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The Deterrent Effect of Perceived Severity: A Reexamination*

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Abstract

In a recent study, Grasmick and Bryjak argue that the failure of previous perceptual deterrence researchers to find an inverse relationship between perceived severity of punishment and criminal involvement is due to the fact that they used an invalid measure of perceived severity and tested an additive rather than an interactive model of the deterrence process. Using cross-sectional data, Grasmick and Bryjak found a moderate inverse relationship between their "refined" measure of perceived severity and self-reported past criminal conduct for those who also perceived the certainty of punishment to be high. This paper attempts to replicate and extend Grasmick and Bryjak's research using panel data. With a correct temporal ordering of variables and an identical severity measure, however, we find that perceived severity has no deterrent effect on later deviant behavior. Our data reveal that the "refined" measure of Grasmick and Bryjak confounds the threat of legal sanctions with the fear of informal penalties, and that the greatest effects on delinquent involvement are from those informal sources of social control.

In the empirical literature on social control and criminal behavior much has been written about the deterrent effect of the threat of legal sanctions. Although research on the deterrence question was long dormant, an explosion of research occurred after publications by Gibbs (a) and Tittle (a). After some early work on the punishment properties of statutes and aggregate crime rates by Antunes and Hunt, Bailey et al., Bean and Cushing, Chiricos and Waldo, Gray and Martin, Logan, and others,¹ the central deterrence proposition became recognized as one relating *perceived* properties of punishment to involvement in crime. The bulk of this literature has shown that the perceived certainty of legal punishment does have a mod-

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erate deterrent effect (Anderson et al.; Burkett and Jensen; Grasmick and Appleton; Grasmick and Green; Jensen et al.; Kraut; Meier and Johnson; Silberman; Teevan,b,c,d; Tittle,b,c; Waldo and Chiricos), although the interpretation of much of that literature has recently been questioned (Meier et al.; Minor and Harry; Paternoster et al.,a,c; Saltzman et al.).

What has been absent from both the aggregate and perceptual literature is any consistent support for another central deterrence proposition, that criminal involvement is inversely related to variations in perceived *severity*. In a recent study, Grasmick and Bryjak cite twelve studies in the deterrence literature which have examined the effect of the perceived severity of punishment on self-reported criminal involvement (Anderson et al.; Bailey and Lott; Cohen; Jensen and Erickson; Kraut; Meier and Johnson; Minor; Silberman; Teevan,b,c,d; Waldo and Chiricos) and report that only two (Kraut; Teevan,c) find evidence in support of the severity hypothesis. The absence in the literature of any deterrent effect for perceived severity is quite an anomaly since the utilitarian calculator underlying the deterrence doctrine was presumed to contemplate both the expectation of cost and the *magnitude* of that cost. In their own article, Grasmick and Bryjak offer two reasons for the failure on the part of previous researchers to find any deterrent effect of the perceived severity of punishment: (1) researchers have not consistently examined the possibility that perceived severity functions as an effective deterrent only when the certainty of punishment is high enough to produce a credible threat (the interaction hypothesis), and (2) researchers have previously employed an invalid measure of perceived severity (the measurement hypothesis).

Regarding the first hypothesis, Grasmick and Bryjak argue that the interaction hypothesis is more compatible with the theoretical position on deterrence; perceived severity cannot be an effective deterrent if the anticipated pain of the punishment is negated by the uncertainty of its infliction. With regard to the measurement hypothesis, Grasmick and Bryjak claim that previous measures of perceived severity are invalid because they do not reflect the individual's own estimate of the cost of the particular punishment. The operationalizations of perceived severity have not been at all consistent.² In spite of variation in their specific content, all of them have assumed that the subjective cost of each punishment is shared, for example, that a fine is perceived by all respondents as less punitive than a short jail or prison term. A more refined measure of perceived severity, Grasmick and Bryjak argue, is one which does not presume that a given distribution of punishments would be ordered the same by all respondents. They instead recommend one which records the respondent's *own* subjective estimate of the perceived costs of the penalty, that is, "I would find that punishment very painful" (whatever that penalty may be) or "I would not find that punishment to be very painful."

In a study employing that refined measure of perceived severity,

Grasmick and Bryjak report the strongest inverse correlation found in the literature between severity and criminal involvement ($r = -.27$). Indeed, their study and the ones by Kraut and by Teevan (c) are the only published studies which find a significant inverse relationship between perceived severity and self-reported criminal involvement.³ Grasmick and Bryjak also report that the deterrent effect of severity is contingent on the level of perceived certainty, with severity having a much stronger effect at the highest level of certainty ($r = -.37$) than at the lowest ($r = -.06$).

The paper by Grasmick and Bryjak is a potentially important contribution to the perceptual deterrence literature. Addressing a troubling anomaly in deterrence research, the absence of an inverse relationship between perceived severity of punishment and criminal involvement, they have shown that with a more "refined" operationalization of severity and a different functional form of the deterrence model severity is an important variable. When other deterrence researchers seem ready to dismiss the significance of the severity of sanction threats in social control, Grasmick and Bryjak's paper suggests that such threats may be of greater importance than once thought.⁴

Before accepting Grasmick and Bryjak's conclusion regarding the deterrent power of perceived severity, however, we must be sure that they have indeed observed the causal influence of severity on criminal involvement, and that such an effect results from deterrence. To validate their claim that the perception of severe punishment affects one's involvement in criminal activity we must be convinced that: (1) the observed effect really results from the *deterrent* effect of perceived severity and not from some other property of punishment independent of severity but confounded with its operationalization (a measurement problem), (2) that we have observed the effect of perceived severity on criminal involvement and not the effect of criminal involvement on perceptions of severity (a time order problem), and (3) that the observed effect for perceived severity does not result from an omitted variable related to both the measure of perceived severity and criminal involvement (a model specification problem). All three of these present possible evidential problems for an unambiguous interpretation of Grasmick and Bryjak's data as evidence of a deterrent effect for perceived severity.

Evidential Problem: The "Refined" Measure of Perceived Severity

In operationalizing perceived severity, Grasmick and Bryjak asked their respondents to imagine what penalty they would receive if they were arrested and found guilty in court for each of eight different offenses. The respondents were then asked to "indicate how big a problem that punishment would create for your life," with response options, (1) no problem at

all, (2) hardly any problem, (3) a little problem, (4) a big problem, and (5) a very big problem. Although this approach to the measurement of perceived severity seems conceptually clear and elegant, particularly when compared to previous operationalizations, it may in fact only substitute one form of measurement invalidity for another.

In responding that the imagined punishment would create a "very big problem" for them, Grasmick and Bryjak's respondents may feel that this is so because, (1) they fear the inherent elements of the punishment (i.e., the amount of the fine or the loneliness and physical danger of confinement), and/or (2) they fear the effect that such punishment would have on their careers or family and social relationships. The first fear represents the fear of legal punishment itself while the second reflects what Gibbs refers to as "stigmatization" (b,84-6). Stigmatization effects are the social and material costs attendant to apprehension and punishment and are conceptually separable from the fear of formal legal punishment *per se*. Gibbs, in stating that deterrence should be reserved for the inhibitory effect that the fear of legal sanctions has on behavior, warns of the confounding that conceptual overinclusiveness brings and urges the analytical separation of deterrent from other preventive effects of punishment. Similarly, in his discussion of the general preventive effects of punishment, Andenaes lists three *independent* sources of social control, (1) moral inhibitions, (2) fear of censure from one's associates, and (3) the fear of punishment. If fear of censure from one's associates entails social as well as professional/occupational costs due to punishment, Gibbs (b) and Andenaes are in agreement in distinguishing purely deterrent from other inhibitory effects.

The fear of stigmatization may be not only an independent but a more important inhibitor of illegal activity than the fear of the expected punishment itself. Previous research on the effect of informal sanctions on behavior has found them to be of greater significance than formal legal sanctions (Akers et al.; Anderson et al.; Burkett and Jensen; Paternoster et al., b, c; Tittle, c). In a study cited by Zimring and Hawkins, British youths were asked to rank what they thought the most important consequences of arrest to be. Ten percent of them said that "the punishment I might get" would be most important while 68 percent referred to family/peer difficulties and an additional 22 percent said "the chances of losing my job." This suggests that the fear of social reprobation or occupational reprobation can be a significant component of the message communicated by sanction threats.⁵

The importance of maintaining a conceptual distinction between the formal and informal properties of sanction threats can be seen in a recent study by Tittle (c). He employed both a measure of "interpersonal severity" and a measure of "formal severity." The first reflected "how upset" the respondent would be if others close to him were to know of the

deviance, while the latter reflected "how upset" the respondent would be if arrested and jailed. Tittle found that interpersonal loss of respect was the best predictor of anticipated involvement in deviance and that with this factor controlled, formal severity had virtually no effect.

Evidential Problem: Temporal Ordering of Variables

Recent critiques of the literature (Meier et al.; Minor and Harry; Paternoster et al.a,b; Saltzman et al.) have noted with reference to perceived certainty that the causal ordering of variables in previous deterrence studies does not allow an unambiguous test of the deterrence hypothesis. These critiques have shown that cross-sectional designs which collect data on *past* criminal involvement and *current* perceptions of the certainty of punishment measure an experiential (the influence of behavior on perceptions) rather than a deterrent effect. Inverse correlations between reports of prior behavior and current perceptions of certainty reflect the fact that those who have committed criminal acts in the past have for the most part avoided detection and subsequently lower their estimates of the risks involved. The critical assumption that researchers must make is that perceptions measured after the occurrence of some behavior are an accurate indicator of the person's perceptions before the acts were committed.⁶ The assumption of perceptual stability becomes less tenable, and confounding of the deterrence hypothesis test more acute, when the measure of prior behavior employed includes behavior committed at any time in the respondent's past.⁷

Tests of the severity hypothesis are not immune from this problem of temporal ordering in cross-sectional research. Grasmick and Bryjak, using adult respondents, asked them to report any involvement they ever had in the past in eight criminal acts. Finding an inverse correlation between current perceptions of severity and prior behavior, they interpreted this finding as support for the deterrence doctrine. Grasmick and Bryjak's data may instead tell us that those respondents who had committed illegal acts in the past subsequently discovered that "nothing bad happened." Those respondents without such experience, and therefore no personally relevant knowledge, were perhaps less sanguine.⁸ Our suggestion that their data more likely reflect an experiential effect is given credence by the fact that they asked their respondents about their involvement in eight criminal acts *ever* in their lives. This measure, then, would include both very recent behavior and that which occurred in the distant past, long before the measurement of perceptions.

Grasmick and Bryjak clearly recognized the problem of making causal inferences about deterrent effects with cross-sectional data, and note that they tested their hypotheses with both prior criminal involve-

ment and estimated future involvement and found no substantive differences between the two sets of results. We agree with their assessment, however, that the use of projected future involvement in crime is questionable and "might create as many problems as it solves" (488). The preferred solution is the use of longitudinal data where the effect of estimates of the severity of punishment on later criminal involvement can be determined. In fact, early in the history of perceptual deterrence research Gibbs strongly advised that ". . . there is only one defensible strategy for assessing the (deterrence) relation in question . . . the appropriate question becomes: what is the association between these perceptions and *subsequent* criminal or delinquent acts" (b,209).

Evidential Problem: Misspecification of the Model

Grasmick and Bryjak's evidence of a deterrent effect for perceived severity comes in the form of simple correlation and ordinary least-squares regression coefficients. Their model of the social control process consists solely of an equation involving two exogenous variables—the perceived certainty and severity of punishment. Other potentially explanatory variables such as informal sanctions, social controls, and strain, are excluded. With reference to our earlier observation on the overinclusiveness of Grasmick and Bryjak's refined measure of perceived severity, the exclusion of informal sanctions could account for the observed inverse relationship between severity and criminal involvement. To illustrate, if a dependent variable y is determined according to the model: $y = B_0 + B_1X_1 + B_2X_2 + e$, and if ordinary least-squares is used to fit the model to sample data, the estimates B_1 and B_2 are unbiased estimates of their respective parameters. If instead the model $y = B_0 + B_1X_1 + e'$ were fit, the effect of the omitted X_2 is absorbed by e' . If in the correctly specified model X_1 and X_2 are correlated, in the misspecified model X_1 and e are correlated and part of the effect of X_2 is incorrectly attributed to X_1 . Moreover, the bias in the parameter estimate does not disappear as the sample size grows larger. Only when the omitted variable is uncorrelated with all of the included variables does this bias disappear. Since prior research has shown that informal sanctions are related to both formal sanctions and involvement in deviance, the exclusion of perceived informal sanction threats and moral beliefs probably results in biased estimates for perceived certainty and severity in their deterrence model.

It would appear from this cursory review that Grasmick and Bryjak's claim that the perceived severity of punishment is an effective deterrent should be viewed with some caution. In view of the importance of their work it is essential that their study be replicated, but replicated in

such a way that the evidential problems will be corrected for. Such is the intent of this research. In our replication, a refined measure of the perceived severity of punishment virtually identical to theirs will be employed. Our initial interest will be in the relationship between this refined measure of severity and criminal behavior both prior and subsequent to the measurement of those perceptions. In this way we can estimate both an experiential (prior behavior–perceptions) and a deterrent (perceptions–subsequent behavior) relationship. We will also examine the extent to which the effect of perceived severity is dependent on the level of the perceived certainty of punishment. Finally, should an inverse relationship be found between the refined measure of perceived severity and criminal involvement (either additive or multiplicative), we will determine to what extent this relationship is due to deterrence or another preventive effect communicated by formal sanction threats. This will be accomplished first by partialling the zero-order correlation between perceived severity and criminal behavior on measures of social and material sanctions. Second, we will include perceived severity in a more fully specified model of the deterrence/social control process.

Methods

Although we will try to replicate Grasmick and Bryjak's study as closely as possible, there are three important differences between their research and our own. First, Grasmick and Bryjak's data-set comes from a sample of adult respondents whereas we survey high school students. Second, they employed eight offenses in the construction of their scales while the present study includes both offense-specific scales comprising four items and general substantive scales which are offense-neutral. Finally, the kinds of offenses examined differ, reflecting the difference in the ages of our respective samples. Many of the offenses in the Grasmick and Bryjak study are those more likely to be committed by adults (gambling, driving under the influence, cheating on income tax returns) while the offenses examined in the present study are more representative of adolescent behavior (petty theft, vandalism, drinking liquor under age, using marijuana). The use of different age samples in the two studies should present no substantial problem in comparing the results. Although it is a premise in juvenile justice that children have limited capacity to make rational decisions, our respondents are in their sophomore and junior years of high school. It can be presumed that youths this age (15–17) possess sufficient rationality to be able to assess the costs and benefits of their actions. The use of four rather than eight offenses in the creation of offense-specific scales is of no real consequence as long as it does not affect their reliabilities. Finally, the

use of different offenses in testing deterrence hypotheses should also present little difficulty since the literature has shown no consistent evidence that deterrence works best only for particular kinds of criminal acts.

SAMPLE

Our data come from a two-wave panel study of high school students. During the fall school semester of 1981, questionnaires were administered to tenth grade students in nine high schools in a southeastern city. A followup administration took place in the same schools during the fall of 1982. All questionnaires were administered in English classes with over 99 percent of attending students agreeing to participate in the study. There were 1,375 students who completed a questionnaire at both times; with a listwise deletion of missing data this was reduced to 1,173 respondents.

MEASURES OF VARIABLES

Delinquent Involvement

Two measures of self-reported delinquent involvement were employed. One was a measure of *prior delinquent involvement* and is similar to that used by Grasmick and Bryjak. For this measure, respondents were asked to estimate the number of times they had ever committed four illegal acts—stealing or shoplifting something worth less than \$10 (petty theft), vandalism, drinking liquor under age, and using marijuana. This measure was obtained at the first questionnaire administration when the students were beginning the tenth grade and reflects their delinquent involvement in those four offenses up to that time. A measure of *subsequent delinquent involvement* was also obtained. At the beginning of the eleventh grade, respondents were asked to estimate how many times in the past year they had committed each of the four offenses. This measure, then, reflects only that behavior committed subsequent to the beginning of the tenth grade (when their perceptions were measured) and up to the beginning of the eleventh grade.

I. In their original study Grasmick and Bryjak created a criminal involvement scale by first dichotomizing their eight criminal involvement items into those respondents who had never committed the offense and those who had committed the offense at least once in the past. They then created a scale by summing each Z-score. We chose to retain our measure of delinquent involvement as frequencies. Since the resulting frequency distribution did have some atypical outlying scores (particularly for the drinking and marijuana items), we first took as the respondent's score the natural log of the self-reported frequency of involvement for each offense (after adding a constant of one to each frequency).

Perceived Certainty and the Refined Measure of Perceived Severity

Our measure of the *perceived certainty* of punishment is similar to that employed by Grasmick and Bryjak and other deterrence researchers. For each of the four offenses, respondents were asked to estimate how likely it is that they would be caught by the police. Five response options were provided ranging from "very unlikely" to "very likely." A refined measure of *perceived severity* identical to that introduced by Grasmick and Bryjak was created. For each of the four offenses respondents were asked, "Suppose you 'committed crime *x*' and you were caught by the police, taken to court and then punished. How much of a problem would that punishment create for your life?" The provided response options were: "no problem at all," "hardly any problem," "a little problem," "a big problem," and "a very big problem."

Other Constructs

Our intention in this paper is to extend the initial work of Grasmick and Bryjak on perceived severity by placing traditional deterrence variables into a more complete model of the social control process. The social control literature has revealed other, informal inhibitors of criminal involvement, such as commitment to conventional goals and institutions, a belief in the legitimacy of rules, affective attachments to conventional others, and perceptions of social disapproval (Akers et al.; Anderson et al.; Arnold and Brungardt; Bishop; Burkett and Jensen; Hirschi; Kraut; Krohn and Massey; Meier and Johnson; Meier et al.; Paternoster et al.,c; Tittle, b,c). We have created composite scales measuring several of these inhibitory variables: *school attachments, parental supervision, beliefs, educational sanctions, social/peer sanctions, occupational sanctions, attachment to parents, friends' behavior*. The specific items measuring each construct are presented in the Appendix.

SCALE CONSTRUCTION

As in Grasmick and Bryjak's procedure, hypothesis tests were conducted with composite scales of theoretical constructs rather than individual items.⁹ Identical scale construction procedures were followed. We first performed a complete N-factor principal components factor analysis for each set of items. The last column of Table 1 reports, for each composite scale, the item loadings on the first factor. The magnitude of these item-to-factor correlations are all .40 or higher, with most being greater than .65. Generally, the loadings found for our items on comparable constructs are greater than those reported by Grasmick and Bryjak for their scales. In addition, the reliability estimate (Chronbach's alpha) for each composite scale is adequate and compares well with those found by Grasmick and Bryjak. From this analysis of the measurement properties of our scales we feel safe in

Table 1. DESCRIPTIVE DATA FOR COMPOSITE SCALES (N = 1173)

Scale	No. of Items	Scale Mean	Scale S.D.	Scale Reliability*	Factor Loadings for First Factor				
School attachment	5	12.663	3.280	.66	.50	.67	.70	.42	.45
Parents' supervision	2	5.833	1.842	.82	.83	.83			
Perceived severity	4	17.787	3.322	.85	.87	.82	.76	.68	
Belief	4	17.697	3.067	.76	.68	.70	.72	.69	
Educational sanctions	4	7.422	3.135	.79	.82	.82	.68	.57	
Social sanctions	4	5.189	3.373	.87	.86	.89	.78	.68	
Occupational sanctions	4	10.946	3.016	.75	.72	.79	.67	.56	
Perceived certainty	4	6.059	3.227	.81	.69	.74	.77	.75	
Attachment to parents	8	43.547	5.460	.81	.65	.62	.59	.59	.56
Friends' behavior	4	3.878	3.044	.75	.64	.70	.71	.70	
Subsequent behavior	4	2.577	2.718	.62	.74	.65	.43	.51	
Prior behavior	4	2.315	2.704	.69	.75	.71	.53	.56	

*Chronbach's alpha based on the composite Z-score scale.

assuming that each set of items represents a unidimensional scale, and that our constructs have properties similar to those of Grasmick and Bryjak. Finally, just as they did in their study, we created a final scale by summing Z-scores.¹⁰

Findings

BIVARIATE RESULTS

The bivariate correlations among all variables are reported in Table 2. Of immediate interest is the inverse correlation between the refined measure of perceived severity and subsequent delinquent involvement ($r = -.19, p < .001$). This correlation reflects the relationship between perceptions of the severity of punishment measured at one point in time and later delinquent behavior, and because it carefully controls for the temporal ordering of variables it is the best specification of the bivariate deterrent effect. Contrary to the conclusions of almost all previous deterrence studies, it appears that perceived severity has both a negative and significant effect, though slight, on subsequent involvement in minor forms of delinquent

behavior. This is consistent with Grasmick and Bryjak's conclusion on both the utility of their refined severity measure and the deterrent effect of perceived severity. This, however, must be tempered with the observation that even with a refined operationalization perceived severity does not have the strongest zero-order effect. Significant and stronger bivariate effects on subsequent delinquent involvement are found for school attachment ($-.24$), parental supervision ($-.40$), belief ($-.43$), educational sanctions ($-.24$), social sanctions ($-.38$), perceived certainty ($-.27$), and friends' behavior ($.52$). In fact, of eleven explanatory variables, perceived severity has the third weakest bivariate effect. Although our large sample size makes it likely that the effect of perceived severity will be statistically significant, it is certainly not large in its substantive effect, nor in comparison with other predictors.

It is important to compare our bivariate results for the refined measure of perceived severity with those found by Grasmick and Bryjak. Recognizing the peril in comparing correlation coefficients across studies we shall instead compare simple unstandardized regression coefficients.¹¹ Grasmick and Bryjak do not report the unstandardized regression coefficient between severity and criminal involvement for their full sample.¹² We can, however, calculate it from the correlation coefficient and variances they report, and it is $b = -.244$.¹³ This is significantly larger than the unstandardized beta we found when regressing our identical measure of perceived severity on *subsequent* delinquent involvement ($b = -.156$, $t_{diff} = -2.94$, $p < .01$).¹⁴ It would appear that we have not been successful in replicating the magnitude of the effect for the refined measure of perceived severity found by Grasmick and Bryjak. It must be kept in mind, however, that they examined the relationship between *prior* criminal involvement and current perceptions of severity, and may have been measuring an experiential rather than a deterrent effect. When we placed the variables in the same time order as Grasmick and Bryjak did, we were successful in reproducing their results. Regressing prior delinquent involvement on the refined measure of perceived severity we found an effect not significantly different from that reported by Grasmick and Bryjak (b 's = $-.222$ and $-.244$ respectively, $t_{diff} = -.77$, $p > .05$). We differ from them in our interpretation of this effect, referring to an inverse relationship between prior behavior and current perceptions as reflecting an experiential effect. What we claim to be the true deterrent effect, the effect of perceived severity on subsequent behavior ($b = -.156$) is significantly weaker than the experiential effect from both their study and our own. We have replicated fairly accurately their experiential effect, but in refining their analysis with two-wave data, we find a significantly smaller deterrent effect.

Our finding of a significant but only weak deterrent effect for the refined measure of perceived severity may reflect the fact that we have

Table 2. CORRELATION COEFFICIENTS AMONG ALL SCALES (N = 1173)

	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀	X ₁₁	X ₁₂	X ₁₃
X ₁	--												
X ₂	.27	--											
X ₃	.23	.24	--										
X ₄	.30	.39	.32	--									
X ₅	.22	.21	.39	.33	--								
X ₆	.29	.32	.33	.44	.47	--							
X ₇	.17	.13	.36	.23	.54	.38	--						
X ₈	.26	.26	.20	.29	.26	.36	.17	--					
X ₉	.32	.28	.21	.26	.11	.20	.14	.12	--				
X ₁₀	-.27	-.41	-.25	-.51	-.28	-.52	-.17	-.40	-.19	--			
X ₁₁	-.24	-.40	-.19	-.43	-.24	-.38	-.13	-.27	-.16	.52	--		
X ₁₂	-.28	-.43	-.27	-.57	-.30	-.45	-.18	-.31	-.21	.65	.67	--	--
X ₁₃	-.16	-.24	-.09	-.04	-.11	-.14	-.12	-.18	.01	.16	.21	.16	--

X₁ = school attachmentX₈ = perceived certaintyX₂ = parents' supervisionX₉ = attachment to parentsX₃ = perceived severityX₁₀ = friends' behaviorX₄ = beliefX₁₁ = subsequent behaviorX₅ = educational sanctionsX₁₂ = prior behaviorX₆ = social sanctionsX₁₃ = sex (0=female, 1=male)X₇ = occupational sanctions

tested the wrong functional form of the deterrence model. As suggested in a very early paper of Tittle (a,417) with aggregate data, Grasmick and Bryjak argue that the appropriate test for the deterrent effect of perceived severity is one which allows for an interaction with perceived certainty.¹⁵ Five previous perceptual studies have tested the interaction hypothesis with mixed results. Two of these (Anderson et al.; Teevan,b) find support for it while three (Bailey and Lott; Cohen; Teevan,d) do not. Grasmick and Bryjak note, however, that all of these tests have been flawed because they employ an inadequate measure of perceived severity. With their refined measure of severity they report evidence of a significant severity x certainty interaction effect.

We attempted to replicate this using identical statistical procedures. The data are reported in Tables 3 and 4. Table 3 reports the results of a

Table 3. REGRESSION OF DELINQUENT INVOLVEMENT ON PERCEIVED CERTAINTY AND SEVERITY OF PUNISHMENT (DETERRENCE MODELS, $N = 1173$; EXPERIENTIAL MODELS, $N = 1173$)

	R ²	b	Stand. Error	t	Beta
<u>Models with Subsequent Delinquent Involvement</u>					
Additive Model:	.092				
Certainty		-.204	.0239	-8.51***	-.242
Severity		-.117	.0232	-5.05***	-.143
Interaction Model:	.093				
Certainty		-.187	.1192	-1.57	-.222
Severity		-.112	.0415	-2.71	-.138
Certainty X severity		-.001	.0064	-.14	-.022
<u>Models with Prior Delinquent Involvement</u>					
Additive Model:	.144				
Certainty		-.226	.0231	-9.77***	-.270
Severity		-.179	.0224	-7.98***	-.220
Interaction Model:	.145				
Certainty		-.337	.1152	-2.92	-.402
Severity		-.212	.0401	-5.28	-.260
Certainty X severity		.006	.0062	.98	.148

p < .001

regression analysis for two functional forms of the deterrence model, an additive and an interaction model. In the first, perceived severity and certainty are entered into the regression equation simultaneously, and the estimated beta coefficients correspond to independent, additive effects. In the interaction model a severity x certainty multiplicative term is added, and the significance of this term is a test for interaction (Allison; Cohen and Cohen). Additive and interaction models are estimated using both subsequent and prior delinquent involvement.

Looking first at the data for subsequent delinquency (the deterrent effect) the additive model reveals that both perceived severity and certainty have significant deterrent effects (b 's = $-.204$, $-.117$ respectively, p 's < .001), with perceived certainty having a greater effect than the refined measure of perceived severity (betas = $-.242$, $-.143$). The interaction model shows a nonsignificant multiplicative term for severity and certainty and does not support the hypothesis that the deterrent effect of perceived severity is contingent upon the level of perceived certainty.

Our failure to replicate Grasmick and Bryjak's interaction effect may be due to the fact that we tested the interaction deterrence hypothesis using subsequent behavior while they employed a measure of prior be-

havior. We did conduct an identical analysis using prior delinquency and report the findings in the bottom of Table 3. The additive model shows a significant and negative relationship between prior behavior and perceived severity and certainty ($b = -.226$; $p < .001$). Consistent with recent studies on the experiential effect (Meier et al.; Minor and Harry; Paternoster et al.,c; Saltzman et al.) the data reported here suggest that those who have committed delinquent offenses have lower estimates of the certainty of punishment than those without such experience. The results for perceived severity reveal that the experiential process is more general in its impact. There is also a significant inverse relationship between prior behavior and estimates of the likely severity of punishment ($b = -.179$; $p < .001$). The behaviorally experienced respondents also have lower estimates of the severity of punishment. This is consistent with a "reduction in fear" hypothesis of criminal involvement (Paternoster et al.,c); most people initially have overly pessimistic estimates of the risks they face in rule breaking which eventually are downwardly adjusted when they begin to commit offenses and discover that rules can usually be broken with impunity.¹⁶

We also tested for the existence of an interaction effect with severity \times certainty and prior delinquency. This strategy provides an exact parallel to Grasmick and Bryjak's analysis. We failed to replicate their finding. They reported a significant negative interaction term in their regression model with prior behavior while the one we report in Table 3 is *positive* though nonsignificant.

In further support of their claim that perceived severity works as a more effective deterrent only at high levels of certainty, Grasmick and Bryjak regressed prior criminal involvement on their refined severity measure within quartile categories of perceived certainty. They found that the relationship between severity and prior behavior was significant only in the highest category of certainty while the relationship between prior behavior and perceived certainty was significant and negative at all levels of severity except the lowest. We replicated this procedure for the deterrence and experiential model, but again failed to reproduce their results.

The deterrence model is reported in the top half of Table 4. It shows that, consistent with the results of our previous regression analysis, the relationship between perceived severity and subsequent delinquent involvement is negative and significant across all categories of perceived certainty. While the magnitude of the effect is not the same at all levels, the strongest inverse relationship is found not at the highest level of certainty ($b = -.086$) but at the second to the lowest level ($b = -.230$). The deterrent effect of perceived severity is, then, more general than Grasmick and Bryjak concluded. The deterrent effect of perceived certainty is equally general. At each level of perceived severity the effect of certainty on subsequent delinquent involvement is negative and significant. Con-

Table 4. REGRESSION OF SUBSEQUENT DELINQUENT INVOLVEMENT AND PRIOR DELINQUENT INVOLVEMENT ON ONE INDEPENDENT VARIABLE WITHIN QUARTILES OF THE OTHER INDEPENDENT VARIABLE

Dependent Variable	Categories	N	r	b	Stand. Error	t
<u>Subsequent Involvement</u>						
<u>Severity</u>	<u>Quartiles of Certainty</u>					
	4 (highest)	292	-.13	-.086	.0397	-2.18*
	3	329	-.15	-.131	.0486	-2.70**
	2	230	-.23	-.230	.0653	-3.52***
	1 (lowest)	322	-.13	-.096	.0405	-2.38**
<u>Certainty</u>	<u>Quartiles of Severity</u>					
	4 (highest)	415	-.30	-.208	.0328	-6.36***
	3	197	-.27	-.207	.0524	-3.95***
	2	235	-.12	-.109	.0611	-1.78*
	1 (lowest)	326	-.25	-.261	.0570	-4.57***
<u>Prior Involvement</u>						
<u>Severity</u>	<u>Quartiles of Certainty</u>					
	4 (highest)	292	-.22	-.136	.0351	-3.89***
	3	329	-.21	-.180	.0467	-3.84***
	2	230	-.21	-.176	.0548	-3.22**
	1 (lowest)	322	-.25	-.201	.0436	-4.62***
<u>Certainty</u>	<u>Quartiles of Severity</u>					
	4 (highest)	415	-.28	-.172	.0296	-5.83***
	3	197	-.38	-.275	.0478	-5.76***
	2	235	-.28	-.256	.0569	-4.49***
	1 (lowest)	326	-.26	-.293	.0602	-4.87***

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

trary to the credibility hypothesis, the deterrent effect for perceived certainty is strongest at the lowest level of perceived severity ($b = -.261$) and is of equivalent magnitude at two of the next three levels (b 's = $-.207$, $-.208$).

As a parallel to what Grasmick and Bryjak had done we conducted an analysis identical to this on prior delinquent involvement. The data are reported at the bottom of Table 4. Consistent with our earlier results, although contrary to those reported by Grasmick and Bryjak, there is no evidence of an interaction effect. There is a negative and significant relationship between prior behavior and perceived severity at each level of

certainty, and a significant effect of prior behavior on perceived certainty within each level of severity.

MULTIVARIATE RESULTS

Our analysis consistently shows a noncontingent negative relationship between the refined measure of perceived severity and subsequent delinquent involvement. Up to this point this inverse relationship has been referred to as a *deterrent* effect. Although the proper time sequencing of the variables allows us to speak with some confidence that this association reflects the influence of perceived severity on delinquent involvement, it is not clear that this reflects a purely deterrent causal influence. The observed negative relationship may be due to the threat posed by formal sanctions or the fear of nonlegal/informal punishment.

Column 1 of Table 5 reports the zero-order correlation between the refined measure of perceived severity and subsequent criminal involvement ($r = -.19$). Columns 2–5 in Table 5 report the partial correlation when three sources of informal punishments for these high school respondents are controlled: (1) fear of social sanctions, (2) fear of subsequent educational liabilities, and (3) fear of subsequent occupational costs. (The items measuring these constructs are provided in the Appendix.) Overall, the data in Table 5 show quite clearly that much of the “deterrent” effect for the Grasmick and Bryjak operationalization of perceived severity can be attributed to informal rather than formal punishment. Column 2 shows that when fear of incurring an educational cost is considered, the correlation between the refined measure of perceived severity and subsequent delinquency declines from $-.19$ to $-.11$. When possible reprobation from peers is separately controlled, the correlation between severity and delinquency becomes negligible, $r = -.07$. The zero-order correlation is virtually unchanged when possible occupational sanctions are controlled ($r = -.16$). It may be that occupational liabilities are too remote to be considered a salient cost by these high school students, most of whom expect to enter college rather than the job market after graduation. Column 5 of Table 5 shows that when social and educational costs are simultaneously controlled the correlation between the refined severity measure and subsequent delinquency diminishes from $-.19$ to $-.05$.

Although the preceding analysis suggests that perceived severity, even when operationalized in a more “refined” manner, may have little deterrent effect once informal costs are controlled, it says little about the effect that formal and informal controls may have in a more fully specified model of social control. Such a model was constructed and estimated, and the results are reported in Table 6. This model includes the refined severity measure, a measure of perceived severity, and sources of informal control found in other studies to be important inhibitors of delinquent and

Table 5. ZERO-ORDER AND PARTIAL CORRELATION COEFFICIENTS BETWEEN PERCEIVED SEVERITY AND SUBSEQUENT AND PRIOR DELINQUENT INVOLVEMENT (N = 1173)

	Subsequent Behavior
(1) Zero-order correlation	-.19***
<u>First-Order Partial</u> s	
(2) Educational sanctions	-.11***
(3) Social sanctions	-.07**
(4) Occupational sanctions	-.16***
<u>Second-Order Partial</u> s	
(5) Educational & social sanctions	-.05*
(6) Educational & occupational sanctions	-.11***
(7) Social & occupational sanctions	-.08**
<u>Third-Order Partial</u> s	
Educational, occupational & social sanctions	-.07**

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

criminal conduct. These other sources of social control include: school attachments; parental supervision; moral beliefs; our earlier measures of occupational, educational, and social sanctions; attachment to parents; and friends' behavior (Akers et al.; Anderson et al.; Burkett and Jensen; Hirschi; Kraut; Krohn and Massey; Meier and Johnson; Paternoster et al.; Wiatrowski et al.). Two separate models were estimated; one includes only additive effects for perceived severity and certainty while the second includes only a severity \times certainty interaction term. Since we are examining the deterrence/social control process the measure of subsequent delinquent behavior will be used.

The results for the additive deterrent effects model are striking. Significant effects on subsequent delinquent behavior are found only for *informal* sources of social control (and sex). The effect of perceived certainty on delinquency is negative, consistent with the deterrence doctrine, but is negligible and non-significant ($b = -.007, p > .05$). Moreover, once

Table 6. STANDARDIZED AND UNSTANDARDIZED REGRESSION COEFFICIENTS FOR VARIABLES AFFECTING SUBSEQUENT INVOLVEMENT IN DELINQUENCY (N = 1173)

	Additive Model				Interaction Model			
	b	Stand. Error	t	Beta	b	Stand. Error	t	Beta
School attachment	-.024	.0221	-1.10	-.029	-.024	.0221	-.109	-.029
Parents' supervision	-.220	.0413	-5.33***	-.149	-.219	.0413	-5.30***	-.148
Perceived severity	.018	.0222	.81	.021	--	--	--	--
Belief	-.149	.0266	-5.60***	-.168	-.146	.0265	-5.51***	-.165
Educational sanctions	-.039	.0266	-1.47	-.045	-.036	.0264	-1.36	-.041
Social sanctions	-.070	.0254	-2.76**	-.087	-.070	.0254	-2.76**	-.086
Occupational sanctions	.042	.0262	1.60	.047	.045	.0258	1.74*	.050
Perceived certainty	-.007	.0226	-.31	-.008	--	--	--	--
Attachment to parents	.001	.0130	.08	.001	.002	.0129	.16	.003
Friends' behavior	.268	.0280	9.57***	.300	.269	.0280	9.61***	.301
Sex	.549	.1358	4.04***	.101	.550	.1011	5.44***	.136
Certainty X severity	--	--	--	--	-.0001	.0012	-.08	-.003
R ² = .35					R ² = .35			

* p < .01 ** p < .01 *** p < .001

other inhibitory factors are controlled, the effect of the refined measure of perceived severity is *positive*, though again negligible and nonsignificant ($b = .018, p > .05$). In this group of respondents, those factors most strongly related to involvement in delinquency are: friends' behavior (beta = .300), beliefs (beta = $-.168$), and parental supervision (beta = $-.149$). When the interaction model is examined, the multiplicative term for the interaction between perceived severity and certainty has no effect on subsequent delinquency ($b = -.0001$). Most of the other parameter estimates in this model are unchanged from the additive effects model.

Conclusions: The Role of Legal Sanctions in Social Control

The results of this regression analysis are at striking odds with the findings in Grasmick and Bryjak's study. We find that social control works primarily through informal processes; and that once these are controlled, perceptions of the severity and certainty of punishment have no effect on

delinquent behavior. Our findings on the centrality of informal controls are consistent with other research. In similar multivariate analyses of the deterrence process Tittle (b,c), Meier and Johnson, and Meier et al. found that peer behavior, moral beliefs, and social disapproval were more strongly related to criminal behavior than the fear of formal sanctions. Our study, which provides a more convincing time ordering of social control and behavior variables, offers even stronger evidence of this. More generally, our findings of inhibitory effects of parental supervision, moral beliefs, social sanctions, and conventional peers offer direct confirmation of social control theory (Arnold and Brungardt; Hirschi).

We are forced, therefore, to take strong exception to the conclusion offered by Grasmick and Bryjak that "perceived severity of punishment if arrested is a significant variable in the social control process" (486). Rather, we are in complete agreement with Tittle that "social control as a general process seems to be rooted almost completely in informal sanctioning. Perceptions of formal sanction probabilities or severities do not appear to have much of an effect, and those effects that are evident turn out to be dependent upon perceptions of informal sanctions" (c,241). It is clear, however, that formal sanction threats are not important in any immediate or direct sense. It may now be incumbent on deterrence theorists and researchers to consider the development and testing of models of informal social control.

An important caveat must be entered at this point, however. Our analyses do not lead us to the conclusion that the severity of formal legal punishment plays *no* role in social control. Our data suggest only the more narrow conclusion that perceived severity has no *direct* and *immediate* effect on the commission of *minor* offenses. It is still reasonable to believe that the threat of legal sanctions plays some role in shaping conforming conduct. First, legal sanctions may have a long-term effect on conformity by strengthening the moral beliefs surrounding an act (Gibbs,b; Scott). Second, as revealed by Tittle's research (b,c) and our own, formal punishment may induce conformity by triggering more effective, informal mechanisms of social control. Most importantly, however, theoretical and policy concerns about the effect of formal legal sanctions are directed at more serious kinds of acts and not the trivial ones examined in this and most of the perceptual deterrence literature. The self-report items in Grasmick and Bryjak's original study, in our own replication, and in all previous studies measure only minor forms of deviance (petty theft, gambling, littering, drinking under age, drug use). Neither our data nor that found in any other perceptual deterrence study say anything about the deterrability of *serious patterned* law violation through the threat of criminal sanctions. The failure to find a deterrent effect for perceived severity and certainty may only apply to these minor offenses where both the detectability of the act is low and the possible punishments are light. More seri-

ous offenses and those which more clearly involve rational premeditation (breaking and entering for theft, convenience store robbery, narcotic trafficking) may be more responsive to sanction threats than the kinds of offenses traditionally looked at by perceptual deterrence researchers. The generalizability of the findings from this body of research is, therefore, severely limited, and deterrence researchers would be well-served to consider more serious, calculative offenses in their studies.

Notes

1. An excellent review and analysis of the aggregate level and early perceptual level research can be found in Gibbs (b). Reviews of later perceptual studies are provided by Tittle (c), Meier et al., and Paternoster et al. (a,b).
2. Unlike perceived certainty (Paternoster et al.,b), the perceived severity of punishment has been measured in about as many different ways as there are tests of the severity hypothesis. Among the operationalizations of perceived severity are the following: "what do you think would happen to you if you were caught by the police committing the following crimes?" with response options ranging on a 5-point continuum from "released by police without arrest" to "conviction and a prison sentence" (Bailey and Lott); "for those Canadians caught by the police what is their usual punishment?" with response options "nothing," "informal handling," "fine," "probation or suspended sentence," "jail" (Teevan,c); "could you estimate the maximum prison penalty in Florida for illegal possession of marijuana—first offense?" (Anderson et al.; Waldo and Chiricos); "how severe are the courts in this community for this offense?" (Meier and Johnson); "before you smoked marijuana (or if you never have smoked it) what do you think the punishment would be if you were caught?" with response options ranging on a 4-point continuum from "very severe" to "nothing" (Teevan,c). Others have asked respondents to estimate the probability that they would receive some specified punishment (Grasmick and Appleton). Tittle (c) asked his respondents to estimate the probability that they would be arrested and jailed for several offenses. Kraut created a seriousness index by asking respondents to estimate the likelihood of eleven consequences happening to them if they were caught shoplifting. Grasmick and Bryjak provide an excellent critical review of these diverse operationalization strategies.
3. Tittle reports a significant inverse relationship between his measure of formal punishment severity and anticipated future involvement in various criminal acts. In a multivariate analysis, however, he found that the direct effect of the fear of formal sanctions was slight and almost completely dependent upon the deterrent power of informal sanctions.
4. In the early years of perceptual deterrence research (1972-74) there were several tests of the severity hypothesis, all but two of which failed to find any evidence of a deterrent effect. Since about the mid-1970s deterrence researchers have no longer included perceived severity in their analyses of the deterrence process. In 1978, in the introduction to their comprehensive analysis of delinquency and perceived risk, Jensen et al. noted that: "Given doubts about the importance of the severity and celerity of punishments, there is justification for focusing deterrence research on the *perceived certainty* of punishment."
5. We noted earlier that both Kraut and Teevan (c) reported a significant inverse relationship between perceived severity and self-reported behavior. Kraut found this relationship for shoplifting while Teevan reported one for both marijuana use and shoplifting. These are the only two published studies prior to Grasmick and Bryjak's to report a significant negative association between severity and criminal behavior. In examining the operational definition of perceived severity employed in these two earlier studies we find that they too may be overinclusive, combining elements of both formal and informal sanctions.
Kraut's severity measure is an 11-item index of "serious consequences" which includes

the fear of arrest, the fear of conviction and jail, as well as "having parents notified," and "harming career opportunities" (361). It is clear that the first two costs reflect the formal dimension of sanction threats while the latter two the threat of nonlegal penalties. The formal and informal elements of sanction threats may have distinct effects. Since both components are combined into a single index, however, these effects are confounded and there is no way to determine if the reported inverse relationship found for this measure is due to the fear of formal sanction threats (deterrence), the fear of social censure (stigmatization) or both.

Teevan (c) operationalized perceived severity by asking his respondents what they thought the penalty would be if they were caught. The response options provided were, "very severe," "not so bad," "nothing to worry about," and "nothing." Teevan's respondents could report that the penalty they would receive would be "very severe" either because they would find the penalty itself painful (a large fine or jail time) or because they fear the possible social reaction to their apprehension.

Grasmick and Bryjak are critical of Kraut's measure but note that Teevan's "is perhaps the only valid indicator of perceived severity in past research" (476). Because they confound formal and informal sanctions we find both types lacking in precision.

6. Silberman clearly describes the critical flaw of cross-sectional deterrence research: "Respondents are asked at a given point in time what their current beliefs are regarding the efficacy of the law enforcement process and then asked to report their past criminal behavior. In order to assert that these beliefs affect the individual's behavior, we must assume a degree of stability in those beliefs. However, it is equally reasonable to assume that the respondent's current beliefs are a product of past behavior, particularly if he has committed an offense and was not caught. Are we really testing deterrence theory? Or are we measuring the effects of past experiences on current beliefs regarding the certainty and severity of punishment?" (444).

7. Grasmick and Bryjak's measure of prior criminal behavior is a good example of this problem in cross-sectional deterrence research. They asked a sample of adult respondents to provide estimates of the certainty and severity of punishment which they perceive at that current moment. These respondents were also asked to estimate the number of times they had committed each offense at any time *ever* in their life, either as an adult or an adolescent. These self-reported behaviors could have occurred 5, 10, 15 or more years in the past. In order to validly assert that the inverse relationship they report between perceived severity and criminal behavior reflects the causal influence of perceptions on behavior Grasmick and Bryjak must assume that the perceptions which they measured at the time of their study are an accurate indicator of those perceptions which existed before the behavior. Recent studies (Minor and Harry; Paternoster et al.,b) have found that perceptions are not particularly stable over even such short intervals as six months. It is doubtful if perceptions are stable over such long periods as are required by an "ever in the past" measure of self-reported behavior in some deterrence studies.

8. The only other perceptual deterrence studies to find a significant inverse effect for perceived severity, Kraut, and Teevan (c), are also beset with this problem of temporal order. Kraut used a measure of perceived severity similar to that employed by Grasmick and Bryjak (see note 4) and a shoplifting index which combined items measuring the respondent's involvement in shoplifting in the past year and *ever* in the past, and the recency of the last shoplifting offense. Teevan's research indicates a greater sensitivity to the problem of temporal order than Kraut's. His measure of criminal behavior does not include all past offenses. He asked his respondents to report the number of times they had used marijuana or shoplifted *in the past three years*. This still presents a problem of temporal order, however, albeit less severe, since the intended dependent variable measures behavior which occurred before the measurement of perceptions. Noting that deviant behavior committed in the past may influence one's current assessment of the personal risks and costs of such behavior,

Teevan asked his respondents to estimate the certainty and severity of punishment *before* they committed them. Teevan thus attempted to create the effect of a panel design by asking a set of retrospective perceptual questions, assuming that his respondents could accurately recall what their perceptions were as long as three years ago.

Grasmick and Bryjak (unreported data) and Tittle (b,c) attempted to solve the problem of temporal order by asking prospective behavioral questions—"would you commit these acts in the future?" and correlating these estimates with current perceptions. Although these are laudable attempts to deal with the problem of temporal ordering in perceptual deterrence research, the validity of retrospective perceptual questions and prospective behavioral ones is unknown and the least confounding solution is the use of panel data.

9. Silberman provides a theoretical rationale for this measurement strategy. Drawing on George Herbert Mead, Silberman notes that the "self" is organized around a *set* of societal rules and regulations rather than specific prohibitions (455-6). In this view, the individual has a generalized perception of morality and a generalized understanding of the reaction (both legal and social) to rule breaking. Such generalized perceptions are presumed to be a greater deterrent than the fear of punishment for particular acts. It is in large part due to Silberman's lead that many recent deterrence researchers have employed composite scales rather than offense-specific items in their analyses.

10. Each composite scale was rescaled. For each item included in the scale the lowest score in the frequency distribution was added to each respondent's score. Every variable, then, had a low score of zero and no negative values.

11. In the original analysis of Grasmick and Bryjak and our own replication, parametric statistics (Pearson correlations and ordinary least-squares regression) are applied to noninterval, nonnormally distributed data. Most of the control variable scales are comprised of Likert-format items and the measures of delinquent involvement are skewed. Rather than treating the data as purely ordinal, nonnormally distributed data and applying nonparametric tests we applied a linear equidistant scoring system to each ordinal item and employed the items' parametric counterparts. In a contribution to the long and controversial history of the issue of using interval-based statistics on ordinal data, Labovitz has shown that "treating ordinal data (which *may or may not* be approximately interval) as interval data by arbitrarily assigning numbers to the ordinal categories can be both legitimate and useful" (a,153). This conclusion is based on his finding that arbitrary (randomly generated) scoring systems yield only small errors when compared to any other scoring system considered to be the "true" one. In monte carlo simulations he found that reasonable changes in the scale of a set of items did not affect the sample correlations to an appreciable degree, and that if a linear equidistant scoring system is used the error is particularly minimal. In Labovitz's (a,b) analyses the treating of ordinal data as if interval presented few problems as long as extreme exponential distributions of the variables were avoided (i.e., if the scoring metric was reduced to a dichotomy). In a more recent examination of the issue, Kim concluded that using ordinal data in regression analysis was preferable to nonparametric strategies such as using the matrix of Kendall taus in the regression procedure. Consistent with Labovitz's findings, Kim reported that the errors introduced into parametric statistics by errors in measurement may not be substantial.

12. In Grasmick and Bryjak's full sample analysis they regressed criminal involvement on both perceived severity and certainty. They report, then, the partial regression coefficient between perceived severity and criminal involvement controlling for perceived certainty (see their Table 4). They also report the results of a bivariate regression analysis between criminal involvement and perceived severity (see their Table 5). This regression is done within quartile categories of perceived certainty, however, and not for the full sample of respondents.

13. Grasmick and Bryjak report the variance of their criminal involvement scale as 28.07 and the variance of their refined severity scale as 34.39 (482). Reporting a bivariate correlation coefficient of $r = -.27$ between severity and criminal involvement we have: $r = \text{cov } xy / [(\text{var } x)(\text{var } y)]^{1/2}$ or $-.27 = \text{cov } xy / [(28.07)(34.39)]^{1/2}$; multiplying both sides by the denomi-

nator we then have $-.27 \times [(28.07)(34.39)]^{1/2} = \text{covariance } xy$, so that covariance $xy = -8.3888$. Since the formula for a bivariate regression coefficient is equal to the following; $b = \text{cov } xy / \text{var } x$ we have $b = -8.3888 / 34.39$, or $b = -.244$.

14. A significance test for the equality of two regression coefficients across samples (a test for equal slopes) is found in Kleinbaum and Kupper. Visher (25) provides a computational formula:

$$t = b_1 b_2 / [SE_1^2 (n_1 - k - 1) + SE_2^2 (n_2 - k - 1) / N - k - 1]^{1/2}$$

where:

b_1 = unstandardized coefficient for group 1

b_2 = unstandardized coefficient for group 2

SE_1 = standard error for group 1

SE_2 = standard error for group 2

n_1 = sample size for group 1

n_2 = sample size for group 2

N = combined sample size

k = number of explanatory variables

15. The extension of the "credibility hypothesis," that severity of punishment is only an effective deterrent when made credible by high certainty, to perceptual level analyses was made by Teevan (a) in a very early paper. In this review of the first perceptual level studies, Teevan suggests an interaction hypothesis: "The relationship between severity of punishment and offenses should be found only for those who perceive a level of certainty high enough to make severity salient" (150).

16. The experiential effect of prior conduct on the perceived certainty and severity of punishment precisely describes the process that Matza refers to as "managing the apprehensive component" of delinquency. In his theory of drift and delinquency Matza notes that the will to repeat delinquent acts requires preparation. One element of preparation is the behavioral component, the expectation that one might not possess sufficient behavior/motor skills to repeat old infractions. The second, and more important element of preparation, is the apprehensive component, the expectation that one may be caught and punished for one's infractions. Both the behavioral and apprehensive components must be overcome before additional infractions are undertaken. Matza states that since most delinquent activity requires only a modicum of ability most adolescents are behaviorally prepared for additional delinquency. Overcoming the apprehensive component is not so easily achieved, however. It may be accomplished in two ways: (1) there may be a stock of subcultural beliefs about the inefficiency of law enforcement efforts, and (2) one may learn through personal experience that the juvenile justice system is ineffective at catching rule-breakers and applies sanctions as a last resort. Obtaining experience in rule breaking can contribute to both of these sources. One's own history of frequent infractions and infrequent apprehensions may gradually become part of the folklore of law enforcement incompetence shared by self and others. More directly, through experience one has immediate and salient verification of that folklore. One learns that detection and punishment for infractions are both sporadic and trivial, and that, therefore, the possibility and consequences of formal reaction can be discounted.

Appendix. List of Other Social Control Variables

1. School Attachments

A 5-item offense-neutral scale measuring the affective bond between the respondent and school. Items include respondents' belief that they could go to a teacher for personal advice,

the degree to which they liked the teachers in their school, if they thought that their teachers understood them, if they thought that their teachers' approval was important, if they wanted to be the kind of person their favorite teacher was.

2. Parental Supervision

A 2-item offense-neutral scale measuring the extent to which the respondent's parents knew: (a) where the respondent was, and (b) whom they were with when they were away from home.

3. Moral Beliefs

A 4-item offense-specific scale measuring "how wrong" the respondent thought it was to: (a) shoplift or steal, (b) vandalize, (c) drink liquor under age, and (d) use marijuana.

4. Educational Sanctions

A 4-item offense-specific measure. Respondents estimated on a 3-point continuum how much their chances of getting a good education would be hurt if they were arrested for: (a) shoplifting or stealing, (b) vandalism, (c) drinking liquor under age, and (d) using marijuana.

5. Social/Peer Sanctions

A 4-item offense-specific measure similar in format to Educational Sanctions measure. Respondents estimated how much their chances of having good friends would be hurt if they were arrested for each of the four offenses.

6. Occupational Sanctions

A 4-item offense-specific measure. Similar in format to Educational and Social Sanctions. Respondents estimated how much their chances of getting a good job would be hurt if they were arrested for four offenses.

7. Attachment to Parents

This is an offense-neutral scale measuring the affective bond between the respondent and his or her parents. Four questions each were asked of the mother and the father, which included how close the respondent felt to each parent, if the respondent wanted to be the kind of person his or her mother and father were, if the mother's and father's approval mattered to the respondent, and if the respondent felt able to talk to each parent if he or she had a problem and needed help.

8. Friends' Behavior

A 4-item offense-specific scale. Respondents estimated on a four point continuum how many of their friends: (a) shoplifted or stole, (b) vandalized, (c) drank liquor under age, and (d) used marijuana.

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