

The Social Predictors of Adolescent Alcohol Misuse: A Test of the Social Development Model*

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ABSTRACT. *Objective:* This study was conducted to investigate the ability of the social development model (SDM) to predict alcohol misuse at age 16 and to investigate the ability of the SDM to mediate the effects of alcohol use at age 14 on alcohol misuse at age 16. *Method:* The sample of 807 (411 males) is from the longitudinal panel of the Seattle Social Development Project which, in 1985, surveyed all consenting fifth-grade students from 18 elementary schools serving high-crime neighborhoods in Seattle, Washington. Alcohol use was measured at age 14, predictors of alcohol misuse were measured at age 15 and alcohol misuse was measured at age 16. Structural equation modeling

was used to examine the fit of the model to the data. *Results:* All factor loadings were highly significant and the measurement model achieved a good fit with the data (Comparative Fit Index [CFI] = 0.93). A second-order structural model fit the data well (CFI = 0.91) and also explained 45% of the variance in alcohol misuse at age 16. The SDM partially and significantly mediated the direct effect of age-14 alcohol use on age-16 alcohol misuse. *Conclusions:* The risk and protective processes specified by the SDM serve as potential targets for the prevention or reduction of adolescent alcohol misuse. (*J. Stud. Alcohol* 62: 179-189, 2001)

MOST 10TH-GRADE STUDENTS have tried alcohol, and roughly one third report a recent episode of heavy drinking (Johnston et al., 1997). Research has identified multiple predictors of adolescent alcohol misuse, including constitutional (Zuckerman, 1987), family (McDermott, 1984; Peterson et al., 1994), school (McDermott, 1984) and peer factors (Hundelby and Mercer, 1987; Kandel, 1985). Given the quantity of predictors and the large number of possible functional alternatives for relationships among these variables, specification of the relationships among predictors in explaining alcohol misuse must proceed theoretically (Bursik and Grasmick, 1996).

The Social Development Model (SDM) is a general theory of human behavior that specifies the role of developmental processes in predicting both prosocial and problem behavior outcomes (Catalano and Hawkins, 1996; Hawkins and Weis, 1985). The SDM is an appropriate theo-

retical model to examine alcohol misuse because it incorporates relationships among a set of empirically determined predictors that include both risk and protective factors. (For reviews of risk and protective factors, see Hawkins et al., 1992, 1995; Kandel et al., 1986; Rutter, 1990.) The dynamic nature of the theory accounts for reciprocal, as well as both direct and indirect, relationships between predictors and behaviors, and between predictors themselves. The model also identifies four distinct phases of child/adolescent socialization: preschool, elementary school, middle school and high school periods. This developmental life-span perspective (Elliott, 1994) allows reciprocal causation between predictors and outcomes to span multiple developmental periods.

By incorporating social learning theory (Bandura, 1977; Burgess and Akers, 1966; Lanza-Kaduce et al., 1984), social control theory (Hindelang, 1973; Hirschi, 1969; Kornhauser, 1978) and differential association theory (Cressey, 1953; Matsueda, 1982; Sutherland, 1973), the SDM is an integrated theoretical approach. This synthesis of theories identifies etiological and developmental mechanisms affecting multiple types of behavior. Social learning theory specifies the role of reinforcement, or rewards, in increasing behavior. Young people who are rewarded for consuming alcohol (e.g., through increased peer acceptance) are predicted to repeat this behavior in the future. Lack of reinforcement for consuming alcohol is expected to reduce future alcohol use. Social control theory emphasizes the predictive effect on behavior of social bonds to parents, school, peers and the community. Traditional control theory

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does not assert a causal role from bonding to others who engage in problem behaviors to problem behaviors themselves (Hirschi, 1969). In contrast, the SDM hypothesizes that bonding to others who engage in such problem behaviors as alcohol misuse promotes adherence to the beliefs and behaviors held by those others, thereby increasing the likelihood of behavioral manifestations consistent with these beliefs and norms. Bonding is expected to serve a protective function against such behaviors as alcohol misuse only when the adolescent is bonded to an individual or group whose norms disapprove of such behaviors. This reconceptualization is consistent with the other theoretical source of the SDM: differential association theory. Based on this theory, the SDM hypothesizes separate but parallel causal pathways to prosocial and antisocial (or problem) behaviors. Including both pathways provides a more realistic representation of the adolescent experience by capturing separable prosocial and antisocial developmental processes as well as the way these processes jointly contribute to behavior over time. Figure 1 shows the two general pathways specified in the SDM.

The SDM hypothesizes four direct influences affecting such problem behaviors as alcohol misuse. The first influence is protective. The more a child believes in the moral validity of society's rules and conduct, the more likely the beliefs are to decrease behaviors inconsistent with these standards. The remaining three direct paths promote problem behavior. First, the costs and benefits that a person perceives to be associated with a particular behavior are hypothesized to affect motivation to engage in that behavior. For example, an adolescent who perceives little cost and great benefit associated with alcohol consumption is hypothesized to be more likely to engage in this behavior. Second, bonding to others who engage in certain behaviors (e.g., alcohol misuse) is hypothesized to increase the likelihood of adopting the norms and behaviors of that group. Third, belief in values consistent with such problem behaviors as alcohol use is expected to promote participation in such behaviors. Overall, the SDM identifies the interacting roles of opportunities, involvement, skills and reinforcement in affecting socialization. These socialization processes lead to social bonding to others, thereby increasing the like-

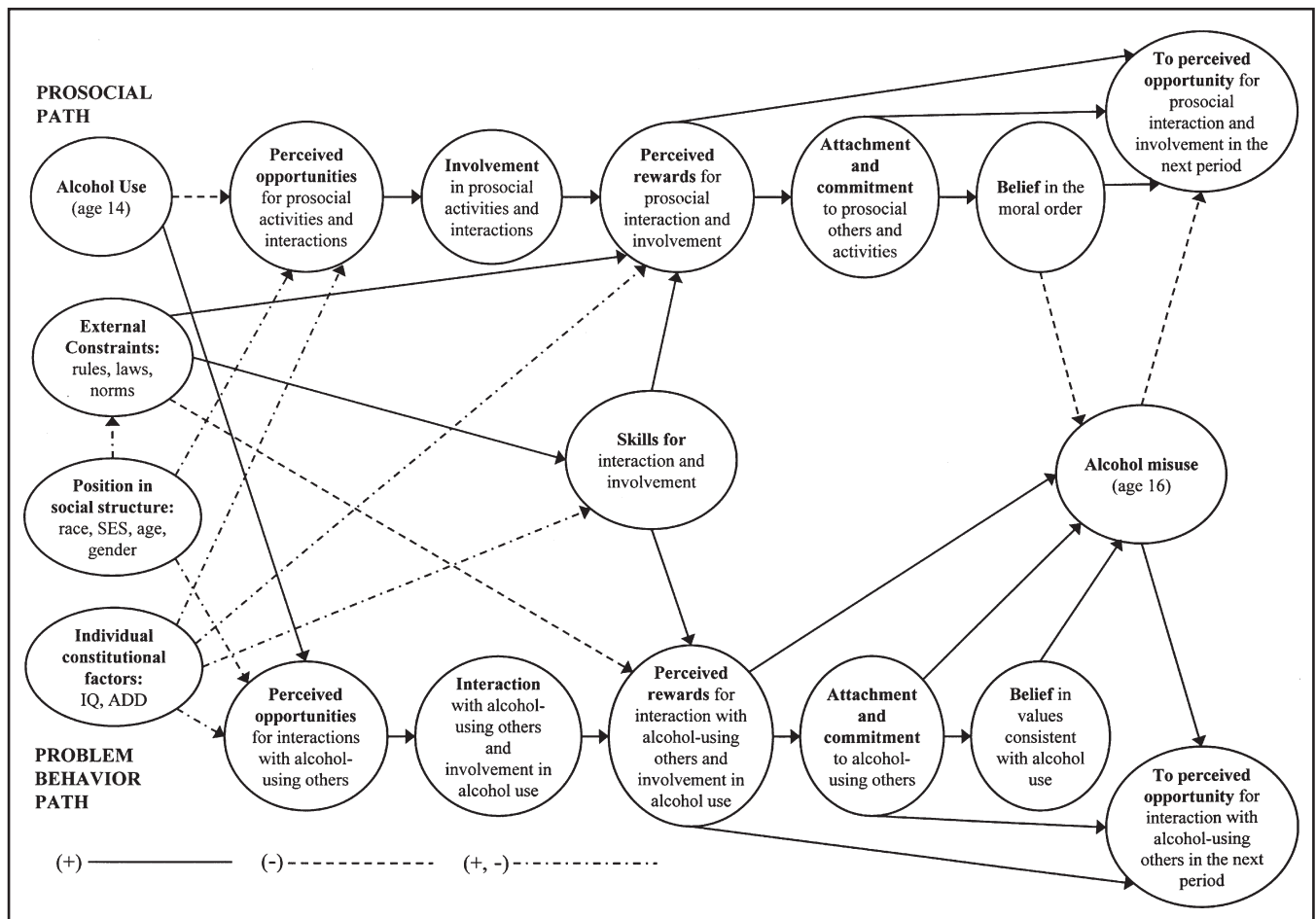


FIGURE 1. The Social Development Model: High school period

likelihood of adopting beliefs and behaviors consistent with the norms of those to whom they are bonded. The behavior of youths will be prosocial, antisocial or mixed, depending upon the types and amounts of influences to which they are exposed.

Structural equation model tests have provided empirical support for the SDM's ability to predict adolescent substance use (Catalano et al., 1996; Fleming et al., 1997) and other problem behaviors (Catalano et al., 1999). This article examines the power of social development constructs measured at age 15 to predict alcohol misuse, as measured by heavy episodic drinking, getting drunk and problems associated with alcohol use, at age 16. Further, the ability of SDM constructs to mediate the effects of prior alcohol use at age 14 on alcohol misuse at age 16 is also investigated. This article represents a unique approach to SDM testing through its attention to mediating processes that affect a stage change from alcohol use to misuse. The analysis tests the ability of the high school submodel of the SDM to mediate alcohol use developed during the prior developmental period (middle school). Thus, it explicitly tests the hypothesis of reciprocal causation between developmental periods (Catalano and Hawkins, 1996).

As noted in Figure 1, the SDM also includes exogenous factors hypothesized to influence the socialization process (Catalano and Hawkins, 1996). These are external constraints (e.g., legal sanctions), position in the social structure (e.g., race or gender) and individual constitutional factors (e.g., intelligence). It is hypothesized that these factors are mediated by the social development processes specified in the model. Their contribution as important predictors is acknowledged; however, the current test of the SDM focuses on the mediating effects of the socialization processes specified in the model.

Method

Sample

The Seattle Social Development Project (SSDP) is a longitudinal, theory-driven study. In September 1985, 18 Seattle elementary schools were identified, which 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 and their parents 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 youths were interviewed annually from 1985 (age 10) to 1991 (age 16), and again in both 1993 (age 18) and 1996 (age 21). Teachers were interviewed annually through 1989 and parents were interviewed annually through 1991.

Participants were 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, delinquency and violence. 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. When participants were age 14, a parent or guardian of the participant was also interviewed, separately from the participant; parents and guardians were asked about their own and the child's attitudes and behaviors. The analyses presented here examine both participant and parent data collected in the spring of 1989, 1990 and 1991, when the students were ages 14, 15 and 16, respectively.

Sample characteristics. The 808 participants examined here consist of nearly equal numbers of males ($n = 412$) and females ($n = 396$). Slightly less than half identify themselves as European American (46%). African Americans (24%) and Asian Americans (21%) also make up substantial portions of the sample. The remaining youths were Native American (6%) or of other ethnic backgrounds (3%). A substantial proportion of the participants was from low-income households. Almost half (46%) of parents reported a maximum family income under \$20,000 per year in 1985, and 52% of the sample had participated in the school free-lunch program at some point in the 5th, 6th or 7th grades. In 1985, 42% of the sample reported only one parent present in the home.

Measures

Multiple indicators of self-reported alcohol misuse at age 16 were constructed for use as dependent measures. Indicators were constructed at age 14 to measure the frequency and quantity of alcohol drinking. All other model constructs were measured at age 15. Multiple indicators were constructed for each latent variable specified by the model. In constructing each indicator, items representing four domains of influence—community, school, family and peer—were combined in order to create indicators that represented a cross-domain composite of a subject's perceptions, attitudes or socialization experiences. This methodology emphasizes multidomain indicators of a single concept (Bollen and Lennox, 1991; Newcomb, 1990). Throughout all analyses, standardized scores were computed prior to combining items into indicators. All coding was such that higher scores reflect more of the indicated construct. The measurement of each latent construct, and sample items, are presented in Table 2. (All items are available from the third author.)

As specified by the SDM, parents, peers and neighborhood can influence youths toward prosocial behaviors and/or toward alcohol misuse. We determined whether parents, friends and neighborhood functioned either as prosocial influences or as influences toward alcohol misuse. The

prosociality of a friend was measured by whether he/she tried to do well in school. The influence of a friend toward alcohol misuse was measured by whether this person tried drugs or alcohol, or got into trouble with teachers or the police. The prosociality of parents was measured by parents' self-reported negative attitude toward adolescent drinking. Parental influence toward alcohol misuse was measured by parents' reports regarding their own drinking behavior. (Parent items are only included for this purpose; all remaining items are drawn from the student survey.) The prosociality of the neighborhood was measured by how safe the participant perceived the neighborhood to be and the participant's rating of the chances for neighborhood youth to be successful and go to college. The neighborhood's influence toward alcohol misuse was measured by the degree to which crime, drug selling and the presence of gangs characterized the neighborhood. For each of these influence variables a dichotomous (0, 1) variable was constructed. For prosocial influences, a 0 indicates influences toward alcohol misuse and 1 indicates prosocial influences. For antisocial influences, 0 indicates prosocial and 1 indicates alcohol misuse influences. Therefore, each indicator on the prosocial and antisocial path was multiplied by the appropriate dichotomous variable. For example, to create the value of prosocial attachment to a friend, the participant's bond to the friend is multiplied by whether this friend tries to do well in school. To determine the value of attachment to an alcohol-using friend, the participant's bond to the friend is multiplied by whether this friend tried drugs or alcohol, or got into trouble with teachers or the police. Thus, if the friend tried to do well in school, the degree of

prosocial attachment to a friend would be the participant's response to this item multiplied by the prosocial influence score (1) of the item. If the friend did not try to do well in school, the value would be 0 (as multiplied by the influences toward alcohol misuse score of 0). If the friend drank alcohol or got into trouble with teachers or the police, the value of the attachment to an alcohol-using friend would be the participant's response to the item, and if the friend did not use alcohol, the value would be 0. This construction permits the prosocial and antisocial contributions of neighborhoods and friends to be modeled independently.

Coding and transformation

If a subject responded to at least half of the items composing an indicator, the mean of the standardized scores of items making up that indicator was computed as the value of that indicator. Alcohol items were skewed toward zero. To help normalize their distribution, these items were log transformed prior to scale construction. Standardized scores were used for the remaining items, including those created by product terms. One subject's reported frequency of monthly drinking was so high (more than 1,000 drinks per month) that response validity was questionable. This individual was dropped from further analyses.

Analyses

The Amos Structural Equations Program (Arbuckle, 1995) 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 intercor-

TABLE 1. Factor intercorrelations for first-order and second-order factor models

Factor	Opp+ 2	Opp- 3	Inv+ 4	Inv- 5	Skill+ 6	Rew+ 7	Rew- 8	Bon+ 9	Bon- 10	Belief+ 11	Soc+ 12	Soc- 13	Misuse 14
First-order constructs													
1. Drinking (age 14)	-.14 [†]	.59 [‡]	-.13 [†]	.62 [‡]	-.34 [‡]	-.25 [‡]	.58 [‡]	-.33 [‡]	.50 [‡]	-.47 [‡]	-.23 [‡]	.69 [‡]	.65 [‡]
2. Prosocial opportunities		-.19 [‡]	.77 [‡]	-.27 [‡]	.34 [‡]	.76 [‡]	-.37 [‡]	.64 [‡]	-.15 [†]	.38 [‡]	—	—	-.16 [†]
3. Opportunities toward problem behavior			-.09*	.80 [‡]	-.46 [‡]	-.32 [‡]	.67 [‡]	-.42 [‡]	.73 [‡]	-.50 [‡]	—	—	.64 [‡]
4. Prosocial involvement				-.26 [‡]	.22 [‡]	.66 [‡]	-.39 [‡]	.62 [‡]	-.12*	.39 [‡]	—	—	-.16 [‡]
5. Involvement with influences toward problem behavior					-.69 [‡]	-.41 [‡]	.75 [‡]	-.58 [‡]	.71 [‡]	-.65 [‡]	—	—	.72 [‡]
6. Skills for interaction						.36 [‡]	-.47 [‡]	.54 [‡]	-.38 [‡]	.44 [‡]	.38 [‡]	-.64 [‡]	-.42 [‡]
7. Prosocial rewards							-.50 [‡]	.79 [‡]	-.27 [‡]	.53 [‡]	—	—	-.29 [‡]
8. Rewards for involvement in problem behavior								-.58 [‡]	.65 [‡]	-.81 [‡]	—	—	.63 [‡]
9. Prosocial bonding									-.34 [‡]	.62 [‡]	.83 [‡]	-.62 [‡]	-.41 [‡]
10. Bonding to influences toward problem behavior										-.47 [‡]	-.24 [‡]	.80 [‡]	.51 [‡]
11. Belief in the moral order											.54 [‡]	-.77 [‡]	-.57 [‡]
Second-order constructs													
12. Prosocial socialization												-.48 [‡]	-.27 [‡]
13. Socialization toward problem behavior													.77 [‡]

Note: Blanks (—) in table are listed for first-order factors that serve as indicators of the second-order factors; loadings of the first-order factors on the second-order factors are shown in Figure 3.

* $p < .05$; [†] $p < .01$; [‡] $p < .001$.

relations among the latent factors. Selected disturbance terms were allowed to covary in order to account for method effects or conceptual correspondence between constructs. Theoretical models were then tested by including structural paths hypothesized by the social development model. Overall model fit was assessed by examining the Nonnormed Fit Index (NNFI; Bentler, 1993; Tucker and Lewis, 1973) and the Comparative Fit Index (CFI; Bentler, 1990), as well as the Residual Mean Squared Error Approximation (RMSEA) Index (Browne and Cudeck, 1993).

Missing data analysis strategies

In order to avoid bias associated with listwise or pairwise deletion of missing data (Little and Rubin, 1987, 1989-90), Amos full information maximum likelihood estimates were computed (Anderson, 1957; Arbuckle, 1995). Fit indices were generated on the basis of maximum-likelihood covariance matrices computed by EMCOV.EXE, a covariance estimation program based on an EM (expectation-maximization) algorithm (Graham and Hofer, 1993; Graham et al., 1994). The nominal sample size of $N = 807$ was provided to Amos in order to generate conservative estimates of model fit.

Results

At age 16, 8.6% of the sample reported engaging in heavy episodic drinking in the past month; 32.6% usually

got drunk when they drank and 32.7% reported that they had experienced problems caused by drinking alcohol.

First-order factor model

To assess the adequacy of the measurement model, a factor analysis was run in which all factor loadings were allowed to vary freely, factor variances were constrained at 1.00 (in order to identify the metric of the latent variables) and all factor intercorrelations were freed. With the exception of drinking at age 14, which was measured by two indicators (V1 and V2 in Table 2), all factors were measured by three indicators (V3, V4, V5, etc.).

As shown in Table 2, all factor loadings were significant (the z statistics for factor loadings are all greater than 1.96) and in the expected direction. The confirmatory factor model fit the data well ($\chi^2 = 1,407.28$, 494 df, $N = 807$; NNFI = 0.94, CFI = 0.95 and RMSEA = 0.05; 95% confidence interval [CI]: 0.045-0.051). 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 influences toward problem behavior, and negative correlations between prosocial constructs and influences toward problem behavior. Measures indicating the same factor were highly intercorrelated in each case. (Correlations, means and standard deviations for measured variables are available from the third author.)

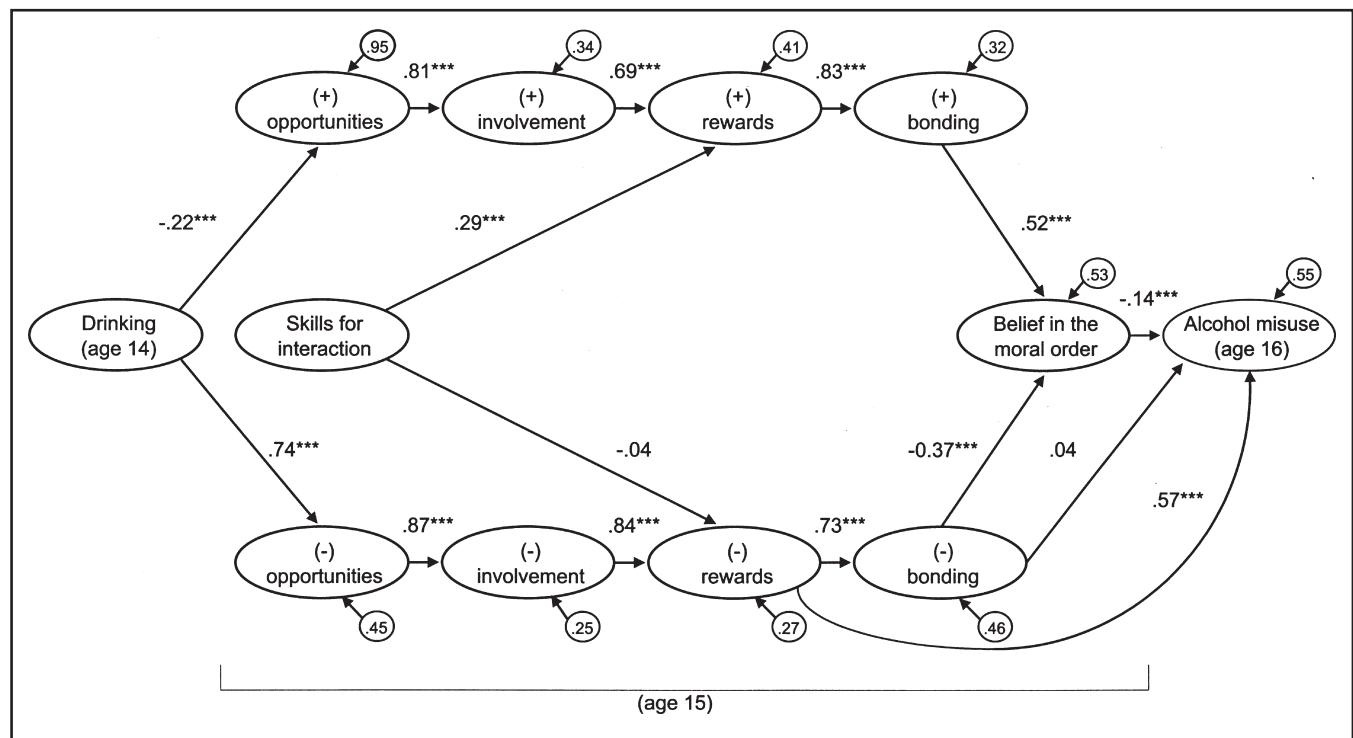


FIGURE 2. Final first-order factor structure for the Social Development Model; (+) prosocial influences, (-) influences toward problem behavior

Figure 2 presents the estimated path coefficients for the structural relationships hypothesized by the social development model; measurement factor loadings are presented in Table 2. In this analysis, the path to the first indicator for each dependent latent variable was fixed at 1.00 in order to scale the factors. The variances of all error and disturbance terms, and the variances of the two exogenous factors (drinking behavior at age 14 and skills for interaction), were allowed to vary freely. The four pairs of disturbance terms for the corresponding prosocial and problem behavior influences were correlated to account for the conceptual correspondence between the constructs. All path coefficients between factors were freely estimated.

As shown in Figure 2, all but two of the paths hypothesized by the SDM were significant and all significant paths were in the expected direction. In contrast to the hypotheses, the path from skills to prosocial rewards for influences toward problem behavior was not significant, and the path from bonding to friends who engage in problem behavior to alcohol misuse at age 16 was not significant. The overall model fit was fair ($\chi^2 = 2,563.14$, 540 df, $N = 807$; NNFI = 0.87, CFI = 0.88 and RMSEA = 0.07; 95%

CI: 0.066-0.071), and the model explained 45% of the variance in alcohol misuse.

The addition of the direct path from alcohol use at age 14 to alcohol misuse at age 16 had little effect on the fit indices ($\chi^2 = 2,474.08$, 539 df, $N = 807$; NNFI = 0.88, CFI = 0.88 and RMSEA = 0.07; 95% CI: 0.064-0.069) or on the value or significance of other structural relationships. In order to determine whether SDM processes significantly mediated the relationship between alcohol use at age 14 and alcohol misuse at age 16, we compared a model with both direct and mediated effects to a model with direct effects only. The model with a direct and mediated effect resulted in a significant change ($\chi^2 = 45.788$, 3 df, $N = 807$, $p < .001$), indicating a significant improvement of fit over the model, with only a direct path for alcohol used at age 14 to misuse at age 16. The SDM processes significantly mediated the relationship between drinking at age 14 to alcohol misuse at age 16. Social development processes at age 15 accounted for 31% of the variance in the relationship between age-14 use and age-16 misuse. The standardized indirect effect of age-14 use and age-16 misuse was 0.18 ($p < .01$) in this model. Thus, both earlier drinking

TABLE 2. Constructs, sample items, factor loadings and z statistics for the measurement models of the first- and second-order factor structures

Constructs and sample items	First-order factor model		Second-order factor model	
	Factor loading	z	Factor loading	z
<i>Drinking (age 14).</i> (Frequency of past month drinking and quantity consumed in a typical drinking occasion)				
V1	.67	18.09	.67	18.16
V2	.86	23.19	.86	23.17
<i>Prosocial opportunities.</i> (Knew where to go to learn a skill, join clubs, or play sports; nice playgrounds and parks in neighborhood; chances at school to get involved in class and other activities; opportunities to do things with parents and participate in family decisions)				
V3	.64	<i>r</i>	.65	<i>r</i>
V4	.65	14.11	.64	13.65
V5	.64	13.88	.64	13.67
<i>Opportunities toward problem behavior.</i> (Invited to join a gang; many kids in neighborhood in trouble; knew adults who got drunk, used drugs, and broke the law; percentage of kids at school who used alcohol or marijuana; siblings who used alcohol or drugs, belonged to a gang, and broke the law)				
V6	.78	<i>r</i>	.78	<i>r</i>
V7	.81	23.18	.79	22.75
V8	.85	24.63	.86	24.65
<i>Prosocial involvement.</i> (How often spent time with other families/adults in neighborhood, attended church, and held membership in community groups; took part in class discussion and other school activities; had a friendly chat with teachers; interacted with their parents; spent time with friends [identified as prosocial])				
V9	.79	<i>r</i>	.78	<i>r</i>
V10	.71	18.45	.71	17.96
V11	.72	18.74	.73	18.34
<i>Involvement with influences toward problem behavior.</i> (Member of a gang; interaction with troubled kids; and interactions with parents [identified as influences toward alcohol misuse])				
V12	.69	<i>r</i>	.71	<i>r</i>
V13	.83	20.61	.82	20.94
V14	.79	19.73	.78	19.83

continued

TABLE 2. *Continued*

Constructs and sample items	First-order factor model		Second-order factor model	
	Factor loading	<i>z</i>	Factor loading	<i>z</i>
<i>Skills for interaction.</i> (Skills to resist influences toward antisocial behavior [e.g., skipping school or using alcohol]; self-reported prosocial skills [e.g., ability to follow directions]; other social and academic skills [higher scores indicate greater ability to resist peer pressure and more prosocial skills])				
V15	.82	24.76	.82	24.43
V16	.77	23.27	.78	23.40
V17	.75	22.52	.75	22.48
<i>Prosocial rewards.</i> (Felt safe at school; enjoyed people in neighborhood; praised by school, teacher and parents for good behavior; parents "put them down" [reverse coded]; perceived friends as enjoyable and helpful)				
V18	.79	<i>r</i>	.79	<i>r</i>
V19	.87	25.80	.87	25.62
V20	.81	23.86	.81	23.89
<i>Rewards for involvement in problem behavior.</i> (Chance of being picked-up by police or being seen as cool for fighting or stealing; thought they would be punished for misbehavior; thought drinking was a good way to make friends; enjoyed time with friends or parents [identified as influences toward alcohol misuse])				
V21	.85	<i>r</i>	.85	<i>r</i>
V22	.81	27.05	.81	26.61
V23	.84	28.32	.84	27.93
<i>Prosocial bonding.</i> (Liked, or wanted to stay in, neighborhood; liked their teachers, school and classes; shared with, wanted to emulate, and would offer to help their parents; shared with, wanted to emulate, and would "stick by" their friends [identified as prosocial])				
V24	.81	<i>r</i>	.81	<i>r</i>
V25	.81	24.30	.81	24.15
V26	.75	22.16	.76	22.18
<i>Bonding to influences toward problem behavior.</i> (Same indicators as above were combined for those whose parents or friends were identified as influences toward problem behavior)				
V27	.91	<i>r</i>	.91	<i>r</i>
V28	.92	38.45	.92	38.50
V29	.80	29.79	.80	29.63
<i>Belief in the moral order.</i> (Would let other students copy their school exams; thought it was okay to cheat; thought it was okay for someone their age to use marijuana, cigarettes and alcohol; beliefs about immoral behavior [e.g., telling lies, stealing]; [higher scores reflect prosocial beliefs])				
V30	.84	<i>r</i>	.84	<i>r</i>
V31	.90	32.29	.90	32.06
V32	.91	32.77	.91	32.75
<i>Alcohol misuse (age 16).</i> (Times consumed 5 or more drinks in a row in past month [episodic heavy drinking]; usually getting drunk when drinking; problems caused by drinking)				
V33	.72	<i>r</i>	.72	<i>r</i>
V34	.32	7.38	.32	7.38
V35	.83	17.82	.84	17.75

Note: *r* = reference indicator with unstandardized loadings fixed at 1.00 to identify the metric of the latent variable. All factor loadings are standardized and significant at $p < .001$.

and subsequent social development processes contribute to age-16 alcohol misuse.

Second-order factor model

Along with results obtained in earlier tests of the SDM (Catalano et al., 1996), the results for the first-order factor model and the factor intercorrelations suggest that a better fit would be produced by modeling two second-order factors in order to capture the substantial common variance in

opportunities, involvement and rewards on the prosocial path and on the problem behavior path. As discussed earlier, these factors are hypothesized to be key elements in socialization processes, ultimately resulting in attachment and commitment (i.e., bonding) to either prosocial others and institutions or to influences toward problem behaviors. We think that it is advantageous (both conceptually and from a preventive standpoint) to distinguish the effects of the separate constructs involved in this process; however, as currently measured, these constructs are highly corre-

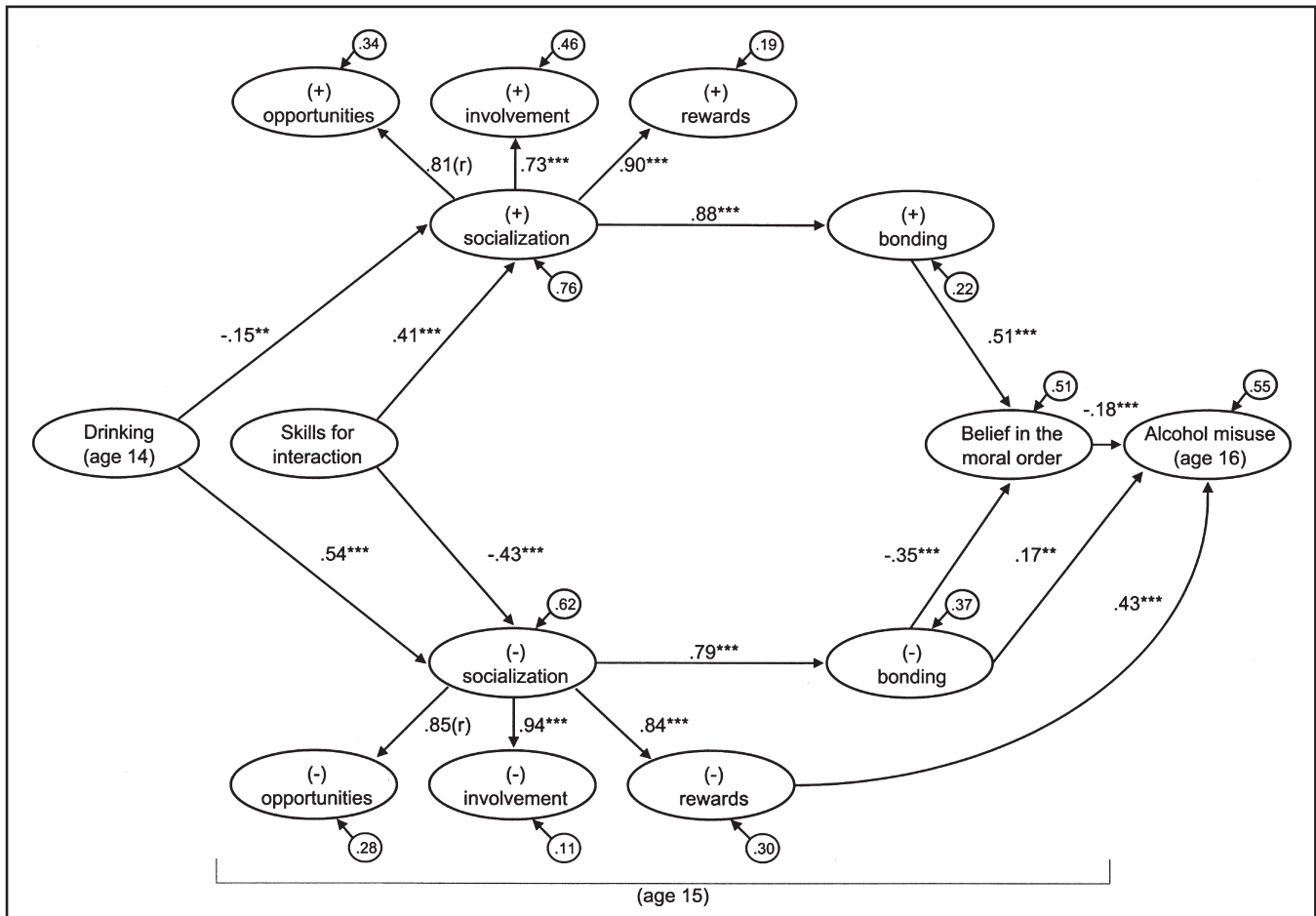


FIGURE 3. Final second-order factor structure for the Social Development Model; (+) prosocial influences, (-) influences toward problem behavior

lated (from 0.67 to 0.87). As these three constructs are also measured at one point in time, it is reasonable to assume that they share substantial variance since, together, the three constructs are intended to capture the socialization experience at age 15. According to the SDM, bonding is hypothesized to be a result of this socialization process and, hence, is expected to be an important mediator of socialization and the development of beliefs and, ultimately, of problem behavior.

The confirmatory factor analysis for the second-order factor model was conducted in a manner identical to the first-order factor model, but with the addition of two second-order factors. The latent factors of prosocial opportunities, involvement and rewards were specified as indicators of the second-order factor prosocial socialization. Similarly, opportunities, involvement and rewards for problem behavior were specified as indicators of the second-order factor socialization toward problem behavior. The factor loadings of the indicators for each of these first-order factors were fixed at 1.00; the variances of each independent factor were fixed at 1.00, with their covariances free to vary. The same

error and disturbance terms for independent variables and factors were allowed to correlate as in the previous model.

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 Figure 3). Correlations between the second-order factors and all other independent factors are shown in Table 1. The second-order CFA model fit the data well ($\chi^2 = 1,747.86$, 526 df, $N = 807$; NNFI = 0.92, CFI = 0.93 and RMSEA = 0.05; 95% CI: 0.051-0.056).

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 problem behavior socialization factors at age 15—as indicated by opportunities, involvement and rewards—are hypothesized to be directly influenced by drinking behavior at age 14 and by skills. Bonding to prosocial others and bonding to influences toward problem behavior are, conceptually, hypothesized to result from the respective socialization processes. In turn, these bonds are hypothesized to influence

the development of moral beliefs and, subsequently, alcohol misuse. As before, the model also hypothesizes a direct effect of rewards for interaction with influences toward problem behaviors and bonding to influences toward problem behaviors on alcohol misuse at age 16.

As in the first-order model test, the first indicator 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 opportunities constructs were specified as the reference indicators. The variances of all error and disturbance terms were freed, as were the variances of the independent factors. The same 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 also freely estimated.

As shown in Figure 3, all path coefficients were significant and in the expected direction. The model with the second-order socialization factors fit the covariance matrix well ($\chi^2 = 2,161.06$, 537 df, $N = 807$; NNFI = 0.89, CFI = 0.91 and RMSEA = 0.06; 95% CI: 0.059-0.064) and explained 45% of the variance in alcohol misuse in this sample at age 16.

The addition of the direct path from alcohol use at age 14 to misuse at age 16 had a minimal effect on the fit indices, as before ($\chi^2 = 2,080.24$, 536 df, $N = 807$; NNFI = 0.90, CFI = 0.91 and RMSEA = 0.06; 95% CI: 0.057-0.063), and on the value or significance of other structural relationships. However, the path from bonding to influences for problem behaviors to alcohol misuse became nonsignificant in this analysis. A comparison of the model with both a direct and indirect path, and a direct path only, again indicated a significant improvement of fit when the SDM mediation was included ($\chi^2 = 59.128$, 3 df, $N = 807$, $p < .001$). The addition of the direct path from alcohol use at age 14 to alcohol misuse at age 16, controlling for social development processes at age 15, showed a reduced but still significant relationship ($\beta = 0.46$, $p < .001$) between alcohol use at age 14 and misuse at age 16. This second-order model indicates that social developmental processes accounted for 50% of the variance in the relationship between age-14 alcohol use and age-16 alcohol misuse. The standardized indirect effect of age-14 use and age-16 misuse in this model was 0.20 ($p < .01$). In sum, these analyses suggest that, relative to the first-order model, the second-order model achieved an improved fit to the data, and greater age-15 social development mediation of the relationship between age-14 alcohol use and age-16 alcohol misuse.

Discussion

A test of the fit of the social development model using multiple indicators of latent constructs demonstrated an ac-

ceptable fit of the measurement and structural models. In the first-order model, the hypothesized relationships between model constructs were confirmed by the model test with two exceptions. All hypothesized paths in the second-order model were confirmed. Although the role of drinking behavior from the prior developmental period was partially mediated by SDM constructs, it was significant when the direct path was added to both first- and second-order models. Adding this direct path did not, however, change other hypothesized structural paths in the first-order model, although in the second-order model it did reduce one path to nonsignificance: that between bonding to influences towards problem behavior and alcohol misuse. The addition of the direct path contributed little to the model's fit. Although we conclude that a direct effect was present, when the mediating role of SDM constructs was tested, it was noted that they added significantly to the explanation of alcohol misuse at age 16 and partially mediated the effect of age-14 alcohol use on age-16 alcohol misuse.

Skills for interaction at age 15 were not significantly negatively related to rewards for involvement with influences toward problem behaviors in the first-order model, although these skills were negatively related to socialization influences in the second-order model, as hypothesized. It is noteworthy that a significant relationship was not found between attachment to influences toward problem behaviors and alcohol misuse in the first-order model; neither was it found in the second-order model that included the direct path between age-14 alcohol misuse and age-16 alcohol misuse. It appears that the effect of attachment to influences toward problem behaviors had an indirect effect on alcohol misuse, through its negative effect on beliefs. However, for alcohol misuse during this time period, both prosocial and problem influences of attachment appear to operate similarly, though in opposite directions.

Indicators of the social development model's socialization constructs were measured for the current test when most study participants were in the first year of high school (age 15). In that period, the socialization process constructs of opportunities, involvement and rewards were highly correlated, and a second-order factor model of prosocial and antisocial socialization fit the data better.

In order to optimally assess the separate effects of these constructs, it may be necessary to measure the constructs at different time points, to allow observation of the socialization process itself. An alternative view is that different time lags may be necessary between measures of different constructs. Opportunities, involvements and rewards are experienced, temporally, moment by moment, whereas social bonds of attachment, commitment and belief are built up over time, from recurring sequences of these socialization experiences. An exploration of the socialization process over different time periods, perhaps through observational studies or through more frequent data collection, may be useful

to establish appropriate time lags. Useful tests of the social development model could be undertaken to investigate the effects of single events, cumulative daily experiences or the effects of involvement and rewards measured over longer time frames or attachment and commitment over shorter and longer intervals. Another hypothesis is that these concepts are inseparable. A rigorous examination of the sequential hypotheses of the socialization processes specified in the social development model remains to be done. In addition, interpretations of study findings should consider that gender groups were combined in the present study. Future research could advance understanding of substance use trajectories by investigating how these may generalize across gender groups.

Theory provides a basis for the design of approaches for preventing and reducing problem behaviors. When the etiological pathways to problem behavior are specified, it is possible to identify intervention points to interrupt the causal process. Interventions to prevent or reduce problem behaviors (as most basically conceived) seek to interrupt the causal processes that lead to antisocial outcomes and strengthen the processes that lead to these behaviors. Given the fit and the large amount of variance explained by the social development model for alcohol misuse at age 16, several implications for prevention are noted. First, each of the constructs in the social development model is a potential focus for intervention to prevent adolescent alcohol misuse. Second, there are multiple direct and indirect paths that may serve as potential targets for the reduction of alcohol misuse. Third, interventions to interrupt the causal processes in the development of alcohol misuse should include components seeking to promote processes that enhance constructs on the prosocial path as well as to interrupt processes on the problem behavior path. Fourth, the direct and indirect influence of prior alcohol use on future alcohol misuse suggests the importance of intervening early in development to reduce alcohol drinking by age 14 (e.g., Hawkins et al., 1997). Last, specification of the model provides a guide for exploring intervention effects on each construct along the hypothesized causal pathways to problem behavior.

The present data show that the social development model, using latent constructs measured at ages 14 and 15, represents a powerful explanation ($r^2 = 0.45$) of alcohol misuse at age 16, and the fit statistics confirm the importance of the high school submodel. The current study is part of a larger project to test the fit of the social development model across periods of development, including linked tests of the elementary, middle school, high school and young adult submodels. A test of each submodel and the links between them will create a more comprehensive picture of the development of alcohol initiation and use, and, at a later developmental period, the diagnostic categories of alcohol misuse, abuse and dependence.

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