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## Modeling the Etiology of Adolescent Substance Use: A Test of the Social Development Model

**Richard F. Catalano, Rick Kosterman, and J. David Hawkins**

*Social Development Research Group, School of Social Work, University of Washington, Seattle.*

**Michael D. Newcomb**

*Department of Counseling Psychology, University of Southern California, Los Angeles.*

**Robert D. Abbott**

*Department of Education, University of Washington, Seattle.*

### Abstract

The social development model is a general theory of human behavior that seeks to explain antisocial behaviors through specification of predictive developmental relationships. It incorporates the effects of empirical predictors (“risk factors” and “protective factors”) for antisocial behavior and attempts to synthesize the most strongly supported propositions of control theory, social learning theory, and differential association theory. This article examines the power of social development model constructs measured at ages 9 to 10 and 13 to 14 to predict drug use at ages 17 to 18. The sample of 590 is from the longitudinal panel of the Seattle Social Development Project, which in 1985 sampled fifth grade students from high crime neighborhoods in Seattle, Washington. Structural equation modeling techniques were used to examine the fit of the model to the data. Although all but one path coefficient were significant and in the expected direction, the model did not fit the data as well as expected (CFI=.87). We next specified second-order factors for each path to capture the substantial common variance in the constructs' opportunities, involvement, and rewards. This model fit the data well (CFI=.90). We conclude that the social development model provides an acceptable fit to predict drug use at ages 17 to 18. Implications for the temporal nature of key constructs and for prevention are discussed.

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The social development model is a general theory of human behavior that hypothesizes similar developmental processes leading to either prosocial or antisocial outcomes (Catalano and Hawkins 1996; Hawkins and Weis 1985). The model takes a developmental life course perspective (Elliott 1994), specifying four submodels for specific periods in childhood and adolescence.

The model is grounded in criminological theory and incorporates research on the etiology of different forms of antisocial behavior. It seeks to explain a broad range of distinct antisocial behaviors through specification of predictive developmental relationships. Antisocial behavior is defined here as the violation of legal codes, including those relative to age. This definition thus includes both violent and nonviolent offending and the illegal use of drugs.

This article presents a test of the social development model in the context of drug abuse. In the analyses reported here, the model was tested for its fit in predicting adolescent substance use.

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Address correspondence and reprint requests to Richard F. Catalano, Social Development Research Group, University of Washington, 146 N. Canal St., Suite 211, Seattle, WA 98103.

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Data from a panel of the Seattle Social Development Project were utilized in the test. Drug use measured when youth were 17 to 18 years old was predicted by social development model constructs measured when subjects were 9 to 10 and 13 to 14 years old.

## Overview of the Theory

The social development model incorporates a growing body of knowledge regarding the effects of empirical predictors, or “risk factors,” in the development of antisocial behavior. It is clear empirically that multiple biological, psychological, and social factors at multiple levels in different social domains (i.e., within the individual and in the family, school, peer group, and community) all contribute in some degree to the development of such problems as delinquency and drug use. On the other hand, some individuals do not become involved in antisocial behavior despite exposure to high levels of risk factors. Investigators have thus sought to identify factors that protect these individuals from undesirable outcomes. The social development model also incorporates such “protective factors,” which are hypothesized to mediate or moderate the effects of risk exposure. (For reviews of risk and protective factors see, for example, Hawkins et al. 1995; Hawkins et al. 1992; Kandel et al. 1986; Newcomb 1995; Rutter 1990; Simcha-Fagan et al. 1986.)

As Bursik (1996) points out, specification of predictive relationships must proceed theoretically because of the large number of observed empirical predictors and the large number of possible functional relationships among them. To some extent, developmental periods of salience for risk and protective factors and their covariation have been established, but theory specification forces choices among a host of plausible rival hypotheses regarding these relationships. The social development model specifies the mechanisms by which identified risk and protective factors interact in the etiology of behavior.

The social development model is consistent with a continuing tradition of integrated theory in the field of criminology (cf. Elliott et al. 1985; Hepburn 1976; Messner et al. 1989). We have sought to synthesize into a coherent model those propositions having the strongest empirical support in existing theories. Our objective was to achieve greater explanatory and predictive power than that provided by the separate theories from which the model was derived. In creating this synthesis, care was taken to examine and resolve any conflicting assumptions from the underlying theories. (For a detailed discussion of the theory's assumptions, see Catalano and Hawkins [1996].) The resulting theory is a synthesis of (a) control theory (Briar and Piliavin 1965; Hindelang 1973; Hirschi 1969; Kornhauser 1978; Nye 1958; Reiss 1951); (b) social learning theory (Akers 1977; Akers et al. 1979; Bandura 1973, 1977; Burgess and Akers 1966; Conger 1976, 1980; Krohn et al. 1980); and (c) differential association theory (Cressey 1953; Matsueda 1982, 1988; Matza 1969; Sutherland 1973). Control theory was used to identify causal elements in the etiology of antisocial behavior as well as in the etiology of conforming behavior. Social learning theory was used to identify processes by which patterns of conforming and antisocial behavior are extinguished or maintained. Differential association theory was used to identify parallel but separate causal paths for prosocial and antisocial processes.

It is hypothesized that children learn patterns of behavior, whether prosocial or antisocial, from the socializing agents of family, school, religious and other community institutions, and their peers. Socialization then follows the same processes of learning whether it produces prosocial or antisocial behavior. Children are socialized through processes involving four constructs: (a) perceived opportunities for involvement in activities and interactions with others, (b) the degree of involvement and interaction, (c) the skills to participate in these involvements and interactions, and (d) the reinforcement they perceive as forthcoming from performance in activities and interactions. When socializing processes are consistent, a social bond develops

between the individual and the socializing agent. This social bond, once it is strongly established, has the power to affect behavior independently by creating an informal control on future behavior. This control inhibits deviant behaviors through the establishment of an individual's "stake" in conforming to the norms and values of the socializing unit.

As adapted from control theory, this social bond comprises attachment to others in the socializing unit, commitment to or investment in lines of action consistent with those of the unit, and belief in the values of the unit. The deletion of involvement from Hirshi's original four elements of the bond is supported both empirically (Elliott et al. 1982; Kempf 1993; Thornberry 1987) and theoretically as discussed below. Bonding is expected to influence individuals' behavior choices by entering into their calculation of the costs and benefits to self-interest of any particular behavior. Individuals tend not to engage in behavior that is inconsistent with the standards and norms of those to whom they are bonded, because the bond itself may be threatened if the behavior is exposed. Research on prosocial bonds has demonstrated an inhibitory effect on antisocial behavior (cf. Brook et al. 1990; Brook et al. 1986; Kempf 1993; Krohn and Massey 1980; Marcos et al. 1986; Newcomb and Bentler 1988).

It is hypothesized in the social development model that an individual's behavior will be prosocial or antisocial depending upon the predominant behaviors, norms, and values held by those to whom the individual is bonded. This approach departs from traditional control theory, which asserts no causal role for bonding to antisocial others in the etiology of delinquency, characterizing relationships among delinquents as cold and brittle (Hirschi 1969). However, much evidence suggests that the relationships among delinquents and drug-involved youths are not always characterized by negative affect (Agnew 1991; Cairns et al. 1988; Gillmore et al. 1992; Giordano et al. 1986). Moreover, recent evidence on adolescent use of tobacco and alcohol indicates that attachment to parents interacts with parents' own use of alcohol and tobacco in predicting adolescents' use of these drugs: high attachment to parents who use alcohol or tobacco led to adolescent drug-use behavior consistent with parents' use, not necessarily to the legal alternative of no use by the adolescent (Foshee and Bauman 1992). This indicates that bonding to a family involved in drug use can predict increased drug-using behavior.

As shown in figure 1, two general pathways are specified in the social development model. One path delineates the processes that encourage prosocial behavior and the other path those that encourage antisocial behavior. Each path is characterized by similar causal processes. We believe this conception represents the differential association mechanism better than the traditional operationalization as a ratio of prosocial to antisocial definitions or behaviors (Agnew 1991; Matsueda 1982; Sutherland 1973). Measuring both pro- and antisocial elements and hypothesizing positive and negative additive effects on social behavior may better represent the reality of social encounters throughout childhood. Many youths experience both pro- and antisocial influences and engage in both types of behavior. For example, currently most youths use alcohol before they are legally permitted to do so (Johnston et al. 1994), and most youths engage in minor delinquency although they may also remain involved in school and other prosocial activities (Elliott 1994). The model suggests how these encounters lead to bonds that have an inhibitory or promotional effect on antisocial behavior. When the preponderance of influences are prosocial, prosocial behavior results. When the preponderance are antisocial, antisocial behavior results. Through separate paths whose processes of reinforcement, learning, and bonding are independent but influence one another over time, the social development model allows for this variation in experience.

### **The Prosocial Path**

The first construct on the prosocial path consists of perceived opportunities to participate in the prosocial order. Inclusion of opportunities in the model does not presume the means/ends

discontinuity hypothesis of strain theory (Merton 1957). Rather, it is simply hypothesized that, for prosocial involvements to occur, youths must perceive opportunities for such involvements. Perceived opportunity is hypothesized to be of causal importance, distinct from the actual number of different activities or interactions in which it is possible to participate. This avoids the problem of cross-level analysis and specifies how the context is important in influencing the behavior of the individual, through the individual's perception of available opportunities (Bursik 1996).

Perception of opportunity for prosocial interaction and involvement affects the actual level of such involvement. This causal ordering differs from the ordering of variables in Hirschi's control theory, in which attachment predicts commitment, and commitment in turn, predicts involvement. In the present synthesis, prosocial interaction and involvement is viewed as a necessary, though insufficient, precondition to development of prosocial bonding. Involvement was not empirically supported in Hirschi's study (1969) nor in more recent research (Kempf 1993) as an element of the social bond that prevents antisocial behavior. The present theory asserts that involvement and interaction precede the formation of attachments and commitments. This alteration in the causal paths appears consistent with the empirical work of behavioral researchers (Bandura 1977; Bem 1972; Festinger 1964) who argue that behavior change (in this case involvement and interaction) may precede attitude change (such as attachment and commitment). In summary, prosocial interaction and involvement is viewed as a behavioral variable that is antecedent to the development of the social bond of attachment and commitment.

The development of attachments and commitments to the prosocial world also depends on the extent to which prosocial involvements and interactions are positively reinforced. It is hypothesized that attachment to prosocial others and commitment to prosocial lines of action result only when prosocial interactions and involvements provide, in sum, positive reinforcement to individuals (Conger 1976, 1980; Hundleby 1986). This is hypothesized to be true whether the rewards are social or nonsocial. Thus, perceived reinforcements (positive reinforcements and punishments) have been added to the interaction and involvement path as intervening variables between involvement/interaction and attachment/commitment. As with perceived opportunities, what is actually rewarding varies with individual preferences, and the perception of an activity or interaction as rewarding involves assessment of several dimensions. For example, whereas employment might be viewed by many as prosocially reinforcing, a youth employed at a low-skilled food service job may dislike the job, hate having peers see him there, and think the wages are too low. Measurement of perceived rewards includes multiple sources of possible reinforcements beyond the actual reward of wages alone.

If attachment and commitment depend on the level of perceived reinforcement for involvement, then factors that enhance reinforcement and perception of reinforcement should indirectly strengthen the development of attachment and commitment. Certain emotional, cognitive, and behavioral skills, for example, should increase the probability of experiencing rewards for prosocial involvement and interaction. These skills include the ability to identify, express, and manage feelings; control impulses; cope with stress; read and interpret social cues; solve problems and make decisions; understand behavioral norms; perform tasks such as academic work; and communicate verbally (W.T. Grant Consortium on the Promotion of Social Competence 1992). Therefore, the individual's skills for prosocial interaction and involvement are hypothesized to affect the level of reinforcement perceived as forthcoming from prosocial interaction and involvement.

Commitment and attachment to prosocial activities and people directly affect the development of belief in the moral validity of society's rules of conduct (the law and prosocial norms). Belief in the moral validity of society's rules of conduct is viewed as internalization of the standards

for behavior of persons and institutions to which one is bonded. Once internalized, these standards become part of the individual's value system and help to determine which activities the individual views as morally acceptable. Belief is thus an internal constraint that is directly affected by attachment to prosocial others and commitment to prosocial activities, and it is hypothesized to decrease directly the probability of antisocial behavior.

### The Antisocial Path

The prosocial path inhibits deviance through strengthening bonds to prosocial others and activities. However, as shown in figure 1, the model predicts the promotion of antisocial behavior as well as its inhibition. The principles of reinforcement hypothesized by social learning theorists are conceptualized in the social development model as equally important in the process of learning deviant behaviors (Akers et al. 1979) as they are in the process of learning prosocial behaviors.

Although only one direct (inhibiting) predictor of antisocial behavior is hypothesized on the prosocial path (belief in the moral order), the social development model hypothesizes three direct predictors of antisocial behavior on the antisocial path. The direct link from each of these three predictors represents a different etiological pathway to antisocial behavior. The predictors are (a) perceived rewards for antisocial interaction and involvement in related behavior, (b) attachment and commitment to antisocial others or lines of action, and (c) belief in antisocial values.

As on the path to prosocial behavior, the first concept on the antisocial path is perceived opportunities for antisocial involvement and interaction. If an individual does not perceive opportunities to interact with drug users and delinquents, actual interaction and involvement are not possible. The greater the perceived opportunities, the more actual interaction and involvement is expected. Interaction with others involved in antisocial behavior is the next concept on the antisocial pathway. Research on predictors of drug use and crime has consistently found strong correlations between association with others engaged in antisocial behaviors and involvement in crime and drug abuse (Brook et al. 1990; Dembo et al. 1979; Elliott et al. 1985).

Initial interactions with those engaged in antisocial behaviors increase the likelihood that an individual will become attached and committed to them, depending on how reinforcing these interactions and involvements are. If one perceives interactions with drug users and delinquents as rewarding, attachments to those individuals and commitments to related behaviors are predicted to develop. Perception of benefit from the behavior is conditioned by perception of personal cost in terms of legal and other sanctions. As on the prosocial path, skills for interaction/involvement are also hypothesized to affect perceived rewards for antisocial behavior. Thus, social and cognitive skills are hypothesized to be predictive in enhancing reinforcement for involvement in both prosocial and antisocial groups and activities. Direct paths are hypothesized from perceived reinforcement for illicit interactions and involvements to attachment and commitment to antisocial others and activities and to perceived further antisocial behavior. The personal calculation of reward may become sufficient to produce antisocial behavior when bonding to prosocial others is weak, resulting in low perceived costs of antisocial behavior (Hirschi 1969), or when perception of risk of detection is low even when prosocial bonds are strong.

Antisocial attachments and commitments are hypothesized in turn to have a direct, positive effect on involvement in antisocial behavior. Although bonds to prosocial others are generally preferred (Gillmore et al. 1992), bonds are nevertheless hypothesized to develop among those engaged in antisocial behaviors (Colvin and Pauly 1983). Attachment to those engaged in antisocial behavior and commitment to antisocial lines of action are hypothesized to be direct

predictors of antisocial behavior. Bonds of attachment and commitment may be formed with those engaged in antisocial behavior, and these attachments and commitments directly contribute to antisocial behavior. These hypotheses are supported by Agnew's findings that "Delinquent Friends (Serious) has the greatest effect on delinquency when the adolescent is attached to these friends, spends much time with them, feels they approve of his or her delinquency and feels pressure from them to engage in delinquency" (1991:64).

Attachment and commitment to antisocial others and activities are hypothesized to lead also to internalized normative approval of antisocial behavior. As with belief in the prosocial moral order, belief in illicit lines of action can develop. Clearly, individuals can generate behavioral norms that advocate antisocial behaviors, such as advocating violence when engaged in revolutionary actions. The autobiography of one organized crime figure indicates an understanding of societal rules and norms, but they are perceived as superseded by "the rules of war," which condone the use of violence among "soldiers" (Bonanno 1983). The development of belief in antisocial values provides the third direct path to antisocial behavior, hypothesized to be associated with frequent and prolonged involvement in antisocial behavior.

### Developmental Perspective

The social development model incorporates a developmental perspective (Loeber and LeBlanc 1990; Shaw and Bell 1992). It explicitly identifies developmentally specific behavioral outcomes indicative of antisocial behavior during different periods of development and identifies the socializing agents expected to influence behavior during these developmental periods. The social development model posits general processes by which bonding and behavior evolve. At the same time, the model recognizes that the socializing contexts in which these processes occur change in salience and importance developmentally as children enter first the family and preschool environments, then the elementary school environment, and so on. This allows for specification of domain- and behavior-specific indicators of the general model constructs appropriate at different developmental periods.

Four developmental submodels have been specified, defined by changes in social environments rather than by states of cognitive or moral development. These developmental periods include preschool, elementary school, middle school, and high school. Transitions from the home to elementary school and from the relatively self-contained classrooms of elementary school to the modular environments of middle school are nearly universally experienced transitions accompanied by shifts in the balance of influence among socializing agents of family, school, and peers. The four submodels delineate specific predictors for each developmental period.

The developmentally specific submodels have been constructed as recursive models. However, the social development model hypothesizes reciprocal relationships between constructs across developmental periods. If two contiguous submodels are laid out end to end, prosocial and antisocial influences from one period affect variables at the beginning of the causal chain in the next. In this sense, each submodel is a phase or period whose outcomes affect the levels of the beginning variables in the next phase or period. This notion of recurring phases allows the construction of models that account for reciprocal effects, that is, mutual causal influences among antisocial behaviors and hypothesized causes (Thornberry 1987, 1996).

To illustrate, in this article involvement in drug use during the elementary period is hypothesized to increase directly the perceived opportunities for interaction with drug-using family members, peers, and school personnel, and to decrease directly the perceived opportunities for prosocial interactions and involvements during middle school. In this way, the process of prosocial and antisocial interaction and bonding is affected by prior problem behavior through this indirect path.

This use of recurring model phases has the advantage over instantaneous reciprocal models of maintaining the ability to make assertions about the temporal priority of predictor variables. Further, this specifies the way in which prior problem behavior affects later antisocial behavior. Although some psychologists (e.g., Caspi and Bem 1990; Huesmann et al. 1984) and criminologists (Gottfredson and Hirschi 1990; Wilson and Herrnstein 1985) have claimed that behavioral continuity or stability is attributed to personality or genotypic traits, this view has been challenged by Sampson and Laub (1992), who demonstrated that behavioral stability has been seriously overstated with regard to aggression. There is substantial evidence that specific life events and adjustments to changing social contexts during adolescence and adulthood can modify the course of antisocial behavior over time (Elliott 1993; Moffitt 1991; Rand 1987; Rutter et al. 1990). The social development model thus hypothesizes the types of events and social contexts that lead to behavioral continuity or change from previous developmental periods. Models that solve the problem of mutual causal influences through the specification of instantaneous reciprocal effects do not appear to us to meet the test of temporal priority of the causal variable (Gollob and Reichardt 1987).

### The Current Test

The test of the social development model presented in this article examines the power of the middle school model to predict one form of antisocial behavior during the high school period: drug use by ages 17 to 18. As specified in the model (Catalano and Hawkins 1996), antisocial behavior in the prior developmental period (in this case early initiation of drug use during the elementary period) is expected to be mediated through the social development model constructs of opportunities for prosocial and antisocial involvement and interaction during the middle school period. That is, the model specifies the process through which prior antisocial behavior affects subsequent antisocial behavior.

In the middle school model, prosocial others include nondrug-using or noncriminally involved family members, school personnel, and peers. Antisocial others include drug users and delinquent or criminally involved family members, school personnel, and peers. During the middle school years, peers and siblings are important socializing influences (Huba and Bentler 1980). Middle school children are exposed to a variety of peers, with both prosocial and antisocial behavior patterns. The norms and values of peers with whom one associates during the middle school period are hypothesized to have a large impact on behavior that persists through adolescence. During this period, peer bonding can have a positive or negative impact on behavior, depending on the preponderance of prosocial or antisocial influences included in the child's peer network. Parents remain an important influence during this period. Evidence suggests that parental influence is particularly important in decisions concerning drug use, sex, and contraceptive use (Munsch and Blyth 1993). Prosocial rewards during the middle school period include perceived rewards from the environment (e.g., community members, parents, teachers, and friends) for involvement in legal activities including schooling and school- and community-sanctioned extracurricular activities. Rewards from antisocial activities include perceived rewards from using drugs, delinquent activity, or avoiding prosocial activities like school. Also included are perceived costs of drug use such as being caught by parents or the police.

### Method

#### Sample

The Seattle Social Development Project (SSDP) is a longitudinal, theory-driven study.<sup>(n1)</sup> In September 1985, 18 Seattle elementary schools were identified that overrepresented students from high crime neighborhoods. The study population included all fifth grade students in these schools (N=1,053). From this population of 1,053 students, 808 students (77%) consented to

participate in the longitudinal study and constituted the SSDP sample. This acceptance rate is comparable to other studies attempting to recruit children or adolescents (Ellickson and Bell 1990; Elliott et al. 1981; Thornberry et al. 1990).

The analyses presented here examined data collected in the fall of 1985 and the spring of 1989 and 1993, when subjects were aged 9 to 10, 13 to 14, and 17 to 18 years, respectively. The sample for these analyses was restricted to youth with complete data on all relevant measures, resulting in a sample size of 590 (73% of the consenting sample).

Students were interviewed in person and asked for their confidential responses to a wide range of questions regarding family, community, school, and peers, as well as their attitudes and experiences with alcohol, drugs, and delinquency. The interviews took about 1 hour. Early in the study, youths received a small incentive (e.g., an audiocassette tape) for their participation; later they received monetary compensation. In 1989 (and in other years not relevant to these analyses), a parent or guardian of the student was also interviewed separately from the student; parents and guardians were asked about their own and the child's attitudes and behaviors. The students' teachers were also surveyed, using the Achenbach Child Behavior Checklist (Achenbach and Edelbrock 1983).

### Sample characteristics

The sample of 590 participants examined here consisted of nearly equal numbers of males (n=296) and females (n=294). Slightly less than half identified themselves as European Americans (49%); African Americans (23%) and Asian Americans (20%) also made up substantial portions of the sample. The remaining youths were Native American (6%) or of other ethnic groups (3%). A substantial proportion of subjects were from low income households. The median of the families' yearly maximum income between 1986 and 1990 was \$35,000. Twenty-four percent of parents reported a maximum family income under \$20,000 per year, and nearly half of the student sample (49%) had participated in the school free-lunch program at some point in the fifth, sixth, or seventh grade. Thirty-seven percent of the sample reported only one parent present in the home in 1989.

The characteristics of the sample of 590 were compared with those who did not have complete data in the original consenting sample of 808 (n=218). We examined the demographic measures described above as well as the substance use indices at ages 9 and 10. Our analysis sample had significantly higher income (the mean of their maximum incomes reported over 5 years was \$30,000 to \$39,999, versus \$20,000 to \$29,999 for attriters,  $p < .01$ ), and they were less likely

<sup>n1</sup>In the first 2 years some students in the sample were part of a preventive intervention. However, intervention effects on mean structures were not considered in the models tested here (see O'Donnell et al. 1995, for a description and analysis of the intervention). Analyses based on the full sample were conducted after the following steps were taken to ensure that there was consistency between the covariance structures of the intervention and control groups (Bentler 1993; Jöreskog and Sörbom 1989).

In order to test the consistency of the covariance structures, we compared the fit of an unconstrained multisample confirmatory factor analysis (CFA) (in which parameter estimates were different in models for subjects who received the intervention and for those who did not receive the intervention) to the fit of a constrained multisample CFA (where the parameter estimates were constrained to be equal). This was done to consider the possibility that the intervention resulted in a covariance structure that differed from that of the controls. Specification of these models was identical to the first-order confirmatory factor analysis model described later.

The unconstrained multisample model fit the data well,  $\chi^2(982, N=590)=1,662.08$ , nonnormed fit index (NNFI, Bentler 1993)=.92, and comparative fit index (CFI, Bentler 1990)=.94. For comparison, we repeated this multisample analysis constraining all factor loadings and factor covariances to be equal for both groups. This constrained multisample model also fit the data well,  $\chi^2(1,083, N=590)=1,789.15$ , NNFI=.93, and CFI=.93. The difference between the unconstrained and constrained models was significant at approximately  $p=.04$  ( $\Delta\chi^2[\Delta df=101]=127.07$ ). However, of the 101 specific constraints imposed, only six significant differences were found between the models for the two groups (Chou and Bentler 1990), four of which were for factor loadings. Moreover, although the differences among two pairs of factor covariances were statistically significant (out of a possible 66), the covariances themselves were of substantial (and significant) magnitude and in the same direction for both intervention and control groups. (These covariances were .50 vs. .23, respectively, between antisocial opportunities and antisocial bonding, and  $-.78$  vs.  $-.57$ , respectively, between skills for interaction and antisocial rewards.) These results suggested few differences in etiological processes between intervention and control groups, supporting a single group analysis test of the structural model.



to have participated in the school free-lunch program (49% vs. 62%, respectively,  $p < .001$ ) or to reside in a single-parent family (37% vs. 49%, respectively,  $p < .01$ ). However, no significant differences emerged in the gender or ethnic makeup of the analysis sample compared to the attriters, nor did they differ on any of the substance use measures at ages 9 and 10.

## Measures

Multiple indicators of self-reported substance use behavior at ages 17 and 18 were constructed for use as dependent measures. Similar, more limited indicators were constructed at ages 9 and 10 to include as measures of substance use during the elementary school period. All other model constructs were measured during the middle school period, at ages 13 and 14. We constructed multiple indicators for each latent variable specified by the model. In constructing each indicator, we attempted to combine items representing four domains of influence: community, school, family, and peer. The rationale for this approach was to create indicators that individually represented an across-domain composite picture of a subject's perceptions, attitudes, or experience. This methodology emphasizes multidomain indicators of a single concept for which measures of internal consistency are less appropriate (see Bollen and Lennox 1991). In line with this methodology, we combined influences from different domains into each indicator, as opposed to having different domains represented in different indicators. For each construct, this approach provides an overall parcel of variables (Newcomb 1990) whereby each indicator of the construct captures aspects of community, school, family, and peer domains. The advantage of this approach is higher consistency between indicators and higher factor loadings on average in the measurement model.

The measurement of each latent construct is described below. Throughout all analyses, standardized scores were computed prior to combining components into indicators. All coding was such that higher scores reflect more of the indicated product. Subjects included in the analyses had complete data on at least half of problems composing each indicator. (V's indicate measured variables or factors composing the constructs, corresponding to table 2, presented later. All are available from the first author.)

## Variables

**Substance use at ages 17 and 18 (V33-V35)**—The procedure of creating cross-domain indicators from items measuring different substances, described above, was applied to substance use. The first indicator combined an item measuring frequency of alcohol use in the past month with a sum of the number of problems reported from the use of alcohol or other drugs (e.g., caused behavior later regretted, hurt relationships with parents or friends, hurt performance at school or job, caused less interest in other activities, interfered with ability to think clearly, and caused unsafe driving). The second indicator combined frequency of binge drinking in the past month (five or more drinks in a row) with marijuana use in the past year. The third indicator combined frequency of drunkenness in the past year with a sum of the use of crack, cocaine, and psychedelics in the past year. To illustrate the level of substance use in this sample at ages 17 and 18, approximately 42% reported drinking alcohol and 23% reported binge drinking in the past month; 46% had been drunk; 33% had used marijuana; and 11% had tried crack, cocaine, or psychedelics within the past year. Nearly half the sample, 48%, said their use of alcohol or drugs had caused them problems.

**Substance use at ages 9 and 10 (V1-V3)**—Due to the limited nature of drug use at ages 9 and 10 and the limited number of items, cross-domain indicators could not be created for early substance use. The first indicator combined initiation of cigarette use and frequency of cigarette use in the past month. The second indicator combined initiation of alcohol use and frequency of alcohol use in the past month. The third indicator was a single item assessing initiation of marijuana use. By ages 9 and 10, a substantial minority had initiated two of the

three substances. Fourteen percent had tried cigarettes, 26% had initiated alcohol use, and 3% reported having smoked marijuana.

**Perceived opportunities for prosocial involvement (V4-V6)**—These three indicators combined items asking whether subjects knew where to go in their community to join clubs, to learn a new skill, and to play sports; whether their neighborhood had nice parks and playgrounds; whether subjects had lots of chances at school to take part in class and extracurricular activities; and whether subjects had opportunities to do things with their parents and participate in family decisions.

**Perceived opportunities for antisocial involvement (V7-V9)**—Indicators combined items asking whether subjects had been invited to join a gang, whether lots of kids in their neighborhood got in trouble, the amount of crime in their neighborhood, and whether subjects personally knew adults who got drunk, used drugs, and seriously broke the law; the percentage of students at school who used alcohol and marijuana; whether they had siblings who used alcohol and drugs, belonged to a gang, and seriously broke the law; and whether their best friends got into serious trouble with teachers.

**Involvement in prosocial activities (V10-V12)**—Indicators combined items asking how often subjects spent time with other families and adults in their neighborhood, frequency of church attendance, and memberships in community groups; whether they took part in class and extracurricular activities and had friendly chats with their teachers; frequency of interacting with prosocial parents (selected for parents who reported alcohol use in moderation or never, and did not smoke marijuana); and time spent with prosocial friends (who did not use alcohol or marijuana or break the law).

**Interaction with those involved in problem behaviors (V13-V15)**—Indicators were based on items regarding gang membership and involvement with antisocial friends, involvement in family substance use (e.g., lighting a cigarette or pouring a drink for a family member), and frequency of “doing what feels good regardless of the consequences.”

**Skills for interaction (V16-V18)**—Items included in indicators assessed the appropriateness of responses to various scenarios involving peer pressure for antisocial behavior (e.g., shoplifting, skipping school, and alcohol use), combined with self-reported prosocial abilities (e.g., to follow directions, concentrate, and complete tasks).

**Perceived rewards for prosocial involvement (V19-V21)**—Indicators assessed whether subjects enjoyed the people in their neighborhood and whether they felt safe in their neighborhood; whether the school, teachers, and prosocial parents complimented the subjects for doing well, and whether parents “put them down”; and whether prosocial friends were enjoyable, helpful, and “let them know when they had done something well.”

**Perceived rewards for antisocial involvement (V22-V24)**—Items for these indicators asked about the likelihood of being picked up by the police, being “seen as cool,” “getting excitement,” and “feeling good” if they beat up somebody and if they stole something; whether subjects would be caught and punished for skipping school and for drinking alcohol, and whether their parents generally let them get away with misbehavior; and whether they thought drinking alcohol was a way to make friends.

**Attachment and commitment (bonding) to prosocial others and activities (V25-V27)**—Indicators combined items asking whether subjects liked or wanted to stay in their neighborhood, whether they liked their teachers, their school, and their classes; whether they

shared with, wanted to emulate, and would volunteer to help their prosocial parents; and whether they shared with, wanted to emulate, and would “stick by” their prosocial friends.

**Attachment and commitment (bonding) to antisocial others and activities (V28, V29)**—These indicators combined questions about sharing with and the desire to be like antisocial parents (who drank three or more times a day or currently used marijuana); and emulating and sticking by antisocial friends (who used alcohol or marijuana, or broke the law in other ways).

**Belief in the moral order (V30-V32)**—These indicators assessed whether subjects would let other students copy their work and exams at school, whether they thought it was okay to cheat, and the importance of telling teachers the truth; the importance of telling parents the truth; whether they thought it was okay for someone their age to use marijuana, cigarettes, and alcohol, and to hit someone with the idea of hurting them; and their beliefs about doing things that were not right in order “to get ahead,” and about taking things “if you can get away with it.” (Note that beliefs were collapsed into a single construct for these analyses. The available measures were combined so that high scores reflected prosocial beliefs.)

## Analyses

The EQS Structural Equations Program (Bentler 1993) was used for all model analyses. Confirmatory factor analyses were run as a first step to determine the adequacy of factor loadings, model fit, and the pattern of intercorrelations among the latent factors. Selected error and disturbance terms were allowed to covary to account for method effects or conceptual correspondence between constructs. Next, theoretical models were tested by including structural paths hypothesized by the social development model a priori. Overall model fit was assessed by examining the nonnormed and comparative fit indices, which indicates an adequate fit with values around .90 or greater (Newcomb 1990,1994).

This article examines the fit of the model for the entire sample. Analysis of the model's comparative fit for interesting subgroupings (by gender, race, or early initiation, for example) was not conducted. Such analysis is important to test the generalizability of the results. A first step, however, is to determine the empirical support for the fit of the model as specified. This task is undertaken in this article.

## Results

### First-Order Factor Model

**CFA model**—A confirmatory factor analysis was run on the social development model constructs specified above. In this analysis, all factor loadings were allowed to vary freely, and factor variances were constrained at 1.00 (in order to identify the metric of the latent variables); all factor intercorrelations were freed, and three pairs of indicator error terms were allowed to correlate freely in order to account for parallel items contained in the corresponding indicators (the three pairs were the error terms for V10 and V13, V25 and V28, and V26 and V29, which correspond to factors as presented in table 2 in the next section). With the exception of antisocial bonding (measured by two indicators), all factors were measured by three indicators.

All factor loadings were significant and in the expected direction (see table 2, corresponding to the structural model). The CFA model also fit the data reasonably well,  $\chi^2(491, N=590) = 1009.06$ , NNFI=.94, and CFI=.95. Factor intercorrelations (including second-order factors described later) are shown in table 1. All coefficients were in the expected direction, with positive correlations among prosocial constructs and among antisocial constructs and negative correlations between prosocial and antisocial constructs. (Correlations, means, and standard

deviations for measured variables are available from the first author. Variables indicating the same factor were highly intercorrelated in each case. With only one exception, these coefficients exceeded .30 in magnitude.)

**Structural model**—Figure 2 presents the estimated path coefficients for the structural relationships hypothesized by the social development model; factor loadings are presented in table 2. In this analysis, the path to the indicator with the largest factor loading (based on the CFA) for each dependent latent variable was fixed at 1.00 in order to scale the factors. The variances of all error and disturbance terms were freed, and the variances of the two completely exogenous factors (substance use at ages 9 and 10 and skills for interaction) were fixed at 1.00. The same three pairs of error terms as described for the CFA were allowed to correlate freely, as were the four pairs of disturbance terms for the corresponding prosocial and antisocial factors. These correlations were added to account for the conceptual correspondence between the constructs (e.g., antisocial opportunities not accounted for by prior behavior were presumed to be related to prosocial opportunities not accounted for by prior behavior, etc.). All path coefficients between factors were freely estimated.

As shown in figure 2, all but one path was significant and in the expected direction; with the exception of the path from antisocial bonding to belief in the moral order, all social development model hypotheses were confirmed. The overall model, however, did not fit the data as well as expected,  $\chi^2(538, N=590) = 1,856.57$ , NNFI=.86, and CFI=.87.

Although the model specifies that antisocial behavior in prior developmental periods affects later behavior only as it is mediated by perceived opportunities in the next period (and hence all subsequent causal mechanisms articulated in the model, as portrayed in fig. 2), we next examined the alternate hypothesis (e.g., Loeber 1988) of a direct path from substance use at ages 9 and 10 to substance use at ages 17 and 18. It is noteworthy that when such a path was added to the structural model described above, although the path itself was significant ( $\beta=.14$ ,  $p<.01$ ), there were virtually no changes in the value or significance of any of the other structural paths or fit indices, and only a 6.67 decrease in chi-square.

### Second-Order Factor Model

On the basis of the results for the first-order factor model and the factor intercorrelations, we next modeled second-order factors to capture the substantial common variance in opportunities, involvement, and rewards. As discussed in the introduction, we consider these factors to be key elements in the process of prosocial socialization and antisocial socialization, ultimately resulting in attachment and commitment (i.e., bonding) to pro- or antisocial others and a subsequent acceptance or rejection of the conventional moral order. Although we maintain that it is advantageous, both conceptually and for practical application, to distinguish the important separate constructs in this process, empirically in these data they are very highly correlated (from .57 to .73). As currently measured at one point in time, it is reasonable to assume that they share a good deal of variance, because together the three constructs are intended to capture the socialization experience. Conceptually, bonding is hypothesized to be a result of this socialization process and, hence, is expected to be an important mediator for the development of belief systems and ultimately of antisocial behavior.

**CFA model**—The confirmatory factor analysis for the second-order factor model was conducted in a manner identical to the first-order factor model with the addition of two second-order factors. The latent factors of prosocial opportunities, involvement, and rewards were specified as indicators of prosocial socialization. Similarly, antisocial opportunities, involvement, and rewards were specified as indicators of antisocial socialization. The largest factor loading of the indicators for each of these first-order factors was fixed at 1.00 to scale

the metric of the latent variables, and the variances of each independent factor were fixed at 1.00 and their covariances freed, also for model identification. Selected error and disturbance terms for independent variables and factors were allowed to correlate as in the previous models.

Again, all factor loadings were highly significant and in the expected direction (as shown for the structural model in table 2; factor loadings of the first-order factors on the second-order factors are shown in fig. 3). The second-order CFA model fit the data reasonably well,  $\chi^2(520, N=590)=1,278.71$ , NNFI=.92, and CFI=.93. Correlations between the second-order factors and all other independent factors are shown in table 1.

**Structural model**—The second-order factor test of the social development model is presented in figure 3; factor loadings of measured variables appear in table 2. The prosocial and antisocial socialization factors in the middle school period—as indicated by opportunities, involvement, and rewards—are hypothesized to be directly influenced by substance use during the elementary school period and skills for interaction. Conceptually, the prosocial and antisocial bonding factors are hypothesized to be results of the respective socialization processes and important mediators for the development of moral beliefs and, later, substance use behavior itself. As before, the model also hypothesizes a direct effect of antisocial rewards on substance use during the high school period.

As in the first-order model test, the indicator with the largest factor loading in the CFA for each dependent latent variable was fixed at 1.00 in order to scale the metric of the factor; for the socialization factors, the respective involvement constructs were specified as the reference indicators. The variances of all error and disturbance terms were freed, and the variances of the independent factors were constrained at 1.00. The same error and disturbance term correlations were freed as in prior models; the disturbance terms of the two socialization factors were also allowed to correlate freely. All path coefficients between factors were freely estimated.

As shown in figure 3, all path coefficients were again significant and in the expected direction, with the exception of the single path from antisocial bonding to belief in the moral order, which remained nonsignificant (as in the first-order model). The addition of the second-order socialization factors clearly improved the overall fit of the model. All indices suggested a better correspondence with the SSDP data,  $\chi^2(535, N=590)=1,551.10$ , NNFI=.89, and CFI=.90.

As before, the addition of a direct path from prior substance use to substance use at ages 17 and 18 had virtually no effect on the fit indices or the value or significance of other structural relationships (only one coefficient demonstrated more than a .01 change; the path from antisocial rewards to substance use dropped to .13 but remained significant at  $p<.01$ ). The additional path was, again, significant ( $\beta=.14$ ,  $p<.01$ ), though the decrease in chi-square remained relatively small at 6.86.

## Discussion

A test of the fit of the social development model using multiple indicators of latent constructs demonstrated an acceptable fit of the measurement and structural model. With two exceptions, the hypothesized relationships between model constructs were confirmed by the model test. Although the role of drug use from the prior developmental period appears to be largely mediated by constructs as hypothesized, when the direct path is added to the model it is significant. Adding this direct path does not, however, change other hypothesized structural paths in the model, and it contributes little to the model's fit. We conclude that a direct effect is still present, but the effects are largely mediated as expected. Further, a significant

relationship was not found between antisocial attachment and commitment and belief in the moral order.

Indicators of most social development model constructs used in the current test were measured when subjects were in middle school, aged 13 and 14 years. For that period, the socialization process constructs of opportunities, involvement, and rewards appear to be highly correlated, and a second-order factor model of prosocial and antisocial socialization fit the data more adequately. This suggests that separating the effects of the constructs may require that measures of the socialization variables be separated in time. The attachment and commitment constructs may be more stable qualities than the socialization processes of opportunities, involvement, and rewards.

Attachment and commitment are attitudes that may change slowly, through the daily accumulation of experiences of opportunities, involvements, and rewards. Temporally, opportunities, involvements, and rewards are experienced moment by moment, whereas social bonds of attachment, commitment, and belief are built up over time from recurring sequences of these socialization experiences. Different time frames may need to be considered for different constructs. An exploration of the socialization process over different time periods, perhaps through observational studies or in more frequent data collections, may be useful to establish appropriate time lags. Useful tests of the social development model could, for example, be undertaken in short-term studies seeking to investigate the effects of single events, cumulative daily experiences, and involvements and rewards measured over longer time frames in predicting levels and changes in attachment and commitment over shorter and longer intervals. Admittedly, an alternative hypothesis may be that these concepts are inseparable and most appropriately are indicators of prosocial or antisocial socialization. For this test, attempting to articulate a sequential process with constructs measured contemporaneously did not help to explain these data. A more rigorous examination of the sequential hypotheses in the social development model remains to be done.

Theory provides a basis for the design of approaches for preventing and reducing antisocial behavior. When the etiological pathways to antisocial behavior are specified, it is possible to identify intervention points to interrupt the causal process. Interventions to prevent or reduce antisocial behavior, most basically conceived, seek to interrupt the causal processes that lead to antisocial outcomes and strengthen the processes that lead to prosocial outcomes. Given the fit of the social development model, the following implications for prevention are noted:

1. Each of the constructs in the social development model is a potential focus of intervention.
2. Multiple interventions may be required because there are multiple direct and indirect paths to antisocial behavior.
3. Interventions to interrupt the causal processes in the development of antisocial behavior should include components seeking to promote processes that enhance constructs on the prosocial path as well as to interrupt processes that enhance constructs on the antisocial path.
4. The direct and indirect influence of prior behavior on future behavior suggests the importance of intervening early in development to reduce early initiation.

Using this test of the social development model, interventions can be conceptualized in terms of their hypothesized effects on the model's constructs and processes. Specification of the model provides a guide for exploring intervention effects on each construct along the hypothesized causal pathway to antisocial behavior.

In conclusion, the social development model using latent constructs measured in elementary and middle school provides an acceptable fit to predict drug use at ages 17 and 18. Further research examining the model's fit in other antisocial behaviors and explanations of different time separation in measuring the socialization variables of opportunities, skills, and rewards should be completed. Finally, the measurement and testing of the effect of antisocial beliefs remains for future research. Unfortunately, this variable was not adequately measured in the study. The lack of this measure may account for the absence of a relationship between antisocial attachment and commitment and belief in the moral order.

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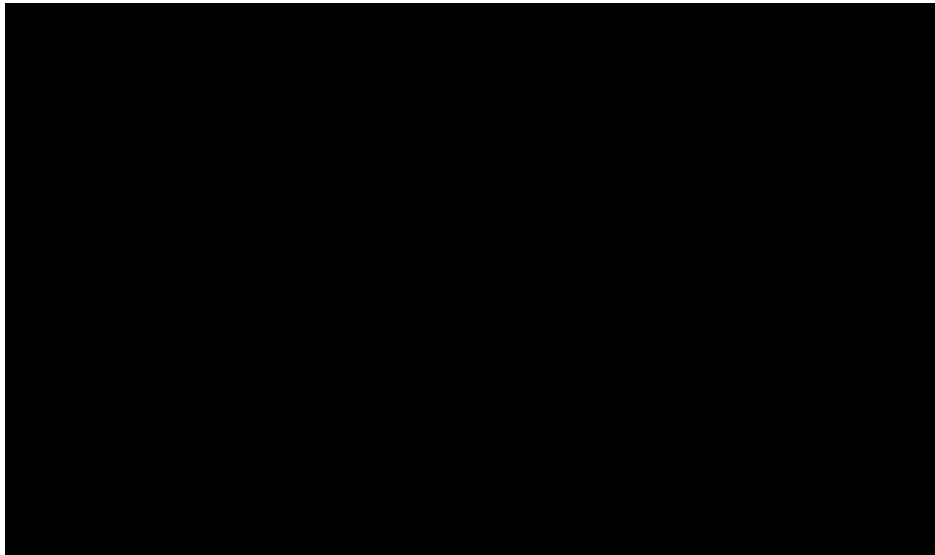
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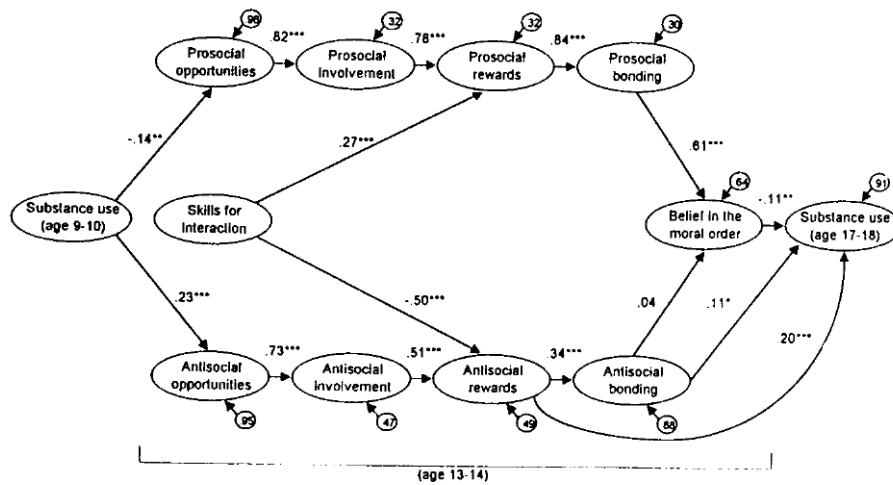


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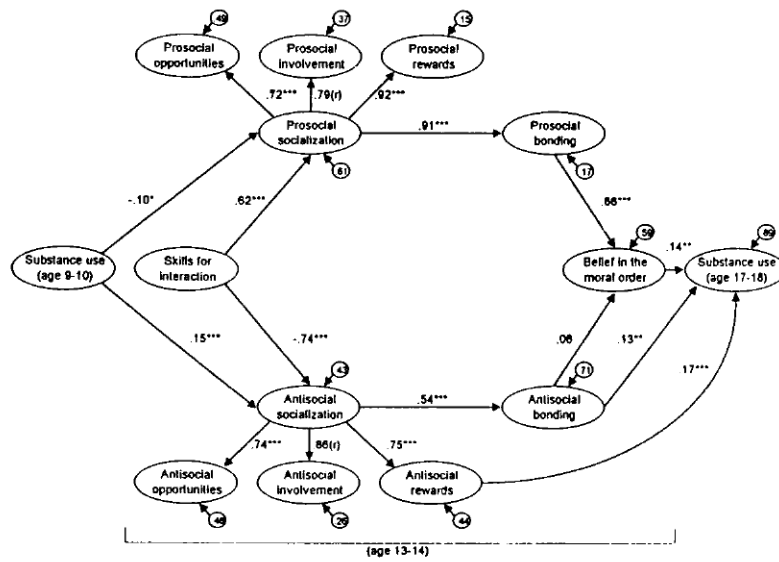


**Figure 1.**  
The Social Development Model of Antisocial Behavior: General Model



Ovals represent latent factors and small circles indicate disturbance terms. All estimates are standardized.  
 \*p < .05; \*\*p < .01; \*\*\*p < .001.

**Figure 2.**  
 Final First-Order Factor Structure for the Social Development Model.



Ovals represent latent factors and small circles indicate disturbance terms. All estimates are standardized.

(r) reference indicator; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

**Figure 3.**  
Final Second-Order Factor Structure for the Social Development Model

Table 1

Factor Intercorrelations for First-Order and Second-Order Factor Models

Factor	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>First-order constructs</i>													
1. Substance use (age 9-10)													
2. Prosocial opportunities	-.13*												
3. Antisocial opportunities	.23***	-.13*											
4. Prosocial involvement	-.22***	.67***	-.32										
5. Antisocial involvement		.73***	-.41										
6. Skills for interaction		-.66***											
7. Prosocial rewards													
8. Antisocial rewards													
9. Prosocial bonding													
10. Antisocial bonding													
11. Belief in the moral order													
12. Substance use (age 17-18)													
<i>Second-order constructs</i>													
13. Prosocial socialization													
14. Antisocial socialization													

Note. Blanks (-) represent first-order factors that serve as indicators of second-order factors; loadings of the first-order factors on the second-order factors are shown in figure 3.

\* p < .05.

\*\* p < .01.

\*\*\* p < .001.

**Table 2**  
 Factor Loadings and Z-Statistics for the Measurement Models of the First- and Second-Order Factor Structures

Measures	First-order factor model		Second-order factor model	
	Standardized factor loading	Z-statistic	Standardized factor loading	Z-statistic
Substance use (age 9-10)	V1 .80 (11.17)	.77 (10.82)	V2 .50 (8.99)	.52 (9.12)
	V3 .41 (7.94)	.42 (7.98)		
Prosocial opportunities	V4 .72 (11.25)	.73 (10.94)	V5 .59 (8.26)	.62 (7.85)
	V6 .41 (8.26)	.40 (7.85)		
Antisocial opportunities	V7 .73 (16.74)	.75 (16.62)	V8 .73 (16.73)	.72 (16.15)
	V9 .82 (16.73)	.80 (16.15)		
Prosocial involvement	V10 .76 (11.72)	.83 (11.35)	V11 .54 (12.16)	.52 (11.35)
	V12 .56 (12.16)	.59 (12.74)		
Antisocial involvement	V13 .73 (9.44)	.76 (9.73)	V14 .46 (9.44)	.46 (9.73)
	V15 .64 (12.53)	.67 (13.54)		
Skills for interaction	V16 .70 (14.58)	.69 (15.61)	V17 .60 (12.63)	.60 (13.62)
	V18 .54 (11.51)	.55 (12.35)		
Prosocial rewards	V19 .81 (21.70)	.84 (24.28)	V20 .82 (19.76)	.85 (21.69)
	V21 .75 (19.76)	.78 (21.69)		
Antisocial rewards	V22 .60 (12.11)	.63 (13.99)	V23 .66 (13.04)	.72 (15.60)
	V24 .75 (22.80)	.81 (21.69)		
Prosocial bonding	V25 .86 (25.33)	.87 (27.63)	V26 .85 (21.69)	.87 (27.63)
	V27 .80 (22.80)	.82 (24.72)		
Antisocial bonding	V28 .95 (24.87)	.95 (33.82)	V29 .98 (21.69)	.99 (33.82)
Belief in the moral order	V30 .77 (20.44)	.78 (21.30)	V31 .77 (20.38)	.77 (21.21)
	V32 .90 (20.87)	.90 (21.28)		
Substance use (age 17-18)	V33 .82 (21.90)	.82 (22.36)	V34 .89 (20.87)	.89 (21.28)
	V35 .78 (20.87)	.78 (21.28)		

Note. (r) = reference indicator with unstandardized loading fixed at one to identify the metric of the latent variable. All factor loadings are significant at  $p < .001$ .