

## Cognitive Social Maturity, Life Change Events, and Health Risk Behaviors among Adolescents: Development of a Structural Equation Model

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**Purpose:** To examine the roles of cognitive social maturity and life change events in a structural equation model (SEM) to explain adolescents' use of marijuana, tobacco, and alcohol. **Methods:** Data were derived from 1322 9th and 10th graders in a HIV prevention study. Students completed a survey of their cognitive social maturity, recent life events and substance use habits. A model from a study on the metabolic control of adolescents with diabetes was modified to apply to health risk behaviors. **Results:** A SEM was tested and fit the data well. Lower cognitive social maturity and greater life change events significantly predicted health risk behaviors. Life events partially mediated the relationship between cognitive social maturity and health risk behaviors. **Conclusions:** Adolescents' social thought processes are related to their recent life events, which in turn are related to their substance use behaviors. Suggestions are made for interventions to improve adolescents' cognitive social maturity.

**KEY WORDS:** cognitive social maturity; life change events; substance use; alcohol use; adolescents.

An exploration of how adolescents think about their health is vital for better understanding the choices they make, whether they choose to engage in risky behaviors with likely negative health consequences or to adopt habits with likely positive health consequences. In studies of adolescents' cognitive social maturity and their general beliefs about their bodies (Bibace & Walsh, 1979; Eiser, 1985; Ingersoll, Orr, Vance, & Golden, 1992), researchers have explored adolescent thought processes and how these may relate to their health. Based on conceptual systems theory, individuals progress from simple, concrete and self-centered thinking to more

complex, abstract, and multi-perspective thought (Harvey, Hunt, & Schroeder, 1961; Hunt & Sullivan, 1974; Miller, 1978; Schroeder, Driver, & Streufert, 1967). At the early stages of maturity, they would not be expected to recognize links between current behaviors and future outcomes due to their motivation for more egocentric needs. This link between current thought processes and health-related behaviors has been demonstrated in a study of adolescents with diabetes. Findings were that those with advanced levels of cognitive social maturity were more likely to self-regulate their insulin dosage and achieve better glycemic control (Ingersoll et al., 1992).

The present investigation extrapolates the application of the above model as follows. First, rather than focusing on adolescents with chronic medical conditions, the focus is on adolescents in general. Second, we extended the previous model to include broader health-related decisions not related to managing medical conditions. Specifically, adolescents who are at lower levels of cognitive social maturity would be more likely to engage in health risk behaviors, such as using harmful substances including marijuana, tobacco, and alcohol. Thus far,

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symptoms of emotional distress (i.e., depression, anxiety, and anger) (e.g., Hussong & Chassin, 1994; Hussong & Hicks, 2003; Wills, Sandy, & Yaeger, 2002; Windle, 1994) and coping methods (e.g., Siqueira, Diab, Bodian, & Rolnitzky, 2000, 2001) have been the individual difference factors receiving the most attention in studies of adolescent substance use. No research could be located that examined the relationship between cognitive social maturity—another individual difference factor—and substance use, as is proposed in the present investigation. This construct is important as it may be amenable to intervention through broad-based programs (e.g., instruction and role playing to target adolescents' abilities to engage in more complex, abstract, and multi-perspective thought when considering their relationships with others). Such an intervention could address a number of the U.S. Department of Health and Human Services' Healthy People 2010 Objectives ([www.healthypeople.gov](http://www.healthypeople.gov)), which is a set of health objectives for the nation to achieve over the first decade of the new century. The specific objectives potentially impacted by such a project are to reduce tobacco use by adolescents (27-2), past-month use of illicit substances throughout the lifespan (26-10), the proportion of persons engaging in binge drinking of alcoholic beverages (26-11), and deaths and injuries caused by alcohol- and drug-related motor vehicle crashes (26-1).

In addition to the individual difference variable of cognitive social maturity, the Ingersoll et al. study with adolescents diagnosed as having diabetes (1992) also considered the affective environment, i.e., life change events, in determining adolescent health behaviors. In their study, greater life change events were significantly associated with adolescents' worse self-regulation of insulin dosage and glycemic control. Life change events reported by adolescents have been found to relate to their engagement in a number of risk behaviors, including drinking alcohol and smoking cigarettes and marijuana (Siqueira et al., 2000, 2001; Wills & Cleary, 1996; Wills et al., 2002). Stressful life changes may interfere with adolescents' abilities to make healthy behavioral choices, particularly in the face of peer pressures and societal practices that make less healthy behaviors easier to adopt (Johnson, 1986).

The goal of this investigation is to examine a theoretical model of the relationship of individual differences in cognitive social maturity and the experience of life change events on adolescent health behaviors. However, the model that was based on

conceptual systems theory also examines how life change events (e.g., broke up with a close girlfriend or boyfriend, lost a job), which could potentially have been attributed to the adolescents' level of cognitive social maturity, may partially mediate the relationship between cognitive social maturity and health risk behaviors. Specifically, adolescents with more simple, concrete and self-centered thinking and those who report more recent life events are expected to be more likely to report greater substance use (i.e., drinking alcohol and smoking cigarettes and marijuana). Moreover, although lower cognitive social maturity may place adolescents' present and future health at risk, it may be their immature social interactions that lead to a more negative affective environment. The individuals in such an environment are in turn at a greater risk for using substances.

## METHODS

### Participants

Participants in the final sample included 1322 9th and 10th grade students enrolled in health education classes in 10 high schools in the Midwest. Students were participants in a larger intervention study aimed at reducing human immunodeficiency virus (HIV) risk. Data for the current study were derived either from pre-test or immediate post-test surveys, depending upon the earliest assessment period when the pertinent questions were asked. The mean time between pre- and post-tests was 18.84 days with a standard deviation of 7.87 and median time of 16 days. Adolescents were exposed to either a HIV or health promotion (e.g., nutrition, physical activity, stress) curricula; however, neither curriculum addressed substance use. This study was approved by the authors' institutional review board. More details regarding the methods have been previously described (Borawski, Ievers-Landis, Lovegreen, & Trapl, 2003).

The original sample was ethnically diverse and consisted of the following groups: White (49.7%,  $n = 675$ ), Black/African-American (35.8%,  $n = 486$ ), Hispanic (11.9%,  $n = 161$ ), Asian or Pacific Islander (1.8%,  $n = 24$ ), and Native American or Alaskan Native (.8%,  $n = 11$ ). As the latter two groups each comprised less than 5% of the sample and race was dummy coded prior to running any analyses, these 35 subjects were dropped from the sample. Thus, the descriptive statistics and analyses

presented in this manuscript represent three ethnic groups (White, Black and Hispanic) and a final sample size of 1322 adolescents. Approximately equal numbers of males and females participated in the present study (52% female), and youth ranged in age from 12–18 years ( $M = 15.15$  years;  $SD = 0.80$  years). However, 99.2% were between the ages of 14 and 17, with 95.5% between the ages of 14 and 16 years. The majority of participants reported living with both parents (61%), with at least one parent having post high school education (60%).

## Measures

### *Demographic Factors*

Participants provided information about their age, gender, ethnicity, and self-reported grades in school. Owing to the homogeneity of the neighborhoods involved in this study, a measure of SES was derived from the recently released 2000 Census and was conceptualized as the percentage of households living below the poverty level within the participant's neighborhood.

### *Cognitive Social Maturity*

Cognitive social maturity has been conceptualized as an individual's concepts and beliefs regarding conflict, uncertainty, rules, and authority (Hunt, Butler, Noy, & Rosser, 1978). The only validated measure of cognitive social maturity that could be located was the one used by Ingersoll and colleagues for adolescents with diabetes (Ingersoll et al., 1992). This measure, the paragraph completion method (Hunt et al., 1978), is a semi-projective instrument requiring written responses to six open-ended topical stems that was not feasible for our use with a relatively large school-based sample. Therefore, for the purposes of the present study, a measure of cognitive social maturity was derived from the Children's Social Desirability (CSD) scale (Carifio, 1994; Crandall, Crandall, & Katkovsky, 1965; Klein, Gould, & Corey, 1969). On the CSD scale participants rate the extent to which they agree with a series of statements regarding the degree to which they take responsibility for their actions and act in a socially responsible manner. Ratings were made using a 4-point Likert scale.

In order to empirically create subscales of this measure to employ as indexes of cognitive social

maturity, exploratory factor analysis using principal axis factoring with direct oblimin rotation was conducted using SPSS. Initial eigenvalues were set at  $>1.0$ , and initial results yielded a three-factor solution. The model was also forced into two and four factor solutions, neither of which fit the data as well as the three-factor solution. Evaluation of a screeplot also suggested a three-factor solution. All items had primary factor loadings of .40 or higher (with the exception of one item which loaded at .37) and secondary factor loadings of less than .19. The final model consisted of the following factors: Factor 1 ( $\alpha = .59$ ) conscientiousness ("When I make a mistake, I always admit I am wrong;" "I never let someone else get blamed for what I did;" and "I am always glad to cooperate with others"); Factor 2 ( $\alpha = .53$ ) peer influence on behavior ("I sometimes want to own things just because my friends have them;" "Sometimes I say something just to impress my friends"); and Factor 3 ( $\alpha = .42$ ) rule-following ("Sometimes I do things I've been told not to do," "I have never been tempted to break a rule or law," "Sometimes I try to get even when someone does something to me I don't like"). The three factors were significantly related, but the correlations were all relatively low (conscientiousness and peer influence,  $r = .16$ ; peer influence on behavior and rule-following,  $r = .17$ ; and conscientiousness and rule following,  $r = .23$ ). Therefore, the factors were considered separately in all subsequent analyses.

### *Life Change Events*

Participants completed the Adolescent Life Change Event Scale (Forman, Eidson, & Hagan, 1983; Yeaworth, 1980), a 29-item measure in which adolescents indicate whether or not one or more life change events occurred within the past year. In the present investigation, an analysis of the original 29 items was conducted to identify events that could be directly attributed to the adolescent's behavior. Three raters (C.E.I., R.N.G., and a psychology fellow) independently coded life change events as either (1) directly attributed to low cognitive social maturity (e.g., hassles with your parents; had trouble with teacher or principal) or (2) not directly attributed to low cognitive social maturity (e.g., lost a favorite pet; brother or sister got married). Raters evidenced high levels of agreement ( $M = 94\%$ ), and any discrepancies were resolved by group consensus. Based on this process, 13 life change events were selected from

Table I. Life Change Events Items

| Items  |
|--|
| Hassles with brother or sister                               |
| Started at a new school                                      |
| Had trouble with teacher or principal                        |
| Hassles with your parents                                    |
| You got badly hurt or sick                                   |
| Close girlfriend got pregnant                                |
| Broke up with a close girlfriend or boyfriend                |
| Lost a job   |
| Family member (other than yourself) had trouble with alcohol |
| Was held back a grade in school                              |
| Was arrested by police                                       |
| Failed one or more subjects in school                        |

the original 29 items. One item was deleted as it related too closely to the outcomes (“Got into drugs or alcohol more heavily”). The final scale consisted of 12 items listed in Table I.

#### Substance Use

Substance use was assessed via three adolescent self-report items. Participants were asked to rate their frequency of (1) smoking cigarettes and (2) use of marijuana on separate 5-point scales ranging from 0 = “Never tried smoking” to 4 = “I smoke every day.” Participants rated their (3) use of alcohol on a 6-point scale ranging from 0 = “Never tried alcohol” to 5 = “I drink alcohol almost every day.” In the present investigation, a substance abuse latent construct was formed, which consisted of each of the three aforementioned observed variables.

#### Statistical Plan

Our three indicators of substance abuse were ordered categorical variables. Spearman correlations (a nonparametric analysis used for ordinal data) and Pearson correlations between these variables and our predictors were nearly identical. In addition, we ran tests of skewness and kurtosis on all of our variables and found them to be generally normally distributed. Given the similarity of the Spearman and Pearson correlations, the normal distribution of the variables and the large  $n$ , we chose to use Pearson correlations and structural equation modeling (SEM) using AMOS 5.0 (Arbuckle & Wothke, 1999). These robust parametric procedures were selected to increase power and protect against Type II error.

SEM was employed to evaluate the relationship between cognitive social maturity and adolescent substance use (while controlling for relevant demographic factors), as well as the mediating role of life change events. The initial model consisted of paths that were significantly correlated at the .10 level or higher using bivariate correlations and in accord with the a priori theoretical model. Because the substance use composite was a latent construct, paths were only drawn to substance use if there were significant bivariate correlations with all three observed variables (alcohol use, smoking of tobacco or marijuana). The SEM model was evaluated as follows. First, modification indices were examined to determine whether the addition of any paths would improve the fit of the model using a sample with no missing data. Next, paths with the lowest standardized regression weights were eliminated in a stepwise fashion until the best-fitting model was obtained. Paths were eliminated one at a time, and following the elimination of a path, the model was re-run, with the weakest path eliminated at each iteration. Adjustment of measurement error was performed within the model for the cognitive social maturity variables. Selection criteria for the final model included achieving CFI and TLI scores of greater than .90 and an RMSEA of .08 or less.

## RESULTS

### Descriptive Statistics

Table II presents the means, standard deviations, and ranges for all the variables in the present investigation. Table III presents the zero-order correlations, which indicate that level of cognitive social maturity and reported life change events are both significant linear contributors to the variance in adolescent health risk behaviors. For the Rule-following subscale, adolescents with lower cognitive social maturity (i.e., less likely to follow rules and more likely to “get even” if they feel wronged) reported significantly more drinking of alcohol ( $r = -.275, p < .001$ ) and smoking of marijuana ( $r = -.211, p < .001$ ) and cigarettes ( $r = -.234, p < .001$ ). For the Conscientiousness subscale, adolescents with lower cognitive social maturity (i.e., less likely to admit wrongdoing, less cooperative, and more likely to let someone else wrongfully take the blame) reported significantly more drinking of alcohol ( $r = -.119, p < .001$ ) and smoking of cigarettes ( $r = -.096, p < .001$ ). Finally, for the

Table II. Descriptive Statistics

| Primary variables                           | Mean (SD)     | Range       |
|---|---------------|-------------|
| 1. Age (in years) <sup>a</sup>              | 15.15 (.80)   | 12.00–18.00 |
| 2. Socio-economic status (SES) <sup>b</sup> | 14.62 (11.86) | 1.37–70.18  |
| 3. Conscientiousness <sup>c</sup>           | 2.85 (.55)    | 1.00–4.00   |
| 4. Peer influence <sup>c</sup>              | 2.67 (.67)    | 1.00–4.00   |
| 5. Rule following <sup>c</sup>              | 2.03 (.54)    | 1.00–4.00   |
| 6. Negative life events                     | 3.35 (2.00)   | 0–12.00     |
| 7. Marijuana use <sup>d</sup>               | .75 (1.07)    | 0–4.00      |
| 8. Cigarette use <sup>d</sup>               | .98 (1.25)    | 0–4.00      |
| 9. Alcohol consumption <sup>e</sup>         | 1.38 (1.23)   | 0–5.00      |

<sup>a</sup>95.5% were between the ages of 14 and 16.

<sup>b</sup>Percentage of households living below the poverty level in the adolescent’s neighborhood.

<sup>c</sup>Cognitive social desirability subscales – 4-point Likert scales.

<sup>d</sup>0 = “Never tried smoking” to 4 = “I smoke every day”.

<sup>e</sup>0 = “Never tried alcohol” to 5 = “I drink alcohol almost every day”.

peer influence subscale, lower cognitive social maturity (i.e., more likely to say something to impress friends or want something their friends owned) was not significantly related to any of the health risk behaviors ( $p$ 's = .46–.65).

Further examination of the zero-order relationships revealed that those adolescents demonstrating lower cognitive social maturity on the rule-following and Conscientiousness subscales reported a greater number of life change events ( $r = -.203, p < .001$ ;  $r = -.064, p < .05$ , respectively). The data also indicate that those experiencing more life change events reported more drinking of alcohol ( $r = .199, p < .001$ ) as well as smoking of marijuana ( $r = .233, p < .001$ ) and cigarettes ( $r = .272, p < .001$ ).

The data also indicated a number of statistically significant zero-order relationships or differences for demographic variables and health risk behaviors.

Specifically, males reported more frequent smoking of marijuana ( $t = 3.92, p < .001$ ) and drinking of alcohol ( $t = 2.06, p < .05$ ) than did females. Older adolescents reported more drinking of alcohol ( $r = .131, p < .001$ ) and smoking of tobacco ( $r = .120, p < .001$ ) and marijuana ( $r = .200, p < .001$ ) than did younger adolescents. Significant differences between ethnic groups were evident for drinking of alcohol ( $F = 26.377, p < .001$ ) and smoking of cigarettes ( $F = 20.42, p < .001$ ) and marijuana ( $F = 4.76, p < .01$ ). Scheffe post hoc tests revealed that Caucasian adolescents reported more frequent drinking of alcohol than either African American or Hispanic adolescents as well as more frequent smoking of cigarettes and marijuana than did African American adolescents. And finally, adolescents living in more affluent neighborhoods reported greater alcohol consumption ( $r = -.088, p < .01$ ).

Structural Equation Model

Based on conceptual systems theory and the model constructed by Ingersoll and colleagues for adolescents with diabetes (1992), we constructed an initial model using AMOS 5.0 (Arbuckle & Wothke, 1999) (see Fig. 1). The model reflects relationships between variables obtained at a common time period, baseline data and immediate follow-up within a few weeks for an intervention study aimed at reducing human immunodeficiency virus (HIV) risk. Note that only the cognitive social maturity subscale of Rule-following was significantly related to all three components of the substance abuse latent construct, and so the other two subscales (conscientiousness and peer influence) were not included in the initial model. There was no indication based on the

Table III. Correlation Matrix

| Primary variables                 | 2      | 3      | 4      | 5      | 6       | 7       | 8       | 9       |
|-----------------------------------|--------|--------|--------|--------|---------|---------|---------|---------|
| 1. Age (Years)                    | .146** | .022   | .028   | -.034  | .081**  | .200**  | .120**  | .131**  |
| 2. Socio-economic status (SES)    |        | .110** | .124** | .050   | .098**  | .056    | .014    | -.088** |
| 3. Conscientiousness <sup>a</sup> |        |        | .156** | .233** | -.064** | -.046   | -.096** | -.119** |
| 4. Peer influence <sup>a</sup>    |        |        |        | .165** | -.013   | .018    | .020    | -.013   |
| 5. Rule following <sup>a</sup>    |        |        |        |        | -.203** | -.211** | -.234** | -.275** |
| 6. Negative life events           |        |        |        |        |         | .233**  | .272**  | .199**  |
| 7. Marijuana use                  |        |        |        |        |         |         | .596**  | .462**  |
| 8. Cigarette use                  |        |        |        |        |         |         |         | .462**  |
| 9. Alcohol use                    |        |        |        |        |         |         |         |         |

<sup>a</sup>Cognitive social desirability subscales.

\* $p < .01$ .

\*\* $p < .001$ .

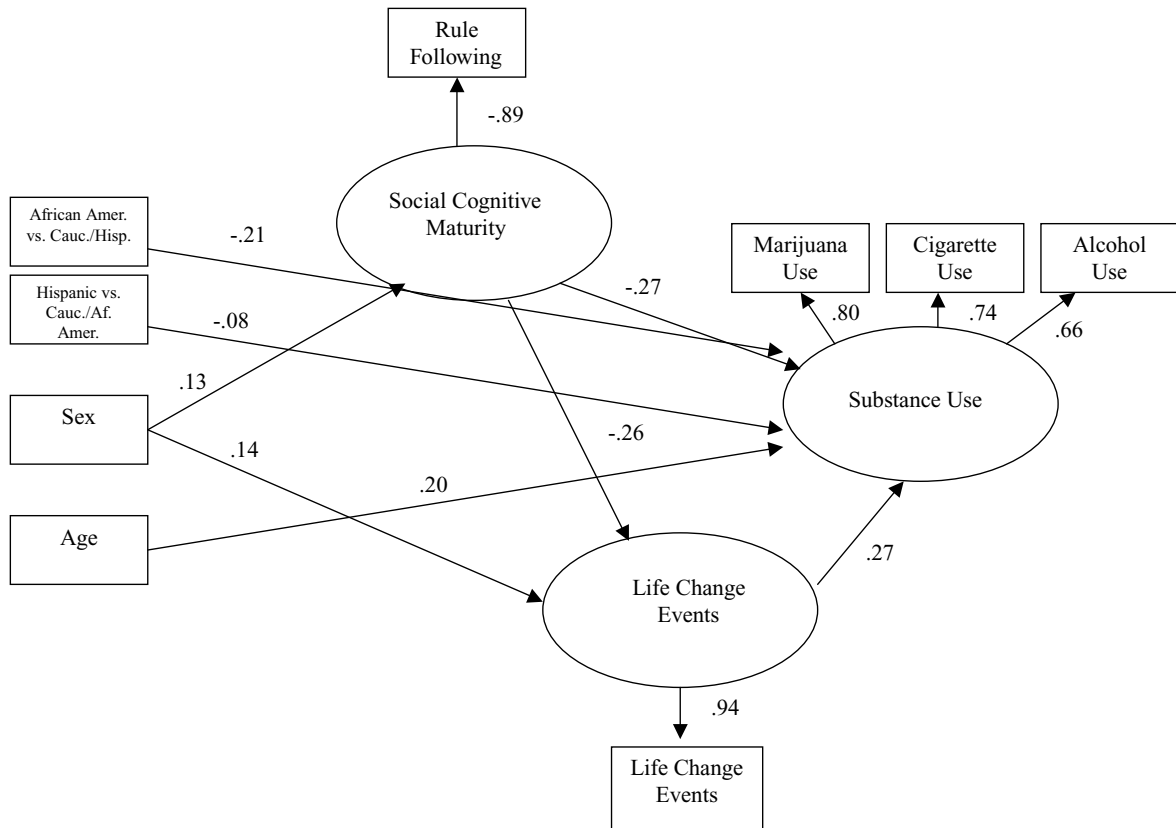


Fig. 1. Proposed model.

modification indices that any of the measurement errors for the indicators (alcohol, cigarettes, and marijuana) of the outcome variable (substance use) were significantly correlated. Examination of our initial model indicated that adjustments could be made to improve the match between the data and the model ( $\chi^2 = 268.847$ ;  $df = 25$ ;  $p = .000$ ; CFI = .856; TLI = .740; RMSEA = .085, 90% CI [.076-.094]).

To identify the sources of error in the original model, we eliminated the weakest paths one at a time (as described previously under “Statistical Plan”) to find the most parsimonious and best-fitting model. First, we eliminated the path between sex (0 = male) and cognitive social maturity. Second, we dropped the path between sex and life change events. Third, we deleted the path between age and substance use. Finally, we deleted the path between ethnicity and substance use. The significance levels of the path coefficients were all  $< .001$ . Table IV contains the models’ goodness of fit indices.

Our final model fit the data well ( $\chi^2 = 29.087$ ;  $df = 4$ ;  $p = .000$ ; CFI = .981; TLI = .930;

RMSEA = .068, 90% CI [.046-.092]) (See Fig. 2). Bentler and Chou (1987) recommend CFI and TLI scores of greater than .90 as indicators of good fitting models. Browne and Cudeck (1992) state that an RMSEA of .08 or less is an adequate fitting model.

#### Test of Mediation

We hypothesized that lower cognitive social maturity would be related to greater health risk behaviors (i.e., substance use composite). Lower cognitive social maturity was also expected to relate to more life change events, which reasonably could be attributed to the adolescents’ behavior, which in turn were then hypothesized to relate to engagement in more health risk behaviors. Once the variable of life change events is added to the structural equation model, the direct relationship between cognitive social maturity and health risk behaviors should weaken. Life change events,

Table IV. Goodness of Fit Indices

| Model   | $\chi^2$ | df | p    | CFI  | TLI  | RMSEA |
|---|----------|----|------|------|------|-------|
| Initial   | 268.847  | 25 | .000 | .856 | .740 | .085  |
| Removed regression path: sex to cognitive social maturity | 287.267  | 26 | .000 | .845 | .732 | .086  |
| Removed regression path: sex to life change events        | 224.035  | 19 | .000 | .873 | .759 | .089  |
| Removed regression path: age to substance use             | 194.590  | 13 | .000 | .882 | .746 | .101  |
| Removed regression path: ethnicity to substance use       | 29.087   | 4  | .000 | .981 | .930 | .068  |

therefore, was expected to function as a partial mediator between cognitive social maturity and health risk behaviors.

As predicted for the direct path, cognitive social maturity had a direct effect on substance use (standardized  $\beta$  weight =  $-.286$ ,  $p < .001$ ). For the indirect path, cognitive social maturity predicted life change events as expected (standardized  $\beta$  weight =  $-.242$ ,  $p < .001$ ). In addition, life change events predicted substance use (standardized  $\beta$  =  $.278$ ,  $p < .001$ ). Post-hoc probing of significant mediation effects was performed as recommended by Holmbeck (2002) to determine if the drop in the total effect (i.e., cognitive social maturity to substance use) is significant upon inclusion of the mediator (life change events) in the model. The Sobel test indicated that life change events did function as a mediator ( $z = -5.542$ ,  $p < .0001$ ) (note that  $p < .05$  if the absolute value of  $z > 1.96$ ) (Preacher & Leonardelli, 2001). Thus, the experience of life change events

does function as a partial mediator of the relationship between cognitive social maturity and substance use.

DISCUSSION

This investigation is the first to our knowledge to examine the role of adolescents' cognitive social maturity in understanding their health risk behaviors. Thus far, researchers have primarily examined the individual difference variables of emotional distress and coping methods for the prediction of which adolescents are more likely to engage in substance use behaviors detrimental to their present and future health (Hussong & Chassin, 1994; Hussong & Cleary, 2003; Siqueira et al., 2000, 2001; Wills et al., 2002; Windle, 1994). Based on analyses of a dataset of 1322, 9th and 10th graders from a randomized, controlled intervention study aimed at reducing human immunodeficiency virus (HIV) risk,

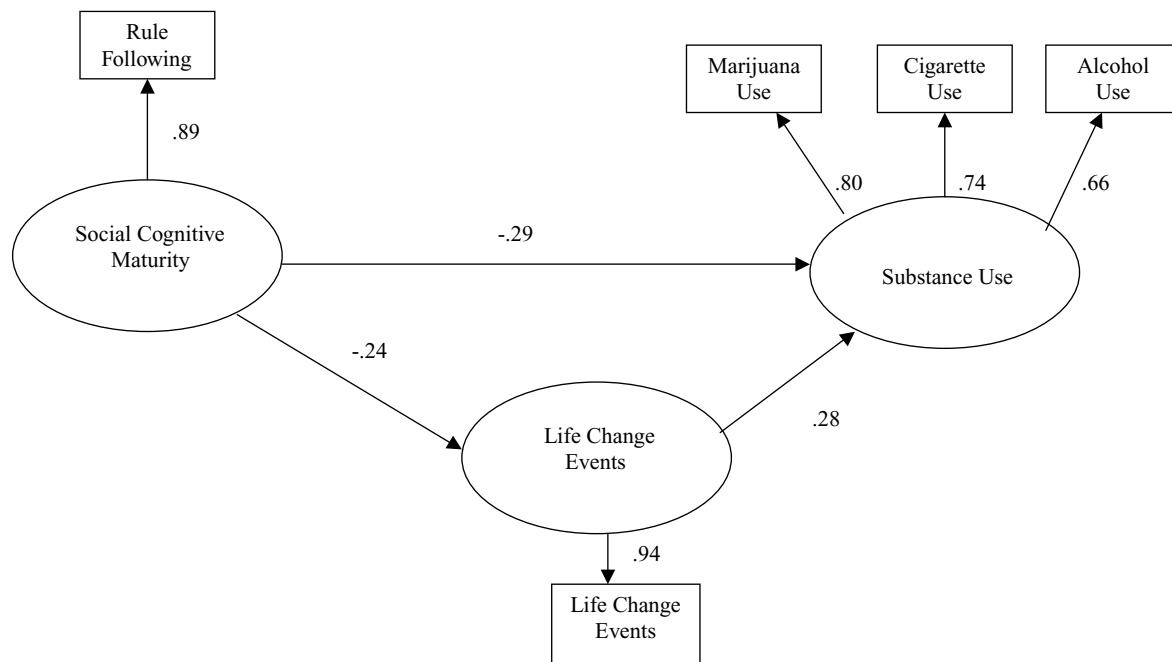


Fig. 2. Final model.

the prediction that lower cognitive social maturity would relate to adolescents' greater engagement in health risk behaviors (e.g., use of alcohol, tobacco, and marijuana) received support for aspects of cognitive social maturity, i.e., how likely adolescents reported they are to break rules or to try to "get even" if someone does something they do not like. This relationship appears to be relatively strong, as 20% of the variance in adolescent substance use was explained by individual differences in cognitive social maturity.

The role of cognitive social maturity is of particular interest in that an experiential curriculum could potentially be developed to teach adolescents how to engage in more complex, abstract, and multi-perspective thought when interacting with others as one means for reducing or preventing substance use. Based on the present findings, this type of curriculum could contribute to meeting the targets for at least four of the Healthy People 2010 Objectives related to reducing the use of tobacco, alcohol, and illicit substance (e.g., marijuana) among adolescents. For example, in 1998 approximately 79% of adolescents aged 12–17 years reported no alcohol or illicit drug use in the past 30 days. The Healthy People 2010 target is for 89% of adolescents to report not using these substances in the past month ([www.healthypeople.gov/document/html/objectives/26-10.htm](http://www.healthypeople.gov/document/html/objectives/26-10.htm)).

This investigation also found the expected significant relationship between life change events and substance use, as has been found in previous studies of adolescent risk factors for alcohol, cigarette and marijuana use (Siqueira et al., 2000, 2001; Wills & Cleary, 1996; Wills et al., 2002). However, this investigation employed a novel subscale of life change events, limited to those with a high probability of being attributed to the adolescent's behavior (e.g., hassles with brother or sister) rather than those that may occur by chance or due to someone else's behavior (e.g., parents got divorced). The reason for this focus was the positioning of the life change events construct in a structural equation model in which causal ordering is vital, i.e., endogenous variables must be reasonably expected to have been caused by all of the variables that proceed them temporally. Thus, we hypothesized that lower cognitive social maturity could potentially bring about a number of specific life change events. The significant negative relationship between these two variables ( $r = -.20$ ) lends some credence to the validity of the selection of events for this subscale.

And finally, our hypothesis was confirmed that life change events (again, those that can reasonably be expected to be attributed to the adolescent) did function to partially mediate the relationship between cognitive social maturity and health risk behaviors. Adolescents who function at a more immature level in their social interactions are more likely to have a greater number of life changes, which in turn place them at greater risk for using substances.

#### Limitations

The findings of the present investigation should be interpreted in light of the following limitations. First, the measures were fairly short due to their being given to a relatively large community sample during the school day at multiple time periods as part of a randomized trial of a sexual education curriculum. Second, the measure of cognitive social maturity used in this investigation was created out of items from a social desirability questionnaire, selected because these items reflect the theoretical description of cognitive social maturity according to conceptual systems theory. The only validated measure of cognitive social maturity that could be located was a semi-projective instrument requiring written responses used by Ingersoll and colleagues with their sample of 120 adolescents with diabetes (Ingersoll et al., 1992). Using this instrument requiring written responses to six open-ended stems and trained raters to assess the individual's level of cognitive social maturity was not feasible for our school-based sample of more than 1322 adolescents. We did not have the opportunity to modify this instrument into a survey because our sample was obtained from an available dataset. Third, the reliability of the index of cognitive social maturity was low; however, an advantage of running SEM is the ability to adjust for measurement error (Arbuckle & Wothke, 1999; Hair, Anderson, Tatham, & Black, 1998; Kline, 1998; Tabachnick & Fidell, 2001). Fourth, the findings are geographically limited, as this was not a nationwide sample. Fifth, self-report is prone to bias, as is the case of all such studies, and the adolescents were the informants for all of the variables (other than SES) included in the model. However, because cognitive social maturity is a cognitive process, self-report would be the most accurate; and also because life change events are objective occurrences, the influence of self-report bias on the present findings is reduced.

## Clinical Implications

These findings lend themselves to the design of components of intervention programs in both school and medical settings to increase adolescents' social cognitive maturity. For example, techniques to improve all students' levels of cognitive social maturity could be integrated into school curriculums within "universal prevention" programs (Schmitz & Jeffery, 2002). Additionally, psychologists in school or medical settings could employ specialized techniques to improve particularly at-risk adolescents' cognitive social maturity as part of "targeted" or "selective prevention" programs (Schmitz & Jeffery, 2002) to prevent or reduce substance use. For example, a session designed to increase cognitive social maturity in a broader-based substance use prevention program could include behavioral skill-building activities. The teacher or psychologist could lead conflictual peer versus authority role-plays or peer versus peer role-plays to develop adolescents' cognitive social maturity via improved empathy skills. Psychologists could individually tailor such role-playing techniques in one-on-one or small group sessions with particularly at-risk students.

## Research Implications

The measurement of cognitive social maturity remains an area in need of much more attention. Better definition of this construct as it may apply to adolescent health behaviors is needed, as is the creation of measures with improved reliabilities. The present investigation offers preliminary evidence that attention to the construct of cognitive social maturity may yield greater understanding of predictors of adolescent health risk behaviors. Future research could explore how lower levels of cognitive social maturity may be related to other consistently identified determinants of onset and maintenance of adolescent substance use, such as peer influence, parenting style, and family conditions (Hussong & Chassin, 1994; Hussong & Hicks, 2003; Siqueira et al., 2000, 2001; Wills et al., 2002; Windle, 1994).

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