptive statistics for all offenses are shown in Table 1. Three control variables, age ($M=39.61$, $SD=10.74$, $Range=18-74$), sex (89% male, coded=0; 11% females, coded=1), and arrest onset ($M=18.64$, $SD=5.35$, $Range=8-57$) were also used based on their empirical relationships to criminal careers and as correlates of specialization (e.g., Armstrong 2008b; Armstrong and Britt 2004; Bouffard et al. 2008; Mazerolle et al. 2000; DeLisi 2006; Osgood and Schreck 2007; Piquero et al. 1999; Sullivan et al. 2006).

Analytical Techniques

Two relatively novel methods to operationalize and estimate criminal specialization were employed.⁵ First, an offense specialization coefficient (OSC)—defined as the sum of a specific offense divided by the total offenses—was created for all 27 offenses. The OSC has a minimum value of zero which reflects no specialization for a specific offense and a maximum value of 1.0 which reflects complete specialization for a specific offense. The OSC is not an absolute measure of specialization, but a relative measure of specialization where low values of the OSC for a particular offense indicate specialization away from that particular offense, and high values indicate specialization within that offense. Importantly, OSC values cannot be compared across offenses, they are instead useful at considering specialization within an offense. As noted by Sullivan et al. (2009), individual-level measures of specialization are useful because they allow investigations of offense-specific offending patterns via multiple regression techniques.

Second, multivariate models for offense specialization coefficients for eight crimes—aggravated assault, auto theft, burglary, DUI, forgery, robbery, theft, and vagrancy—were executed using simultaneous quantile regression.⁶ Quantile regression (Koenker

⁴ The use of both official and self-reported data is important because prior research found that specialization is evident from self-reports but not official records based on analyses of data from the Dunedin Multidisciplinary Health and Development Study (Lynam et al. 2004).

⁵ One reason for such divergent findings on specialization is that diverse methods and measures have been used. As noted by Farrington (1986, p. 225), there is no standard measure of specialization. Prior studies have used a host of measures (e.g., the diversity index, forward specialization coefficient, and transition matrices) and analytical approaches (e.g., multinomial logit regression, marginal logit modeling, Tobit regression with Cragg specification, probit regression, truncated regression, and log linear models) (Armstrong and Britt 2004; Britt 1996; Deane et al. 2005; Paternoster et al. 1998; Sullivan et al. 2006) yet no definitive measure or analytical technique has emerged (Sullivan et al. 2009).

⁶ It could be argued that the OSC is biased by the total number of offenses and since the current study utilized offenders with a minimum of 30 arrests, there was greater opportunity to specialize. We view the large arrest criterion as a strength compared to offenders with fewer arrests. For instance, claiming theft-specialization for an offender with five career arrests (two of which are for theft) is less compelling than evidence of specialization among an offender with 30 arrests. Also, the eight crimes of interest were selected for two reasons, one substantive and one statistical. First, they represent a cross-section of violent, property, white-collar, traffic, and public-order offenses which maximizes experimental variance. Second, there was inadequate statistical power (e.g., convergence was not achieved) to execute simultaneous quantile regression models for other offenses, such as murder, rape, arson, kidnapping, receiving stolen property, sex offenses, and embezzlement.

Table 1 Offense-specific-arrests and descriptive statistics

Offense	Mean	SD	Min	Max
Murder	.12	.39	0	3
Rape	.40	1.74	0	31
Robbery	.81	1.80	0	14
Aggravated Assault	2.20	2.67	0	16
Simple Assault	4.06	4.26	0	27
Kidnapping	.11	.45	0	4
Burglary	4.04	4.96	0	35
Theft	7.44	9.78	0	84
Auto Theft	1.62	2.81	0	24
Arson	.09	.47	0	6
Sexual Offenses	.32	1.65	0	27
Embezzlement	.02	.15	0	2
Stolen Property	.30	1.23	0	17
Forgery	1.14	3.36	0	32
Fraud	1.97	3.60	0	37
Vandalism	1.75	2.92	0	37
Weapons Offenses	1.01	1.93	0	20
Prostitution	.54	4.65	0	70
Family Offenses	1.36	2.65	0	16
DUI	2.34	2.94	0	17
Selling Narcotics	.79	2.55	0	26
Possession/Use Narcotics	4.59	8.39	0	102
Disorderly Conduct	5.85	6.82	0	54
Vagrancy	3.74	9.68	0	73
Failure to Appear	8.68	8.44	0	71
Failure to Comply	3.86	4.76	0	33
Escape	.55	1.28	0	14
Total Career Arrests	59.76	30.64	30	267

and Bassett 1978; Koenker and Hallock 2001) is a method for fitting a regression line through the conditional quantiles of a distribution. It allows the examination of the relationship between a set of independent variables and the different parts of the distribution of the dependent variable. Quantile regression surmounts some of the disadvantages of the conditional mean framework built upon central tendencies which tend to lose information on phenomena whose tendencies are toward the tails of a given distribution (Hao and Naiman 2007). This is particularly important for the OSC because increasing values reflect greater specialization and the predictors of that specialization might change across quantiles. The current models examined specialization at the 75th and 95th quantiles as shown here:

$$Q_{.75}(y) = \alpha_{.75} + \beta_{.75,1} \text{Onset}_1 + \beta_{.75,1} \text{Age}_1 + \beta_{.75,1} \text{Sex}_1 + \varepsilon$$

$$Q_{.95}(y) = \alpha_{.95} + \beta_{.95,1} \text{Onset}_1 + \beta_{.95,1} \text{Age}_1 + \beta_{.95,1} \text{Sex}_1 + \varepsilon$$

In STATA 9.2, simultaneous quantile regression estimates these equations simultaneously and obtains an estimate of the entire variance-covariance of the estimators by bootstrapping with 100 simulations (Gould 1997). To examine whether the effects of onset, age, and sex were the same when predicting specialization at the 75th and 95th quantiles, post-estimation equality of coefficients F tests were conducted. The 75th and 95th quantiles were selected because they represent high levels of specialization which is the current research interest. Moreover, they provide two thresholds with which to utilize simultaneous quantile regression to see if the independent variables had differential predictive validity across quantiles.⁷

Simultaneous quantile regression is a robust regression technique that accounts for the non-normal distribution of error terms and heteroskedasticity (Koenker and Bassett 1978; Koenker and Hallock 2001). Unlike traditional linear models, such as OLS regression, that assume that estimates have a constant effect, simultaneous quantile regression can illustrate if independent variables have non-constant or variable effects across the full distribution of the dependent variable. To examine this, baseline OLS regression models were executed including the Cook-Weisberg χ^2 test for heteroskedasticity (Cook and Weisberg 1982) and are discussed after the descriptive findings. In addition, equality of coefficients F tests were conducted for simultaneous quantile regression models to assess differences at the 75th and 95th quantiles.

Results

Table 2 contains mean offense specialization coefficients for 27 crimes including standard deviation and range. For many serious crimes including murder, rape, kidnapping, arson, and sexual offenses, the mean OSC is less than 1% suggesting very little relative specialization on average for these crimes, and in the case of murder, reflects the low prevalence of the offense. Yet for other crimes including theft (mean OSC=.114), simple assault (mean OSC=.071), burglary (mean OSC=.069), possession/use narcotics (mean OSC=.072), disorderly conduct (mean OSC=.094), failure to appear (mean OSC=.147), and failure to comply (mean OSC=.071) there is modest evidence of relative specialization in these crimes.

What is more illustrative are the maximum OSC values which show stronger evidence of relative specialization for some offenses, such as rape (maximum OSC=.408), simple assault (maximum OSC=.513), theft (maximum OSC=.895), forgery (maximum OSC=.744), prostitution (maximum OSC=.864), and several other offenses where greater than 50% of the habitual offenders' arrests were for individual crimes.

Table 3 displays unstandardized regression coefficients for onset, age, and sex and the eight dependent variables in traditional OLS regression models. Two points are

⁷ Although commonly used in econometric research, quantile regression models are beginning to be used in criminology. Recently, Britt (2009) used quantile regression models to demonstrate that case- and offender-specific variables have differential predictive validity across sentencing quantiles based on sentencing data from Pennsylvania.

Table 2 Offense specialization coefficients

Offense	Mean	SD	Min	Max
Murder	.002	.009	0	.091
Rape	.008	.029	0	.408
Robbery	.013	.027	0	.246
Aggravated Assault	.040	.048	0	.263
Simple Assault	.071	.074	0	.513
Kidnapping	.002	.009	0	.075
Burglary	.069	.081	0	.559
Theft	.114	.109	0	.895
Auto Theft	.027	.045	0	.328
Arson	.001	.008	0	.083
Sexual Offenses	.006	.032	0	.529
Embezzlement	.0002	.002	0	.022
Stolen Property	.005	.019	0	.205
Forgery	.021	.064	0	.744
Fraud	.035	.059	0	.661
Vandalism	.029	.042	0	.296
Weapons Offenses	.016	.028	0	.150
Prostitution	.007	.055	0	.864
Family Offenses	.028	.057	0	.372
DUI	.048	.065	0	.367
Selling Narcotics	.014	.043	0	.452
Possession/Use Narcotics	.072	.097	0	.653
Disorderly Conduct	.094	.087	0	.619
Vagrancy	.045	.096	0	.569
Failure to Appear	.147	.114	0	.509
Failure to Comply	.071	.084	0	.550
Escape	.009	.021	0	.146

immediately noticeable. First, all models were limited by significant evidence of heteroskedasticity which violates one of the main assumptions of linear regression. Second, the coefficients in the OLS models were similar to those in the simultaneous quantile regression models at the 75th quantile. There was less similarity between the OLS regression estimates and those from the quantile models at the 95th quantile.

Table 4 displays simultaneous quantile regression models for theft, aggravated assault, auto theft, and robbery specialization. Recall that theft was among the offenses with the highest OSC value. At the 75th quantile, offenders with an early arrest onset ($b = -.006$, $t = -2.71$), older offenders ($b = .003$, $t = 4.05$), and females ($b = .159$, $t = 3.74$) were associated with relative specialization in theft. At the 95th quantile, female offenders continue to significantly engage in relative theft specialization ($b = .200$, $t = 2.61$). For aggravated assault, neither onset nor age was associated with specialization. Compared to females, males were significantly specialized in aggravated assault at both the 75th

Table 3 OLS regression models for theft, aggravated assault, auto theft, robbery, burglary, forgery, DUI, and vagrancy specialization

Variable	Theft	Aggravated assault	Auto theft	Robbery	Burglary	Forgery	DUI	Vagrancy
Onset	-.003**	-.000	-.001***	-.001***	-.002**	-.001**	.001	.004
Age	.001**	.000	-.000	.000***	.000	.001***	.001***	.001**
Sex	.051***	-.024***	-.018**	-.007	-.027**	.063***	.004	-.044***
Adjusted R ²	.028	.019	.059	.067	.033	.105	.036	.092
Cook-Weisberg χ^2 Test for Heteroskedasticity	113.3***	10.81***	37.52***	125.67***	5.38*	352.17***	58.61***	113.3***

Unstandardized regression coefficients

* $p < .05$, ** $p < .01$, *** $p < .001$, **** $p < .000$

Table 4 Simultaneous quantile regression models for theft, aggravated assault, auto theft, and robbery specialization

	Theft			Aggravated assault			Auto theft			Robbery														
	75th Quantile			75th Quantile			75th Quantile			75th Quantile														
	b	BSE	t	b	BSE	t	b	BSE	t	b	BSE	t												
Onset	-.006	.002	-2.71**	-.000	.004	-0.01	.000	.001	0.94	-0.00	.001	-0.06	-.001	.000	-4.26***	-1.48	-.001	.000	-2.43**	-.002	.001	-2.79**		
Age	.003	.001	4.05***	.002	.002	1.11	.000	.000	0.18	-0.00	.001	-0.55	-.000	.000	-1.10	-0.00	.000	-0.35	.001	.000	2.64**	.002	.001	2.64**
Sex	.082	.031	2.66**	.200	.077	2.61**	-.037	.010	-3.58***	-.066	.028	-2.34*	-.028	.006	-4.43***	-.051	.029	-1.77	-.007	.005	-1.40	-.034	.019	-1.81
Constant	.159	.042	3.74***	.199	.065	3.06**	.047	.014	3.21***	.169	.040	4.15***	.083	.012	6.79***	.174	.041	4.20	.007	.009	0.84	.023	.012	0.60
Pseudo R ²	.031			.071			.027			.028			.067			.057			.060			.113		

BSE bootstrap standard error

* $p < .05$, ** $p < .01$, *** $p < .001$

($b=-.037, t=-3.58$) and 95th quantiles ($b=-.066, t=-2.34$). For auto theft, early onset was associated with relative specialization at the 75th quantile ($b=-.001, t=-4.26$). Males had significantly greater specialized in auto theft ($b=-.028, t=-4.43$) than females at the 75th quantile but not at the 95th quantile. Early onset ($b=-.001, t=-2.43$) and older age ($b=.001, t=2.64$) was associated with relative robbery specialization at the 75th and 95th quantiles ($b=-.002, t=-2.79; b=.002, t=2.64$).

Specialization for burglary, forgery, DUI, and vagrancy appears in Table 5. Early onset was associated with burglary specialization at the 75th quantile ($b=-.004, t=-4.33$), however, no other significant effects emerged. Conversely, all covariates were associated with forgery specialization at both the 75th and 95th quantiles. Offenders with an early arrest onset ($b=-.001, t=-4.22; b=-.004, t=-2.10$), older offenders ($b=.001, t=4.57; b=.003, t=2.21$), and female offenders ($b=.107, t=3.22; b=.291, t=2.30$) were significantly specialized in forgery. Older offenders were also significantly likely to specialize in DUI at both the 75th ($b=.002, t=2.38$) and 95th quantiles ($b=.005, t=3.78$). Several significant effects emerged for vagrancy specialization. At the 95th quantile, offenders with a later onset were more likely to specialize in vagrancy ($b=.008, t=2.04$) as were older offenders ($b=.005, t=2.47$) and males ($b=-.104, t=-2.41$). At the 75th quantile, older ($b=.002, t=3.43$) and male ($b=-.038, t=-3.29$) offenders specialized in vagrancy.

An advantage of simultaneous quantile regression is the ability to model the effects of covariates on an outcome across the distribution. If the distribution of the OSC for these offenses has constant variance, then the estimated coefficients at the 75th and 95th quantiles will be equivalent except for the intercepts. When the coefficients differ, there is evidence of heteroskedasticity. But it is also important to assess if onset, age, and sex predict specialization similarly across quantiles. Table 6 displays equality of coefficients F tests for all eight offenses. In four circumstances, there were differential effects. For robbery, sex operated differently across quantiles $F(1, 496)=3.01$. For forgery, sex also operated differently across quantiles $F(1, 496)=3.04$. For DUI, age operated differently across quantiles $F(1, 496)=6.83$. And for vagrancy, onset operated differently across quantiles $F(1, 496)=3.30$.

Discussion

Criminological research on specialization has been traditionally characterized by contrasting and at times polemical positions. On one hand, early attempts to create discrete typologies of offenders (e.g., Clinard and Quinney 1973; Gibbons and Garrity 1962) failed because they were not mutually exclusive, had weak face validity, and most critically, did not match the behavioral manifestations of criminal careers which overwhelmingly displayed a range of offenses that dispelled specific labels (Gibbons 1975). On the other hand, researchers that promoted generality (e.g., Britt 1994; DeLisi 2003a, b; Gottfredson and Hirschi 1990) often lost sight that although offending versatility is the larger trend, there is also interesting evidence of specialization. In other words, a happy medium can be reached which acknowledges the norm of offender generality while also exploring contexts, dynamics, and opportunities that lend themselves to offenders recurrently committing and getting arrested for the same offense. More recent research (e.g., Armstrong 2008a, b;

Table 5 Simultaneous quantile regression models for burglary, forgery, DUI, and vagrancy specialization

	Burglary			Forgery			DUI			Vagrancy														
	75th Quantile			75th Quantile			75th Quantile			95th Quantile														
	b	BSE	t	b	BSE	t	b	BSE	t	b	BSE	t												
Onset	-.004	.001	-4.33***	-.003	.003	-1.01	-.001	.000	-4.22***	-.004	.002	-2.10*	.001	.002	0.64	.001	.004	0.32	.003	.002	1.87	.008	.004	2.04*
Age	.000	.000	0.13	-.000	.000	-0.07	.001	.000	4.57***	.003	.001	2.21*	.002	.001	2.38**	.005	.001	3.78***	.002	.001	3.43***	.005	.002	2.47**
Sex	-.037	.022	-1.61	-.040	.048	-0.83	.107	.033	3.22***	.291	.127	2.30*	.022	.019	1.13	-.001	.023	-0.04	-.038	.012	-3.29***	-.104	.043	-2.41***
Constant	.165	.025	6.57***	.280	.052	5.34***	-.001	.003	-0.31	.034	.022	1.53	-.027	.024	-1.12	-.032	.092	-0.35	-.076	.023	-3.26***	-.119	.091	-1.31
Pseudo R ²	.034			.017			.113			.191			.042			.097			.078			.133		

p*<.05, *p*<.01, ****p*<.001

BSE bootstrap standard error

Table 6 Equality of coefficients *F* tests between 75th and 95th quantiles

	Theft	Aggravated assault	Auto theft	Robbery	Burglary	Forgery	DUI	Vagrancy
Onset	1.01	.29	.36	.57	.04	2.23	.00	3.30*
Age	0.02	.60	.00	1.56	.01	1.81	6.83*	2.03
Sex	2.08	.96	.67	3.01*	.00	3.04*	1.07	1.20

* $p < .05$

Lussier 2005; McGloin et al. 2009; Osgood and Schreck 2007; Sullivan et al. 2006; Williams and Arnold 2002) is thus more balanced and we believe poised to further specify the empirical understanding of the versatility and specialization that typifies criminal careers.

In this respect, the current study complements recent research on specialization by showing that even among an enriched sample of habitual criminals—many of whom were ages 40–60—there is evidence of specialization amidst versatility. To qualify for inclusion in the current sample, offenders needed a minimum of 30 career arrests and the mean career arrest total was nearly 60. As shown in Table 1, the sample demonstrated an array of crime spanning 27 offenses that encompassed violent, property, drug, traffic, and public-order offending. For most of these crimes, the mean offense specialization coefficient was modest to low suggesting relatively low levels of specialization within particular crimes. But for other crimes, the mean OSC values were considerably higher and the maximum values indicated that depending on the offense, there was considerable specialization. Substantively, the current findings support McGloin et al. (2009) who found evidence of short-term specialization ensconced in a career of diverse offending among a sample of male prisoners. The current findings also show that specialization is discernible even with retrospective data spanning lengthy offending patterns which complements recent research which found specialization in the short term of offending patterns (McGloin et al. 2009; Sullivan et al. 2006, 2009).

The current models also suggest that not only is there evidence of specialization among serious adult offenders, but also that it is differentially predicted by age, sex, and arrest onset. Interesting sex differences emerged with male offenders more likely to demonstrate specialization in aggravated assault, auto theft, and vagrancy and female offenders more likely to specialize in theft and forgery. These findings partially support prior research which found that women are more likely to specialize (Bouffard et al. 2008; DeLisi 2002) and work which found that men are more specialized (Osgood and Schreck 2007). Age was positively related to several types of specialization suggesting that offenders indeed become more specialized the further they progress in their criminal career (Armstrong 2008a, b; Blumstein et al. 1988a, b). Differential effects for arrest onset emerged with early starters more likely to specialize in theft, burglary, and auto theft at the 75th quantile and forgery and robbery at the 75th and 95th quantiles. That finding conflicts with prior research (Mazerolle et al. 2000; Piquero et al. 1999) which found that early starters were more general, not specialized, in their offending. Moreover, the current study found that onset and age had predictive effects in the same regression models. This conflicts with prior research which found that the effect of onset on versatility

vanished once controlling for age (Piquero et al. 1999). Onset was positively associated with vagrancy specialization at the 95th quantile.

There are some limitations to the current study that future research could build upon. First, the current data were retrospective, raw criminal justice data that were supplemented by offender self-reports, but lacked contextual information that could shed light on specialization patterns or situations that might facilitate specialization or versatility. For instance, McGloin et al. (2007) found that local life circumstances, such as employment and marital status and substance abuse patterns, influenced offender specialization even while controlling for offender propensity. Anecdotally, many of the older offenders in the current sample were homeless and unemployed and accumulated numerous arrests for public-order crimes, such as vagrancy. The multivariate analysis indicated that onset and age were positively related to vagrancy specialization at the 95th quantile suggesting that the local life circumstance of transiency predicts vagrancy specialization.

Second, the dataset was devoid of victimization history and psychiatric diagnoses, both of which have been linked to criminal specialization. For instance, Daversa and Knight (2007) examined offending pathways of sexual coercion against children in a sample of ($n=329$) adolescent sex offenders. They identified four pathways encompassing variables, such as emotional, physical, or sexual abuse, psychopathy, sexual fantasies, feelings of sexual inadequacy, and feelings of child fantasy that resulted in specialized sexual offending against younger children. Given the extremity of the criminal conduct of some of the offenders (e.g., maximum values of three murder arrests, 31 rape arrests, four kidnapping arrests, 14 robbery arrests, and 102 drug arrests) and the interpersonal style that many offenders exuded during bond interviews (e.g., narcissistic, manipulative, irresponsible, mean, callous), having data on psychiatric disorders, such as antisocial personality disorder and substance abuse disorders would have facilitated the current analyses (Briken et al. 2006; Hill et al. 2007). For instance, we hypothesize that offenders with substance abuse disorders would accrue extensive arrests for drug specialization at the 75th and 95th quantiles. A greater use of psychiatric measures would also build a bridge between traditional criminological studies of specialization and research on the more pathological, clinical sorts of psychopathology described in the DSM-IV-TR (American Psychiatric Association 2000).

Third, the current dataset ($n=500$) is relatively modest and geographically limited compared to other research which analyzed data from large birth cohorts or larger samples (Blumstein and Cohen 1979; Brame et al. 2004; Lynam et al. 2004; Soothill et al. 2008) and it is unknown if the external validity of the present findings would be replicated across data sets. We do not purport that the offense specialization coefficient (OSC) is the definitive measure of specialization; however, it is promising. For years, specialization measures were critiqued for placing statistical sophistication above substantive value and interpretability (Bursik 1980; DeLisi 2003a, b). In contrast, the OSC is a simple indicator of relative specialization. There has also been considerable debate about the best way to estimate specialization and the distribution of specialization measures (Britt 1996; Farrington 1986; Paternoster et al. 1998; Sullivan et al. 2006, 2009). Again, we do not purport that simultaneous quantile regression is the definitive way to study specialization, but it allows researchers to model the effects of theoretically and empirically meaningful

covariates on different quantiles of the specialization distribution. Irrespective of measures or analytical methods, it is clear that the specialization/versatility debate is no longer an “either/or” issue, but one where important variations in specialized offending occur even among versatile career criminals.

References

- American Psychiatric Association (2000) Diagnostic and statistical manual of mental disorders, fourth edition, text revision (DSM-IV-TR). Author, Washington
- Armstrong TA (2008a) Exploring the impact of changes in group composition on trends in specialization. *Crime Delinq* 54:366–389
- Armstrong TA (2008b) Are trends in specialization across arrests explained by changes in specialization occurring with age? *Justice Q* 25:201–222
- Armstrong TA, Britt CL (2004) The effect of offender characteristics on offender specialization and escalation. *Justice Q* 21:843–876
- Blumstein A, Cohen J (1979) Estimation of individual crime rates from arrest records. *J Crim Law Criminol* 70:561–585
- Blumstein A, Cohen J, Farrington DP (1988a) Longitudinal and criminal career research: further clarifications. *Criminology* 26:57–74
- Blumstein A, Cohen J, Das S, Moitra SD (1988b) Specialization and seriousness during adult criminal careers. *J Quant Criminol* 4:303–343
- Bouffard LA, Wright KA, Muftic LR, Bouffard JA (2008) Gender differences in specialization in intimate partner violence: comparing the gender symmetry and violent resistance perspectives. *Justice Q* 25:570–594
- Brame R, Fagan J, Piquero AR, Schubert CA, Steinberg L (2004) Criminal careers of serious delinquents in two cities. *Youth Violence Juv Justice* 2:256–272
- Brennan P, Mednick S, John R (1989) Specialization in violence: evidence of a criminal subgroup. *Criminology* 27:437–453
- Briken P, Habermann N, Kafka MP, Berner W, Hill A (2006) The paraphilia-related disorders: an investigation of the relevance of the concept in sexual murderers. *J Forensic Sci* 51:683–688
- Britt CL (1994) Versatility. In: Hirschi T, Gottfredson MR (eds) *The generality of deviance*. Transaction, New Brunswick, pp 173–192
- Britt CL (1996) The measurement of specialization and escalation in the criminal career: an alternative modeling strategy. *J Quant Criminol* 12:193–222
- Britt CL (2009) Modeling the distribution of sentence length decisions under a guidelines system: an application of quantile regression models. *J Quant Criminol* 25:341–370
- Bukhanovsky AO, Hempel A, Ahmed W, Meloy JR, Brantley AC, Cuneo D, Gleyzer R, Felthous AR (1999) Assaultive eye injury and enucleation. *J Am Acad Psychiatry Law* 27:590–602
- Bureau of Justice Statistics (2008) Survey of state criminal history information systems, 2006. U. S. Department of Justice, Office of Justice Programs, Bureau of Justice Statistics, Washington
- Bursik RJ (1980) The dynamics of specialization in juvenile offenses. *Soc Forces* 58:851–864
- Chaiken J, Chaiken MR (1982) Varieties of criminal behavior. RAND, Santa Monica
- Clinard M, Quinney R (1973) *Criminal behavior systems*. Holt, Rinehart, & Winston, New York
- Cook RD, Weisberg S (1982) Residuals and influence in regression. Chapman and Hall, New York
- Copes H, Cherbonneau M (2006) The key to auto theft: emerging methods of auto theft from offenders’ perspective. *Br J Criminol* 46:917–934
- Craig LA, Browne KD, Stringer I, Beech A (2005) Sexual recidivism: a review of static, dynamic and actuarial predictors. *J Sex Aggress* 11:65–84
- Daversa MT, Knight RA (2007) A structural examination of the predictors of sexual coercion against children in adolescent sexual offenders. *Crim Justice Behav* 34:1313–1333
- Deane G, Armstrong DP, Felson RB (2005) An examination of offense specialization using marginal logit models. *Criminology* 43:955–988
- DeLisi M (2001) Extreme career criminals. *Am J Crim Justice* 25:239–252
- DeLisi M (2002) Not just a boy’s club: an empirical assessment of female career criminals. *Women Crim Justice* 13:27–45

- DeLisi M (2003a) Self-control pathology: the elephant in the living room. In: Britt CL, Gottfredson MR (eds) Control theories of crime and delinquency, advances in criminological theory, vol 12. Transaction, New Brunswick, pp 21–38
- DeLisi M (2003b) The imprisoned non-violent drug offender: specialized martyr or versatile career criminal? *Am J Crim Justice* 27:167–182
- DeLisi M (2005) Career criminals in society. Sage, Thousand Oaks
- DeLisi M (2006) Zeroing in on early arrest onset: results from a population of extreme career criminals. *J Crim Justice* 34:17–26
- Dunford FW, Elliott DS (1984) Identifying career offenders using self-reported data. *J Res Crime Delinq* 21:57–87
- Elliott DS, Huizinga D, Morse B (1986) Self-reported violent offending: a descriptive analysis of juvenile violent offenders and their offending careers. *J Interpers Violence* 1:472–514
- Farabee D, Joshi V, Anglin MD (2001) Addiction careers and criminal specialization. *Crime Delinq* 47:196–220
- Farrington DP (1986) Age and crime. *Crime Justice Annu Rev Res* 7:189–250
- Farrington DP, Jolliffe D, Hawkins JD, Catalano RF, Hill KG, Kosterman R (2003) Comparing delinquency careers in court records and self-reports. *Criminology* 41:933–958
- Geerken MR (1994) Rap sheets in criminological research: considerations and caveats. *J Quant Criminol* 10:3–21
- Gibbons DC (1975) Offender typologies: two decades later. *Br J Criminol* 15:140–156
- Gibbons DC, Garrity DL (1962) Definitions and analysis of certain criminal types. *J Crim Law Criminol Police Sci* 52:27–35
- Gottfredson MR, Hirschi T (1990) A general theory of crime. Stanford University Press, Stanford
- Gould W (1997) Interquartile and simultaneous-quantile regression. *Stata Tech Bull* 38:14–22
- Greenwood PW, Turner S (1987) Selective incapacitation revisited: why the high- rate offenders are hard to predict. RAND, Santa Monica
- Guerette RT, Stenius VMK, McGloin JM (2005) Understanding offense specialization and versatility: a reapplication of the rational choice perspective. *J Crim Justice* 33:77–87
- Hanson RK, Harris AJR (2000) Where should we intervene? Dynamic predictors of sexual offense recidivism. *Crim Justice Behav* 27:6–35
- Hao L, Naiman DQ (2007) Quantile regression. Quantitative applications in the social sciences. Sage, Thousand Oaks
- Hill A, Habermann N, Berner W, Briken P (2007) Psychiatric disorders in single and multiple sexual murderers. *Psychopathology* 40:22–28
- Hill A, Habermann N, Klusmann D, Berner W, Briken P (2008) Criminal recidivism in sexual homicide perpetrators. *Int J Offender Ther Comp Criminol* 52:5–20
- Hirschi T, Gottfredson MR (eds) (1994) The generality of deviance. Transaction, New Brunswick
- Hochstetler A, DeLisi M, Puhmann AM (2007) Toward an integrated model of offending frequency: a replication study. *Justice Q* 24:582–599
- Jessor R, Jessor SL (1977) Problem behavior and psychological development: a longitudinal study of youth. Academic, New York
- Koenker R, Bassett G (1978) Regression quantiles. *Econometrica* 46:33–50
- Koenker R, Hallock KF (2001) Quantile regression. *J Econ Perspect* 15:143–156
- Lindberg N, Holi MM, Tani P, Virkkunen M (2005) Looking for pyromania: characteristics of a consecutive sample of Finnish male criminal with histories of recidivist fire-setting between 1973 and 1993. *BMC Psychiatry* 5:47
- Lussier P (2005) The criminal activity of sexual offenders in adulthood: revisiting the specialization debate. *Sex Abuse J Res Treat* 17:269–292
- Lussier P, LeBlanc M, Proulx J (2005a) The generality of criminal behavior: a confirmatory factor analysis of the criminal activity of sex offenders in adulthood. *J Crim Justice* 33:177–189
- Lussier P, Proulx J, LeBlanc M (2005b) Criminal propensity, deviant sexual interests and criminal activity of sexual aggressors against women: a comparison of explanatory models. *Criminology* 43:249–282
- Lynam DR, Piquero AR, Moffitt TE (2004) Specialization and the propensity to violence: support from self-reports but not official records. *J Contemp Crim Justice* 20:215–228
- Mazerolle P, Brame R, Paternoster R, Piquero A, Dean C (2000) Onset age, persistence, and offending versatility: comparisons across gender. *Criminology* 38:1143–1172
- McGloin JM, Sullivan CJ, Piquero AR, Pratt TC (2007) Local life circumstances and offending specialization/versatility: comparing opportunity and propensity models. *J Res Crime Delinq* 44:321–346

- McGloin JM, Sullivan CJ, Piquero AR (2009) Aggregating to versatility? Transitions among offender types in the short term. *Br J Criminol* 49:243–264
- Miethe TD, Olson J, Mitchell O (2006) Specialization and persistence in the arrest histories of sex offenders: a comparative analysis of alternative measures and offense types. *J Res Crime Delinq* 43:204–229
- Miller SJ, Dinitz S, Conrad JP (1982) *Careers of the violent*. D.C. Heath and Company, Lexington
- Moffitt TE, Krueger RF, Caspi A, Fagan J (2000) Partner abuse and general crime: how are they the same? How are they different? *Criminology* 38:199–232
- Osgood DW, Schreck CJ (2007) A new method for studying the extent, stability, and predictors of individual specialization in violence. *Criminology* 45:273–312
- Paternoster R, Brame R (1998) The structural similarity of processes generating criminal and analogous behaviors. *Criminology* 36:633–666
- Paternoster R, Brame R, Piquero A, Mazerolle P, Dean CW (1998) The forward specialization coefficient: distributional properties and subgroup differences. *J Quant Criminol* 14:133–154
- Piper ES (1985) Violent recidivism and chronicity in the 1958 Philadelphia cohort. *J Quant Criminol* 1:319–344
- Piquero A (2000) Frequency, specialization, and violence in offending careers. *J Res Crime Delinq* 37:392–418
- Piquero AR, Buka SL (2002) Linking juvenile and adult patterns of criminal activity in the Providence cohort of the National Collaborative Perinatal Project. *J Crim Justice* 30:259–272
- Piquero A, Paternoster R, Mazerolle P, Brame R, Dean CW (1999) Onset age and offense specialization. *J Res Crime Delinq* 36:275–299
- Piquero AR, Farrington DP, Blumstein A (2007) *Key issues in criminal career research: new analyses of the Cambridge study in delinquent development*. Cambridge University Press, New York
- Robertiello G, Terry KJ (2007) Can we profile sex offenders? A review of sex offender typologies. *Aggress Violent Behav* 12:508–518
- Rowe DC, Osgood DW, Nicewander WA (1990) A latent trait approach to unifying criminal careers. *Criminology* 28:237–270
- Sampson RJ, Laub JH (1993) *Crime in the making: pathways and turning points through the life course*. Harvard University Press, Cambridge
- Schwamer SL (1998) Patterns of violent specialization: predictors of recidivism for a cohort of parolees. *Am J Crim Justice* 23:1–17
- Schwamer SL (2000) Burglary specialization within a parole cohort: criminal lifestyle or moonlighting? *J Crime Justice* 23:95–108
- Shover N (1996) *Great pretenders: pursuits and careers of persistent thieves*. Westview, Boulder
- Simon LMJ (1999) Are the worst offenders the least reliable? *Stud Crime Crime Prevent* 8:210–224
- Soothill K, Francis B, Liu J (2008) Does serious offending lead to homicide? Exploring the interrelationships and sequencing of serious crime. *Br J Criminol* 48:522–537
- Steffensmeier DJ, Ulmer JT (2005) Confessions of a dying thief: understanding criminal careers and illegal enterprise. Transaction, New Brunswick
- Sullivan CJ, McGloin JM, Pratt TC, Piquero AR (2006) Rethinking the “norm” of offender generality: investigating specialization in the short-term. *Criminology* 44:199–234
- Sullivan CJ, McGloin JM, Ray JV, Caudy MS (2009) Detecting specialization in offending: comparing analytic approaches. *J Quant Criminol* 25:419–441
- Tunnell KD (2006) *Living off crime*, 2nd edn. Rowman & Littlefield, Lanham
- van Wijk A, Loeber R, Vermeiren R, Pardini D, Bullens R, Doreleijers T (2005a) Violent juvenile sex offenders compared with violent juvenile nonsex offenders: explorative findings from the Pittsburgh Youth Study. *Sex Abuse J Res Treat* 17:333–352
- van Wijk A, van Horn J, Bullens R, Bijleveld C, Doreleijers T (2005b) Juvenile sex offenders: a group on its own? *Int J Offender Ther Comp Criminol* 49:25–36
- Vandiver DM (2006) A prospective analysis of juvenile male sex offenders: characteristics and recidivism rates as adults. *J Interpers Violence* 21:673–688
- Vaughn MG, DeLisi M, Beaver KM, Howard MO (2008) Toward a quantitative typology of burglars: a latent profile analysis of career offenders. *J Forensic Sci* 53:1387–1392
- Vaughn MG, DeLisi M, Beaver KM, Howard MO (2009) Multiple murder and criminal careers: a latent class analysis of multiple homicide offenders. *Forensic Sci Int* 183:67–73
- Veneziano C, Veneziano L (2002) Adolescent sex offenders: a review of the literature. *Trauma Violence Abuse* 3:247–260
- Weisburd D, Chayet EF, Waring EJ (1990) White-collar crime and criminal careers: some preliminary findings. *Crime Delinq* 36:342–355

- Williams RK, Arnold BL (2002) Offense specialization among serious habitual juvenile offenders in a Canadian city during the early stages of criminal careers. *Int Crim Justice Rev* 12:1–21
- Wolfgang ME, Figlio RM, Sellin T (1972) *Delinquency in a birth cohort*. University of Chicago Press, Chicago
- Wright KA, Pratt TC, DeLisi M (2008) Examining offending specialization in a sample of male multiple homicide offenders. *Homicide Stud* 12:381–398

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