THE DETERRENT EFFECT OF PERCEIVED SEVERITY: A REEXAMINATION

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This research was supported by Grant #81-IJ-CX-0023 and #83-IJ-CX-0045 from the National Institute of Justice, Crime Control Theory Program. Computer support was provided by the Computer Science Center, University of Maryland. We wish to express our thanks to Douglas A. Smith for his advice and assistance.

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ABSTRACT

The deterrence doctrine unequivocally states that the perception of the severity of punishment is inversely related to criminal involvement. Despite its central position in the deterrence argument there has been little empirical support for the severity hypothesis. In a recent study, Grasmick and Bryjak critique previous deterrence research and test the severity hypothesis using a different functional form of the deterrence doctrine (an interaction model) and a "refined" measure of perceived severity. They report the largest correlation in the literature between the fear of punishment severity and prior criminal behavior. In an extension of their analysis with different data, we find that: (1) with a correct temporal ordering of deterrence variables there is a moderate but additive effect for the "refined" measure of perceived severity, and (2) the direct effect found for their measure of severity is due mainly to the influence of informal sanction threats. We argue for the development of a model of informal social control.

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In the empirical literature on social control and criminal behavior much has been written about the deterrent effect of the threat of legal sanctions. While research on the deterrence question was long dormant an explosion of research occurred after the initial publication of Gibbs (1968) and Tittle (1969). After some early work on the punishment properties of states and aggregate crime rates by Antunes and Hunt (1973), Bailey, et al., (1974), Bean and Cushing (1971), Chiricos and Waldo (1970), Gray and Martin (1969), and Logan (1972), the central deterrence proposition became recognized as one between perceived properties of punishment and individual levels of involvement in crime. The bulk of this literature has shown that the perceived certainty of legal punishment does have a moderate deterrent effect (Anderson et al., 1977; Burkett and Jensen, 1975; Grasmick and Appleton, 1977; Grasmick and Green, 1980; Jensen, et al., 1978; Kraut, 1976; Meier and Johnson, 1977; Silberman, 1976; Teevan, 1976 a,b,c; Tittle, 1977, 1980; Waldo and Chiricos, 1972), although the interpretation of much of that literature has recently been questioned (Minor and Harry, 1982; Paternoster et al., 1983b; Saltzman et al., 1982).

What has been absent from this literature has been any consistent support for another central deterrence proposition, that criminal involvement is inversely related to variations in perceived severity. Grasmick and Bryjak (1980) cite twelve studies in the deterrence literature which have examined the effect of perceived severity of punishment on criminal involvement (Anderson et al., 1977; Bailey and Lott, 1976; Cohen, 1978; Jensen and Erickson, 1978; Kraut, 1976; Meier and Johnson, 1977; Minor, 1977; Silberman, 1976; Teevan, 1976 a,b,c; Waldo and Chiricos, 1972), and report that only one (Kraut) finds evidence in support of the severity hypothesis. They also note Jensen et al.'s (1978:58) conclusion that "given doubts about the importance of the severity...of punishment...there is justification for focusing deterrence research on the perceived certainty of punishment". 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 article, Grasmick and Bryjak (1980: 473-477) offer two reasons for the failure on the part of previous researchers to find any deterrent effect for 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 unsound measure of perceived severity (the measurement hypothesis). Regarding the first hypothesis, Grasmick and Bryjak argue that the interaction hypothesis is more compatible with theoretical statements of deterrence. Rational calculators cannot be expected to take into account the magnitude of the costs for illegal behavior if those costs are negated by the uncertainty of its infliction.

Regarding the measurement hypothesis, Grasmick and Bryjak claim that previous deterrence researchers have used invalid measures of perceived severity because they did not measure the individual's own estimate of the cost of the particular punishment. In operationalizing perceived severity most researchers have asked respondents to either estimate the likelihood that they would receive some specified punishment or instructed to choose the one they think they are likely to receive from a list of penalties. In doing this, it is assumed that the subjectively felt cost of each punishment is collectively shared, for example, that a large fine is felt by all respondents as more punitive than a prison term. A more refined measure of severity Grasmick and Bryjak argue is one which does not assume that a particular penalty is perceived as equally painful by all, but which instead records the respondent's own subjective estimate of the costs of the punishment, i.e. "I would find that punishment very painful" (whatever it is) or "I would not find that punishment very painful".

In a study using one such refined measure of perceived severity, Grasmick and Bryjak (1980) report the strongest inverse correlation between perceived severity and criminal involvement to be found in the literature ($r=-.27$; $p<.001$). Their paper is an important contribution to deterrence research because no other study has found an effect for perceived severity as large in magnitude. Indeed, their study and the one by Kraut (1976) are the only published studies which found a moderate inverse relationship between perceived severity and self-reported criminal involvement.[1] Grasmick and Bryjak also report in their paper that the deterrent effect of perceived severity is contingent upon the level of certainty, with severity having a much stronger effect at a high level of certainty ($r=-.37$) than at the lowest level ($r=-.06$). Their conclusion (Grasmick and Bryjak, 1980: 486) is that their refined severity measure is superior to previous operationalizations of the concept, and they note that the dismissal of perceived severity from deterrence research is in err because the "perceived severity of punishment if arrested is a significant variable in the social control process."

Evidential Problems: The Refined Measure of Perceived Severity

Our attention in this paper is directed at the refined measure of perceived severity offered by Grasmick and Bryjak (1980). As mentioned, with such a measure they find the strongest support in the literature for the deterrent power of perceived severity. Given the magnitude of the effect found for severity, it appears that the employment of such a refined measure allows a troubling anomaly in deterrence research to be resolved. Upon closer inspection , however, there is good reason to be cautious about such a measure and the extent to which the anomaly is resolved.

In operationalizing "refined" perceived severity, Grasmick and Bryjak asked their respondents what the penalty would be for them if they were arrested and found guilty in court for each of eight different offenses. They were then asked to "indicate how big a problem that punishment would create for your life", with response options as, (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 punishment they would receive 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), 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 punishment itself while the second reflects what Gibbs (1975: 84-86) refers to as "stigmatization". Stigmatization effects are the social and material costs attendant to apprehension and punishment and are separable from the fear of formal legal punishment per se. Gibbs states that deterrence should be reserved for the inhibitory effect that the fear of legal sanctions has on behavior. He warns (1975: 85) of the confounding that conceptual overinclusiveness brings and urges the analytical separation of deterrent from other preventive effects of punishment, such as stigmatization: "the fear of stigmatization is analytically distinct from and in addition to whatever fear one may have of legal punishment itself." In his discussion of the general preventive effects of punishment, Andenaes (1974:50-51) 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 associates entails social as well as professional/occupational costs due to punishment then both Gibbs (b) and Andenaes are in agreement in distinguishing purely deterrent from stigmatizing 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. There can certainly be little doubt as to the influence and power that social others have over our actions and perceptions. Research on the effect of informal sanctions on behavior has found them to be of greater significance than formal legal sanctions (Akers et al., 1979; Anderson et al., 1977; Burkett and Jensen, 1975; Paternoster et al., 1983b; Tittle, 1980). In a study cited by Zimring and Hawkins (1973:192), 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". It would appear, then, that the fear of social reprobation or occupational reproval can be a significant component of the message communicated by sanction threats. Grasmick and

Bryjak's finding of a moderate inverse correlation between their "refined" measure of perceived severity and criminal involvement may not reflect the deterrent effect of the fear of punishment itself, but the stigmatization which accrues as a result of discovery. [2]

Grasmick and Bryjak are not the only deterrence reseachers to operationalize perceived severity in this manner. The first to do so was Tittle (1980) in a large study of American adults in three states. Tittle used a measure of "interpersonal severity" which measured "how upset" the respondent would be if others close to him were to know of his deviance. Tittle distinguishes this measure conceptually and empirically from a measure of "formal severity". He found that interpersonal loss of respect was the best predictor of anticipated future deviance and that formal severity had virtually no effect. The important feature of Tittle's approach is a differentiation between formal and informal properties of sanction threats, a distinction ignored in Grasmick and Bryjak's measure.

Evidential Problems: Temporal Ordering of Variables

Recent critiques of the deterrence literature (Minor and Harry 1982; Paternoster et al., 1983a b; Saltzman et al., 1982) have noted with reference to perceived certainty that the causal ordering of variables in previous deterrence studies does not allow an unambiguous test of deterrence hypotheses. These critiques have shown that cross-sectional designs which collect data on past criminal involvement and current perceptions of punishment risk measure an "experiential" (the influence of behavior on perceptions) rather than a deterrent effect. Inverse correlations between reports of prior behavior and current estimates of risk reflect the fact that those who have committed criminal acts in the past and have avoided detection subsequently lower their estimate of the risks involved. The critical assumption that researchers must make is not that prior behavior is a good indicator of future involvement as Grasmick and Bryjak note, rather it is that perceptions measured after the occurrence of the behavior are a good indicator of perceptions prior to the behavior (see Paternoster et al., 1982, 1983a and Silberman, 1976 for a discussion of this assumption in perceptual deterrence research).[3] The assumption of perceptual stability becomes less tenable, and confounding of the hypothesis test more acute, when the measure of prior behavior employed includes behavior committed at any time in the respondent's past.

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 about their past involvement ever in eight criminal acts. Ignoring for the moment the previously discussed measurement issue, they reported a moderate inverse correlation between current perceptions of severity and prior behavior and interpreted this finding as support for the deterrence doctrine. Grasmick and Bryjak's data may instead show that when their respondents committed illegal acts in the past they probably discovered that "nothing bad happened". When asked how much problem punishment would create in their life they relied on their own personal histories and responded in the negative. Those respondents without such experience, and therefore no personally relevant knowledge, were more pessimistic - producing the observed negative correlation between severity and prior criminal involvement. Grasmick and Bryjak clearly recognized the problem and note that they tested their hypotheses with both prior criminal involvement and estimated future involvement and found no substantive differences in their findings. We agree with their assessment (1980:488), however, the use of projected future involvement in crime is questionable and "might create as many problems as it solves". 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 (1975:209) 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."

The purpose of the present paper is to replicate and extend the analysis of Grasmick and Bryjak. A refined measure of the severity of punishment virtually identical to theirs will be employed and will be correlated with self-reported criminal involvement. Should a moderate inverse correlation be found, we will examine to what extent this relationship is due to stigmatization rather than to deterrence. This will be accomplished by partialling the zero-order correlation between perceived severity and criminal behavior on measures of social and material sanctions. If the zero-order correlation diminishes when these measures are controlled then we can conclude that the "refined" measure of perceived severity is actually a measure of the stigmatizing effects of punishment and that the fear of such effects consititutes an important ingredient of sanction threat messages. We have employed both a measure of subsequent behavior and a measure of prior criminal conduct for a comparison with Grasmick and Bryjak's earlier findings.

METHODS

Although we will try to replicate Grasmick and Bryjak's analysis as closely as possible, there are three important differences between their study and the one reported on here. The Grasmick and Bryjak study was based on a sample of adult respondents whereas our research surveys high school students. In addition, they employed eight offenses in the construction of their scales while the present study was restricted to four. Finally, the kinds of offenses examined differed, reflecting the difference in sample demographics. Grasmick and Bryjak collected data on offenses more characteristic of adults (theft of something worth less than $20,theft of something worth more than $20,gambling, physically hurting someone on purpose, cheating on tax returns, illegal use of fireworks, driving under the influence, littering) while the offenses analyzed here are more representative of adolescents (petty theft, vandalism, drinking liquor under age, using marijuana).

The use of different populations in the two studies should present no problem for our purposes since the process of deterrence is assumed to be invariant across age groups. While our use of fewer offenses, and thus fewer items in scale construction, may depress the reliability of our measures relative to Grasmick and Bryjak's, that is an empirical issue to be investigated and if it exists corrections for attenuations made. The use of different offenses in tests of deterrence hypotheses should also present little difficulty in comparing our results with theirs. The literature has shown no consistent evidence that deterrence works best with some kinds of offenses rather than others, <u>mala in se</u> vs. <u>mala prohibita</u>, instrumental vs. expressive (Jensen et al., 1978; Silberman, 1976; Waldo and Chiricos, 1972; Zimring and Hawkins, 1973). The critical similarity between the studies is an equivalence of measures of perceived severity, and the establishment of an inverse correlation between this measure and the measure of criminal involvement. Once established, the issue becomes one of accounting for such a relationship.

Sample

The data come from a panel study of high school students. During the fall school semester of 1981 questionnaires were administered to 2,703 tenth grade students in nine high schools in a southern city. A follow up 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 agreeihg to participate in the study. At the second questionnaire administration 2,258 eleventh grade students completed a questionnaire. Of the 2,703 students who had completed a questionnaire in the tenth grade 1,625 (60%) also completed one in the eleventh.[4] Students who had dropped out, moved,or were absent on the day the questionnaire was administered were excluded from further analysis. Only those students who completed a questionnaire at both times comprise the present sample.

Measures

Criminal Involvement

Two measures of self-reported criminal involvement were used here. One was a measure of prior criminal involvement and is similar to that employed by Grasmick and Bryjak. For this measure, respondents were asked to estimate the number of times that 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 estimate was obtained at the first questionnaire administration, when the students were beginning the tenth grade, and measures their criminal involvement in those four offenses up to that time. A measure of subsequent criminal 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 above. This measure, then, reflects only that behavior committed subsequent to the beginning of the tenth grade and up to the beginning of the eleventh. This time period corresponds to a one year interval after our measurement of their perceptions which occurred in the tenth grade.

In their research, Grasmick and Bryjak dichotomized their eight criminal involvement items into those who had never committed the offense and those who had committed the offense at least once in the past. We chose to retain our measure of involvement as frequencies. Since the reported frequency distribution did have some atypical outlying scores (particularly for the drinking and marijuana items) we 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 Severity and Other Independent Variables

A refined measure of perceived severity identical to that introduced by Grasmick and Bryjak was employed. 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?". Response options were "no problem at all", "hardly any problem", "a little problem", "a big problem" and "a very big problem". It allows each respondent to contemplate the nature of their own likely punishment and then asks them to provide an estimate of how severe they perceive that punishment to be.

Our concern in this paper is the extent to which the refined measure of perceived severity actually reflects perceptions of the social and material costs of legal penalties. A particular punishment may be seen as creating a "big problem" because of the adverse effect it would have on one's social relationships or career. For adult populations, such as Grasmick and Bryjak's, important sources of social disapproval would be one's spouse, other family members, friends or business associates. For our sample of adolescents, salient sources of social reprobation would probably include parents and peers. While occupational liabilities may be too remote to enter into a calculation of costs, the most immediate "occupation" of these respondents, educational pursuits, are an immediate foci of possible penalties.

<u>Parental sanctions</u> were measured by asking respondents to respond to the following questions, "If you 'committed crime x' how do you think your father would react if he knew?". Response options ranged on a five point continuum from "strongly disapprove" to "strongly approve". Identical questions were asked concerning anticipated mother's reaction to each offense. <u>Peer sanctions</u> were assessed by asking respondents identically worded questions about the reactions of their best friends to each offense. Finally, four items measuring <u>educational sanctions</u> were used. Respondents were asked to estimate how much they thought their chances of getting as much education as they wanted would be hurt if they were arrested for each of the four offenses. The three response options were, "hurt very little", "hurt a little", and "hurt a lot".

The measure of the <u>perceived certainty</u> of punishment used here is similar to that used in other deterrence studies. 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". This measure of perceived certainty asks for the respondent's estimate of their own likelhood of apprehension rather than for a generalized other (Jensen et al., 1978; Paternoster et al., 1982).

The means and corresponding standard deviations of each item for all measures are provided in Table 1. Each construct is measured with four offense-specific items except for parent sanctions which includes eight items.

TABLE 1 ABOUT HERE

Scale Construction

Similar to Grasmick and Bryjak, hypothesis tests were conducted with composite scales rather than offense-specific items (theoretical justification for such a procedure can be found in Silberman 1976). To coincide with their scale analysis we first performed a principal component factor analysis on all items. Table 2 reports the loadings for each item on the first principal component. All of the correlations between an item and its first component are .40 or higher with most of them larger than .70. The magnitude of the loadings reported here and those from Grasmick and Bryjak's (1980:481) study are very close with ours generally being higher.

The internal consistency of each scale was then tested using Cronbach's alpha (bottom of Table 2). For each scale the reliabilities are quite good, with all but one being .70 or higher. In comparing these reliabilities with those reported by Grasmick and Bryjak (1980: 481) it is important to note that they are virtually identical in magnitude. It would appear that our four item scales are at least as reliable as their eight item composites. The only major discrepancy is found for the criminal involvement scale. Their eight item scale for prior criminal involvement had a reported alpha reliability of .73. Although our measure of prior criminal behavior has an equivalent reliability (α=.71), the appropriate hypothesis tests conducted in this paper will be done with the measure of subsequent criminal involvement which had a somewhat lower reliability (α=.60). This will present no real problem for the analyses to follow because we are not so much concerned with the magnitude of a correlation as in how the coefficient changes when controls are introduced. Since a lower reliability of one measure will attenuate our observed correlations, however, we will also present correlations corrected for unreliability where appropriate.

TABLE 2 ABOUT HERE

Scales for both measures of criminal involvement were formed by summing the logged frequency scores for each offense item. For the perceived severity measure, perceived certainty, and parents, peer and educational sanctions, scales were constructed by summing and averaging the scores across each item. High scale scores mean high perceptions of severity, certainty, and social/educational sanctions. Means and standard deviations for each scale are reported at the bottom of Table 2.

FINDINGS

The zero-order correlations between the deterrence (severity,certainty), stigmatization (parent, peer and educational sanctions) and criminal involvement scales are reported in Table 3. The deterrence hypothesis to be tested here is the relationship between perceptions of the severity of punishment and subsequent behavior. In looking at the effect of perceived severity it can be seen that consistent with the deterrence doctrine there exists a moderate inverse relationship between perceived severity and subsequent criminal involvement ($r=-.19$, $p<.001$). It is interesting to note that the correlation reported here between the refined measure of perceived severity and criminal involvement is weaker than that reported by Grasmick and Bryjak (1980: 482) in their original paper ($r=-.27$), even though equivalent severity measures were used. It is important to remember, however, that their reported correlation is between perceived severity and prior criminal involvement. Table 3 shows that the correlation between severity and prior behavior found here ($r=-.25$) is equivalent in magnitude to that found by Grasmick and Bryjak.

TABLE 3 ABOUT HERE

It would appear from this stage of the analysis that contrary to much of the published empirical literature, perceptions of the severity of punishment do act as a deterrent. It is perhaps not the most important element, however, for in comparison with perceived certainty and fear of informal penalties it has the weakest correlation with subsequent criminal involvement. In part, this may reflect the fact that perceptions of the severity of punishment operate as a deterrent only when the threat of severe penalties is credible, i.e., at high levels of certainty. Grasmick and Bryjak (1980:483-484) tested for such an interaction using a multiplicative term (severity x certainty) in a multiple regression analysis, and found support for the interaction hypothesis. Again, the dependent variable in their analysis was prior criminal involvement. A more precise test of the interaction hypothesis can be made by using a measure of subsequent behavior.

Table 4 presents a test of two models, an additive effects only model for perceived severity and certainty, and an interaction model which contains the product term. The test for an interaction effect is the significance of the regression coefficient for the product term in a regression equation which also includes main effects (Allison 1977; Cohen and Cohen, 1983). These two models are tested using subsequent criminal behavior as the dependent variable with identical models estimated using prior behavior, for comparison to Grasmick and Bryjak's findings.

The first panel of Table 4 reports the results of the hypothesis test for the additive model using subsequent behavior. In this model the partial regression coefficients for both perceived severity and certainty are highly significant, and consistent with the deterrence doctrine both effects are negative. In this additive model, then, two central deterrence propositions receive support - involvement in criminal behavior is significantly less likely for those who perceive punishment to be certain and severe. The temporal order of the variables in this additive model makes this interpretation of the regression equation less ambiguous than previous tests of the hypotheses. An examination of the interaction model reveals that the effect of perceived severity is not contingent upon the level of perceived certainty. The product term in the interaction model is not significant, indicating that perceived severity and certainty have independent, additive effects on subsequent criminal involvement. If this refined measure of perceived severity is, as we hypothesize, a multidimensional measure of social reprobation and other informal sanctions then our findings are consistent with those reported by Tittle (1980). He found that his measure of informal severity (interpersonal loss of respect) was independent of the level of formal sanction fear.

TABLE 4 ABOUT HERE

Using prior behavior as their measure of criminal involvement Grasmick and Bryjak found evidence of an interaction effect for severity. The results of our own test with a similar criminal involvement measure is found in Table 4 and it too reveals a significant interaction effect. However, the regression coefficient for our product term is positive ($b=.347$; $p < .05$), indicating that the inverse relationship between perceived severity and criminal involvement is strongest at low levels of certainty.

We can complement this interpretation with an analysis which directly parallels that presented by Grasmick and Bryjak (1980:484-485) Table 5 reports the results of a series of regression equations with criminal involvement regressed on perceived severity within levels (quartiles) of perceived certainty. The top panel presents the results for subsequent criminal involvement and the bottom panel is equivalent to Grasmick and Bryjak's analysis with prior behavior. The analysis involving subsequent behavior confirms our earlier finding of a significant, additive effect for the refined measure of perceived severity. At each level of perceived certainty there is a significant inverse effect of severity on subsequent criminal involvement. The bottom panel confirms our finding of an interaction effect between perceived certainty and severity on prior criminal involvement. A comparison of unstandardized regression coefficients shows that the relationship between prior behavior and perceived severity is strongest at the lowest level of certainty.

To summarize the results thus far, we have found a significant negative effect between Grasmick and Bryjak's refined measure of perceived severity and subsequent criminal behavior. Similar to Tittle's (1980) study and those by Bailey and Lott (1976), Cohen (1978) and Teevan (1976c) we did not find any evidence to support their contention that this effect is contingent upon high levels of perceived certainty. Our finding of a deterrent effect for perceived severity is a surprising confirmation of an important proposition in the deterrence doctrine. The consistent absence of support for this central hypothesis has for a long time been an anomaly for deterrence theory. The key to this anomaly could reside, as Grasmick and Bryjak have suggested, in the poor way that previous researchers have operationalized perceived severity. The construction and utilization of a refined measure has seemingly indicated that perceived severity of punishment should not be dismissed from considerations of social control.

As we have suggested earlier in this paper, however, this resolution of the perceived severity anomaly may be a spurious one. Perhaps the Grasmick and Bryjak refined measure of perceived severity is indeed a more adequate measure than those previously employed. Perhaps, however, the measure is so overinclusive that it incorporates non-deterrent effects of sanction threats. Specifically, we have offered the hypothesis that the measure may include stigmatization effects as well as the directly deterrent fear of punishment itself.

Within our group of teenaged respondents three sources of stigmatization were examined, reprobation from parents, disapproval of peers, and damaged educational opportunities. The effect of partialling for these stigmatization effects on the relationship between perceived severity and criminal involvement is reported in Table 6. Our primary interest will be in the change that occurs in the observed zero-order relationship between the refined measure of perceived severity and subsequent behavior (the first row of Table 6). Comparative data for prior behavior is also provided. The first column of Table 6 reports the zero-order correlation ($r=-.19$, $p < .001$). The first set of partial correlations reported are the first-order partials for our three measures of stigmatization. It can be seen that the correlation between perceived severity and subsequent behavior diminishes considerably when possible social costs from peers are taken into account. The magnitude of the correlation is almost reduced in half by this first-order partial. However, when the effect of possible parental disapproval is controlled the zero-order correlation is almost unaffected (-.19 reduced to -.17; $p < .001$). Apparently, for these respondents parental disapproval does not enter into their assessment of the cost of deviance. The fear of educational liabilities is, however, an important cost consideration for these high school respondents. When this element of sanction fear is controlled the zero-order correlation between perceived severity and behavior is reduced from -.19 to -.12.

TABLE 6 ABOUT HERE

The combined effect of two stigmatization variables is presented in the next three columns of Table 6. It can be seen that the fear of parental reprobation adds little to the effect of either peer sanctions or fear of educational costs. The second-order partials involving parent sanctions are little different from the first-order partials for peer and educational sanctions. The combination of the latter two perceived costs, though, does produce an additional reduction in the zero-order correlation between perceived severity and behavior. When these elements of sanction threats are controlled the correlation declines from -.19 to -.06. Although the effect remains significant it is negligible in magnitude. This second-order partial is identical to the third-order partial when parent sanctions are introduced as a third control, further suggesting that these respondents do not take into account parental disapproval when calculating the costs of deviance.

It would seem from this analysis that perceived severity has no substantial effect on subsequent involvement in crime once peer disapproval and the fear of educational costs are controlled. Further evidence of this can be seen in Table 7 which reports the zero-order correlation and partial correlations between perceived severity and criminal involvement within levels of perceived certainty. As we found before, each of the zero-order correlations is significant. Each is substantially reduced, however, when controls for peer sanctions and educational sanctions are introduced. All of the second-order partial correlations are negligible, and only one is significant. These findings are similar to those reported by Tittle (1980). In a multivariate analysis of the effect of formal and informal sanction threats on expected future deviance he found that formal severity had a negligible effect once informal severity (loss of interpersonal respect) was controlled.

TABLE 7 ABOUT HERE

It could be argued at this point that the observed correlations (zero-order and partial) are attenuated due to measurement error, and that if corrected the observed effect for perceived severity would be larger than those reported in Tables 6 and 7. There is some merit to this point. Although the reliability for the refined measure of severity is satisfactory (α=.85), the reliability of our measure of subsequent criminal involvement is considerably less so (α=.60). When our correlation between perceived severity and subsequent behavior is corrected for attenuation it increases from r=-.19 to -.27. [5] Unfortunately, there is no easy correction for attenuation for first and second-order partial correlations (Cohen and Cohen, 1983). We can, however, present the data in the form of a latent variable causal model, wherein observed indicators of unobserved constructs can be used to estimate the reliability of the construct. The causal connections linking these latent variables can then be estimated and these parameters are the causal parameters between perfectly reliable, "true" variables (i.e., corrected for attenuation).

Figure 1 presents the appropriate measurement and structural equation model for the effect of peer sanctions, perceived severity, and educational sanctions on subsequent criminal involvement. Our intent here is not to present a full causal model of determinants of criminal behavior, rather it is the more narrow one of determining and distinguishing the independent and direct effects of purely deterrent and stigmatization factors. There is both a measurement model and a structural equation model represented in Figure 1. In the exogenous component of the measurement model each unobserved variable (ξ_1, ξ_2, ξ_3) is measured by four observed indicators (x_1, x_2, $x_3, \ldots, x_{12}$). Each of the observed variables are directly affected by two elements, a latent variable (ξ) which represents an underlying theoretical construct and a disturbance term (δ) representing measurement error. In the endogenous component of the measurement model, the unobserved variable (η) is measured by four observed indicators (y_1, y_2, y_3, y_4). Again, each of these observed variables is directly affected by a latent variable (η) and an error component (ε). The values of the λ_{ij}'s in the measurement model represent the direct causal effects of the latent constructs on each observed indicator. The structural equation model in Figure 1 is represented by the relationships among the exogenous variables (ξ's) and between each exogenous variable and the endogenous variable (η). The three exogenous variables are free to covary (curved arrows), and each has a direct effect on the endogenous variable. Both the covariances among the exogenous latent constructs and the direct effects of the exogenous variables on the endogenous variable are represented by the γ_{ij} terms in Figure 1. The ζ term in Figure 1 is a disturbance term representing error in the structural equation for η. It is the variance in the endogenous variable unexplained by the model. All parameters in the model were estimated using Joreskog and Sorbom's (1983) LISREL V program.

FIGURE 1 ABOUT HERE

Determining the Adequacy of the Model

In latent variable models such as in Figure 1, the adequacy of a model is determined by the fit between the observed variance/covariance matrix (S) and that generated by a hypothetical model (Σ). The closer the fit between observed and estimated covariance matrices the more adequate is the proposed causal structure in accounting for the data. In determining goodness-of-fit LISREL produces a χ^2 statistic and corresponding degrees of freedom. Unlike conventional uses of χ^2, a small value of χ^2 suggests the acceptance of the proposed model. As a hypothesis test, however, χ^2 is sensitive to sample size and departures from normality in the observed variables. With large samples the χ^2 test will lead to the rejection of a model even when the difference between Σ and S is trivial. When one has a large number of obervations the issue becomes one of determining how well the model approximates the data. Various methods of examining the fit between Σ and S have been proposed. Wheaton et al., (1977) have suggested that ratios of χ^2 to degrees of freedom of 5 or less are indicative of a good fit. Hoelter (1983) has shown the inadequacy of the χ^2/df ratio and provides a more exact goodness-of- fit index which he calls "critical N". According to Hoelter (1983:330), critical N estimates "the size that a sample must reach in order to accept the fit of a given model on a statistical basis" (i.e., at a given alpha level). The formula for critical N (CN) is:

$$CN = \frac{(1.65 + \sqrt{2df-1})^2}{2\chi^2/(N-G)} + G$$

where N is the number of observations and G is the number of groups. Hoelter suggests that critical N values greater than 200 represent a good fit between Σ and S since monte carlo studies indicate that maximum likelihood estimates are robust to departures from normality in samples exceeding 200 obervations (see Hoelter, 1983 for a more detailed discussion and application of the CN statistic).

Results of Model Estimation

Based on Figure 1, an initial model was estimated in which all measurement errors were assumed to be independent (i.e., COV $\delta_i \delta_j$ = COV $\varepsilon_i \varepsilon_j$ = 0). This model provided a very poor fit to the data (X^2=1802.40, 98 df; ratio X^2/df = 18; CN = 98). An examination of the fitted covariance matrix and normalized residuals (S-Σ) suggested that the assumption of independent measurement errors should be rejected. In particular, the residuals showed that the error terms for indicators of different theoretical constructs but similar behavioral referrents were correlated ($\delta_1\delta_5$, $\delta_2\delta_6$, $\delta_3\delta_7$, $\delta_4\delta_8$, etc.). There are twelve of these correlated errors that should not have been constrained to zero. In addition, however, the proposed model did not account very well for the sample covariance between each x item and its corresponding behavior item in the endogenous construct (i.e., x_1y_1, x_2y_2, x_3y_3,...,$x_{12}y_{12}$). This suggested that twelve additional correlated error terms be unconstrained ($\delta_1\varepsilon_1$, $\delta_2\varepsilon_2$, ... ,$\delta_{12}\varepsilon_{12}$). Unfortunately, there is no parameter matrix in the standard LISREL model which contains as an element the covariance between measurement error for an x variable and measurement error for a y variable. In fact, such covariances are constrained to be zero in the regular LISREL model.

In two recent papers, Smith and Patterson (1984, 1985) present a generalization of the standard LISREL model which permits an estimation of these and other parameters. Although a discussion of their generalization is beyond the scope of the present work (see their papers for a detailed presentation of the general LISREL model including proofs), the general LISREL model requires only three matrices, $\hat{\Lambda}$, $\hat{\beta}$, and $\hat{\Psi}$. The elements corresponding to the covariance between ε and δ terms are found in the $\hat{\Psi}$ matrix (see Appendix A for a discussion of the matrices for the generalized LISREL model).

For the model in Figure 1, the $\hat{\Psi}$ matrix is a partitioned 20x20 matrix with the following elements:

$$\hat{\Psi} = \begin{array}{c} \\ \varepsilon_1 \\ \varepsilon_4 \\ \delta_1 \\ \delta_4 \\ \delta_{12} \\ \zeta \\ \xi_1 \\ \xi_2 \\ \xi_3 \end{array} \begin{array}{c} \begin{array}{ccccccccc} \varepsilon_1 & \varepsilon_4 & \delta_1 & \delta_4 & \delta_{12} & \zeta & \xi_1 & \xi_2 & \xi_3 \end{array} \\ \left[\begin{array}{ccccccccc} \varepsilon_1\varepsilon_1 & & & & & & & & \\ \varepsilon_4\varepsilon_1 & & & & & & & & \\ \delta_1\varepsilon_1 & & & & & & & & \\ & \delta_4\varepsilon_4 & & & & & & & \\ & & & & \delta_{12}\delta_{12} & & & & \\ & & & & & \psi_{11} & & & \\ & & & & & & \phi_{11} & & \\ & & & & & & \phi_{21} & \phi_{22} & \\ & & & & & & \phi_{31} & \phi_{32} & \phi_{33} \end{array}\right] \end{array}$$

The triangular 16x16 submatrix contains the variances ($\varepsilon_1\varepsilon_1$, $\varepsilon_2\varepsilon_2$, ..., $\delta_1\delta_1$, $\delta_2\delta_2$, $\delta_3\delta_3$, ..., $\delta_{12}\delta_{12}$) and covariances ($\varepsilon_2\varepsilon_1$, ..., $\delta_2\delta_1$, ..., $\delta_{12}\delta_{11}$) for errors in measurement. With this reconfiguration of the standard LISREL matrix we can estimate the covariance between errors in y variables and errors in x variables by freeing elements in the 16x16 submatrix (for example, $\delta_1\varepsilon_1$, $\delta_2\varepsilon_2$). Our examination of the normalized residuals from the first model (model of independent errors) suggested that twelve such correlated errors should be freed ($\delta_1\varepsilon_1$, $\delta_2\varepsilon_2$, $\delta_3\varepsilon_3$, $\delta_4\varepsilon_4$, $\delta_5\varepsilon_1$, $\delta_6\varepsilon_2$, $\delta_7\varepsilon_3$, $\delta_8\varepsilon_4$, $\delta_9\varepsilon_4$, $\delta_{10}\varepsilon_2$, $\delta_{11}\varepsilon_3$, $\delta_{12}\varepsilon_4$), in addition to twelve other correlated errors involving only x variables ($\delta_5\delta_1$, $\delta_6\delta_2$, $\delta_7\delta_3$, $\delta_8\delta_4$, $\delta_9\delta_1$, $\delta_{10}\delta_2$, $\delta_{11}\delta_3$, $\delta_{12}\delta_4$, $\delta_9\delta_5$, $\delta_{10}\delta_6$, $\delta_{11}\delta_7$ $\delta_{12}\delta_8$).

A second model was estimated which was identical to that shown in Figure 1 except that it freed twenty-four correlated error terms. This model provided a significantly better fit to the data (χ^2=692.05, 74 df; difference of χ^2=1110.35, 24 df; $p < .001$)[6] than the model with independent measurement errors. Although an improvement over the model with independent measurement errors, it provided only a marginally adequate fit to the data (ratio χ^2/df = 9; CN = 197). An examination of the residuals from this model suggested three additional correlated errors among the x variables ($\delta_4\delta_3, \delta_8\delta_7, \delta_{12}\delta_{11}$); which are measurement errors in the exogenous variables for marijuana use and drinking under age. Freeing these parameters provided a model with a significant improvement in fit (χ^2=360.07, difference in χ^2=331.98, 3 df; $p < .001$) and, overall, provided a much better fit to the observed data (ratio χ^2/df = 5; CN = 364). The normalized residuals suggested one final parameter to be freed, that parameter corresponding to a covariance between the error in measurement for y_1 and y_2 ($\varepsilon_2\varepsilon_1$). Freeing this parameter produced a significantly better fit (χ^2 difference = 47.37, 1 df; $p < .001$), and this final model provided a very good fit to the observed data (ratio χ^2/df = 4; CN = 414).

This final model is identical to that presented in Figure 1 with the ommission of the covariances among the error terms.[7] Table 8 reports both the maximum likelihood estimates and the estimates from the LISREL standardized solution.[8] Our main interest is in the structural coefficients, γ_{ij}'s. The interpretation of the structural coefficients is straightforward. The value of γ_{ij} indicates that a unit change in the exogenous variable ξ_j results in a change in η_j of γ_{ij} units, holding all other variables constant. When the latent constructs have been standardized, the γ^*_{ij} coefficients indicate that a standard deviation change in ξ_i results in a γ^*_{ij} standard deviation change in η_i, controlling for all other variables in the model.

TABLE 8 ABOUT HERE

The estimates for the final model show that, of all exogenous variables, peer sanctions have the strongest effect on subsequent criminal involvement.

As expected, the sign of the coefficient is negative and is highly significant ($\gamma^* = -.409$; $p < .001$) indicating that the threat of peer disapproval has a strong inhibitory effect. The second strongest effect is found for the fear of educational sanctions. Its sign is also negative and significant, suggesting that even when the threat of peer disapproval is controlled the threat of possible educational costs is an additional, independent fear ($\gamma^* = -.088$, $p < .01$). The coefficient for the perceived severity of punishment is also negative, consistent with the deterrence doctrine, and is significant, although just barely so and is not nearly as strong an inhibitor as the informal sanction threats ($\gamma^* = -.068$; $p < .05$). This suggests that perceived severity of punishment has a very weak deterrent effect on criminal involvement even after two informal costs of punishment are accounted for. More importantly, however, this analysis is consistent with our earlier conclusion that much of the large deterrent effect observed by Grasmick and Bryjak for their refined severity measure is due to extra-legal informal threats rather than to the fear of punishment itself.

The parameter estimates reported in Table 8 for the structural effects were obtained after fitting successive models to the data, each differing in the number of correlated measurement errors estimated. The freeing of previously constrained measurement errors ultimately provided us with a model which fit the data well. A question may arise, however, as to the stability of the structural estimates (γ_{ij}'s) over different model estimations, i.e., does freeing measurement error covariances in different models bias the structural effects? In Table 9 we present the structural estimates under each fitted model. Model 1 was the first model estimated, and assumed independent measurement error. Models two through four are nested models where previously constrained covariances among measurement errors are freed. What is clear from Table 9 is that with each successive model we have a better fit to the data with little change in the estimates of the structural equations. Once the initial assumption of independent measurement errors was discarded subsequent versions offered a "fine tuning" of the model with almost no change in the structural effects. These estimates, then, appear to be efficient estimates of the effects of the exogenous variables on subsequent criminal involvement, and the freeing of additional parameters would have improved the fit in the model with little or no substantive change.

TABLE 9 ABOUT HERE

SUMMARY AND CONCLUSION

In his 1975 book, Gibbs cautioned deterrence researchers not to confuse strictly deterrent effects from other preventive effects of punishment. Although perhaps at that time directing his comments to those employing aggregate data, his caveat is no less applicable to those engaged in perceptual deterrence research. Sanction threats can deter because of the threat of punishment itself (deterrence) or because of the fear of the social and material costs punishment would bring (stigmatization).

In one recent perceptual deterrence study, Grasmick and Bryjak (1980) introduce a "refined" measure of perceived severity of punishment. In their research they report the largest correlation between perceived severity and criminal involvement. This was indeed a striking finding since only one other study had previously found any deterrent effect for perceptions of severity.

Grasmick and Bryjak's finding provided support for a central proposition of the deterrence doctrine and their discussion of the operationalization of perceived severity offered an explanation for previous negative findings.

The findings from our replication and extension of Grasmick and Bryjak's analysis, however, suggests that careful scrutiny into this refined measure is in order. Using an identical measure of perceived severity with a more rigorous temporal ordering of variables, we found no deterrent effect. We did observe a moderate inverse correlation between this measure of perceived severity and subsequent criminal involvement ($r=-.27$ when corrected for attenuation). We discovered, however, that the effect of this refined measure was due mainly to the effect of the fear of the stigmatizing consequences of punishment (social and educational costs). When informal costs were introduced to control for the non-deterrent effects of sanction threats the observed correlation between severity and criminal involvement disappeared. An examination of the causal relationship among latent variables revealed that peer disapproval had the strongest effect on subsequent involvement in criminal behavior, and the fear of educational costs had the second strongest effect. Once these informal costs were controlled the refined severity measure had a much samller, although still significant, deterrent effect.

It would appear from our analyses that the refined measure of perceived severity introduced and recommended by Grasmick and Bryjak measures a more global dimension of sanction threat than what is traditionally understood as the perceived severity of punishment. It appears to be a multidimensional concept, reflecting both the informal costs of punishment as well as the fear of punishment itself. We have identified at least two of these other dimensions, peer disapproval and educational liabilities, which, when controlled, reduce the direct effect of perceived severity on subsequent criminal involvement. If other social costs could have been measured and estimated (such as the fear of teacher disapproval or loss of school or leisure privileges) perhaps the remaining effect of this perceived severity measure would have diminished further. In sum, our findings regarding the relative role of formal and informal sanction fear are at odds with Grasmick and Bryjak's (1980: 486) conclusion that "perceived severity of punishment...is a significant variable in the social control process." Rather, we are in complete agreement with Tittle (1980: 241) that "social control as a general process seems to be rooted almost completely in informal sanctioning...perceptions of formal sanction ...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." It may now be incumbent upon deterrence theorists and researchers to consider the development of models of informal social control.

NOTES

1. Grasmick and Bryjak were not the first to report a significant effect for perceived severity. They and Kraut, however, were the first to report a deterrent effect for "formal s verity". Before Grasmick and Bryjak's results were published, Tittle (1980) also reported a significant inverse relationship between perceptions of severity and criminal involvement. As will be discussed in detail below, there is an important difference between the research by Kraut and Gramsick and Bryjak on the one hand and Tittle on the other. Both Kraut and Grasmick and Bryjak combine elements of formal and informal sanctions in their measure of perceived severity. Kraut, for instance, employs an eleven item index of "serious consequences" of apprehension for shoplifting which includes the fear of arrest, conviction and jail as well as "having parents notified" and "harming career opportunities". Tittle maintains a conceptual and empirical distinction between informal and formal severity, finding deterrent effects for the former but not the latter.

2. This could also explain the moderate inverse correlation (r=-.20) between perceived severity and self-reported shoplifting found by Kraut (see note 1). These two studies are the only published studies in the literature reporting a deterrent effect for perceptions of "formal severity".

3. Silberman (1976:444) clearly describes the problem 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?"
Estimates of the stability of perceptions have found them susceptible to change even over short periods of time (Paternoster et al., 1983a; Minor and Harry, 1982), questioning the utility of cross-sectional designs for perceptual deterrence research.

4. The considerable mortality between tenth and eleventh grade was due for the most part to students leaving the area. Two of the largest high schools surveyed were located near a military installation and had a substantial proportion of students with fathers in the service. These students accounted for a significant portion of the Time1-Time2 mortality. Similarly, children of military families transferred into these schools in the eleventh grade and thus were not part of our tenth grade sample. Neither of these groups were included in thse analyses.

5. The correction for attenuation is made by dividing the observed correlation coefficient by the square root of the product of the two reliability estimates:

$$r_{x*}r_{y*} = \frac{r_{xy}}{\sqrt{r_{xx}r_{yy}}}$$

6. If one model M1 is nested in another M2 then we can test the significance of the improvement in fit of M2 relative to M1. The hypothesis that the parameters restricted in M1 but not in M2 are equal to zero is tested with a difference in chi-square test: $X^2 1 - X^2 2 = X^2 M1-M2$ with df = df1-df2.

7. For clarity of presentation the estimated variances and covariances of

errors in measurement are not reported in Figure 1 nor in Table 8. The measurement error variance/covariance matrix can be found in Appendix B, these are final-model estimates only.

8. The standardized solution reported in Table 8 produces the standardized estimates obtained from analyzing the covariance matrix and is not the same result one would obtain if the correlation matrix were analyzed. This is because the LISREL standardized solution rescales the variance of the latent variables; the observed variables remain in their original metric. These standardized estimates are, then, the solution for parameters for latent variables that have been rescaled to unit variance.

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Table 1

MEANS AND STANDARD DEVIATIONS FOR ALL OFFENSES

Questionnaire Item	Petty Theft	Vandalism	Alcohol Use	Marijuana Use
Subsequent Behavior				
Mean	.229	.298	2.166	.828
Standard Deviation	.661	.688	1.838	1.587
(N)	(1574)	(1571)	(1534)	(1548)
Prior Behavior				
Mean	.642	.730	2.333	.919
Standard Deviation	1.094	1.157	2.073	1.720
(N)	(1565)	(1554)	(1521)	(1551)
Certainty				
Mean	2.994	2.792	2.149	2.647
Standard Deviation	1.058	1.053	1.038	1.243
(N)	(1592)	(1587)	(1587)	(1580)
Severity				
Mean	4.396	4.247	4.162	4.634
Standard Deviation	.804	.851	.945	.728
(N)	(1592)	(1590)	(1589)	(1587)
Parents' Sanctions				
Father				
Mean	4.774	4.777	4.421	4.804
Standard Deviation	.632	.632	.808	.623
(N)	(1565)	(1562)	(1561)	(1567)
Mother				
Mean	4.815	4.791	4.562	4.827
Standard Deviation	.597	.616	.779	.610
(N)	(1599)	(1604)	(1601)	(1602)
Educational Sanctions				
Mean	2.103	2.143	2.205	2.671
Standard Deviation	.764	.732	.752	.612
(N)	(1584)	(1581)	(1572)	(1578)
Peer Sanctions				
Mean	3.897	3.806	3.260	3.973
Standard Deviation	.850	.857	.962	1.026
(N)	(1596)	(1596)	(1596)	(1602)

Table 2

FACTOR LOADINGS AND RELIABILITY COEFFICIENTS FOR COMPOSITE SCALES

Offense	Subsequent Behavior	Prior Behavior	LOADINGS FOR FIRST FACTOR: Certainty	Severity	Parents' Sanctions: Father	Parents' Sanctions: Mother	Educational Sanctions	Peer Sanctions
Petty Theft	.40	.56	.69	.86	.80	.84	.80	.87
Vandalism	.45	.56	.73	.82	.80	.85	.82	.87
Alcohol Use	.73	.72	.77	.76	.68	.73	.69	.71
Marijuana Use	.63	.67	.75	.70	.82	.84	.59	.69
Cronbach's Alpha	.60	.71	.81	.85	.92*		.79	.84
Scale Mean	3.508	4.615	2.641	4.363	4.726		2.281	3.735
Scale SD	3.499	4.545	.877	.690	.525		.563	.765
(N)	(1507)	(1478)	(1566)	(1583)	(1537)		(1571)	(1575)

* This value of Cronbach's alpha is the reliability for the eight item Parents' Sanction Scale constructed by combining the father and mother items.

Table 3

BIVARIATE CORRELATIONS AMONG ALL VARIABLES (N=1283)

	Certainty	Severity	Parents' Sanctions	Educational Sanctions	Peer Sanctions	Subsequent Behavior	Prior Behavior
Certainty	–						
Severity	.19[c]	–					
Parents' Sanctions	.02	.21[c]	–				
Educational Sanctions	.24[c]	.38[c]	.06[a]	–			
Peer Sanctions	.33[c]	.25[c]	.30[c]	.28[c]	–		
Subsequent Behavior	-.28[c]	-.19[c]	-.11[c]	-.23[c]	-.44[c]	–	
Prior Behavior	-.33[c]	-.25[c]	-.13[c]	-.28[c]	-.54[c]	.70[c]	–

[a] $p<.05$

[b] $p<.01$

[c] $p<.001$

Table 4

REGRESSION OF CRIMINAL INVOLVEMENT ON CERTAINTY AND SEVERITY

Model	R^2	Variable	b	Standard Error	Beta	t
Subsequent Behavior						
Additive Model	.102	C	-1.006	.104	-.254	9.695[c]
		S	-.785	.137	-.150	5.711[c]
Interaction Model	.102	C	-1.188	.675	-.300	1.759[a]
		S	-.883	.387	-.168	2.283[a]
		CS	.040	.148	-.053	.272
Prior Behavior						
Additive Model	.165	C	-1.593	.131	-.308	12.177[c]
		S	-1.451	.173	-.212	8.376[c]
Interaction Model	.167	C	-3.156	.850	-.609	3.711[c]
		S	-2.298	.487	-.335	4.717[c]
		CS	.347	.187	.351	1.860[a]

a $p<.05$

b $p<.01$

c $p<.001$

Table 5

REGRESSION OF CRIMINAL INVOLVEMENT ON PERCEIVED SEVERITY WITHIN FOUR LEVELS OF PERCEIVED CERTAINTY

	(N)	r	b	Standard Error	t
Subsequent Behavior					
4 (highest)	(344)	-.14	-.655	.252	2.598[b]
3	(297)	-.23	-1.287	.320	4.022[c]
2	(321)	-.13	-.733	.314	2.338[a]
1 (lowest)	(402)	-.15	-.729	.238	3.066[b]
Prior Behavior					
4 (highest)	(344)	-.20	-1.110	.294	3.773[c]
3	(297)	-.24	-1.726	.403	4.283[c]
2	(321)	-.15	-.957	.362	2.645[b]
1 (lowest)	(402)	-.27	-1.816	.323	5.627[c]

[a] $p<.05$

[b] $p<.01$

[c] $p<.001$

Table 6

ZERO-ORDER CORRELATION BETWEEN CRIMINAL INVOLVEMENT AND PERCEIVED SEVERITY AND PARTIAL CORRELATIONS (N=1302)

		First-Order Partials			Second-Order Partials			Third-Order Partials
	Zero-Order Correlation	Peer Sanctions	Parents' Sanctions	Educational Sanctions	Peer Sanctions Parent Sanctions	Peer Sanctions Educational Sanctions	Parents' Sanctions Educational Sanctions	Peer Sanctions Parent Sanctions Educational Sanctions
Subsequent Behavior	-.19[c]	-.10[c]	-.17[c]	-.12[c]	-.10[c]	-.06[a]	-.10[c]	-.06[a]
Prior Behavior	-.25[c]	-.15[c]	-.23[c]	-.17[c]	-.15[c]	-.10[c]	-.14[c]	-.10[c]

[a] $p<.05$

[b] $p<.01$

[c] $p<.001$

Table 7

ZERO-ORDER AND PARTIAL CORRELATIONS BETWEEN CRIMINAL INVOLVEMENT AND PERCEIVED SEVERITY WITHIN FOUR LEVELS OF PERCEIVED CERTAINTY

	Quartile Categories of Perceived Certainty	(N)	Zero-Order Correlation	Partialling for: Peer Sanctions	Partialling for: Educational Sanctions	Partialling for: Peer Sanctions and Educational Sanctions
Subsequent	4 (highest)	(332)	-.14[b]	-.07	-.08	-.03
Behavior	3	(287)	-.22[c]	-.13[a]	-.17[b]	-.10[a]
	2	(313)	-.13[b]	-.06	-.09[a]	-.05
	1 (lowest)	(393)	-.15[c]	-.08	-.09[a]	-.05
Prior	4 (highest)	(332)	-.19[c]	-.11[a]	-.14[b]	-.07
Behavior	3	(287)	-.24[c]	-.12[a]	-.18[c]	-.09
	2	(313)	-.15[b]	-.07	-.09[a]	-.04
	1 (lowest)	(393)	-.27[c]	-.20[c]	-.20[c]	-.17[c]

[a] $p<.05$

[b] $p<.01$

[c] $p<.001$

TABLE 8

Parameter Estimates for Deterrence - Stigmatization Model (T-Value)

	Maximum Likelihood Solution		Standardized Solution
λ^y_{11}	.230		.359
λ^y_{21}	.288		.428
λ^y_{31}	1.262		.708
λ^y_{41}	1.000*		.648
λ^x_{11}	1.000*		.890
λ^x_{21}	1.002		.881
λ^x_{31}	.797		.626
λ^x_{41}	.825		.606
λ^x_{52}	1.000*		.881
λ^x_{62}	1.033		.838
λ^x_{72}	.878		.650
λ^x_{82}	.588		.580
λ^x_{93}	.996		.833
$\lambda^x_{10,3}$	1.000*		.869
$\lambda^x_{11,3}$	.609		.527
$\lambda^x_{12,3}$	.435		.456
γ_{11}	-.547	(-10.87)	-.409
γ_{21}	-.100	(- 1.98)	-.068
γ_{31}	-.137	(- 2.48)	-.088
ϕ_{11}	.557		1.000
ϕ_{21}	.122		.240
ϕ_{22}	.463		1.000
ϕ_{31}	.127		.267
ϕ_{32}	.146		.336
ϕ_{33}	.407		1.000
ψ	.803		.788

Chi-Square	312.70
df	70
Critical N	414

(See note 8)

*Fixed value

TABLE 9

Structural Effects and Chi-Square Over Model And Estimations (Standardized Solution)

Parameter	Model 1	Model 2	Model 3	Model 4
γ_{11}	-.448	-.405	-.409	-.405
γ_{21}	-.080	-.067	-.068	-.068
γ_{31}	-.093	-.092	-.088	-.087
Chi-Square	1802.40	692.05	360.07	312.70
df	98	74	71	70

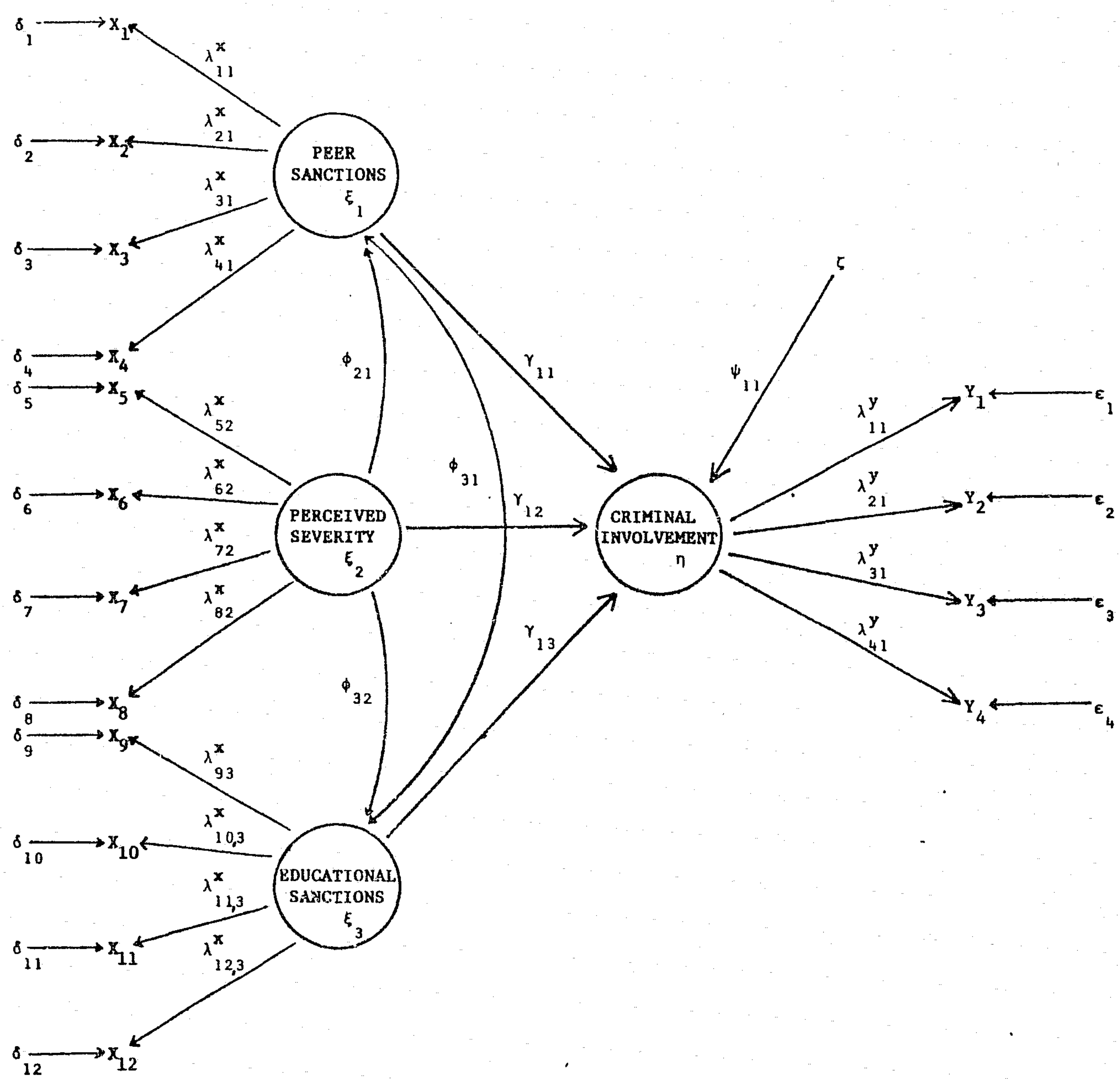

Figure 1. A MODEL OF DETERRENT AND STIGMATIZATION EFFECTS

Appendix A: Generalization of the LISREL Model.

This appendix presents a brief description of a generalization of the LISREL model. For a more complete presentation, including proofs, the reader should consult Smith and Patterson a, b. The generalized LISREL model, using version 5 of LISREL, requires that the matrix θ_ε be constrained to zero and three new matrices be defined, $\hat{\Lambda}$, $\hat{\beta}$, $\hat{\psi}$. These three new matrices are simply reconfigurations of standard LISREL matrices. For the model presented in Figure 1, $\hat{\Lambda}$ is a 16 x 20 matrix (partitioned identity and zero) as follows:

$$\hat{\Lambda} = \begin{array}{c} \\ y_1 \\ y_2 \\ y_3 \\ y_4 \\ x_1 \\ \cdot \\ \cdot \\ \cdot \\ x_{12} \end{array} \begin{array}{c} \begin{array}{cccccccccccc} y_1 & y_2 & y_3 & y_4 & x_1 & \cdot & \cdot & \cdot & x_{12} & \eta & \xi_1 & \xi_2 & \xi_3 \end{array} \\ \left[\begin{array}{cccccccccccc} 1.0 & & & & & & & & & & & & \\ & 1.0 & & & & & & & & & & & \\ & & 1.0 & & & & & & & & & & \\ & & & 1.0 & & & & & & & & & \\ & & & & & & & & & & & & \\ & & & & & & & & & & & & \\ & & & & & & & & & & & & \\ & & & & & & & & & & & & \\ & & & & & & & & 1.0 & & & & \end{array} \right] \end{array}$$

Each row of $\hat{\Lambda}$ corresponds to an observed variable and the columns correspond to both observed and latent variables. The matrix $\hat{\Lambda}$ is used to define the latent constructs in terms of their observed indicators <u>only</u> if the η's and ξ's are perfectly measured. Since our latent constructs are measured by multiple indicators each is represented by a column of zeros.

As Smith and Patterson a, b show, $\hat{\beta}$ is a partitioned matrix:

$$\hat{\beta} = \begin{array}{c} \\ y \\ x \\ \Lambda \\ \xi \end{array} \begin{array}{c} \begin{array}{cccc} y & x & \eta & \xi \end{array} \\ \left[\begin{array}{cccc} & & \Lambda & \\ & & & \Lambda_x \\ & & & \Gamma \\ & & & \end{array} \right] \end{array}$$

In our model $\hat{\beta}$ is a 20 x 20 matrix with the following elements:

$$\hat{\beta} = \begin{array}{c} \\ y_1 \\ y_2 \\ y_3 \\ y_4 \\ x_1 \\ \cdot \\ \cdot \\ \cdot \\ x_{12} \\ \eta \\ \xi_1 \\ \xi_2 \\ \xi_3 \end{array} \begin{array}{c} \begin{array}{cccccccccc} y_1 & y_2 & y_3 & y_4 & x_1 & \cdots & x_{12} & \eta & \xi_1 & \xi_2 & \xi_3 \end{array} \\ \left[\begin{array}{cccccccccc} & & & & & & & \Lambda^y_{11} & & & \\ & & & & & & & \Lambda^y_{21} & & & \\ & & & & & & & \Lambda^y_{31} & & & \\ & & & & & & & \Lambda^y_{41} & & & \\ & & & & & & & & \Lambda_{11} & & \\ & & & & & & & & \cdot & & \\ & & & & & & & & \cdot & & \\ & & & & & & & & \cdot & & \\ & & & & & & & & & & \Lambda^x_{12,3} \\ & & & & & & & & \gamma_{11} & \gamma_{12} & \gamma_{13} \\ & & & & & & & & & & \\ & & & & & & & & & & \\ & & & & & & & & & & \end{array} \right] \end{array}$$

This matrix first allows us to specify the measurement model.

Since column variables affect row variables $\hat{\beta}_{1,\ 17}$ $(=\Lambda^{y}_{11})$ reflects the effect of the endogenous latent variable (η) on its first observed indicator, y_1. The effect of η on y_2, y_3 and y_4 corresponds to the elements $\hat{\beta}_{2,\ 17}$, $\hat{\beta}_{3,\ 17}$, $\hat{\beta}_{4,\ 17}$ respectively. In a similar way, the elements of $\hat{\beta}$ are used to define the effects of ξ_1 ξ_2 and ξ_3 on their indicators x_1 thru x_{12}. As in the standard LISREL procedure one of the loadings for each construct is fixed at 1.0 in order to define the metric; the other parameters are free parameters to be estimated. Note that these elements in $\hat{\beta}_{ij}$ correspond to the λ effects in the standard LISREL model which are there defined by the two matrices Λ_y and Λ_x. We can also define our structural effects in the $\hat{\beta}$ matrix. Keeping to the rule that column variables affect row variables, the effect of ξ_1 on η is defined by the element $\hat{\beta}_{17,\ 18}$, the effect of ξ_2 on η by $\hat{\beta}_{17,19}$ and the effect of ξ_3 on η by $\hat{\beta}_{17,20}$. These $\hat{\beta}$ elements correspond to the γ_{ij} in the standard LISREL model and are there defined by the Γ matrix. The reconfigured matrix $\hat{\hat{\beta}}$, then, contains elements which correspond to the Λ and Γ matrices in the standard version of LISREL.

Having defined $\hat{\Lambda}$ and $\hat{\beta}$, the remaining matrix in the generalized LISREL model is $\hat{\Psi}$. The $\hat{\Psi}$ matrix has the same dimensions as $\hat{\beta}$. For the model in Figure 1, $\hat{\Psi}$ is a 20 x 20 matrix which contains the covariances for the errors in measurement (θ_{ε}, θ_{δ}), errors in equations (Ψ), as well as the correlation matrix for the exogenous variables (Φ). $\hat{\Psi}$, then, is a partitioned matrix with the following form:

$$
\hat{\Psi} = \begin{array}{c|ccccccccccc|}
 & \varepsilon_1 & \varepsilon_2 & \varepsilon_3 & \varepsilon_4 & \delta_1 & \cdots & \delta_{12} & \zeta & \xi_1 & \xi_2 & \xi_3 \\
\hline
\varepsilon_1 & \theta_\varepsilon & & & & & & & & & & \\
\varepsilon_2 & & & & & & & & & & & \\
\varepsilon_3 & & & & & & & & & & & \\
\varepsilon_4 & & & & & & & & & & & \\
\gamma_1 & & & & & \theta_\delta & & & & & & \\
\cdot & & & & & & & & & & & \\
\cdot & & & & & & & & & & & \\
\cdot & & & & & & & & & & & \\
\delta_{12} & & & & & & & & & & & \\
\zeta & & & & & & & & \Psi & & & \\
\xi_1 & & & & & & & & & & & \\
\xi_2 & & & & & & & & & & \Phi & \\
\xi_3 & & & & & & & & & & & \\
\hline
\end{array}
$$

By freeing some of the elements in the $\hat{\Psi}$ matrix we were able to estimate the covariance between errors in y variables and errors in x variables (for instance $\hat{\Psi}_{5,1} = \text{cov}\ \gamma_1\ \varepsilon_1$), and obtain a better fit for our proposed model.

Appendix B: Variance/Covariance Matrix for Measurement Errors-Final Model

Partitioned Psi Matrix (Error Variances/Covariances Only Reported)

	ε_1	ε_2	ε_3	ε_4	δ_1	δ_2	δ_3	δ_4	δ_5	δ_6	δ_7	δ_8	δ_9	δ_{10}	δ_{11}	δ_{12}
ε_1	.871															
ε_2	.162	.817														
ε_3	.000	.000	.499													
ε_4	.000	.000	.000	.579												
δ_1	-.037	.000	.000	.000	.208											
δ_2	.000	-.069	.000	.000	.000	.224										
δ_3	.000	.000	-.202	.000	.000	.000	.608									
δ_4	.000	.000	.000	-.029	.000	.000	.134	.633								
δ_5	.014	.000	.000	.000	-.010	.000	.000	.000	.224							
δ_6	.000	-.078	.000	.000	.000	.020	.000	.000	.000	.298						
δ_7	.000	.000	-.079	.000	.000	.000	.114	.000	.000	.000	.577					
δ_8	.000	.000	.000	-.125	.000	.000	.000	.124	.000	.000	.140	.663				
δ_9	-.032	.000	.000	.000	.029	.000	.000	.000	.021	.000	.000	.000	.307			
δ_{10}	.000	-.044	.000	.000	.000	.019	.000	.000	.000	.107	.000	.000	.000	.246		
δ_{11}	.000	.000	-.120	.000	.000	.000	.133	.000	.000	.000	.188	.000	.000	.000	.722	
δ_{12}	.000	.000	.000	-.162	.000	.000	.000	.153	.000	.000	.000	.207	.000	.000	.235	.792