



Beyond Prediction to Explanation in Risk Assessment Research

A Comparison of Two Explanatory Theories of Criminality and Recidivism

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A New Generation of Risk Assessment Research

Predictions of dangerousness, violence, and recidivism continue to play an ever-growing role in the legal system. These psycho-legal assessments determine a myriad of legal outcomes including, but not limited to, probation status (i.e., prediction of recidivism), civil commitment (i.e., prediction of danger to self or others), psychotherapist liability under a *Tarasoff* duty (i.e., prediction of danger to a specified victim), the imposition of the death penalty (i.e., prediction of a continued danger to society), and sentencing under the new sexual predator laws (i.e., prediction of danger to society and recidivism).

Given the substantial inaccuracy of clinical predictions of recidivism, violence, and dangerousness and the extreme legal importance of these judgments, risk assessment research was undertaken during the 1980s to improve these predictions (Melton, Petrila, Poythress, & Slobogin, 1997; Monahan & Steadman, 1994).¹ Research determined that clinical predictive effectiveness was improved with specific populations under certain conditions. For example, empirical research found that clinicians were more accurate in predicting well-specified behavioral outcomes over short time periods than they were at pre-

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¹This research has been primarily concerned with the prediction of dangerousness and violence, but empirical findings in these areas also has important consequences for the prediction of criminal recidivism. See Monahan and Steadman (1994) for a review of the second generation of dangerousness prediction research.

dicting more general behaviors (i.e., dangerousness, violence, or recidivism) over longer time periods (Monahan & Steadman, 1994).

More importantly, this research focused on creating actuarial instruments to aid in risk assessments. These instruments were created by researchers who determined appropriate risk factors for different types of risk assessments, constructed actuarial assessment instruments from these risk factors, and empirically tested these instruments on different populations (Melton et al., 1997). The initial selection of risk factors used in these actuarial models was based on previous empirical research and, to a limited extent, preexisting theories, with the resulting actuarial assessment instruments representing a statistical/mathematical solution to risk assessment rather than an explanatory solution.

Early studies of the predictive accuracy of these actuarial assessment instruments found them significantly more accurate than other forms of prediction, especially pure clinical opinions (Hart, Webster, & Menzies 1993; Grove & Meehl, 1996; Mossman, 1994). More recent research examining the efficacy of well-constructed actuarial instruments has demonstrated even higher levels of accuracy in predicting recidivism (see Pima County Probation Office, 1993) and dangerousness (see Gardner, Lidz, Mulvey, & Shaw, 1996; Rice, 1997; Rice & Harris, 1995).

Yet these instruments are still fundamentally deficient. Probation risk assessment and other forms of risk assessment have become exclusively based on prediction rather than explanation of behavior. Actuarial assessment instruments are, by and large, atheoretical, and consequently, do not effectively examine the causes of the behavior that the instruments are designed to predict.² Present methods of probation risk assessment simply highlight individuals who are high risks for recidivism, without explaining why these individuals are more likely to recidivate. For example, it is well-known that the best predictor of an individual's future criminal activity is the individual's past criminal activity, but from a policy standpoint, this finding offers no insight on how to rehabilitate this individual or prevent other individuals from committing an initial criminal act.

For purposes of pure prediction, the issues of prevention and rehabilitation may be irrelevant, but for psychology, law, and society these issues are of much more significant concern. In order to offer explanations of criminal behavior and examine ideas concerning appropriate rehabilitation and preventive programs, theories of criminality must be empirically tested. Most importantly, once causal attributes have been discerned, policy-makers can develop more effective programs that specifically target these factors. The identification of causal criminal factors will also allow probation offices to focus more effectively on prevention and rehabilitation of offenders, rather than simply subjecting "high-risk" offenders to greater scrutiny.

²In the area of dangerousness prediction, Monahan and Steadman (1994) have argued for a move to more theory based actuarial assessment instruments. Their MacArthur risk assessment study is currently attempting to advance this goal by empirically validating a theory based instrument in five cities across America.

This article exemplifies this new generation of risk assessment research in which existing actuarial instruments should be used specifically to test distinct explanatory theories. Specifically, the information and variables contained in the actuarial instrument should be used to create overarching variables that represent key components of the theories being examined. The existence of these theoretical variables should be statistically verified using confirmatory factor analysis, and then causal models created based on what the theory proposes as the relationship between these constructs. Finally, the overall ability of the constructed theoretical model to explain behavior should be empirically tested by its ability to fit the behavior of individuals originally assessed on the actuarial instrument. This article presents the first attempt at employing this approach. A probation risk assessment instrument is used to determine which of two theories of criminality (i.e., impulse control theory and one evolutionary psychology theory) better explain the recidivism of an offender population. Before discussing the methodology of this experiment, it is important to understand the theoretical bases for the criminality theories that are tested.

The Criminality Theories

Throughout the history of the social sciences there has been a vast number of theories advanced to both explain and predict criminality. Criminality, for purposes of this article, refers to a continued or repeated pattern of behavior in which an individual is convicted of violating the law. Few of these criminality theories, however, have been adequately operationalized to present empirical testable hypotheses. Two explanatory, theory-driven models of criminality, the competitively disadvantaged male (CDM) model based on evolutionary psychology and the work of A. J. Figueredo, and a self-control model based on the ideas of Michael Gottfredson and Travis Hirschi, have been sufficiently developed to allow more rigorous empirical testing of their assumptions and hypotheses.

These two theories offer differing explanations and hypotheses concerning the nature of criminality and recidivism. Gottfredson and Hirschi's impulse control model conceptualizes criminal behavior as a learned deficit or a behavioral abnormality. According to this model, criminal behavior is the result of improper learning during a critical period of childhood development. This learning failure causes an inability to properly control impulses, and leads these individuals to perform a variety of inappropriate behaviors (including criminal acts). In contrast, the CDM model interprets criminal behavior as a conditional adaptive strategy. The performance of criminal acts is viewed as means to increase reproductive success when individuals are disadvantaged by lack of social and occupational success. The relevant aspects of each of these models will be discussed in order that appropriate empirical models can be constructed.

The CDM Model and Evolutionary Psychology Theory

In recent years, there has been resurgence of evolutionary psychology theories to explain a variety of different human behavior patterns. Evolutionary

psychology theories of rape (Thornhill & Thornhill, 1992), spousal abuse (Figueredo, 1993), child abuse (Kobayashi, Sales, Figueredo, & McCloskey, 1995), sociopathy (Mealey, 1995), mate selection (Buss, 1989; Perusse, 1993), antisocial personality disorder (MacMillan & Kofoed, 1984), and interpersonal development (Belsky, Steinberg, & Draper, 1991) have been advanced. Criminality and criminal behaviors, however, have been an area of special focus of evolutionary psychology theory (Cadoret, 1978; Cloninger & Gottesman, 1987; MacMillan & Kofoed, 1984; Mealey, 1995; Mednick, Gabrielli, & Hutchings, 1987).

According to evolutionary theory, behaviors with important reproductive consequences are likely to be the targets of natural selection (Buss, 1989; Darwin, 1859; Figueredo, 1993). Natural selection involves the creation of the fittest species through the passing of advantageous characteristics to future generations. In order for this transfer to occur, a species must achieve reproductive success. Behaviors that either increase or decrease reproductive success will have the greatest impact on whether important attributes are passed on. Darwin used a specific term, sexual selection, to highlight the importance of, and to refer to, behaviors or characteristics that directly advanced a species' or an individual's reproductive likelihood.

Human Mating Strategies. Humans utilize a variety of mating strategies to achieve reproductive success. Shields and Shields (1983) has characterized the most common as: (a) honest advertisement and courtship, (b) deceptive advertisement and courtship, and (c) coercion. In modern human societies, most sexual encounters are a result of the consent of both parties (Perusse, 1993). Unlike animals, human reproduction rarely occurs without the female affirmatively agreeing to participate. As a consequence, in human mating strategies, female choice plays a larger role than in other animal species (Buss, 1989; Perusse, 1993; Thornhill & Thornhill, 1992). In order for a male to achieve reproductive success, he must meet female reproductive criteria (Buss & Schmitt, 1993).

According to Buss' (1989) cross-cultural study of 37 countries, women in 36 of 37 cultures prefer men who have high status and high financial capacity. These men are viewed by women as both being likely and having the means to invest in their offspring. These high-status men are seen by females as having the greatest probability of ensuring the successful development of offspring who will aid in the passing on of the female's genes. As a result of this mate-selection bias, men who have limited status and financial capacity are disadvantaged in the sexual marketplace (Buss & Schmitt, 1993; Symons, 1979).

Alternative or Conditional Strategy. According to evolutionary principles, the development of criminality as a human reproductive strategy can either be viewed as a genetically obligated pattern of behaviors (an alternate strategy) or as a conditional strategy in which genetic predisposition is influenced by environmental stimuli (Figueredo, 1993; Rowe, 1996; for a further discussion of

the distinction see Rowe, Vazsonyi, & Figueredo, 1997). The CDM model is best characterized as a conditional strategy because environmental stimuli (e.g., lack of social success) are hypothesized to cause individuals to perform criminal acts. In contrast, an alternative strategy would suggest that a genetic factor causes both social failure and criminal behavior (Rowe et al., 1997). There is some limited support for the alternative strategy theory of criminality. Rowe et al. (1997) empirically demonstrated that the alternative strategy was more predictive of the mating patterns of adolescents than the conditional strategy.

The accumulated genetic heritability studies of criminality, however, tend to support that criminality is likely a conditional strategy. Criminal behavior concordance rate between twins find a higher but not perfect relationship between monozygotic as compared to dizygotic twins (Cloninger & Gottesman, 1987; Eysenck, 1989; Wilson & Herrnstein, 1985). If criminality were solely controlled by genetic influences, monozygotic twins who share the same genetic makeup would either exhibit or not exhibit criminality identically—but they do not. Additionally, adoption studies have found a .60 correlation between biological criminal parents and the criminal behavior of their offspring who were placed with noncriminal parents (Hutchings & Mednick, 1977; Mednick & Finello, 1987; Mednick et al., 1987). In other words, biological children of convicted felons who are adopted by other individuals, even at birth, show statistically significant higher probabilities of criminal behavior. While this evidence appears to strengthen the alternative strategy, it is actually somewhat contradictory evidence. If criminality was purely controlled by genetic influences, one would expect a near perfect correlation to be found. Yet, these adoption studies show that only 36% of the variance is controlled by an inherited genetic factor.

Support for criminality as an evolutionary conditional strategy also comes from studies showing that the criminal behavior of adopted children is influenced by their adoptive parent's criminal behavior. For example, the children of criminal, biological parents show even greater levels of criminality when their adopted parents also exhibit criminal or antisocial behaviors (Hutchings & Mednick, 1977; Mednick & Finello, 1987; Mednick et al., 1987). As a result of such evidence, this study chose as a model the evolutionary conditional explanation of criminality.

CDM theory posits that, “the most oft-mentioned factor suggested as being relevant to the development of a cheating strategy, especially in males, is being competitively disadvantaged with respect to the ability to obtain resources. . . .” (Mealey, 1995). These sexually disadvantaged individuals have been termed *competitively disadvantaged males* (CDMs) (Figueredo, 1993). In addition to financial status, Figueredo (1993) has suggested that competitive disadvantage in human mating can also result from being less behaviorally competent in sexual courtship/social relationships. These low status men or CDMs must resort to other mating strategies to achieve reproductive success. CDMs who are unable to outcompete other males through female choice (i.e., attractiveness), social competence, or financial capacity are theorized to be the most likely to adopt an alternative strategy (Thornhill & Thornhill, 1992).

CDM theory views criminality or the commission of criminal acts as a strategy to obtain reproductive success (Figueredo, 1993).³ CDMs commit crimes to aid them in the procurement of property or to gain direct sexual reproduction. As a result of a successful crime, their status and subsequent reproductive success should increase. The criminal property obtained will “trick” females into viewing the male as one who now will be more likely to have the financial ability to invest in her offspring’s survival. Therefore, females will be more likely to mate with the criminal offender. Criminality represents a means for males to increase their financial/achievement status when other avenues of reaching this goal are blocked. Similar to animals mating strategies, humans that are most likely to commit crimes are those who: lack both earning capacity and social skills, have the highest capacity for reproductive success, and have the lowest actual reproductive success. The CDM model also offers an explanation why criminality rates are highest in late adolescence and early twenties because that is when human males have the greatest reproductive capacity and when they are most likely to be disadvantaged financially (Figueredo, 1993).

Predictions of criminality based upon CDM theory. Several empirically testable hypotheses can be created from the CDM theory that criminality is a conditional reproductive strategy. A CDM structural equation model is visually represented in Figure 1.

Briefly the major factors and causal pathways of the model include:⁴

1. An achievement status variable (variable #1) that indicates an individual’s financial and employment status in society. This variable has an impact on substance abuse, past criminality, and future non-drug-related probation revocation. Individuals low in achievement status will have more difficulty achieving reproductive success because women view financial status as an important reproductive criteria. Therefore, individuals with low achievement status are more likely to adopt strategies that involves fraudulent procurement of status (i.e., criminal behavior). Individuals low on achievement status should have committed more past criminal acts (pathway #1), and more future non-drug-related acts (pathway #2). In addition, lack of achievement status may lead individuals to participate in other activities that might lead to reproductive success. Substance abuse (pathway #3) may be an alternate means for a disadvantaged male to associate with women when the women’s ability to view potential sexual partners is impaired.
2. A social relations/interpersonal relationships variable that (variable #2)

³ It should be noted that the CDM theory of criminality is almost exclusively concerned with the criminal behavior patterns of males, and the commission of property or sexual crimes. Evolutionary psychology theories of criminality, at this point, fail to offer a compelling explanation of female crime or non-property-related crime. Consequently, the CDM theory suffers as an overarching explanation of all crime, but it may still have merit as an explanation of a subset of criminal behavior.

⁴The CDM model was created with the help of A. J. Figueredo, and consequently, represents an accurate representation of the CDM model’s hypotheses.

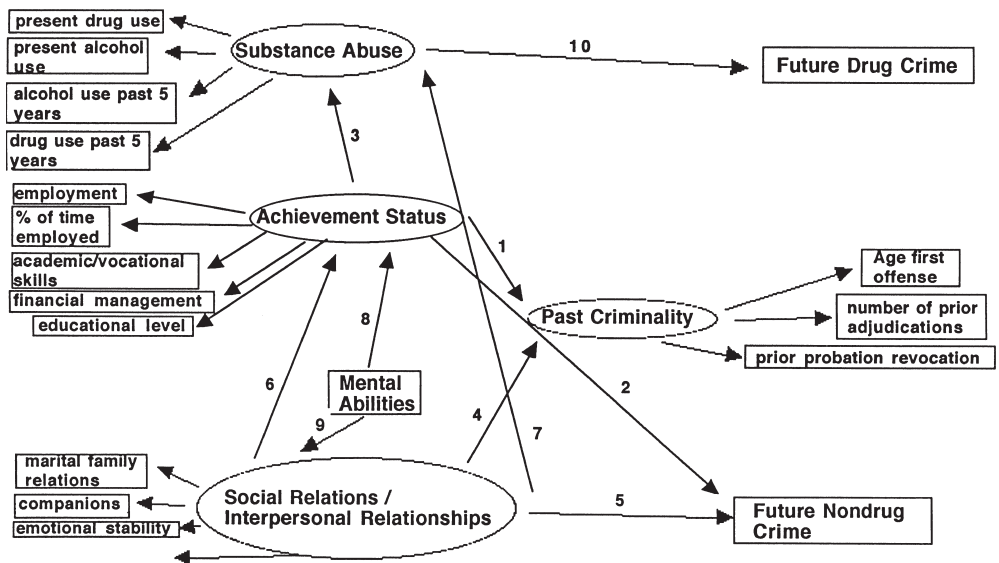


FIGURE 1. Representation of the hypothesized causal pathways for the competitively disadvantaged male theory of criminality.

indicates an individual's ability to form meaningful relationships with other people (this is an attribute described by Figueredo (1993) as causing competitive disadvantage in males). This variable has a causal impact on substance abuse, past criminality, achievement status, and future non-drug-related probation revocation. Individuals deficient in social relations ability should have difficulty achieving reproductive success because they can not interact in an effective manner with members of the opposite gender. Consequently, these individuals are also likely to utilize a reproductive strategy that involves criminal behavior to enhance their reproductive consequences both in the past (pathway #4) and in the future (pathway #5). Individuals lacking in social skills should also have difficulty achieving occupational success. These individuals' interpersonal deficits should inhibit them from performing societal behaviors that are necessary to advance their career or education (pathway #6). Finally, low socially skilled individuals should participate in activities that may increase their mating chances. As mentioned above, substance abuse (pathway #7) represents a strategy that may lead to interaction with women when the women's ability to choose mates is impaired.

3. A mental abilities variable (variable #3) that indicates an individual's intelligence. Individuals lower in intelligence should find the attainment of both achievement status (pathway #8) and normal social relations (pathway #9) more difficult.
4. A substance abuse variable (variable #4) that indicates an individual's past and present use of alcohol and drugs. Substance abuse should have a causal impact on probation revocation for future drug crimes. Under the CDM model, it is theorized that some crimes may not be committed as a

mating strategy, but rather as the result of strong environmental factors or addiction. Consequently, a substance abuse history should lead to the commission of future drug crimes (pathway #10) that are related to a drug or alcohol addiction and not directly linked to mate selection.

The most essential hypotheses that can be generated from the evolutionary model of criminality are:

1. Male individuals who lack both social skills/ interpersonal skills and financial status should commit more crime in the past than other individuals that have higher ratings on social skills, financial status, or both.
2. Male individuals who lack social skills/interpersonal skills and financial status should fail probation more often than individuals that have higher ratings on social skills, financial status, or both.
3. Greater mental ability should both increase an individual's financial status and successful interpersonal relationships.
4. The CDM model path (see Figure 5) should fit the data better than the Gottfredson and Hirschi self-control model.

Gottfredson and Hirschi's Self-Control Theory of Criminality

Unlike the CDM model, the self-control control model was developed by two sociologists, Michael Gottfredson and Travis Hirschi. According to Gottfredson and Hirschi's theory, criminality and the commission of crime is not a unique behavioral pattern. Rather, they argue that the commission of specific criminal acts is but one indication of a general underlying deficit—poor self-control or low impulse control. Low self-control is the inability of an individual to delay gratification of rewards, or the inability of an individual to conform his/her behavior to certain requirements when adverse consequences are not directly apparent. Self-control invades all aspects of the individual's life. Consequently, individuals who commit crimes are also likely to perform other behaviors that reflect a lack of control. Gottfredson and Hirschi propose that criminals are merely a subset of individuals that have poor self-control. They do not contend, however, that low self-control necessarily leads to criminality. Their theory simply argues that individuals with low self-control who have the opportunity to commit crimes are more likely to exhibit criminal behavior than individuals who have higher levels of self-control and fewer opportunities (Gottfredson & Hirschi, 1990).

In addition, they posit that alcohol and drug use do not lead to or cause delinquency or vice versa. Gottfredson and Hirschi (1990) state, “. . . the relationship between drug use and delinquency is not a causal question. The correlates are the same because drug use and delinquency are both manifestations of an underlying tendency to pursue short-term immediate pleasure” (p. 93). Other manifestations of poor self-control include: inability to form deep and personal relationships (i.e., low social competence), poor job performance and higher unemployment (i.e., low financial capacity), lower likelihood of being married, and higher rates of divorce (Gottfredson & Hirschi, 1990).

Gottfredson and Hirschi's (1990) self-control theory argues that low self-control is a product of inadequate child-rearing practices, and not genetic predisposition. In their book, they attack Mednick's et al. (1987) findings on the heritability of criminality, contending that these results are inconclusive. They highlight that these studies suffer from a number of serious methodological flaws. They further contend that there is a *critical period* of childhood development in which impulse control or low self-control is *learned*. In order to develop self-control in their offspring, parents must: monitor their children's behavior, recognize deviance when it occurs, and punish deviant behavior. Finally, Gottfredson and Hirschi postulate that poor self-control and opportunity for deviance fluctuates throughout the lifetime; self-control is at its weakest in late adolescence when opportunity for deviant behavior is at its highest. This hypothesis offers an explanation for why criminality reaches its azimuth in late adolescence and declines later in life.

Empirical Testing of the Self-Control Model. There has already been empirical testing with some limited empirical support for Gottfredson and Hirschi's (1990) self-control theory of criminality (Grasmick, Tittle, Bursik, & Arneklev, 1993; Keane, Maxim, & Teevan, 1993). While applauding these research efforts, Hirschi (1993) pointed to a number of methodological and conceptual flaws in these studies. More specifically, they cautioned against the use of self-report and voluntary participation of subjects in measuring self-control. They reasoned that individuals with low self-control were especially unlikely to take the time to fill out a research survey, and thus, the results of research employing this methodology were likely to be biased toward individuals with more moderate levels of self-control. Hirschi (1993) also argued that self-report data was more likely to reflect what individuals thought they should be doing and was not an accurate reflection of the behaviors individuals actually performed. Finally, Gottfredson and Hirschi warned that general population sample testing would be unlikely to include enough individuals with low self-control, and that it would be more appropriate to sample from a sub-population that would be likely to exhibit a wide variation in self-control (Hirschi, 1993). Thus, future research is still needed to effectively test their criminality theory.

This study will hopefully correct many of the methodological and conceptual faults that plagued previous attempts to validate Gottfredson and Hirschi's (1990) self-control theory. In this study, there are no drop-outs (the archival nature of the study and the mandatory filling out of the risk assessment instrument for probation does not allow for nonparticipation), the research data is not self-report (the data is based on the report of the probation officer, court records, and interviews with family members), and the data was not collected on a general population (the data was generated from a population of probationers). Furthermore, many of the low self-control behaviors specifically mentioned by Gottfredson and Hirschi were collected on the risk assessment instrument, including: difficulties in interpersonal relations, employment instability, drug use, and alcohol use. It should be noted, however, that this study will not fully test all of the implications of Gottfredson and Hirschi's theory. The constructed model emphasizes self-control, but fails to examine both the opportunity and child-rearing components of their theory.

Predictions of Criminality Based Upon a Self-Control Theory. Several empirically testable hypotheses can be derived from Gottfredson and Hirschi's (1990) self-control model. A structural equation model of self-control theory is visually represented in Figure 2. Briefly the major factors and causal pathways of the impulse control model are:⁵

1. A self-control/impulse control variable (variable #1) that indicates an individual's overarching learned ability to control aspects of their behavior. Self-control should have direct effects on an individual's: achievement status (variable #2), social relations (variable #3), substance abuse (variable #4), past criminality (variable #5), mental abilities (variable #8), future drug-related probation revocation (variable #6), and future non-drug-related probation revocation (variable #7). Individuals low on self-control should have substantial problems in many aspects of their lives. Low self-control individuals should have: difficulty achieving financial status (pathway #1), difficulty achieving meaningful social relations (pathway #2), greater problems with alcohol and drug use (pathway #3), higher incidence of past criminality (pathway #4), higher incidence of future drug-related probation revocation (pathway #5), higher incidence of future non-drug-related probation revocation (pathway #6), and lower overall intellectual functioning (pathway #7).

The most essential hypotheses of the Gottfredson and Hirschi (1990) self-control model are:

1. Self-control should exist as a causal factor that affects ratings on: financial/achievement status, substance abuse, social relationships, probation revocation for drug crimes, probation revocation for non-drug crimes, and past criminality.
2. No factor other than self-control should have a causal effect on ratings on any of the other factors. For example, substance abuse should have no independent effect on past criminality or future criminality.
3. Gottfredson and Hirschi's structural equation model should fit the data better than the CDM structural equation model.

Methods

Subjects

The records of 150 males who had been convicted of a crime and sentenced to probation in Pima County were collected. These 150 males consisted of two groups: (a) 75 randomly selected males whose probation was revoked during a 6-month period from October 1993 to March 1994, and (b) 75 randomly selected males who successfully completed probation from October 1993 to

⁵The self-control model was designed with the aid of several of Travis Hirschi's students, and therefore, is likely to offer an accurate representation of Gottfredson and Hirschi's theory.

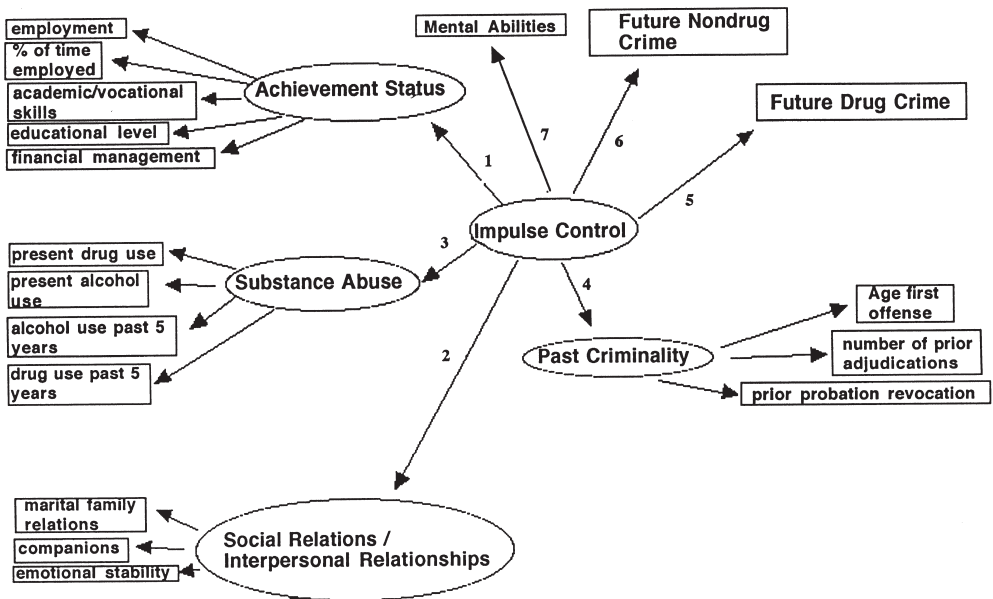


FIGURE 2. Representation of the hypothesized causal pathways for the self-control theory of criminality.

March 1994 (both sets of subjects were selected from Pima County's probation revocation data base).⁶ Due to the archival nature of the research informed consent was unnecessary. The Pima County probation office, however, approved the use of the subjects' records for this study on the condition that confidentiality be maintained. As a consequence, no demographic data was obtained on the participants.

Procedure

After being convicted of a crime, an offender in Pima County is assessed by a presentence investigator. The presentence investigator filled out the 22 item risk/needs assessment instrument based on: (a) presentence interviews with the defendant, (b) various records received from the criminal justice and other collateral agencies, and (c) interviews with collateral sources such as family members, friends, employers etc. The Pima County Risk/Need assessment instrument is based on a predictive/actuarial model created by the National Institute of Corrections (Pima County Probation Office, 1993).

The instrument consisted of 10 risk assessment questions and different evaluation weights: (1) age at first adjudication, (2) number of prior adjudications,

⁶Successful and nonsuccessful completers of probation were used because it was important for the models to predict successful completion of probation as well as recidivism.

(3) prior probation/parole revocation, (4) present crime designation, (5) felonious criminal behavior past 5 years, (6) highest level of education received, (7) percent of time employed during the last year, (8) alcohol abuse during the past 5 years, (9) drug abuse during the past 5 years, and (10) officer's impression of attitude.

The instrument also contained 12 offender needs evaluations: (1) marital/family relations, (2) companions, (3) academic vocational skills, (4) employment, (5) financial management, (6) health, (7) mental abilities, (8) emotional stability, (9) sexual behavior, (10) alcohol use, (11) drug use, and (12) officer impression of needs.

Based on an offender's evaluation scores on both the risk and needs section, the offender received a predetermined level of probation (minimum, medium, or maximum). An offender obtained a separate probation designation for both the risk and the needs section of the instrument.⁷

This instrument was recently validated on the Pima County criminal offender population. Different weights were assigned to the different assessment questions based on the particular characteristics of the Pima County probation population (Pima County Probation Office, 1993). According to the report, 22% of probationers were assigned to minimum supervision, 58% of probationers were assigned to medium supervision level, and 20% of probationers were assigned to maximum supervision level. A previous study found that 21.4% of minimum supervision offenders had their probation revoked, 60.2% of medium supervision offenders had their probation revoked, and 95% of maximum supervision offenders had their probation revoked (for more information on the validation of the Risk/Needs Assessment instrument see Pima County Probation Office, 1993).

After an offender received his risk-needs supervision level, the offender was placed on probation. Probation was terminated when the offender either successfully completed his designated period or when the probation was revoked for administrative reasons, the commission of a new crime, or both.⁸

Measures

The empirical testing of the CDM and Gottfredson and Hirschi's self-control structural equations models was developed from offender evaluations on the Risk/Needs assessment instrument. Originally for the CDM model, 4 la-

⁷If the assigned level of probation differed between the risk and the needs section then the offender received the higher of the two levels of probation. For example, if an offender risk score places the offender in the medium supervision level and the offender's needs scores places the offender in the maximum supervision level, then the offender would be assigned to maximum level of supervision.

⁸Subjects were only included in this study if the probation revocation was for a new crime or an administrative reason and a new crime violation. (In Pima County it is uncommon for an offender's probation to be revoked solely for a new crime; a violator are usually written up for both administrative and criminal offense.) The original Risk/Needs assessments for all the subjects were obtained and used in testing the CDM and self-control structural equation models.

tent variables were created from 18 manifest variables of the assessment instrument. A latent variable is a variable not directly measured by observation, but rather is created through a confirmatory factor analysis of a number of variables that can be directly measured. In contrast, a manifest variable is a variable that can be directly observed and measured (Long, 1983).

1. A latent past criminality variable was created from five manifest variables: (1) felonious behavior past 5 years, (2) age of first offense, (3) number of prior adjudications, (4) prior probation revocation, and (5) present offense designation. Past criminality represents an offender's prior interaction with the law and the legal consequences of that interaction. During the initial testing of the models it was determined that two variables, felonious behavior, past 5 years, and present offense designation, were not loading on the past criminality variable for conceptual reasons. These two variables were dropped from the analysis, and past criminality was based on the other three manifest variables.
2. A latent social relations/interpersonal relationships variable was created from four manifest variables: (1) marital/family relations, (2) companions, (3) emotional stability, and (4) sexual behavior. Social relations/interpersonal relationships represents the offender's ability to develop socially acceptable relationships with other people prior to his conviction. Prior to testing it was determined that the sexual behavior variable did not accurately reflect an offender's sexual behavior, but rather was solely an indicator of past sexual offenses. As a result of this discovery the sexual behavior was dropped from the analysis, and the other four variables were used to measure interpersonal relationships.
3. A latent substance abuse variable was created from four manifest variables: (1) present alcohol use, (2) alcohol use past 5 years, (3) present drug use, and (4) drug use past 5 years. Substance abuse represents an offender's past and present alcohol and drug dependence prior to his conviction.
4. A latent achievement status variable was created from five manifest variables: (1) employment, (2) percent of time employed in the last year, (3) highest educational level obtained, (4) academic/vocational skills, and (5) financial management. Achievement status represents the financial status/occupational status an offender obtained before his conviction.

In addition to creating latent variables, a severity of reoffense scale was developed to transform both drug and non-drug crime recidivism from a dichotomous variable into a more continuous variable. The severity scale is based on the possible punishment for the event leading to probation revocation according to the Arizona Criminal Code (see Table 1).

The Gottfredson and Hirschi's model utilizes the same latent constructs, manifest constructs, and reoffense scale as the CDM model. The self-control model, however, also contains a higher-order latent variable, self-control. A higher-order latent variable is a latent variable that is created from other latent variables rather than from manifest variables (Long, 1983).⁹

TABLE 1
Crime Recidivism Severity for Probationers

Nondrug crime	Drug crime	Severity rating ^a
Violates parole	Violates parole	1
Fine	Fine	2
Misdemeanor	Misdemeanor	3
Felony or misdemeanor (judicial discretion)	Felony or misdemeanor (judicial discretion)	4
Felony	Felony	5

^aSuccessful completion of parole received a 0 rating.

5. The higher-order latent variable self-control was developed from four latent variables: (1) achievement status, (2) social relations/interpersonal relationships, (3) substance abuse, and (4) past criminality, and two manifest variables: (1) probation for a drug crime and (2) probation revocation for a non-drug crime. Impulse control represents Gottfredson and Hirschi's belief that underlying criminality is poor self-control, and a generalized tendency to exhibit other signs of low impulse control.

Empirical Testing

The structural equation models created were tested in two ways. First, utilizing EQS, a structural equations modeling program, a confirmatory factor analysis determined if the latent and the higher order latent variables existed for this data set. The factor loadings between the manifest and latent variables were determined using maximum likelihood estimation. The statistical testing of the measurement model was evaluated by both a confirmatory fit index and a goodness-of-fit chi-square. During the initial phase, the program determined if the manifest variables shared variance, which was caused by the same overarching construct, the latent variable. Next, if the latent and higher order latent variables were found to exist, then EQS tested the confirmatory fit index and the goodness-of-fit chi-square of the two criminality theories. EQS also determined if the causal pathways specified (the arrows) by each of the models were statistically significant, (i.e., show a significant correlation between the two variables.).

⁹It should be noted that no manifest measures of self-control were taken for the offender population, and the measurement of self-control does not directly come from Gottfredson and Hirschi's (1990) book. Yet, the latent variables utilized to determine self-control's value are ones that were suggested by Gottfredson and Hirschi's theory, and should produce similar results. Generally, theoretically constructed latent variables should be even more accurate than a manifest variable. Unfortunately, since there is only one type of data source (i.e., questionnaire filled out by a probation officer), it is possible that relationships based on the self-control variable could be biased by method variance. Campbell and Fiske (1959) point out that method variance occurs when perceived correlations are due to a similar method of data collection, and not actual correlations between the measures. This limitation could be corrected in future studies by utilizing a number of different methods of data collection or including a manifest variable to measure self-control.

Through nested model comparisons of the measurement model, the self-control model, and the CDM model, the ability of the models to fit the data was directly compared. The model that achieved the lowest goodness-of-fit chi square with the greatest degrees of freedom represents the most appropriate and parsimonious explanation of the data (Bentler, 1989).

Results

The Measurement Model

The results of the confirmatory factor analysis of the measurement model were mixed. The factor loadings between the 15 manifest variables and the 4 latent variables were statistically significant at $p < .05$. See Figure 3 for a visual representation of the measurement model, and factor loading scores of manifest variables on the latent variables. While the measurement model achieved adequate fit with the data (Normed Fit Index = .844, Non-Normed Fit Index = .884, and Confirmatory Fit Index = .912), it failed to demonstrate a statistically significant goodness-of-fit chi-square ($\chi^2 = 159.361, df = 79, p < .001$). In regard to structural equation modeling, a goodness-of-fit chi-square represents how ineffectively a model fits the data. Consequently, a nonsignificant chi-square should lead to a rejection of the null hypothesis while significant chi-squares should indicate an acceptance of the null hypothesis.

A high correlation ($r = .873$) between the substance abuse latent factor and the interpersonal relationship latent factor may have contributed to the failure

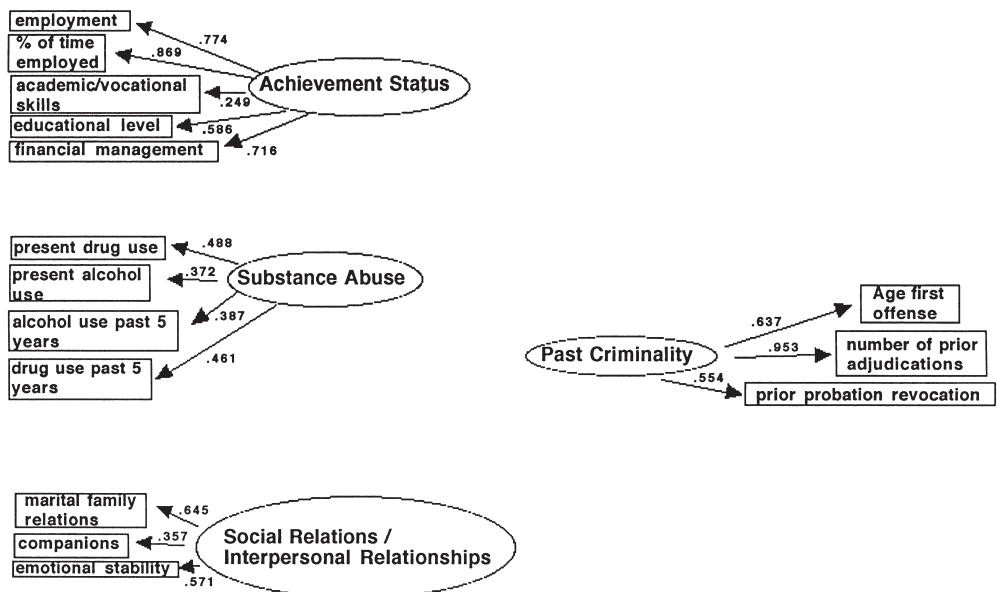


FIGURE 3. Representation of the factor loading scores and path coefficients for the measurement model, based on the characteristics of 150 probationers. Confirmatory Factor Index = .912, $\chi^2 = 159, df = 79$.

of the measurement model to demonstrate a statistically significant chi-square. High correlations among latent factors suggests that one factor rather several explains the highly correlated factors variance, and weakens the overall fit of the model. However, a three latent factor model (a model that created one latent factor from the manifest variables that contributed to the substance abuse factor and the interpersonal relationship factor) did not show a significantly higher fit to the data than the original four latent factor model.

The Self-Control Model

Gottfredson and Hirschi’s self-control model attained statistical significance on fit indices, but did not demonstrate an adequate chi-square. Similar to the measurement model, all 15 manifest variables loaded to a statistically significant degree on the four latent factors. See Figure 4 for a visual representation of the self-control model, factor loading for the manifest variables, and path coefficients between the latent variables. Likewise, the results of the self-control model indicated an adequate fit between the data and the model (Normed Fit Index = .808, Non-Normed Fit = .890, and Confirmatory Fit Index = .910, where .900 is used as a cutoff for significance). However, the goodness-of-fit chi-square was not statistically significant for the self-control model ($\chi^2 = 210.038, df = 125, p < .001$). Given that the measurement model did not exhibit a significant chi-square, it is not surprising that the more saturated theoretical models, which are based on the measurement model, did not show adequate chi-squares.

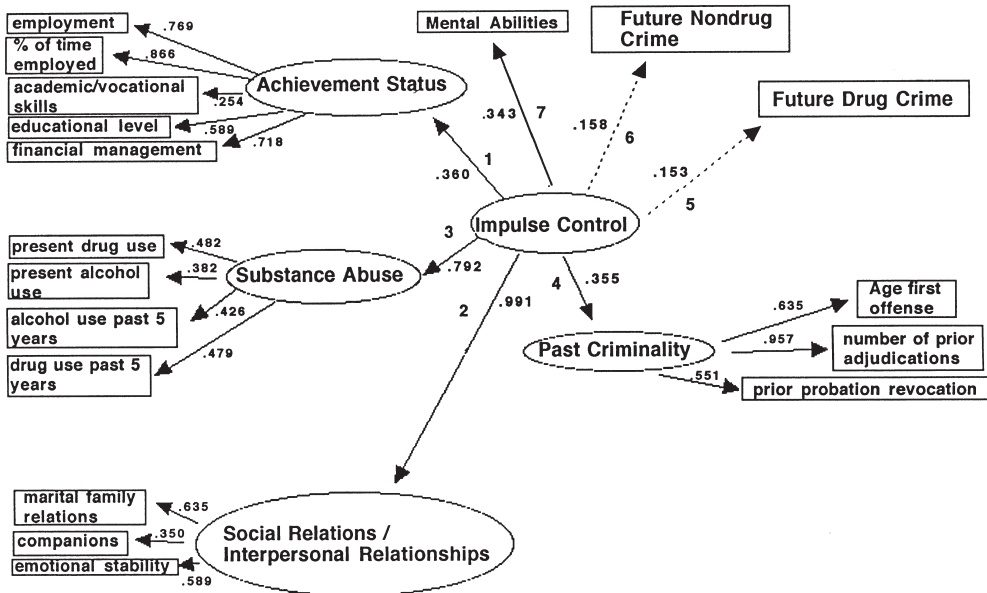


FIGURE 4. Representation of the factor loading scores and path coefficients for the self-control model theory, based on the characteristics of 150 probationers. Confirmatory Factor Index = .910, $\chi^2 = 210, df = 125$. (Statistically significant pathways are symbolized by dark lines and non-significant pathways, by dotted lines.)

In the self-control model, the majority of the specified path coefficients were statistically significant at $p < .05$. In Figure 4, the statistically significant pathways are indicated by a line and nonsignificant pathways are indicated by a dotted line. The only two path coefficients that failed to achieve statistical significance were between the self-control variable and the future non-drug crime variable (pathway #5, $r = .218$) and the self-control variable and the future drug crime variable (pathway #7, $r = .183$). In sum, while the model as a whole demonstrated statistically significant fit to the data, two important pathways did not attain significance.

The CDM Model

The CDM model results also indicated statistically significant factor loading between the fifteen manifest variables and the four latent factors. See Figure 5 for a visual representation of the CDM model, factor loading of the manifest variables, and path coefficients of the latent variables. The CDM model did not fit the data as well as the self-control model (Normed Fit Index = .799, Non-Normed Fit Index = .871, and Confirmatory Fit Index = .897). The fit of the entire model closely approached but did not achieve statistical significance. The CDM model's goodness-of-fit chi-square also did not attain statistical significance ($\chi^2 = 220.747, df = 123, p < .001$).

Unlike the self-control model, only 4 of the 10 CDM model's path coefficients achieved statistical significance. The links between social relations and

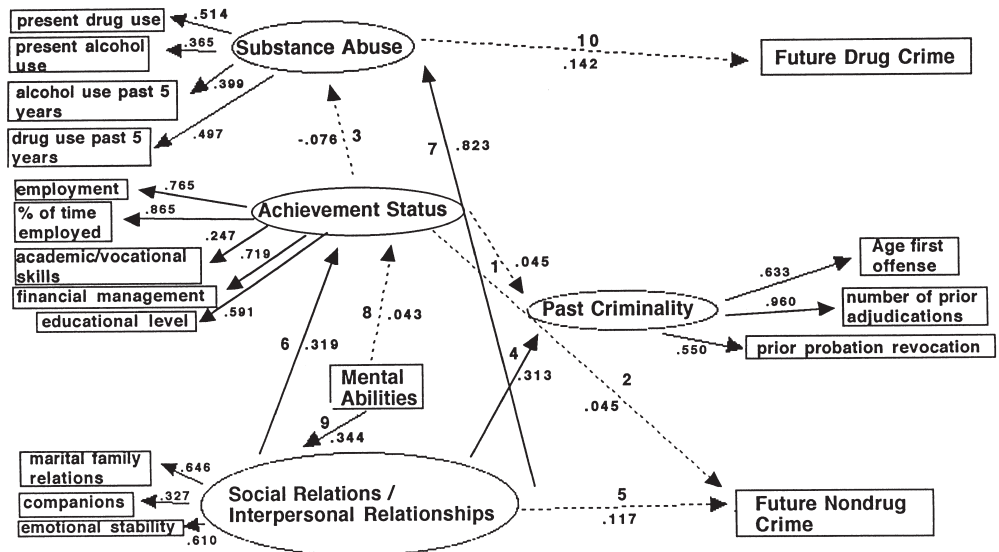


FIGURE 5. Representation of the factor loading scores and path coefficients for the competitively disadvantaged male theory of criminality, based on the characteristics of 150 probationers. Confirmatory Factor Index = .89, $\chi^2 = 221, df = 123$. (Statistically significant pathways are symbolized by dark lines and nonsignificant pathways, by dotted lines.)

past criminality, social relations and achievement status, social relations and substance abuse, and mental abilities and social relations were all demonstrated to be statistically significant ($r = .448, p < .05$, pathway #4; $r = .328, p < .05$, pathway #5; $r = .679, p < .05$, pathway #6; and $r = .418, p < .06$, pathway #9). In Figure 5, the statistically significant pathways are represented by a line, and the nonstatistically significant pathways are represented by a dotted line. The failure of the other paths to attain statistically significant path coefficients and the inadequate fit of the overall model indicates the CDM model's inability to effectively explain this data.

Nested Model Comparisons

The self-control model was superior to both the measurement and the CDM model. A nested model comparison of the measurement model with the self-control model revealed that the self-control model explained the data more accurately than the measurement model ($D \chi^2 = 50.677, df = 46, p < .25$). The CDM model also showed improvement over the measurement model ($D \chi^2 = 61.386, df = 44, p < .10$), but not to the same degree as the self-control model. Moreover, a nested model comparison of the two theoretical models indicated that the self-control model exhibited a better fit of the data and a statistically more parsimonious representation of the data ($D \chi^2 < 0, p > .25$).

Discussion

Current Test of the Two Theories

One purpose of this article was to test the robustness of two theoretical models to explain the future behavior of the offenders tested in this study. Gottfredson and Hirschi's (1990) self-control model outperformed the CDM model on all statistical measures, including: fit indices, goodness-of-fit chi-squares, and parsimony. The self-control model fit the data adequately (Confirmatory Fit Index $> .9$), and a nested model comparison of the self-control and the CDM model indicated that the self-control model was significantly more efficient in explaining the data than the CDM model ($D \chi^2 > .25$). In simple terms, the self-control model offered the best fit of the data based on the least complicated theoretical relationship between the variables.

The self-control model's hypothesized pathways also exhibited statistically significant correlations. The higher order latent variable self-control was found to cause the mental abilities variable, the substance abuse factor, the achievement status factor, the interpersonal relationship factor, and the past criminality factor. The statistical confirmation of the overarching causal nature of the self-control variable provides support for Gottfredson and Hirschi's belief that low self-control contributes to difficulties in a number of different areas including: employment status, interpersonal relationships, and drug and alcohol use.

Unfortunately, while almost all causal paths for the self-control model were significant, the two causal pathways that failed to achieve significance (the

path between the self-control latent factor and the future drug crime variable and the path between the self-control latent factor and the future non-drug crime variable) are strongly relevant to the testing of Gottfredson and Hirschi's criminality theory. Given that the models were specifically designed to predict recidivism and the Risk/Needs instrument has been demonstrated to adequately predict recidivism, the inability of the self-control theory to adequately predict the only two measures assessing recidivism detracts from the success of the self-control model. Low self-control did not sufficiently predict the occurrence of future non-drug or future drug-related criminal behavior. As a result of this finding, the self-control theory is only of partial value in explaining criminality.

It should be noted, however, that the future drug crime and future non-drug crime variables are based on the criminal justice system actually apprehending probationers for criminal activity. It is possible that many of the probationers are committing a substantial number of criminal acts that are not represented in our data. As a consequence, the probation revocation variables may be extremely inaccurate indicators of probationer criminal activity. The inability of the self-control model to demonstrate significant relationships with these variables may be a product of their measurement rather than an actual weakness of the self-control model.

In contrast to the self-control model, there is more limited support from this study for the CDM model and its theory of criminality. While the CDM model approached adequate fit with the data (Confirmatory Fit Index $> .89$) and a nested model comparison showed significant improvement from the measurement model ($D \chi^2 < .10$), only 4 of the 10 specified causal pathways achieved statistical significance.

The CDM theory did achieve some significant predictions, but the causal pathways most central to the theory were not supported. Many of the causal pathways involving the social relations variable achieved statistical significance. This evidence offers support for the CDM's hypotheses that low social skills may be linked to criminal behavior. The most integral pathways for the CDM model, however (the paths between the achievement status latent factor and the future non-drug crime variable, the achievement status latent factor and the past criminality factor, the interpersonal factor and the future non-drug crime variable), were not statistically significant.

The unsupported pathways represent the CDM theory's hypotheses that individuals that exhibit low financial status are most likely to adopt criminal behavior as a conditional adaptive mating strategy. The inability of the CDM model to demonstrate an adequate relationship between latent factors and the future non-drug crime variable could be the result of ineffective measurement of the non-drug crime variable, but this contention is inadequate to explain why so many of the CDMs models paths failed to achieve significance.

One of the potential weaknesses of this study was the mixed success of the measurement model, the confirmatory factor analysis model on which both the self-control and the CDM models were based. Although all the measurement model's latent factors and manifest variable factor loadings were found to be significant, the model did not achieve a nonsignificant chi-square. As a

consequence of this insignificant chi-square, the null hypothesis, that more than four or less than four latent factors more adequately explained the data, could not be rejected.¹⁰ The ineffectiveness of the measurement model could be the result of many factors including: scoring problems inherent in the Risk/Needs assessment instrument, high correlation between inter-factor manifest variables, and possible misspecification of the models.

The self-control and the CDM model's reliance on this potentially inadequate measurement model makes statistical analyses of their results somewhat problematic. It is possible that either of the two theoretically models would have performed differently (either better or worse) with a more accurate measurement model. Future empirical studies will have to be undertaken to more adequately address this problem. Yet, even with the weakness of the measurement model, head to head comparisons of the CDM model and self-control model demonstrated that the self-control model more successfully explained probationer past and future criminal behavior.

Implications for Third Generation Research

The second and arguably most important goal of this study was to demonstrate exactly how a third generation of risk assessment research could be accomplished. The results of this study, although mixed, provide evidence for the value of such a research program. In determining policy for probation assessment and other areas, it is as important to know which theories of criminal behavior do not demonstrate empirical support as it is to know which theories have garnered empirical evidence in their favor. Without continued testing of various theories that will help us to understand why certain individuals are at greater risk than other individuals, it is not possible to craft programs to prevent and rehabilitate these offenders successfully, or to identify those causal indicators of recidivism that would substantially increase the efficacy of current risk assessment instruments.

But this study also offers other lessons for such future research work. First, future empirical work should assess important variables through a variety of measures (e.g., self-report, clinical interview, archival data, and actuarial based instruments). This will eliminate the possibility that the method of data collection is contributing to the statistical effectiveness and the fit of models, and focus the results exclusively on models' theoretical underpinnings. In addition, while actuarial-based instruments have demonstrated their usefulness in improving the prediction of and the decision-making in a vast number of different risk assessment areas, there is considerable danger in relying exclusively on such instruments. As noted in the introduction, the use of strict actuarial-based techniques of risk assessment runs the risk of identifying high-risk individuals without offering any means of explaining why these individuals should receive greater scrutiny.

¹⁰A three-latent-factor model also was tested, but it did not significantly improve on the fit of the four-factor model.

Second, future research should also select assessment instruments that contain more distinct manifest variables. The high inter-correlation between all the variables in the chosen assessment instrument made it difficult to create useful latent variables, and minimized the overall fit of the models. A risk assessment instrument with lower correlations among all manifest variables would allow more accurate empirical testing of different theories.

Third, and finally, assessment instruments that contain the relevant variables of a theory must be chosen for this research. If there is not a good fit between the theory's components and the assessment instruments' variables, then any models constructed and results obtained will be of questionable worth. Advocates of the chosen theories will argue that the constructed models do not represent accurate reflections of the tested theories. This problem can be combatted by allowing theory proponents to review the fit between model and theory before the models are empirically tested (as was done in this study). Alternatively, as more theory-based actuarial instruments are created, these instruments could be utilized to construct and test models based on their instruments' proposed theory.

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