TESTING THE CORE EMPIRICAL IMPLICATIONS OF GOTTFREDSON AND HIRSCHI'S GENERAL THEORY OF CRIME

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In A General Theory of Crime, *Gottfredson and Hirschi propose that low self-control, in interaction with criminal opportunity, is the major cause of crime. The research reported in this article attempts to test this argument while closely following the nominal definitions presented by Gottfredson and Hirschi. A factor analysis of items designed to measure low self-control is consistent with their contention that the trait is unidimensional. Further, the proposed interaction effect is found for self-reported acts of both fraud and force (their definition of crime). Inconsistent with the theory are (a) the finding that criminal opportunity has a significant main effect, beyond its interaction with low self-control, on self-reported crime and (b) the substantial proportion of variance in crime left unexplained by the theoretical variables. Suggestions are offered for modifying and expanding the theory.*

Gottfredson and Hirschi's (1990) *A General Theory of Crime* is sure to generate important theoretical debates and research. The theory is part of a trend in criminology that pushes the causes of crime further back in the life course into the family (e.g., Cernkovich and Giordano 1987; Hagan, Simpson, and Gillis 1987; Hill and Atkinson 1988; Laub and Sampson 1988; Larzelere and Patterson 1990; McCord 1979, 1991a, 1991b, 1991c; Loeber and Southamer-Loeber 1986; Patterson and Dishion 1985; Rankin and Wells 1990; Straus 1991; Thornberry, Lizotte, Krohn, Farnworth, and Jang 1991; Wells and Rankin 1986, 1988, 1991; Widom 1989). In this respect, it is a return to an emphasis found in the works of Sheldon and Eleanor Glueck

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(1937, 1950; see also McCord and McCord, 1959; Nye 1958) and also resembles in some ways important themes in the more recent work of Wilson and Herrnstein (1985). But unlike the Gluecks and unlike Wilson and Herrnstein (see also Ellis 1991; Eysenck 1989; Fishbein 1990; Fishbein and Thatcher 1986; Gove and Wilmoth 1990; Herrnstein 1983; Rowe 1986), Gottfredson and Hirschi stop short of proposing a genetic or other biological explanation of crime. Instead, their focus is on early childhood socialization in the family, which can produce an enduring criminal predisposition called low self-control.

The emphasis on early childhood socialization as the cause of crime is a departure from the emphasis on more proximate causes of crime initiated by Sutherland's (1947) theory of differential association (see Laub and Sampson 1991) and manifested most recently in such perspectives as labeling theory (Lemert 1972), routine activity theory (e.g., Felson and Cohen 1980; Miethe and Meier 1990) and some versions of rational choice theory (e.g., Cornish and Clarke 1986).[1] Further, the importance that Gottfredson and Hirschi attach to the single, unidimensional enduring trait of low self-control is at odds with the criminal career perspective (see Blumstein, Cohen, Roth, and Visher 1986), which argues that different independent variables probably will be necessary to explain participation in, frequency of, and persistence in crime (see also Nagin and Smith 1990; Smith, Visher, and Jarjoura 1991).

The research to be reported assesses the core empirical implications of Gottfredson and Hirschi's theory. The first concerns measurement. Their argument implies that low self-control is a unidimensional trait consisting of impulsivity, a preference for simple rather than complex tasks, risk seeking, a preference for physical rather than cerebral activities, a self-centered orientation, and a volatile temper.

The second implication is explanatory – that low self-control in combination with opportunity to commit crime is a (perhaps *the*) primary cause of criminal behavior, which Gottfredson and Hirschi define as acts of force or fraud in pursuit of one's self-interest. As in Hirschi's (1969) earlier influential work, motivation to commit crime is not a variable; rather, all actors are rational and motivated to pursue their self-interest, including the commission of crime. What varies among individuals is their level of self-control *and* their access to opportunities to commit crimes. But neither low self-control nor the existence of crime opportunity by themselves are the primary determinants of crime. Instead, it is the combination of the two, or their interaction effect, that results in criminal behavior.

These two arguments from *A General Theory of Crime* are so central that support for them is an essential prerequisite for future consideration of Gottfredson and Hirschi's theory. For now, we forgo criticism of the theory

(for a critical review, see Barlow 1991). Rather, for purposes of this initial test, we accept the assumptions and guidelines offered by Gottfredson and Hirschi. In that spirit, we try to develop operational definitions of the concepts, including low self-control, that closely match the nominal definitions offered by Gottfredson and Hirschi, and we incorporate their somewhat unconventional definition of crime as well as their definition of crime opportunity. When necessary, we assume that certain assertions from the theory are true as we assess the empirical implications described above. In those instances, we note the assumptions being made.

NOMINAL DEFINITIONS

Much to their credit, Gottfredson and Hirschi usually are very explicit in defining the concepts in their theory. For our purposes, definitions of low self-control, crime, and crime opportunity are essential.

Low Self-Control

In a section titled "The Elements of Self-Control," Gottfredson and Hirschi (1990, pp. 89-91) describe the "nature" of low self-control. Their definition is closely linked to their descriptions of criminal acts; consequently, people who have low self-control have personalities predisposing them toward committing such acts. Although we are not testing this in the present research, Gottfredson and Hirschi propose that low self-control is established in early childhood in families in which parents do not closely monitor the child's behavior, do not recognize deviant behavior when it occurs, and do not punish such behavior (1990, p. 97). Once established in early childhood, individuals' levels of self-control remain stable over the life course and are relatively unaffected by other institutions (1990, pp. 107-8). Instead, self-control affects individuals' performances or outcomes in institutions such as school, the labor force, and marriage that they encounter later in life (1990, pp. 154-8). Those with low self-control not only are more likely to commit crime but also are more likely to be unsuccessful in school, the labor force, and marriage.

Our reading of Gottfredson and Hirschi's definition led to the identification of six components of the personality trait of low self-control, and, as described later, questionnaire items aimed at tapping each of these were developed. We were gratified several months later, after our data had been collected, that Barlow (1991) identified essentially the same components.

First, Gottfredson and Hirschi note that low self-control includes a "tendency to respond to tangible stimuli in the immediate environment, to have a concrete 'here and now' orientation," in contrast to high self-control which enables people to "defer gratification" (1990, p. 89). This component of low self-control appears to correspond to the notion of *impulsivity*, which is an important theme in Wilson and Herrnstein's (1985) *Crime and Human Nature*. (For a critique of the concept of impulsivity, see Malle and Neubauer 1991.)

Second, low self-control involves a tendency to "lack diligence, tenacity, or persistence in the course of action" so that people with low self-control prefer "easy or simple gratifications of desires" and try to avoid complex tasks (1990, p. 89). In our research, we label this component of low self-control preference for *simple tasks*.

A third characteristic of people with low self-control is a tendency to be "adventuresome" rather than "cautious" because criminal acts are "exciting, risky, or thrilling" (1990, p. 89). We refer to this element as *risk seeking*.

Fourth, low self-control embraces a preference for physical activity rather than "cognitive" or "mental" activity (1990, p. 89). We call this the *physical activity* component of low self-control.

Fifth, "people with low self-control tend to be self-centered, indifferent, or insensitive to the suffering and needs of others" (1990, p. 89). This trait we label *self-centered*.

Finally, "people with low self-control tend to have minimal tolerance for frustration and little ability to respond to conflict through verbal rather than physical means" (1990, p. 90). We refer to this as the *temper* component of low self-control.

Two points should be noted concerning our interpretation. First, we have omitted three statements from Gottfredson and Hirschi's definition that seem to refer to consequences of low self-control rather than definitional components of the personality trait established in early childhood. One is the statement that "people lacking self-control need not possess or value cognitive or academic skills" and "need not possess manual skills that require training or apprenticeship" (1990, p. 89). To us, the statement that people lacking self-control "need not" possess these traits suggests they are irrelevant to the definition of self-control. Gottfredson and Hirschi would maintain, however, that people whose early family experiences lead to low self-control will, as they age, tend to lack the future orientation, willingness to engage in complex tasks, tenacity, and so on, to achieve academic or manual skills. Also, Gottfredson and Hirschi state that people with low self-control "tend to have unstable marriages, friendships, and job profiles" (1990, p. 89) and "tend to pursue immediate pleasures that are *not* criminal:

they will tend to smoke, drink, use drugs, gamble, have children out of wedlock, and engage in illicit sex" (1990, p. 90; see also Arneklev et al. forthcoming). All three of these statements seem to describe predicted outcomes of low self-control rather than personality traits that comprise low self-control. Consequently, these characteristics of individuals are not incorporated into our measure. Rather, our interpretation is that they should be viewed as dependent variables in subsequent research on the consequences of low self-control.

Second, Gottfredson and Hirschi clearly assert that these six traits we have sketched are not alternative ways of having low self-control; rather, they form a single unidimensional latent trait. As they suggest, "There is considerable tendency for these traits to come together in the same people, and since the traits tend to persist through life, it seems reasonable to consider them as comprising a stable construct useful in the explanation of crime" (Gottfredson and Hirschi 1990, pp. 90-91). In other words, a factor analysis of valid and reliable indicators of the six components is expected to fit a one-factor model, justifying the creation of a single scale called low self-control. In effect, this is a very crucial premise in Gottfredson and Hirschi's theory. A single, unidimensional personality trait is expected to predict involvement in all varieties of crime as well as academic performance, labor force outcomes, success in marriage, various "imprudent" behaviors such as smoking and drinking, and even the likelihood of being involved in accidents. Evidence that such a trait exists is the most elementary step in a research agenda to test the wealth of hypotheses Gottfredson and Hirschi have presented.

Crime

In their theory, crime is not equated with criminality. Crimes are acts, whereas criminality is an individual predisposition to commit crimes. Criminality, therefore, is subsumed under the personality trait low self-control, but low self-control also predisposes people to engage in certain other kinds of irresponsible behavior, which are not necessarily crimes (Gottfredson and Hirschi 1990, p. 91-94).

Gottfredson and Hirschi define crime as an act "of force or fraud undertaken in pursuit of self-interest" (1990, p. 15). Self-interest is equivalent to the pursuit of pleasure. Drawing from the writings of Bentham, they note that the typical definition of crime as illegal behavior acknowledges only one of four sanctioning systems, the political, and ignores physical, moral, and religious sources of pleasure and pain (Gottfredson and Hirschi 1990, pp. 4-14). By shunning a definition of crime in terms of law, Gottfredson and

Hirschi avoid the problem that a particular behavior might be illegal in some societies but not in others and, within one society, might be illegal at some point in history but not at others. Thus the definition of crime as the use of force or fraud undertaken in the pursuit of self-interest is one reason Gottfredson and Hirschi (1990, pp. 175-77) can maintain that their theory is a "general" theory, not bound to a specific culture or historical period. The definition also enables them to insist that no special theory, beyond their own general theory, is necessary to explain white-collar crime, which is but one type of fraud (Gottfredson and Hirschi 1990, pp. 180-201). Further, although opportunities for specific kinds of force and fraud vary by age, delinquency and adult criminality stem from the same causal factor (Gottfredson and Hirschi 1990, pp. 124-44).

Although criminal behavior is not equated with illegal behavior, Gottfredson and Hirschi (1990, p. 175) do acknowledge that most acts defined as illegal will be consistent with their definition of crime. It is worth noting that in more conventional definitions of crime and delinquency, "force" and "fraud" parallel somewhat the distinction between violent personal crimes and property crimes. Their contention that low self-control is a determinant of both of these, and, consequently, that the distinction between them is of little theoretical importance, is an important one that is addressed in the present research.[2]

Crime Opportunity

According to Gottfredson and Hirschi's theory, low self-control by itself is not the primary determinant of crime. Instead, crime opportunity is a second key independent variable, that specifies the conditions under which low self-control most likely leads to crime. In the presence of an opportunity to commit a crime, individuals with low self-control are likely to commit it whereas individuals with high self-control are not. Crime, then, is an interactive function of self-control and crime opportunity. Fraud and force occur primarily when individuals with low self-control encounter opportunities to engage in fraud or force. Consequently, characteristics of crime opportunities are an important feature of the theory.

Unfortunately, compared to their discussion of self-control and its consequences, Gottfredson and Hirschi say relatively little about crime opportunity. Although, like levels of self-control, opportunity is expected to vary across individuals, possible sources of such variance are not described in detail. This is potentially a crucial omission because a likely possibility is that social structural factors affect individuals' degree of exposure to crime

opportunity. By failing to address this issue, the theory can be interpreted as one that focuses on personality and neglects social structure as a determinant of crime (see Barlow 1991).

Despite the absence of consideration of sources of variation in exposure to crime opportunities, Gottfredson and Hirschi (1990, pp. 12-13) do describe characteristics of situations in which force or fraud are most likely to enhance an individual's self-interest (i.e., provide pleasure). The description relies on evidence about typical incidents of burglary, robbery, homicide, auto theft, rape, and embezzlement. The opportunity for crime is said to be maximum in situations where force or fraud can produce "immediate" rather than "delayed" pleasure (Gottfredson and Hirschi 1990, p. 12); where force or fraud would be "mentally and physically easy," not requiring "mental and physical exertion" (Gottfredson and Hirschi 1990, p. 12); and where there is "little risk of detection and little risk of resistance" (Gottfredson and Hirschi, 1990, p. 13). Our measure of exposure to crime opportunities incorporates reference to situations in which acts of force or fraud would be immediately gratifying, easy, and unlikely to be quickly detected. We would note, however, an apparent inconsistency between the "risk seeking" component of low self-control and the inclusion of "little risk of detection" in the definition of crime opportunity. Those with low self-control, by Gottfredson and Hirschi's definition, should not be attracted to situations involving little risk.

CAUSAL EMPIRICAL IMPLICATIONS

The primary theme of *A General Theory of Crime* is that low self-control, combined with crime opportunity, is a major determinant of crime. However, in our reading, the theory is unclear about how much, if any, of an independent effect low self-control should have on crime other than through interaction with crime opportunity. Gottfredson and Hirschi state in one place that high self-control should lead to lower levels of crime "under all circumstances" (1990, p. 118), but in various passages in their book they acknowledge that situational circumstances and other individual characteristics, which are not specifically identified and therefore are not included in our research, might affect the extent to which low self-control affects criminal behavior. Hence, although their formulation seems to allow low self-control to affect crime independently, whether the theory actually specifies a large main effect of low self-control beyond its interaction with crime opportunity is problematic. It is clear, however, that the key contention of their theory is contingent—that low self-control is the primary determinant of crime *through* its interaction with criminal opportunity, as they define it.

Although the status of the main effect of low self-control in the theory is somewhat ambiguous, it seems much more certain that the theory does not anticipate an independent main effect for crime opportunity beyond its interaction with low self-control. A crime opportunity has little bearing on criminal behavior unless the individual encountering it has low self-control. Persons with high self-control will resist the temptations of crime opportunities. Given the primacy of the self-control variable and its interaction with opportunity in the theory, evidence of a significant main effect of crime opportunity surely would require additional theoretical elaboration beyond the somewhat meager discussion it receives, especially in light of the extensive discussion of low self-control. A significant main effect for crime opportunity would suggest that even in the absence of low self-control, crime opportunity leads to crime. The current version of Gottfredson and Hirschi's theory seems not to account for such a possibility.

METHODOLOGY

Sample

Data to test the measurement and causal hypotheses were collected as part of the 13th annual Oklahoma City Survey conducted by the Department of Sociology, University of Oklahoma, in spring 1991. A simple random sample of 395 adults (18 and older) was drawn from the *R. L. Polk Directory* for the city. Initial contact was made with a letter indicating that a member of the research team would soon try to schedule an appointment for an interview. Attempts to schedule appointments were made in person by trained interviewers. Members of the target sample who refused to participate or could not be located were replaced by random selection until a total of 395 face-to-face interviews was conducted.[3]

Unfortunately, 1990 Census data are not yet available, so we compared the 1991 sample to the 1980 Census figures for the community. In the population data, 53.2% are women, nearly identical to the 54.3% in the sample. The difference is not significant. Likewise, the difference between percentage White in the population (83.7%) and in the sample (81.5%) is not significant. However, the mean age of the sample (46.5) is significantly ($p < .001$) greater than the mean age of the adult population in the 1980 Census (42.7). We suspect, however, that this difference reflects an actual aging of the population, consistent with national trends, rather than sampling bias. In fact, the mean age of the annual Oklahoma City Survey samples has been increasing steadily over the years that the annual survey has been conducted.

A listwise deletion of missing cases resulted in an N of 389 for the analysis that follows. Although the interviews were face-to-face, respondents recorded information about their criminal behavior on a separate answer sheet, which the interviewer did not see. Most likely, this strategy is largely responsible for the fact that of the original 395 cases, only 6 were lost due to missing data.

Measures

LOW SELF-CONTROL

As noted earlier, six components of the personality trait Gottfredson and Hirschi call low self-control were identified: impulsivity, preference for simple rather than complex tasks, risk seeking, preference for physical rather than cerebral activities, self-centered orientation, and a volatile temper linked to a low tolerance for frustration. Initially, we considered the self-control subscale (Sc) of the California Psychology Inventory (Gough 1975) as a possible measure of this trait. The Sc subscale does include some of the themes in Gottfredson and Hirschi's definition. For example, the item "Sometimes I feel like smashing things" would seem to capture a volatile temper. "I would do almost anything on a dare" is a possible indicator of being risk seeking. "I like to be the center of attention" might tap a self-centered orientation. "I often act on the spur of the moment without stopping to think" could be an indicator of impulsivity. Thus, in general, Gottfredson and Hirschi's definition of low self-control overlaps considerably with the Sc subscale on the California Psychological Inventory.

However, the 38-item Sc subscale contains no items tapping either preference for simple rather than complex tasks or preference for physical rather than cerebral activities. Further, the Sc subscale contains many items that simply lack face validity in terms of Gottfredson and Hirschi's definition of low self-control (e.g., "Police cars should be specially marked so that you can always see them coming," "I have had very peculiar and strange experiences," and "My home life was always happy.") Consequently, we chose to develop our own measures of the six components, following as closely as possible Gottfredson and Hirschi's descriptions of them.

Various combinations of items were pretested on several samples of college students with the goal of selecting a total of 24 items—four for each of the six components—that had sufficient variances and that tended to be unidimensional in their factor structure.

From the pretests, we arrived at the 24 items presented in Table 1. Respondents in the Oklahoma City Survey were presented with these and

TABLE 1: Low Self-Control Scale Items (N = 389)

Item	*Mean*	SD	*Factor Loading*
Impulsivity			
I often act on the spur of the moment without stopping to think.	2.53	0.97	.470
I don't devote much thought and effort to preparing for the future.	1.80	0.84	.388
I often do whatever brings me pleasure here and now, even at the cost of some distant goal.	2.06	0.91	.616
I'm more concerned with what happens to me in the short run than in the long run.	1.92	0.94	.580
Simple Tasks			
I frequently try to avoid projects that I know will be difficult.	2.11	0.93	.415
When things get complicated, I tend to quit or withdraw.	1.69	0.78	.420
The things in life that are easiest to do bring me the most pleasure.	2.16	0.86	.397
I dislike really hard tasks that stretch my abilities to the limit.	1.93	0.87	.472
Risk Seeking			
I like to test myself every now and then by doing something a little risky.	2.88	0.97	.288
Sometimes I will take a risk just for the fun of it.	2.37	1.05	.429
I sometimes find it exciting to do things for which I might get in trouble.	1.80	0.99	.523
Excitement and adventure are more important to me than security.	1.63	0.83	.500
Physical Activities			
If I had a choice, I would almost always rather do something physical than something mental.	2.36	0.89	.341
I almost always feel better when I am on the move than when I am sitting and thinking.	2.89	0.91	.349
I like to get out and do things more than I like to read or contemplate ideas.	2.73	0.91	.361
I seem to have more energy and a greater need for activity than most other people my age.	2.74	0.89	—

Self-Centered			
I try to look out for myself first, even if it means making things difficult for other people.	1.65	0.77	.602
I'm not very sympathetic to other people when they are having problems.	1.59	0.80	.392
If things I do upset people, it's their problem not mine.	1.74	0.85	.395
I will try to get the things I want even when I know it's causing problems for other people.	1.49	0.68	.489
Temper			
I lose my temper pretty easily.	2.02	1.01	.418
Often, when I'm angry at people I feel more like hurting them than talking to them about why I am angry.	1.62	0.84	.498
When I'm really angry, other people better stay away from me.	2.16	1.12	.407
When I have a serious disagreement with someone, it's usually hard for me to talk calmly about it without getting upset.	2.35	1.00	.416

asked to respond using the categories (4) strongly agree, (3) agree somewhat, (2) disagree somewhat, or (1) strongly disagree. A high score, therefore, indicates low self-control. The means and standard deviations are included as part of Table 1. Only the very first item in the table was taken directly from the Sc subscale in the California Psychological Inventory, although several others are slight modifications of Sc subscale items.

Principal components analysis was applied to the 24 items to determine if the creation of a single scale can be justified, as proposed by Gottfredson and Hirschi. The results are somewhat ambiguous as indicated by the factor eigenvalues, the first 10 of which are reported below. The numbers in parentheses are the difference between the eigenvalue of that factor and the previous one.

Factor 1	4.66
Factor 2	2.34 (2.32)
Factor 3	2.07 (0.27)
Factor 4	1.81 (0.26)
Factor 5	1.78 (0.03)
Factor 6	1.11 (0.67)
Factor 7	0.94 (0.17)
Factor 8	0.77 (0.17)
Factor 9	0.74 (0.03)
Factor 10	0.70 (0.04)

Among the 24 factors necessary to perfectly reproduce the correlation matrix, 6 have eigenvalues greater than 1.0. According to the Kaiser Rule for determining the number of factors, therefore, a 6-factor solution would be appropriate (Nunnally 1967). Both an orthogonal and an oblique rotation of the 6 factors generally separate each of the six components as distinct factors.

However, in a principal components analysis, the number of factors with eigenvalues greater than 1.0 will, in part, be an increasing function of the number of items. With a large number of items, the Kaiser Rule most likely overestimates the number of significant factors, and the Scree Discontinuity Test has been proposed as a preferable strategy for determining the number of factors (Nunnally 1967). Following the logic of the Scree test, the most obvious break in eigenvalues is the difference of 2.32 between the first and second factor, compared to .27 between the second and third, strongly suggesting a one-factor model would be appropriate. But the difference between the fifth and sixth factor of .67 is another discontinuity in eigenvalues between pairs of adjacent factors, although much smaller than the first. Therefore, because valid measurement is so crucial, we examined a five-factor model in some detail.

The five-factor solution was examined using varimax, quartimax, and oblique rotations, leading to the same conclusion in all cases. In the five-factor model, regardless of rotation method, one factor *tends* to combine the impulsivity and simple tasks items, whereas the remaining four factors are unique to each of the four other groups of items. However, a few of the items have substantial loadings on more than one factor. Attempts to improve the five-factor model by deleting specific items eventually results in the elimination of the impulsivity items, leaving five relatively clean factors for each of the remaining five components. Thus, the five-factor model, with the elimination of items with poor factor discrimination, eventually becomes identical to the six-factor model but without the impulsivity factor.

In general, we cannot find *strong* evidence that combinations of items into subgroups produces readily interpretable multidimensionality. Instead, from an empirical perspective, the strongest case can be made for a one-factor unidimensional model, given the large difference in eigenvalues between the first and second factors. Our conclusion is that the six components we have identified as Gottfredson and Hirschi's definition of low self-control appear to coalesce into a single personality trait. We do not, however, wish to give the impression that we consider ours the definitive conclusion on this issue. We would encourage others to replicate our measure and develop other items, testing their unidimensionality with a wide variety of samples.

Under the assumption that low self-control is unidimensional, the next step in scale construction is identifying the linear composite of items that produces the most reliable unidimensional scale. Reliability analysis suggests that Cronbach's alpha could be increased from .805 to .812 by eliminating from the scale the last one of the four items in the Physical Activities component. In retrospect, it is apparent that the "activities" referred to in this particular item need not be interpreted as physical activities by respondents, perhaps explaining why the item detracts from the reliability of the composite scale.

Deletion of any of the other items would reduce the scale reliability. Consequently, the remaining 23 items were subjected to a principal components analysis with a forced one-factor solution. The resulting loadings are reported in the last column of Table 1. As a group, the physical activities items tend to have the lowest loadings, suggesting that this might be the weakest component of the scale. The very lowest loading occurs for the first item in the risk seeking component, suggesting the possible need to find an alternative to this item in subsequent research.

We chose to create the scale for low self-control as the linear composite of the z-score transformations of the items, thereby giving equal weight to

each item's variance in the variance of the composite. The sum of raw scores would have given more weight to the items with the higher standard deviations. Another alternative would be to weight items according to their factor loadings from Table 1. Although such a strategy might be worth pursuing, one consequence would be that the physical activities items, because they have as a group lower loadings than the other components, would contribute less to the variance of the composite. There are no suggestions in Gottfredson and Hirschi's description of low self-control that some components merit more weight than others.

As a sum of *z*-score transformations, the variable low self-control has a mean of 0. The standard deviation is 10.20. The kurtosis of 3.37 is not significantly different from that of a normal distribution ($t = +1.48$). However, the median is –.39, reflecting the positive skewness of the distribution (.45) which is significantly greater ($t = +3.65$) than the skewness of 0 in a normal distribution. In other words, compared to the normal distribution, there are a few outliers at the high end of the Low Self-Control Scale.

CRIMES

As noted previously, Gottfredson and Hirschi define crime as "acts of force or fraud undertaken in pursuit of self-interest" (1990, p. 15). The definition intentionally avoids equating criminal behavior with illegal behavior. We directly implement their definition in this research. Respondents were asked how many times in the past 5 years they had (a) "distorted the truth or falsely represented something to get something you couldn't otherwise obtain" (fraud), and (b) "used or threatened to use force against an adult to accomplish your goals" (force). The mean is 1.44 for fraud and .64 for force. For both crimes, the distributions are strongly positively skewed, and the overwhelming majority of respondents are in the category 0 (87% for fraud and 91% for force).

Two issues become readily apparent. First is the problem of causal order. Low self-control is measured as a present trait of respondents, but criminal behavior is measured with self-reports over the past 5 years. In most theories of crime, this would be a serious problem. But, in Gottfredson and Hirschi's formulation, low self-control is a personality trait established early in life, which remains relatively stable over the life course. In particular, the rank order of a group of people in terms of their levels of self-control is not expected to change with increased age. Thus the present level of self-control, or at least the present rank order of respondents in terms of self-control, according to the theory, can reasonably be expected to reflect the respondents' relative levels of self-control during the past 5 years. Although critics of the

theory might question the invariance of self-control over the life course, our task is not to be critical, but rather to accept some of Gottfredson and Hirschi's claims in order to test others. With this strategy, temporal order is not an issue, and cross-sectional analysis is appropriate (see Gottfredson and Hirschi 1990, pp. 223-40). Gottfredson and Hirschi's argument that, because levels of self-control remain stable during the life course, panel designs would provide results identical to cross-sectional designs is one that must be tested in future research. Such research is essential for the theory and must involve a panel that begins with children at a very young age, younger than those included in typical panel studies. Age appropriate measures of low self-control and of force and fraud will have to be developed.

Second, the distributions of the crime variables pose problems for analysis. The overwhelming majority of respondents are in the 0 category. Because those who are not in the 0 category express a wide range of answers, a few extremes produce a high positive skewness for each offense. Our analysis strategies are adapted to these distributions.

CRIME OPPORTUNITY

The key causal argument in Gottfredson and Hirschi's theory is that low self-control, in conjunction with crime opportunity, leads to criminal behavior. Neither low self-control nor the presence of crime opportunity by themselves are primary causes of crime. Rather, their effect is interactive.

Again, we followed the theorists closely in formulating items to tap crime opportunities: Our questions asked about exposure to situations in which committing an act of force or fraud would have been "possible to do easily," "gratifying at the moment," "without much chance that somebody who might do something about it would quickly find out." Such a definition of opportunity was presented to respondents as a preface to this section of the questionnaire and was repeated for each of the two crimes. Like the questions concerning crimes, these opportunity questions ask reports of the number of crime opportunities encountered over the past 5 years. The mean is 4.64 for fraud and 4.19 for force. Again, the univariate distributions show a high proportion of cases in the 0 category (71% for fraud and 87% for force). Among those reporting some opportunity, the range is considerable and there are positive outliers, producing a high degree of positive skewness.

CONTROL VARIABLES

The analysis reported below includes controls for possible sources of spuriousness using dummy variables for gender and race (White vs. non-

White) and the continuous range of ages. Gottfredson and Hirschi offer hypotheses concerning the links between such variables and self-control, crime opportunity, and crime,[4] but tests of these hypotheses are beyond the scope of the present article. We will note, however, that our conclusions are identical, whether or not the control variables are in the equation.

ANALYSIS

To test the interaction argument, we use a multiplicative term involving low self-control and crime opportunity. Examination of the SPSS diagnostics indicated that multicollinearity would not be a problem (Belsley 1982). The high positive skewness in the univariate distributions of both crime and crime opportunity create obstacles for straightforward OLS regression. A common adjustment for skewness is the log transformation of the variable. However, log transformations result in the estimation of nonlinear effects, although Gottfredson and Hirschi make no claims that the effects their theory predicts are nonlinear. Instead, the corrective strategy for positive skewness we employ, which has been suggested by Nagin and Smith (1990), is to recode all scores above the 90th percentile to the 90th percentile. However, for three of the four items, strict adherence to the procedure would have produced a dichotomy. For these, we decided to allow three categories. When the transformations were completed, the crime items for both fraud and force and the crime opportunity item for force had values from 0 to 2. The crime opportunity item for fraud ranged from 0 to 10.

If the theory is correct, we would expect evidence consistent with three predictions. First, the multiplicative term representing the interaction of low self-control and crime opportunity should have a large significant positive effect on the measures of fraud and force. This follows from the argument that low self-control permits the individual to respond to opportunities for criminal behavior. Thus as opportunity increases, so should the effect of low self-control on crime. Second, the magnitude of the effect of the interaction term should be greater than the main effect of low self-control. Our reading of Gottfredson and Hirschi's theory is that the primary channel through which low self-control leads to crime is in its interaction with crime opportunity. At best, their theory is ambiguous concerning whether low self-control should have any main effect at all; at a minimum, the theory appears to predict that the interaction effect will be greater than the main effect of low self-control alone. And third, crime opportunity should have no direct main effect on crime beyond its interaction with low self-control. The presence of a crime

TABLE 2: OLS Regressions of Truncated Crime on Low Self-Control and Crime Opportunity (N = 389)

	Fraud			*Force*		
	b	*Beta*	p	*b*	*Beta*	p
Low self-control	.007	.117	.023	.022	.035	.466
Crime opportunity	.040	.227	<.001	.312	.397	<.001
Low self-control × crime opportunity	.004	.235	<.001	.011	.156	.002
Intercept	3.870			2.577		
R^2	.222			.262		
p	<.001			<.001		

NOTE: Coefficients reported include controls for gender, race, and age. Tests of significance are one-tailed.

opportunity results in a crime only when that opportunity is encountered by a person with low self-control.

The results presented in Table 2 permit an evaluation of these predictions concerning the prominence of a Low Self-Control × Crime Opportunity interaction effect on criminal behavior. In the equations, gender, race, and age are controlled, although their coefficients are not reported. Before considering specific regression coefficients, the ability of the model to account for variance in criminal behavior should be noted. The R^2 is .222 for fraud and .262 for force. These values are overwhelmingly attributable to the theoretical variables because removal of the control variables from the equations results in only slight reductions to .200 for fraud and .241 for force. Even without the control variables, the overall F's for the two equations are significant far beyond the .001 level.

The first prediction, that the multiplicative term for the interaction of low self-control and crime opportunity will have a significant positive effect, is upheld. The standardized coefficients for the product terms in both equations are positive and significant: .235 ($p < .001$) for fraud, and .156 ($p = .002$) for force. The importance of this finding should not be overlooked. Rarely do theories of crime predict interaction effects, and interaction effects often are difficult to detect statistically because multiplicative terms are by nature correlated with their components, which also are independent variables in the equation. Further, the fact that the product term is significant for *both* fraud and force is important, providing evidence for Gottfredson and Hirschi's view that these two kinds of behavior which differ in many ways (see note 2) nevertheless are both a function of the interaction of low self-control and crime opportunity.

Evidence for the second prediction is less definitive, but still generally supportive of the theory. For force, the prediction clearly is supported. While the Beta of .156 for the interaction term is significant, the Beta of only .035 for the main effect of low self-control is clearly insignificant. In other words, in the case of force, the *only* effect of low self-control on crime is through its interaction with crime opportunity. This finding is consistent with the importance Gottfredson and Hirschi attach to the Low Self-Control × Crime Opportunity interaction. The results for fraud, however, are less dramatic but still basically consistent with the prediction. Even with the multiplicative term in the equation, low self-control has a significant positive main effect on fraud. The Beta is significant at the .023 level. On the other hand, we suggested that the minimum expectation is that the effect of the product term be greater than the main effect of low self-control. In fact, this is the case (.235 vs. .117), although the difference between these two standardized coefficients is not significant. On balance, therefore, the findings concerning the second prediction generally favor the argument proposed by Gottfredson and Hirschi, but the significant main effect of low self-control on fraud would seem to require additional theoretical clarification.

The results in Table 2 for both force and fraud clearly fail to support the third prediction—that crime opportunity will not have a significant main effect. For fraud, the main effect of crime opportunity (Beta = .227) is nearly equal in magnitude to the interaction effect (Beta = .235), and the difference between the two is not significant. The findings for force are even more inconsistent with the prediction. The Beta of .397 for the main effect of crime opportunity is more than twice as large as the Beta of .156 for the multiplicative term, and the difference between the two coefficients is significant at the .003 level.[5] Not only does crime opportunity have a significant main effect on force, but that effect also is significantly greater than the interaction effect of low self-control and crime opportunity. Such a finding could not be predicted from Gottfredson and Hirschi's theory and is especially troublesome given the relative lack of attention they devote to this variable.

DISCUSSION

In this research we attempted to create a set of circumstances where Gottfredson and Hirschi's theory would have the greatest chance of success. Our measures of the variables followed closely their descriptions and guidelines; we adopted their definition of crime, and tried to measure it accordingly; we uncritically accepted their assumption of causal ordering; and we addressed what seem to us to be the central empirical implications of their

argument. Our purpose has been to determine whether, under these favorable circumstances, the theory is promising enough to justify further attention by the criminological community.

Our overall answer is yes, the theory clearly merits serious consideration. The elements of low self-control they identify do appear to form a general unidimensional trait, although our findings on this issue certainly warrant further research. Moreover, just as the central argument of the theory suggests, and despite the statistical problems in detecting interaction effects, the interaction of low self-control and crime opportunity significantly predicts both fraud and force that the respondents reported committing during the previous 5 years. Finally, the effect that low self-control has on crime occurs primarily in interaction with crime opportunity.

However, some patterns in the data indicate that the theory is in need of modification and expansion. For one thing, in the context of our findings, Gottfredson and Hirschi have devoted insufficient attention to the criminal opportunity variable and the sources of its variation. Although they contend that the effect of low self-control is contingent on opportunity for crime, the main focus of their theory is low self-control. In fact, Akers' (1991) review of *A General Theory of Crime* does not even mention the opportunity variable.

One of the distinguishing features of Gottfredson and Hirschi's current formulation is its compatibility with a recently emerging line of theory and research challenging sociological arguments that give primacy to structural variables. Whether or not this is a fair assessment of the authors' intent, that is how the theory is likely to be interpreted in the absence of further consideration of crime opportunity and the sources of its variation (e.g., Barlow 1991; Nagin and Farrington 1991, 1992; for a critical assessment of this trend in criminology, see Krisberg 1991). In a brief section of the book, Gottfredson and Hirschi do suggest structural variables that affect the ability of families to instill self-control in their children (1990, pp. 102-5), but once the child's level of self-control is established in early childhood, it remains relatively stable throughout life as a predisposer toward crime. Sources of variation among individuals in exposure to criminal opportunities are essentially unexplored by Gottfredson and Hirschi. If crime opportunity is largely a consequence of social structure and process, Gottfredson and Hirschi's presentation, in its current form, can be said to give much greater weight to individualistic traits than to larger social organization characteristics.

Yet our data show crime opportunity, as Gottfredson and Hirschi define it, to be important not just in providing the condition under which low self-control has its primary effect on crime but also as a significant predictor of

fraud and force independent of its interaction with low self-control. As a predictor of crime, crime opportunity in our data appears to be almost as strong as (in the case of fraud) or stronger than (in the case of force) the term representing the interaction of low self-control and crime opportunity. It appears that regardless of the level of self-control, the opportunity to commit crime predicts criminal behavior, at least to a modest degree. If our results can be believed and are sustained by additional research, they weaken considerably the appeal of Gottfredson and Hirschi's theory as presently formulated. It places too little emphasis on criminal opportunity, which most likely is linked to social structure (e.g., Cohen and Felson 1979) and focuses attention on the personality characteristic of low self-control. Our finding concerning the main effect of crime opportunity raises questions about the recent trend toward emphasis on individualistic variables linked to developmental and/or familistic process, a trend so elegantly and creatively epitomized in *A General Theory of Crime*. Indeed, our results direct attention back toward features of the social environment that influence the number and distribution of criminal opportunities. Hence, despite providing promising support for certain aspects of the theory, our data seem to weaken its structural challenge.[6]

Further, the variables drawn from the theory leave much of the variance in self-reported crime unexplained. Some surely is due to methodological weaknesses in our research. After all, the sample is restricted in size, age range, and locale. Although the theory presumably is applicable to all people under all circumstances, the possibility of some distortion from sample bias cannot be ignored. No doubt some of the unexplained variance is due to measurement error and can be reduced with further refinements in measurement. Inaccurate recall and other problems with self-reported data, as well as the skewed distributions of variables probably are other sources of unexplained variance. In addition, some might also stem from the apparent logical inconsistency between Gottfredson and Hirschi's definition of low self-control, which includes risk seeking, and their definition of criminal opportunity, which includes little risk of detection. To be true to the theory, this inconsistency was incorporated into our operational definitions.

But it is unlikely that such factors alone will account for all the unexplained variance. It seems highly likely that there are other variables not included within the theory, and therefore not in our equations, that are necessary for explaining crime. It appears that this theory, at best, has identified one mechanism that affects crime. By the usual criteria employed in evaluating theories, this alone is praiseworthy. In this case, however, it appears to fall short of the expectations generated by Gottfredson and Hirschi's presentation. Although they are careful to insert caveats disclaiming

the possibility of perfect prediction, acknowledging that "situational conditions" and "other properties of the individual" can counteract the causal effects of low self-control (Gottfredson and Hirschi 1990, pp. 89, 96), and specifically claiming only that "high self-control effectively reduces the possibility of crime" (p. 89) and that those with high self-control will be "less likely under all circumstances throughout life to commit crime" (p. 118), Gottfredson and Hirschi imply that their theory will explain the bulk of criminal behavior with a high degree of accuracy. This is clear from their contention that all important hereditary factors and components of personality in one way or another are incorporated within the self-control variable (p. 96, 110) and from their argument that situational and social structural variables are important only to the extent that they are linked to low self-control or expressed through the variable of opportunity, which interacts with low self-control (pp. 119, 123-214). Disclaimers notwithstanding, therefore, their overall portrayal suggests a powerful theory implying that the interaction of low self-control with criminal opportunity will predict criminal behavior with a high degree of accuracy without the help of other variables. Our results are inconsistent with such an expectation.

Our analysis suggests the need for additional variables. A good beginning point for expansion of the theory could be incorporation of variables that might affect motivation toward crime, variables that play a central role in "strain" theories. As did Hirschi (1969) in his earlier work, Gottfredson and Hirschi assume that everybody is equally motivated to commit acts of fraud and force, the differences in actual commission being due to variations in self-control and/or opportunity. There is good reason, however, to think that the things one can obtain by force and/or fraud carry different values for different individuals—that is, the motivation for crime is not equal for everybody (see Agnew 1992). Consequently, actual criminal behavior should vary to some extent independently of self-control or opportunity, and motivation for crime might influence the extent to which individuals' perceive situations as constituting criminal opportunity as well as the extent to which self-control produces crime, given opportunity. In the past, Hirschi (1979) has not been favorable toward calls for theoretical integration. Whether Gottfredson and Hirschi will maintain this posture for their present theory remains to be seen. In our opinion, the premise stated early in *A General Theory of Crime* that all individuals are equally motivated to commit crime, is not a necessary ingredient of the theory.

Second, Gottfredson and Hirschi often allude to situational circumstances and individual characteristics that might mute or counteract the effects of low self-control. To elaborate and improve the theory, they might systematically spell out what those circumstances or characteristics are. With those addi-

tional contingencies, the main hypothesis might be far more conditional than it presently appears to be, and as a result, prove far more accurate. At the very least, identifying and theoretically elaborating those contingent circumstances would enable researchers to measure and take them into account. The result should be far better prediction.

The supportive findings in our research certainly mandate serious further consideration of the theory, and they justify investigation of additional implications and hypotheses from it. At the same time, however, contrary results suggest that the theory needs expansion, refinement, and elaboration before it can explain crime to the degree Gottfredson and Hirschi imply. We conclude, therefore, that Gottfredson and Hirschi's formulation constitutes an important innovation, but that it requires additional theoretical work.

NOTES

1. Gottfredson and Hirschi consider their theory compatible with rational choice theory: Individuals with low self-control make different choices than individuals with high self-control (1990, pp. 64-84). Other developments in rational choice theory, however, focus on more immediate characteristics of the crime setting. They rely on advances in decision-making theory, especially discussions of decision-making heuristics, which propose that actors make choices that sometimes are less than optimal but nevertheless predictable (see Cornish and Clarke 1986).

2. See Loeber and Southamer-Loeber (1986, pp. 92-95) for a discussion of the possibility that family socialization experiences associated with subsequent fraud may not be the same as those associated with force.

3. We should note that our research is an application of Gottfredson and Hirschi's theory to *adults*. From their own perspective, however, this is not problematic. Although absolute levels of key variables such as criminal opportunity and criminal behavior might be different for adults than for adolescents, the patterns of relationships among low self-control, criminal opportunity, and criminal behavior are expected to be invariant across age levels (Gottfredson and Hirschi 1990, pp. 126-44).

4. In Gottfredson and Hirschi's (1990, pp. 154-68) formulation, adult respondents' years of education and other measures of socioeconomic status would not be potential sources of spuriousness because they are dependent on, rather than causes of, self-control. Thus, we have not included such variables as controls. Future research, however, might consider the extent to which the effects of self-control on crime are indirect *via* socioeconomic status as an intervening variable.

5. Given the different metrics in which the variables in the equations in Table 2 were measured, it was necessary to conduct tests for the equality of the standardized regression coefficients to compare the effect of the interaction term to the effects of low self-control and crime opportunity. We approached this through LISREL by first estimating the full model (which by definition has a chi-square value of 0) and then imposing a set of equality constraints on the standardized coefficients. If these restrictions do not result in a significant increase in the chi-square statistic, then the null hypothesis of equality cannot be rejected. In the fraud equation, the comparisons made indicate that the effect of the product term is not significantly different from the main effect of either low self-control or crime opportunity. However, this is not the

case for the force equation. Setting the coefficient for crime opportunity equal to that of the interaction effect results in an increase in the chi-square statistic that is significant at the .003 level. Thus the null hypothesis that these two coefficients are equal is rejected, and, given their relative magnitudes, the conclusion must be that the direct effect of crime opportunity is greater than the direct effect of the Low Self-Control x Crime Opportunity interaction.

6. For a similar view, see Barlow 1991, p. 237.

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