

Testing Deterrence among High-Risk Juvenile Offenders: Evidence from the Pathways to Desistance Study

Dr. Alaina Bearsby Steele¹, Dr. Daniel Philip Hepworth²

Murray State University, Murray, KY, USA

Abstract: This study analyzed the Pathways to Desistance dataset to examine whether principles of deterrence affected offending behaviors in youth categorized as serious juvenile offenders. Deterrence theory is grounded in the classical school of criminology and its rational choice perspective, arguing that individuals weigh the costs and benefits associated with crime and act in ways that maximize benefits and minimize costs. Testing deterrence theory with negative binomial regression across four waves of data demonstrated that deterrence predicted decreases in offending among study participants. These findings support the relevance of deterrence-based strategies in mitigating offending patterns among serious juvenile offenders. They further demonstrate the importance of the perception of legal consequences in shaping decision-making and deterring future criminal behavior in this population.

Keywords: deterrence, juvenile offending, punishment perception, peer influence, youth crime prevention

1. Introduction

Societies that thrive in states of peace, safety, and civility rely on social contracts that promote prosocial conduct (Simpson & Willer, 2015). Acceptable behavior has in part been defined in laws- as have the consequences for people who break those laws (Walker, 2014). A key goal of the criminal justice system is to motivate voluntary compliance with the laws set out in the social contract (Tyler, 2003). Deterrence theory argues that crime can be controlled through the promulgation and enforcement of laws that increase the severity, certainty, and celerity of punishment (Beccaria, 1963). The actual or perceived threat of punishment serves to remind individuals of the consequences of breaking the law (Tyler, 2006).

Duffee and Maguire (2007) argue that the widespread use of criminal sanctions stems from the common belief that frequent and harsh punishments prevent and control crime through deterrence and incapacitation. However, research does not consistently support the efficacy of deterrent strategies, nor does it shed consistent light as to under what conditions they are effective (Cullen & Jonson, 2017; Nagin, 2013b). This raises critical questions about the theory's applicability to juveniles, whose cognitive and emotional development may hinder their ability to process or respond to threats of deterrence in the same manner as adults, potentially leading to engagement with the justice system. As juveniles mature, they become more capable of reflecting on environmental influences, regulating emotions, and applying problem-solving skills. (Wood et al., 2017). Through the lens of deterrence, this study seeks to identify effective mitigation techniques tailored to serious youth offenders, particularly those that account for developmental differences. Understanding the influence of deterrence in juvenile justice is essential for designing effective policies that prevent youth recidivism while ensuring developmental appropriateness.

2. Literature Review

Deterrence theory stems from the classical school of criminology and the work of social philosophers, such as Cesare Beccaria and Jeremy Bentham, who supported a utilitarian view to human behavior (Cullen & Jonson, 2017; Nagin, 1998, 2013a; Pratt et al., 2008). Classical school ideology contends that individuals are rational beings, guided by free will, who will seek to maximize pleasure and minimize pain (Cullen & Jonson, 2017). The underlying assumption is that people will engage in rational decision-making, opting for actions that offer the greatest benefit at the lowest cost (Pratt et al., 2008; Ulen, 2014). In the 18th century, Beccaria argued that crime resulted from hedonistic self-interest that was unchecked by effective legal sanctions (Beccaria, 1963). The classical school's perspective, which posits that people are rational beings motivated by the pursuit of pleasure and avoidance of pain, laid the groundwork for the United States' legal system's emphasis on deterrence. (Cullen et al., 2008).

Deterrence theory expanded upon classical school philosophy and sought to influence the decision-making process to foster law-abiding behavior. The appeal of deterrence as crime prevention lies in the intuitiveness of its key tenets: proportionality, celerity, and certainty, with certainty yielding the greatest deterrent effect (Cullen & Jonson, 2017; 2013b; Nagin et al., 2015).

Proportionality argues that punishments must be commensurate with the harms and rewards of crimes, occur without regard to individual differences, except for certain factors, such as age or mental capacity (Akers & Sellers, 2013).

Celerity, the swiftness of criminal justice intervention, has received comparatively little empirical attention and, when it has been empirically examined, its actual importance is unclear (Nagin 2013b; Pratt & Turanovic, 2016). Even Beccaria (1963) believed its significance was in its ability to foster just punishments, not its deterrent value. Ultimately,

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implementation of swiftness within the justice system is difficult at best.

Finally, certainty refers to the likelihood of legal intervention and has received the greatest empirical support. According to Nagin and colleagues (2015), the certainty of punishment is a function of three probabilities conditioned on the likelihood of apprehension, conviction, and formal punishment following criminal behavior. However, empirical support for the deterrent effect of certainty lies almost exclusively with the threat of apprehension (Nagin, 2013b; Nagin et al., 2015). Waldo and Chiricos (1972) further clarified by noting the important role subjective risk plays in perceptions of certainty of apprehension.

Similarly, Loughran and colleagues (2013:329) explored whether a difference exists between what they termed “self-risk (i.e., one’s subjective belief that [they] will get caught) versus other risk (or the subjective belief that the average person will get caught).” They found offenders were overconfident in their ability to avoid punishment. This aligns with other research (e.g. Loughran et al., 2013; Walker, 2014, which suggests that overconfident people tend to underestimate their likelihood of getting caught, a perception that decreases with time and experience.

Importantly, deterrence effects are highly influenced by perception and most people, regardless of criminality, do not have a sufficient understanding of the actual levels of certainty, celerity, or proportionality/severity (Bernasco et al., 2017; Piquero & Pogarsky, 2002). As such, perceptual deterrence studies seek to determine how an individual’s perception of the certainty, celerity, and proportionality of sanctions impact criminal behavior.

Nagin and Pogarsky (2003) conducted a study to measure perceptual deterrence, allowing participants to cheat for a reward, under varying levels of certainty and severity of punishment. Consistent with existing research, certainty of punishment deterred cheating, whereas severity had little impact. (Nagin & Pogarsky, 2003).

To date, essentially all deterrence research focuses on the perceptual foundation of compliance, as risk perception is a fundamental component of deterrence theory (Loughran, 2015; Nagin 1998, 2013). One important finding from this research is that deterrence policies and practices have varying effects across those who experienced sanctions. Differential deterrence suggests that individual characteristics play a crucial role in shaping one’s perception of risk and, subsequently, their deterability (Piquero et al., 2011).

Juvenile Development

Neuropsychological research has shed light on the relationship between brain development and behaviors (Hernandez et al., 2020). Because key psychological and cognitive capacities of youth are still developing, their perceptions, decision-making, appreciation of consequences, and behavioral regulation differ substantially from those of adults. Research consistently indicates that adolescents do not possess the same level of comprehension as adults with regard to understanding the seriousness and moral implications of their actions (Wood et al., 2017). Thus, deterrence-based

strategies, which assume rational decision making, have been more commonly studied in relation to adult behavior than juvenile behavior (Bates & Swan, 2019).

Loughran and colleagues (2015) found no evidence that severity of punishment has a meaningful specific deterrent effect for youth who have engaged in serious offenses. Rather, what holds greater significance is their perceived risk of getting caught. Additionally, Redding (2008) suggests that strict punishment may lead to more serious outcomes and increased recidivism among juvenile offenders. The current study seeks to expand on this body of research by applying robust quantitative methods to a uniquely constructed set of behavioral and contextual variables in order to assess the deterrent impact of criminal sanctions on serious juvenile offenders.

3. Methods

Sample

The present study used data from the Pathways to Desistance Study, a longitudinal study that followed 1,354 adolescents involved in serious offending to explore the how treatment, punishments, and life course changes influenced offending trajectories (Schubert et al., 2004). Participants were enrolled in the study between November 2000 and January 2003 and were followed for seven years. The study boasted a strong retention rate of 95% at the 6-, 12-, and 18-month marks and 93% at the 24-month mark.

Participants were between 14 to 17 years old at the time of their offense and were recruited from Maricopa County (Phoenix), AZ, (48.3%, $n=654$) and Philadelphia, PA, (51.7%, $n=700$), and were adjudicated for a serious offense (Schubert et al., 2004). The sample was 86.4% male ($n=1,170$) and racially/ethnically diverse: 41.4% of participants identified as Black ($n=561$); 33.5% as Hispanic ($n=454$); 20.2% as White ($n=274$); and 4.8% as other ($n=65$).

Participants completed extensive baseline interviews, followed by interviews every six months for the first three years, and annually thereafter (see www.pathwaysstudy.pitt.edu). Important life events, such as changes in residence, education, and interpersonal relationships, were recorded monthly; adolescent participants who exited residential facilities completed additional interviews at the time of their release. Participant retention is always of concern in longitudinal research (Engels & Diehr, 2003; Laird, 1988), so it is notable that 86% of respondents completed at least eight of the ten follow-up interviews conducted within the seven-year period for the Pathways project (Schubert et al., 2004).

4. Measures

Dependent Variable

The dependent variable in this study is *Frequency of Offending-Recall Period*. This measure was adapted from Huizinga and colleagues (1991) and captures adolescent participants’ self-reported involvement in a wide range of antisocial and illegal activities throughout each recall period (i.e., the time separating wave interviews). These measures consist of 24 items identifying participation in various types

of violence (e.g., homicide, assault, robbery), drug offenses (e.g., sold marijuana), and property crimes (e.g., burglary, motor vehicle theft, arson) (Mulvey, 2016).

The self-reporting of offending behaviors is a primary and reliable method of measuring crime in criminology. Although it may be prone to biases influenced by a range of factors (Gomes et al., 2019), it remains a widely accepted and valuable resource for criminologists. As Sohoni and colleagues (2020) note, self-report data is “valuable to criminologists for its potential at revealing offending patterns free from biases affecting official data obtained by police” (p. 770).

Independent Variables

Deterrence (Personal and Social Costs and Rewards)

The current research uses three measures of deterrence drawn from the Pathways to desistance Study: *certainty of punishment (for self and others)*, *personal rewards of crime*, and *social costs of punishment*. The scales in this study speak to two of the three components of deterrence theory: certainty and severity. Although the Pathways dataset lacked an operational measure of celebrity, this aligns with previous research due to the conceptual and methodological challenges in empirically measuring celebrity.

Researchers measured *certainty of punishment-other* by calculating the mean of seven items designed to tap into vicarious perceptions of certainty of punishment. This measure included questions such as whether the respondent is aware of others being caught and punished (see www.pathwaysstudy.pitt.edu).

Certainty of punishment-you assessed a respondent's personal experiences with apprehension and punishment, and how those experiences influenced their perceptions of the likelihood of being caught and punished again if they engaged in similar behaviors (Mulvey, 2016). This measure was also computed as the mean of seven items (see www.pathwaysstudy.pitt.edu).

Social costs of punishment tapped into a respondent's fear of losing important social relationships (i.e., social costs) if they engaged in criminal or delinquent behavior (see www.pathwaysstudy.pitt.edu). It included questions such as, “If I broke the law, how likely is it that I would lose the respect of my friends?” Responses were rated on a 5-point Likert scale ranging from (1) Very unlikely to (5) Very likely (see www.pathwaysstudy.pitt.edu).

Finally, the measure for *personal rewards of crime* is calculated as the mean of seven items, such as “How much ‘thrill’ or ‘rush’ is it to break into a store or home?” Responses were recorded on an 11-point scale ranging from 0 (no fun) to 10 (a great deal of fun) (see www.pathwaysstudy.pitt.edu). For this study, this variable was reverse coded so that higher values predicted lower frequencies of offending. This adjustment allowed it to be combined with the other deterrence variables to form a single measure of deterrence.

Combined Independent Variable Measure

In the current analysis, the four independent variable

constructs were additively combined to form a single measure for deterrence, with each variable contributing equally. While this may not align with existing research, the study's authors found no formal guidelines for weighting these variables. Current research is not always consistent regarding variable impact. For example, some emphasize certainty of punishment, while others prioritize severity (see Pogarsky, 2002). Because there are no formal guidelines for assigning weights and the literature's findings are inconsistent, using differential weights could introduce bias and compromise the integrity of the results. Thus, this study used an unweighted combined measure of deterrence to assess the overall influence of deterrence on the dependent variable.

Control Variables

Demographic control variables for analysis included participant sex, race/ethnicity, age, and socioeconomic status (SES), as these characteristics may affect criminal justice experiences and perceptions of deterrence. Sex was coded as 1 – male and 0 – female. Race/ethnicity was based on self-report and was dummy coded into three binary variables: Black (1 = Black, 0 = all others); Hispanic (1 = Hispanic, 0 = all others); and Other (1 = Other, 0 = all others). Age was calculated by subtracting the participant's date of birth from the interview date and rounded to the nearest whole number.

Models also included variables measuring participation in alcohol or drug treatment, impulse control, peer delinquency, and prior delinquency, as prior research links these factors to offending patterns during the adolescent developmental period.

Drug or Alcohol Treatment

Empirically driven treatment programs that target individual criminogenic risks and needs have been shown to reduce recidivism (see for example Farabee et al., 2001). The *treatment* variable captured self-reported participation in a drug or alcohol treatment program within the last 6 months ((0 = yes, 1 = no).

Impulse Control

Impulsivity is an empirically demonstrated correlate of crime (see Vazsonyi et al., 2006). It plays a particularly prominent role among adolescents, because of their developmental life stage (Higgins et al., 2013). *Impulse control* variable was calculated as the mean of eight items drawn from the Weinberger Adjustment Inventory (WAI; Weinberger & Schwartz, 1990). This measure included items such as “I say the first thing that comes into my mind without thinking enough about it.” Participants rated responses on a 5-point scale ranging from (1) = False to (5) = True (see www.pathwaysstudy.pitt.edu).

Peer Delinquency

Research has consistently demonstrated the significant influence of peers in adolescents' lives and the impact of these relationships on youth behavior (Andrews & Bonta, 2016; Maneiro et al., 2022). The present study measured peer delinquency using a subset of items from the Rochester Youth Study (Thornberry et al., 1994) to assess the degree of antisocial activities among a participant's peers (Mulvey, 2016). This scale has two dimensions: *peer antisocial behavior* (e.g., “During the last six months, how many of your

friends have sold drugs?"') and *peer antisocial influence* (e.g., "During the last six months, how many of your friends have suggested that you should sell drugs?"). Both constructs used the same 5-point Likert type scale: (1) None of them to (5) All of them. *Peer antisocial behavior* was calculated as the mean of 12 items. *Peer antisocial influence* was calculated as the mean of seven items.

Prior Offending

Prior offending provides essential context for participant responses in future waves, as past behavior is considered a strong predictor of future behavior (Ouellette & Wood, 1998). For each model in the current study, the *prior delinquency* variable assessed at the baseline time period served as a control to account for this. *Prior delinquency* is a count variable with the sum of the frequencies of participants' self-reported involvement in a variety of offenses during the 12 months prior to their enrollment in the Pathways study.

Offset Variable

The dependent variable in this study is a frequency count of criminal activities committed during the recall period. Although Pathways researchers made every attempt to keep follow-up interviews consistent across participants to simplify statistical analyses, it was not always possible (Schubert et al., 2004). For instance, an interview may be conducted early than planned if there was uncertainty about the participant's future availability, such as in the case of housing instability). Alternatively, a late interview could result from the inability to locate a respondent.

Given that the recall periods varied by length across participants, the study incorporated a control for the differences in the number of days between completed interviews. This was accomplished with an offset variable (see Coxe et al., 2009). The offset value for this study was calculated as the natural logarithm of the number of days in the recall period.

Analysis

Negative binomial regression via SPSS was utilized to analyze the first four waves of the Pathways to Desistance study to assess whether deterrence theory predicts a decrease in criminal offending behaviors among study participants. Given the persistent concern of participant retention in longitudinal studies, the analysis was focused on the first four waves to enhance study integrity.

An extension of Poisson regression, negative binomial regression corrects for overdispersion, making it well suited for the social sciences, where the assumption that the mean equals variance is seldom met (Piza, 2012). Both Poisson and negative binomial regression "account for the unique distribution of count data and preserve the validity and power of the statistical analysis," but negative binomial regression is preferred when overdispersion is present (Garson, 2013; Piza, 2012, p. 3).

To check for overdispersion the variance of the dependent variable was compared to the mean across all four waves. Because the variance exceeded the mean, negative binomial regression was chosen over Poisson. Although the Pathways data were overdispersed due to excess zeros, negative

binomial regression was selected over zero inflated negative binomial regression because the zeros reflect actual reporting and represent a single-outcome process of zero offenses.

Time-Order

To establish causal order between the independent variables and their predictions for the dependent variable, a time-lagged regression approach was used. Specifically, the independent and control variables at time t were regressed on the dependent variables at time $t + 1$. For example, the independent variable and control variables from Wave 1 were regressed on the dependent variable from Wave 2, and this pattern continued throughout Waves 2, 3, and 4.

5. Results

Researchers conducted two models at each wave. For main effects models, control variables and individual measures of deterrence were regressed onto the dependent variable from the subsequent wave to assess the unique contribution of each deterrence measure in predicting offending behavior. For combined effects models, control variables and the combined measure of deterrence were regressed onto the dependent variable from the subsequent wave. The omnibus tests for all models were statistically significant ($p < 0.001$), indicating the predictor models outperformed the null models in all instances. Detailed results are presented below.

Wave 1: Deterrence Main Effects Model

There were several statistically significant predictors in the Wave 1 main effects model. *Certainty of punishment - you, social costs of punishment, low personal rewards of crime, impulse control, peer antisocial behavior, sex, and the other race/ethnicity* were all statistically significant. Personal/direct exposure to certainty of punishment predicted a 12.45% decrease in offending counts per unit increase ($p < 0.001$). For every unit decrease in personal rewards of crime, study participants experienced a 9.06% decrease in frequency of offending counts ($p = 0.012$). Social costs of punishment predicted a 16.56% decrease in offending counts ($p = 0.047$). A one unit increase in impulse control resulted in a 16.72% decrease in offending counts ($p = 0.025$). For every unit increase in peer antisocial behavior, participants experienced a 100.37% increase in offending counts ($p < 0.001$). Male participants were 1.89 times more likely to reoffend than females ($p = 0.003$). Lastly, people in the other race/ethnicity category were 3.00 times more likely to have a new offense than those in the White category ($p = 0.002$).

Table 1: Wave 1 Deterrence Main Effects Model

Measure	B	SE	p	Exp(B)
(Intercept)	-4.046	1.403	0.004*	0.017
Certainty of Punishment - You	-0.133	0.035	0.000*	0.875
Certainty of Punishment - Other	0.031	0.043	0.466	1.031
Social Costs of Punishment	-0.181	0.091	0.047*	0.834
Low Personal Rewards	-0.095	0.038	0.012*	0.909
Impulse Control	-0.183	0.082	0.025*	0.833
Peer Antisocial Behavior	0.695	0.126	0.000*	2.004
Peer Antisocial Influence	0.013	0.124	0.917	1.013
Prior Delinquency	0.000	0.000	0.107	1.000
Treatment	-0.378	0.232	0.103	0.685
SES	-0.008	0.006	0.229	0.992
Age at Baseline	0.056	0.065	0.391	1.058

Female	0.634	0.211	0.003*	1.885
Black	0.174	0.206	0.399	1.190
Hispanic	0.222	0.225	0.323	1.249
Other	1.098	0.353	0.002*	2.998
(Scale)	1.000	0.000		
(Negative Binomial)	5.517	0.000	0.000*	

Wave 1: Combined Deterrence Main Effects Model

In this model, statistically significant predictors included the combined deterrence measure, *impulse control*, *peer antisocial behavior*, sex, and the *other race/ethnicity* category. The combined deterrence measure predicted a 7.13% decrease in the frequency of offending counts per unit increase in overall perceptions of deterrence ($p<0.001$). For every unit increase in impulse control, frequency of offending counts was predicted to decrease by 14.79% ($p=0.041$). Peer antisocial behavior predicted a 95.42% increase in offending counts per unit increase ($p<0.001$). Male respondents were 1.85 times more likely to report a new offense than female respondents ($p=0.003$). Finally, adolescents within the other race/ethnicity category were 2.90 times more likely to have a new offense than those identified as White ($p=0.002$).

Table 2: Wave 1 Combined Deterrence Main Effects Model

Measure	B	SE	p	Exp(B)
(Intercept)	-4.354	1.369	0.001*	0.013
Deterrence	-0.074	0.015	0.000*	0.929
Impulse Control	-0.160	0.079	0.041*	0.852
Peer Antisocial Behavior	0.670	0.119	0.000*	1.954
Peer Antisocial Influence	0.070	0.112	0.531	1.073
Prior Delinquency	0.000	0.000	0.094	1.000
Treatment	-0.349	0.222	0.117	0.705
SES	-0.007	0.006	0.232	0.993
Age at Baseline	0.061	0.063	0.335	1.063
Female	0.617	0.205	0.003*	1.853
Black	0.107	0.194	0.580	1.113
Hispanic	0.220	0.216	0.307	1.246
Other	1.063	0.342	0.002*	2.895
(Scale)	1.000	0.000		
(Negative Binomial)	5.199	0.231	0.000*	

Wave 2: Deterrence Main Effects Model

Certainty of punishment you and others were both statistically significant predictors of decreased offending counts in this model, as were *social costs of punishment* and *low personal rewards*. Additional statistically significant predictors included *peer antisocial behavior*, *prior delinquency*, sex, and *race/ethnicity* (Black, Hispanic, and other). All deterrence-related variables were significant in Model 2, but the direction of relationships varied. For example, certainty of punishment for self, predicted a 10.86% decrease in frequency of offending counts per unit increase ($p=0.002$), whereas certainty of punishment for others resulted in a 10.74% increase in offending counts ($p=0.025$). Social costs of punishment and low personal rewards each predicted decreases in offending. When the social costs of punishment increased by one unit, frequency of offending decreased by 18.21% ($p=0.049$) and when personal rewards decreased by one unit, offending counts decreased by 13.67% ($p<0.001$).

Each of the significant control variables predicted increases in offending behaviors. When prior delinquency increased by one unit, offending counts were predicted to increase by

0.10% ($p<0.001$). Study participants who associated with peers who exhibited antisocial behaviors experienced a 63.23% increase in offending per unit ($p<0.001$). Male participants were 1.69 times more likely to reoffend than females ($p=0.035$). Finally, adolescents in the Black, Hispanic, and other race/ethnicity categories were 1.89 times ($p=0.008$), 2.34 times ($p<0.001$), and 3.22 times ($p=0.004$) more likely to have a new offense than those in the White category, respectively.

Table 3: Wave 2 Deterrence Main Effects Model

Measure	B	SE	p	Exp(B)
(Intercept)	-7.269	1.669	0.000*	0.001
Certainty of Punishment - You	-0.115	0.036	0.002*	0.891
Certainty of Punishment - Other	0.102	0.046	0.025*	1.107
Social Costs of Punishment	-0.201	0.102	0.049*	0.818
Low Personal Rewards	-0.147	0.038	0.000*	0.863
Impulse Control	-0.072	0.101	0.476	0.931
Peer Antisocial Behavior	0.490	0.160	0.002*	1.632
Peer Antisocial Influence	0.135	0.193	0.482	1.145
Prior Delinquency	0.001	0.000	0.000*	1.001
Treatment	-0.003	0.295	0.992	0.997
SES	0.004	0.008	0.667	1.004
Age at Interview	0.163	0.088	0.063	1.177
Female	0.527	0.249	0.035*	1.694
Black	0.636	0.240	0.008*	1.889
Hispanic	0.848	0.227	0.000*	2.335
Other	1.170	0.404	0.004*	3.222
(Scale)	1.000	0.000		
(Negative Binomial)	6.710	0.317	0.000*	

Wave 2: Combined Deterrence Main Effects Model

The combined deterrence measure, *peer antisocial behavior*, *prior delinquency*, sex, and *Black*, *Hispanic*, and *Other race/ethnicity* categories were statistically significant predictors. The overall combined deterrence measure predicted a 4.97% decrease in offending counts per unit increase ($p=0.001$). Each unit increase in peer antisocial behaviors resulted in a 54.50% increase in frequency of offending counts ($p=0.008$). Prior delinquency predicted a 0.10% increase in offending per unit increase ($p=0.001$). Male respondents were 1.86 times more likely to report a new offense than female respondents ($p=0.012$). Finally, participants within the Black, Hispanic, and other race/ethnicity groups were 1.91 times ($p=0.012$), 1.90 times ($p=0.004$), and 3.38 times ($p=0.003$) more likely to have a new offense than those in the White category, respectively.

Table 4: Wave 2 Combined Deterrence Main Effects Model

Measure	B	SE	p	Exp(B)
(Intercept)	-7.039	1.625	0.000*	0.001
Deterrence	-0.051	0.016	0.001*	0.950
Impulse Control	-0.070	0.098	0.475	0.932
Peer Antisocial Behavior	0.435	0.164	0.008*	1.545
Peer Antisocial Influence	0.338	0.198	0.088	1.402
Prior Delinquency	0.001	0.000	0.001*	1.001
Treatment	0.081	0.284	0.775	1.084
SES	0.003	0.008	0.735	1.003
Age at Interview	0.097	0.083	0.244	1.102
Female	0.618	0.247	0.012*	1.855
Black	0.645	0.242	0.008*	1.906
Hispanic	0.642	0.225	0.004*	1.900
Other	1.217	0.403	0.003*	3.377
(Scale)	1.000	0.000		
(Negative Binomial)	6.852	0.323	0.000*	

Wave 3: Deterrence Main Effects Model

Statistically significant predictors in this model included *peer antisocial behavior, recent participation in drug or alcohol treatment, parental socioeconomic status, and sex*. Although no individual deterrence predictors were statistically significant in this model, *certainty of punishment for self* was the most noteworthy contributor, approaching a low-level statistical significance predicting a 7.04% decrease in offending per unit ($p=0.091$). Study participants with peers who exhibited antisocial behaviors experienced an 81.66% increase in frequency of offending counts per unit increase ($p=0.002$). Those who participated in drug or alcohol treatment during the recall period experienced a 62.09% decrease in frequency of offending counts per unit increase ($p=0.015$). A one-unit increase in parental socioeconomic status resulted in a 1.92% increase in offending counts ($p=0.045$). Finally, male participants were 2.26 times more likely to report a new offense than female participants ($p=0.003$).

Table 5: Wave 3 Deterrence Main Effects Model

Measure	B	SE	p	Exp(B)
(Intercept)	-7.129	2.222	0.001*	0.00
Certainty of Punishment - You	-0.073	0.043	0.091	0.93
Certainty of Punishment - Other	0.026	0.058	0.653	1.03
Social Costs of Punishment	0.087	0.103	0.396	1.09
Low Personal Rewards	-0.059	0.052	0.253	0.94
Impulse Control	-0.071	0.131	0.590	0.93
Peer Antisocial Behavior	0.597	0.192	0.002*	1.82
Peer Antisocial Influence	-0.063	0.134	0.639	0.94
Prior Delinquency	0.235	0.212	0.269	1.26
Treatment	-0.970	0.396	0.015*	0.38
SES	0.019	0.009	0.030*	1.02
Age at Interview	0.162	0.098	0.100	1.18
Female	0.814	0.275	0.003*	2.26
Black	-0.146	0.312	0.639	0.86
Hispanic	0.089	0.295	0.763	1.09
Other	0.306	0.505	0.544	1.36
(Scale)	1.000	0.000		
(Negative Binomial)	8.164	0.409	0.00*	

Wave 3: Combined Deterrence Main Effects Model

Statistically significant predictors in this model included *peer antisocial behavior, prior delinquency, recent drug or alcohol treatment, parental socioeconomic status, and sex*. The combined single measure of deterrence approached statistical significance ($p=0.051$). *Drug or alcohol treatment* was the only significant predictor of decreases in offending behavior in Model 6. Participants who reported taking part in drug or alcohol treatment during the recall period experienced a 59.22% decrease in offending per unit. ($p=0.030$). *Peer antisocial behavior, prior delinquency, and parental socioeconomic status* all predicted increases in offending counts. Adolescents exposed to antisocial peer behaviors experienced 77.00% increases ($p=0.003$) and those with prior delinquency of their own predicted a 0.10% increase in offending per unit increase ($p=0.001$). A one-unit increase in parental socioeconomic status resulted in a 1.71% increase in offending counts ($p=0.045$). Finally, male participants were 2.21 times more likely to report a new offense than female participants ($p=0.003$).

Table 6: Wave 3 Combined Deterrence Main Effects Model

Measure	B	SE	p	Exp(B)
(Intercept)	-6.438	2.284	0.005*	0.002
Deterrence	-0.032	0.016	0.051	0.969
Impulse Control	-0.084	0.134	0.533	0.919
Peer Antisocial Behavior	0.571	0.193	0.003*	1.770
Peer Antisocial Influence	0.198	0.203	0.329	1.219
Prior Delinquency	0.001	0.000	0.001*	1.001
Treatment	-0.897	0.410	0.030*	0.408
SES	0.017	0.009	0.045*	1.017
Age at Interview	0.143	0.100	0.153	1.154
Female	0.795	0.272	0.003*	2.214
Black	-0.114	0.290	0.695	0.892
Hispanic	0.090	0.293	0.759	1.094
Other	0.386	0.490	0.431	1.471
(Scale)	1.000	0.000		
(Negative Binomial)	8.211	0.410	0.000*	

Wave 4: Deterrence Main Effects Model

Peer antisocial behavior, prior delinquency, parental socioeconomic status, sex, and membership in the Hispanic race/ethnicity group were all statistically significant predictors in this model. None of the individual *deterrence* predictors achieved significance.

A one-unit increase in parental socioeconomic status predicted a 2.27% decrease in offending counts ($p=0.040$), whereas all other significant variables predicted increases in frequency of offending. Peer antisocial behavior resulted in an 86.27% increase in frequency of offending counts per unit increase ($p=0.006$). Prior delinquency resulted in a 0.10% increase in frequency of offending per unit increase ($p<0.001$). Male respondents were 2.52 times more likely to reoffend than female respondents ($p=0.010$). Finally, adolescents in the Hispanic race/ethnicity category were 1.93 times more likely to have a new offense than those in the White category ($p=0.029$).

Table 7: Wave 4 Deterrence Main Effects Model

Measure	B	SE	p	Exp(B)
(Intercept)	1.178	2.720	0.666	3.248
Certainty of Punishment - You	-0.027	0.059	0.645	0.973
Certainty of Punishment - Other	-0.082	0.081	0.309	0.921
Social Costs of Punishment	0.042	0.127	0.741	1.043
Low Personal Rewards	-0.033	0.057	0.559	0.968
Impulse Control	-0.143	0.142	0.315	0.867
Peer Antisocial Behavior	0.622	0.224	0.006*	1.863
Peer Antisocial Influence	-0.076	0.220	0.730	0.927
Prior Delinquency	0.002	0.000	0.000*	1.002
Treatment	-0.462	0.555	0.407	0.630
SES	-0.023	0.011	0.040*	0.977
Age at Interview	0.092	0.117	0.435	1.096
Female	0.924	0.379	0.015*	2.519
Black	0.233	0.329	0.479	1.262
Hispanic	0.655	0.316	0.038*	1.925
Other	0.546	0.582	0.349	1.726
(Scale)	1.000	0.000		
(Negative Binomial)	9.631	0.481	0.000*	

Wave 4: Combined Deterrence Main Effects Model

Statistically significant predictors in this model include *peer antisocial behavior, prior delinquency, sex, and membership in the Hispanic race/ethnicity category*. The overall combined measure of *deterrence* was not statistically significant.

A one-unit increase in peer antisocial behavior predicted a 79.14% increase in offending ($p=0.013$). Prior delinquency resulted in a 0.20% increase in frequency of offending per unit increase ($p<0.001$) and one-unit increase in parental SES, predicted a 2.27% decrease in frequency of offending counts ($p=0.021$). Male participants were 2.61 times more likely to have a new offense than females ($p=0.010$). Finally, adolescents within the Hispanic race/ethnicity category were 1.95 times more likely to report a new offense than those in the White category ($p=0.029$).

Table 8: Wave 4 Combined Deterrence Main Effects Model

Measures	B	SE	p	Exp(B)
(Intercept)	1.450	2.736	0.597	4.263
Deterrence	-0.042	0.023	0.068	0.959
Impulse Control	-0.144	0.149	0.337	0.866
Peer Antisocial Behavior	0.583	0.233	0.013*	1.791
Peer Antisocial Influence	-0.068	0.216	0.754	0.934
Prior Delinquency	0.002	0.000	0.000*	1.002
Treatment	-0.498	0.571	0.386	0.608
SES	-0.023	0.010	0.021*	0.977
Age at Interview	0.090	0.120	0.457	1.094
Female	0.960	0.371	0.010*	2.612
Black	0.273	0.324	0.399	1.314
Hispanic	0.670	0.307	0.029*	1.954
Other	0.533	0.584	0.363	1.704
(Scale)	1.000	0.000		
(Negative Binomial)	9.656	0.483	0.000*	

6. Discussion

Overview

Although the juvenile justice system was founded on principles of rehabilitation (Bernard & Kurlychek, 2010), deterrence often influences how delinquency is addressed in practice (Bates & Swan, 2019). However, research regarding the theory's effectiveness remains mixed (Pratt et al., 2008) and some have questioned whether it is appropriate for deterrence to be a driving punishment ideology, particularly for youth (see Crofts et al., 2023).

Key Findings

Overall, the findings of the current study provide modest support for deterrence theory. Deterrence does have a significant relationship with frequency of offending counts but fell short in some models with this sample. The combined deterrence measure significantly predicted decreases in offending behaviors in two of the corresponding combined effects models (Models 2 and 4). Individual deterrence effects were significant in Models 1 and 3, and the findings suggest that certainty of punishment is a key contributor to deterrent effects, with certainty of punishment for self being more consistent than certainty of punishment for others. All relationships for direct/personal deterrence were in the expected direction, with increases in certainty of punishment for self-predicting decreases in the frequency of offending counts.

Of further interest, the predicted changes in offending were generally smaller for deterrence measures than other variables incorporated in the model. For instance, exposure to peer antisocial behavior predicted increases in offending behaviors that outsize all other predictors: 100.37% in Model 1, 95.42% in Model 2, 63.23% in Model 3, 54.50% in Model 4, 81.66%

in Model 5, 77.00% in Model 6, 86.27% in Model 7, and 79.14% in Model 8. Moreover, this predictor often achieved the most stringent level of statistical significance (ranging from $p<0.001$ in Models 1 and 2 to a high of $p=0.013$ in Model 8). This finding is consistent with current research emphasizing the importance of peer relationships on adolescent behavior, the importance of which should not be overlooked.

Hypothesis 2 states that experiencing a criminal sanction will predict a decrease in the frequency of offending. When looking at the overall combined measure of deterrence, this measure was a statistically significant predictor of decreased offending counts in Waves 1 and 2. When looking at what feeds the impact of this overall measure, direct/personal experiences and perceptions and personal rewards best predicted decreases in offending. This finding is largely in line with Decker, Wright, and Logie (1993) who found that the threat of being caught, as well as the level of gain, had an influence on an offender's decision-making process.

The overall finding that the combined deterrence measure generally predicted decreased frequency of offending counts was not unexpected. Other research has found similar results. Helland and Tabarrok (2007) found a modest deterrent effect in California's three-strike laws. Nagin (1998) concluded that perceived deterrence was a successful specific deterrent. And, Nagin and Pogarsky (2003) found support for certainty of punishment. All of this strongly supports the notion that deterrence is a critical element of the foundation of social control policy.

7. Policy Implications

As a response to delinquency, the juvenile justice system has historically relied heavily on detention (Mendel, 2023; Puzancherra et al., 2022), which removes youth from their homes and places them in institutional settings away from their families and primary support networks. Although fewer young people are being locked up than 20 years ago, the United States still imprisons far too many kids (Mendel, 2023). While this might be effective in some cases, it could have unintended negative consequences in others. It is important that deterrence-based practices and policies provide the foundation for our system of social control. This study provided support for the notion that deterrence can reduce offending. This finding was especially prominent in relation to certainty. Severity was also found to be somewhat important, though proportionality played a more significant role. These findings align with prior research, such as Nagin (2013), who found that increasing severity of punishment offers limited returns. Accordingly, policy reform should prioritize not only the certainty of apprehension and conviction but also the consistency and proportionality of punishment.

We should also consider expanding the use of community-based corrections, especially for low-risk offenders. Institutional correctional settings can act as criminogenic environments that have the potential to exacerbate criminal propensity, especially for those who pose a low risk to society (see Holman & Zeidenberg, 2006; Mendel, 2023). While deterrence policies are essential for social control policy, we

should seek only a level of severity necessary to achieve public safety.

8. Limitations

A key limitation of this study is that it focuses exclusively on participants who engaged in serious offending behaviors. Because most justice-involved youth do not fall into this category, the findings may not generalize to youth involved in less severe or more developmentally typical forms of delinquency. While longitudinal datasets like this one are the gold standard for studying life course trajectories of crime, caution is warranted in interpreting the results, as predictors of reoffending identified in the Pathways sample may not apply broadly to all youth populations.

9. Recommendations for Future Research

To build on the growing body of literature on deterrence theory, future studies should dedicate research attention to different youth populations, including nonviolent and non-offending youth. Research shows that juveniles differ in areas that influence decision-making process as well as deterability, such as cognitive development, levels of self-control, and the presence of risk or protective factors. Utilizing samples that more closely reflect the juvenile population would enhance the generalizability of the findings. Furthermore, a greater understanding of the factors (e.g., self-control, peer influence, exposure to violence) influencing juvenile delinquency is crucial if we ever hope to devise and implement effective prevention and intervention strategies. Finally, research suggests that the deterrent effect decreases over time, especially with more severe sentences, showing policy adjustments in this area might be a useful area of study.

10. Conclusion

This study's findings lend support to certainty of punishment as a key contributor to deterrent effects, while also inviting a broader reconsideration of what "punishment" should look like, particularly for juvenile populations. While deterrence can have measurable effects in specific contexts, sustainable changes in youth behavior often depend on approaches that are more supportive than punitive. Severe sanctions for juvenile offenders may actually exacerbate their criminality. As such, it may be more effective to apply deterrence principles through interventions that target known risk factors, particularly those that shape risk perception. Achieving desistance and enhancing public safety require programs and policies that address the underlying drivers of juvenile offending, rather than relying solely on traditional deterrence.

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