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## Relationships Between Level and Change in Family, School, and Peer Factors During Two Periods of Adolescence and Problem Behavior at Age 19

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### Abstract

While prior research has examined family, school, and peer factors as potential predictors of problem behavior, less attention has been given to studying when these factors are most predictive of problems and if and when changes in these factors signal risk. Using annual data on a community sample of 1,040 individuals (47% female; 81% White), this study models growth in risk and protective factors during two developmental periods (Grades 5–8 and Grades 9–12) in order to predict substance misuse and crime at age 19. For protective factors of positive relationships with family and positive bonds to school, both the levels of these factors at Grade 5 and change between Grade 5 and Grade 8 predicted substance misuse and crime in early adulthood. Higher likelihoods of both forms of problem behavior also were predicted by increases in the risk factor of exposure to negative peers between 5th and 8th grade. In the late adolescent period, levels at 9th grade of all risk and protective factors examined predicted both substance misuse and crime. Also, increases in exposure to negative peers in late adolescence predicted greater likelihoods of both forms of problem behavior, while greater risk of substance misuse was predicted by decreases in school bonding and academic achievement, and greater risk of crime was predicted by worsening relationships with family. The results add to prior research by indicating that in addition to the level, change in risk and protective factors during these two stages of development can be signals of risk and are promising targets for intervention.

### Keywords

Substance use; Antisocial behavior; Risk and protective factors

## Introduction

The most promising strategy for designing prevention programs involves identifying and targeting modifiable risk and protective factors (Coie et al. 1993; Mrazek and Haggerty 1994; National Research Council and Institute of Medicine 2009). A wealth of research has established predictive associations between experiences in the social environments of family, school, and peers during adolescence and problem behaviors such as misuse of alcohol, cigarettes, and other drugs (Hawkins et al. 1992) and involvement in violence (Hawkins et al. 1998) or delinquency (Farrington 1998; Hawkins et al. 1998). Experiences within social environments are commonly assessed as potential risk and protective factors at particular time points that predict behavioral outcomes concurrently or at later time points. The empirical findings from this body of research have been used to guide prevention efforts designed to affect change in developmentally salient risk and protective factors (Elliott 2000; Mrazek and Haggerty 1994; National Institute on Drug Abuse 1997). Few studies, however, have made full use of longitudinal data to characterize risk and protective factors across late childhood and adolescence. This study seeks to enhance our understanding of the importance of change in risk and protective factors and to identify when these changes are salient with respect to predicting behavioral outcomes.

In the family domain, three interrelated factors that frame the experiences of children are the style of parental family management, the strength of parent–child bonding, and the degree of conflict among family members (Galambos et al. 2003; Steinberg 2001). Each of these variables is the product of interactions between children and their parents (Kerr and Stattin 2000; Patterson et al. 1998). Theories of social development suggest that families are the primary socializing domain in childhood and early adolescence, and become a less direct influence on behavioral outcomes during later adolescence (Bronfenbrenner 1986; Catalano and Hawkins 1996). Most empirical investigations of family influences have focused on childhood and early adolescence, which also coincides with the timing of most family-based preventive interventions (Farrington and Welsh 1999; Petrie et al. 2007).

In the school domain, two variables have been consistently identified as being associated with problem behavior: bonding to school and academic achievement (Maguin and Loeber 1996; Resnick et al. 1997). Developmentally, the influence of experiences in school has been demonstrated from mid-elementary school and continues through adolescence (Hawkins et al. 1992; Maguin and Loeber 1996). Given the access provided by schools and the consistent findings of associations between school factors and problem behavior (Bronfenbrenner 1986; Catalano and Hawkins 1996), programs attempting to keep young people engaged in school and succeeding academically have been seen as a prevention tool across childhood and adolescence (Gottfredson and Wilson 2003; Gottfredson et al. 2002).

Due to a combination of selection, socialization, and situational factors, peer behavior becomes the strongest correlate of behavioral outcomes as youth pass from childhood to adolescence (Patterson et al. 1989; Thornberry et al. 1994). Hawkins et al. (1998), for instance, in a review of risk factors for adolescent violence, found that peer antisocial behavior becomes the strongest predictor of violence by age 14. The peer domain also is an increasing focus of attention for prevention as youth leave childhood and progress through adolescence. Almost all prevention programs for adolescents include components that address peer influences, either teaching skills for deflecting negative peer influence or encouraging parents, schools, or communities to minimize unstructured socializing with peers and create opportunities for structured prosocial involvements with peers and adults (Foxcroft et al. 2003; Gottfredson et al. 2004). Thus, prior research and the field of prevention have identified exposure to negative peer behavior as an important risk factor that grows in importance as youth get older.

While concurrent associations between problem behavior and social environment factors may be partly due to situational effects (Hirschi and Gottfredson 1988; Osgood et al. 1996) and reciprocal relationships between youth behavior and the reactions of socializing units to their behavior (Kerr and Stattin 2000; Patterson et al. 1998; Thornberry et al. 1994), theoretical models of social development generally hypothesize that the effects of socialization experiences extend beyond immediate social contexts (e.g., Catalano and Hawkins 1996; Patterson et al. 1998; Thornberry et al. 1994). Thus, the influence of experiences in family, peer, and school environments in adolescence are commonly hypothesized to extend into the next period of development. With respect to misuse of drugs and alcohol, these influences may become most noticeable during early adulthood, when rates of substance use reach their developmental peak (Bachman et al. 2002). While rates of violence and lawbreaking tend to decline after age 18 (Howell et al. 1995), some individuals persist in these behaviors and the consequences of these behaviors become more severe in terms of incarceration, effects on long-term developmental outcomes, and cost to society (Blumstein and Cohen 1987).

## Current Study and Hypotheses

The current study characterizes level and change in family, school, and peer factors during two periods: late childhood to early adolescence (the last years of elementary school through middle school), and late adolescence (the high school years). The late childhood and early adolescent period is the time of early onset of many forms of problem behavior and has been the focus of universal prevention programs that target factors in the family, school, and peer domains. Later adolescence is when delinquency and substance use behavior become more prevalent and prevention programs often shift to focusing on peer influence and changing peer norms about drugs, violence, and delinquency (Dusenbury and Falco 1995; Toumbourou and Catalano 2005). For each time period, and for the family, school, and peer factors reviewed above, we model the associations of level of the factor at the beginning of the period and change over the remaining years of that time period with age 19 substance misuse and crime. In contrast to other studies that have examined change in social environment factors concurrent with change in problem behaviors (e.g., Duncan et al. 2000; Hawkins et al. 2001; Laird et al. 2003; Stoolmiller 2004), we examine predictive relationships extending across the developmental transition into the period after high school. Also in contrast to earlier studies, we examine the predictive associations of change in family, school, and peer factors with later problem behavior, adjusting for initial level of those factors.

Drawing upon findings from prior studies, we are guided by the hypothesis that levels of risk and protective factors from both time periods will predict later problem behaviors. We also expect change to be predictive of problem behaviors, after adjusting for level at the start of the period. More specifically, we hypothesize that decreases in protective factors (e.g., bonding to family and school) and increases in risk factors (e.g., exposure to negative peer behavior) will predict more problem behavior in early adulthood. While we expect levels of risk and protective factors from the more proximal time period of later adolescence to be stronger predictors of early adult outcomes, we hypothesize that, due to the shifting importance of socializing domains across development, change in adolescents' relationships with their families may be less important during the high school period while change in exposure to negative peers becomes more important. We expect variation in changes in school bonding and academic achievement in both developmental periods to predict later problems.

## Methods

### Sample

Participants were from the Raising Healthy Children (RHC) project, a longitudinal study of students drawn from 10 public schools in a suburban Pacific Northwest school district. Families with students in first and second grade in the 10 project schools were sent active consent advance letters. After receiving the advance letters, each family was approached through a home visit and invited to participate in the study. Active consent was obtained from 76% of eligible families, and 938 students were enrolled in the project in the fall of 1993. Demographic information on eligible families who chose not to participate was not made available by the school district. An additional 102 students who were from the same grade levels and had transferred to the study schools were enrolled in the fall of the subsequent year. The ethnic composition of the analysis sample is 81% White, 7% Asian or Pacific Islander, 4% Hispanic, 4% Black, and 3% Native American. Fifty-three percent of the sample is male. In the spring of participants' fifth-grade school year, 26% either received free or reduced price school lunches or came from families that received food stamps or Temporary Aid to Needy Families (TANF), and 28% were living in single-parent households (85% of which were headed by a mother). At the age 19 time point, when normally progressing participants were in the spring of their first year post-high school, the average age was 18.94 years (age range 18–20).

In addition to being a study of the etiology of problem behaviors, RHC is a randomized test of a multicomponent preventive intervention. The intervention consisted of instructional staff development for teachers; parenting workshops; social, emotional, and cognitive skills training for students; home-based case management services for high-risk students; and brief booster sessions for families when the youth participants were experiencing developmental transitions in adolescence. Additional details regarding the RHC intervention have been reported by Brown et al. (2005), Catalano et al. (2003) and Haggerty et al. (2006). The possible effects of the preventive intervention were not the primary focus of the current study. However, we did conduct analyses to assess whether it was appropriate to combine participants from the intervention and control conditions of the RHC project in the same analysis. There were no statistically significant ( $p < .05$ ) differences between conditions in levels or change in any of the risk or protective factors during either developmental time period, nor were there differences in problem behaviors at age 19. Multiple-group models were run for models relating levels and change in risk and protective factors to age 19 outcomes (corresponding to models represented in Table 3). Cross-group constraints across experimental condition were placed on paths from level and change growth factors to outcomes and from covariates to outcomes and then released. None of the differences in fit between constrained and unconstrained models were statistically significant. More details on the results for these models are available from the first author. On the basis of these results, participants from both conditions were pooled.

### Consent and Data Collection

Prior to baseline data collection, parents provided written consent for their child's participation and for data collection from parents, teachers, students, and school records. After age 18, youth participants provided written consent for subsequent data collection. Surveys were administered to participants in each year of the project, to their parents annually through Grade 12, and to their teachers annually through Grade 8. Surveys were administered annually in the spring. Survey data were collected for all students enrolled in the project, even if they transferred from their original school or school district. By the beginning of the 5th year of the study, 51% of the students had switched elementary schools (see Fleming et al. 2001), and by 10th grade, 51% had transferred out of the school district.

Over the course of the study, children received token gifts, gift cards, or cash for completing the surveys. Data for the current study are organized by the grade level they would be in if they were progressing normally.

All 1,040 participants were included in the current study. Missing data patterns included noncompletion of surveys (both student and parent), and missing items (due to nonresponse, omission of items from one cohort, and not applicable school items for dropouts). Seventy (6.7%) participants had completed surveys between Grades 1 and 4 but did not complete a survey at any time point between Grade 5 and Grade 12; 119 (11.4%) lacked data from the parent survey in Grade 5; 103 (9.8%) lacked data on fifth-grade teacher surveys; and 131 (12.6%) did not complete the age 19 survey. Further, the older grade cohort was missing data on peer measures at the fifth-grade time point. Of those who completed a survey at the 12th-grade time point, 162 (18%) were no longer in school and lacked measures of school bonding and academic achievement at that time point. Descriptive data on prevalence rates of indicators of substance misuse and crime were based on cases with nonmissing data at the age 19 time point. In the primary analysis models linking risk and protective factors to later problem behavior, Full Information Maximum Likelihood (FIML) procedures were used so that cases with partial data were included in the analyses. Included in the models were correlates of missingness (such as grade cohort) in order to reduce bias in model estimates and more closely approach the assumption of data being missing at random. This approach to missing data has been found to increase power and reduce bias compared to dropping cases with incomplete data (Graham et al. 2003). It should be noted, however, that model estimates are based primarily on information from cases with more complete data; thus, the 70 cases with data only on fixed demographic characteristics have only a small influence on model estimates.

## Measures

**Age 19 Outcomes**—We employed dichotomous indicators of substance misuse and crime based on information provided in the participant surveys at the spring post-high school time point. Although dichotomization results in loss of information on higher end frequency of these behaviors, we chose to create dichotomies that capture more severe and less common patterns of behavior and conform to the primary targets of prevention programs. For measures of substance use, we used cut points that capture repeated use (as opposed to no use or experimentation), which resulted in approximately a quarter or less of the sample being scored as engaged in that behavior. In the following description of outcome measures, prevalence rates for each outcome are noted parenthetically based on data from the 909 participants who completed their age 19 survey.

There were five indicators of substance misuse:

**Frequent heavy drinking:** (16% prevalence.) This was based on whether a respondent reported binge drinking (>4 drinks in an occasion for females, >5 for males) more than nine times in the prior year.

**Frequent marijuana use:** (16% prevalence.) This was based on whether a respondent reported using marijuana more than nine times in the prior year.

**Daily smoking:** (27% prevalence.) This was based on whether a respondent reported smoking daily in the month prior to the interview.

**Cocaine/amphetamine use:** (13% prevalence.) This was based on whether a respondent reported any use in the prior year.

**Opiate use:** (15% prevalence.) This was also based on whether a respondent reported any use in the prior year.

There were three indicators of crime:

**Nonviolent crime:** (17% prevalence.) This was based on whether the respondent reported either selling illicit drugs, stealing a vehicle or something worth more than \$200, or breaking into “a house, store, school or other building without the owner's permission.”

**Violent crime:** (12% prevalence.) This was based on whether a participant reported any of the following: hitting “someone with the idea of seriously hurting;” beating “someone so badly they probably need a doctor;” “threatening someone with a weapon;” or using “a weapon or force to get money or things from people.”

**Trouble with police:** (15% prevalence.) This was based on whether a respondent reported either being arrested or “in trouble with the police for something you did.”

**Risk and Protective Factors**—Measures of risk and protective factors were based on student survey data, with the exception of measures of academic achievement from Grade 5 through 8 that came from surveys of teachers. Student and teacher surveys were administered in the spring. These measures were drawn from similar measures used in the Seattle Social Development Project (Herrenkohl et al. 2000), the Communities That Care Survey (Glaser et al. 2005), and in prior studies of risk and protective factors (Farrington 1998; Hawkins et al. 1992, 1998). The same items and scoring for measures were used across time points, again with the exception of academic achievement which was based on teacher report of academic performance in the late childhood and early adolescence period and student report of grades in late adolescence.

In the family domain, measures were based on items which offered response options from 1 (NO!) to 4 (YES!), producing scales with this same range. There were three measures in the family domain:

**Positive family management:** A scale of positive family management was based on 14 items covering monitoring (e.g., “Do your parents know where you are most afternoons after school?”), rules (e.g., “Does your family have clear rules about alcohol and drug use?”) and use of appropriate consequences (e.g., “Does your mom or dad tell you they're proud of you when you've done something well?”). Skewness ranged from  $-1.16$  to  $-0.43$  across time points and internal consistency (Chronbach's  $\alpha$ ) ranged from .78 to .83.

**Family bonding:** A scale of family bonding was based on 8 items (e.g., “Are you close to your father?”, “Are you close to your mother?”, and “Do you talk to your mom or dad about what you did in school?”). Skewness ranged from  $-0.76$  to  $-0.28$  and  $\alpha$  from .80 to .85.

**Family conflict:** A scale of family conflict was based on 5 items (e.g., “Do you and your mom or dad get into arguments/disagreements about doing homework?” and “Do your mom and dad disagree a lot about the rules in your house?”). Skewness ranged from 0.23 to 1.20 and the  $\alpha$  from .67 to .77.

We examined the following measures in the school domain:

**School bonding:** A scale of school bonding was based on 4 items (e.g., “Do you look forward to going to school?” and “Do you try to do well in school?”). These items also had

the 1 (NO!) to 4 (YES!) response options. Skewness for the school bonding scale ranged from  $-0.70$  to  $-0.30$  and the  $\alpha$  from  $.64$  to  $.72$ .

**Academic achievement grades 5–8:** This measure was a scale based on 3 teacher-report items that asked the teacher to rate the student in terms of reading, language arts, and math. The response options for these items ranged from 1 (needs improvement) to 5 (above average). Skewness of the scale ranged from  $-0.15$  to  $-0.02$  and the  $\alpha$  from  $.93$  to  $.96$ .

**Academic achievement grades 9–12:** In the later time period, academic achievement was based on the item, “In general, what were your grades like this year?” for which the response options ranged from 0 (mostly E's or F's) to 4 (mostly A's). The skewness of this measure ranged from  $-0.84$  to  $-0.64$ .

**Negative peers:** A scale of negative peer behavior was based on 7 items that asked “how many of your ten best friends” engaged in a variety of negative behaviors (e.g., “drink alcohol” and “get into fights”). The response options for the items were from 1 (none) to 5 (a lot). Skewness for the scale ranged from  $.52$  to  $2.35$  and the  $\alpha$  from  $.67$  to  $.92$ .

In modeling growth, all of these measures were treated as continuous and normally distributed. The skewness of all measures were within the range of what is considered acceptable (Kline 1998), with the notable exception of measures of the risk factor of negative peer behavior which had skewness of over two at two of the first three time points. This distribution reflects that few participants at these early ages reported that their friends were engaging in negative behaviors such as substance use or delinquency; after Grade 7, when peer negative behaviors became more common, skewness was reduced.

**Covariates**—Measures of gender, intervention condition, race/ethnicity, grade cohort, socioeconomic status, and early antisocial behavior were included as covariates in the analysis of the relationships between family, school, and peer factors and later problem behavior. Inclusion of covariates served two purposes. First, we attempted to adjust for possible confounds of the risk and protective factors under investigation to provide a more conservative test of predictive associations with early adult problem behavior. Second, presence of covariates served as auxiliary variables to augment model estimates in the presence of missing data (Collins et al. 2001; Graham et al. 2003). To control for childhood problem behavior, we include a measure of early antisocial behavior based on teacher report from when participants were in fifth grade (the beginning of the first developmental period examined), composed of 10 items (e.g., “tells a lot of lies” and “starts fights”) taken from the Teacher Observation of Classroom Adaptation-Revised (Werthamer-Larsson et al. 1990) and the Child Behavior Checklist—Teacher Report (Achenbach 1991). The internal consistency reliability for this measure was  $r_{\alpha} = .92$ . Demographic covariates included grade cohort, gender, and race/ethnicity, represented with two dummy variables for White and Asian/Pacific Islander, with Black, Hispanic, or Native American youth grouped into the reference category. Three measures of socioeconomic status were used. Parent education was based on the average of mother and father education, as reported by parents when their children were in fifth grade, using a 9-point ordinal response option. Low-income status (based on receipt of free or reduced price school lunch or TANF) and single-parent status (based on whether the child lived with only one parent) were binary measures, also based on parent survey data from when participants were in fifth grade. Intervention condition was also included as covariate.

Because residential and college status in the post-high school period are associated with substance use and lawbreaking behavior (Bachman et al. 2002; White et al. 2008), we also included covariates for whether participants were in college and whether they were living

with their parents at the age 19 time point. Four categories of college and residential status were created based on whether, at the time of the spring age 19 interview, youth reported that they were: (a) living with their mother or father and (b) attending a 2- or 4-year college. Participants that were enrolled in trade or vocational schools or were in military training ( $n = 43$ ) were assigned to the noncollege groups. Prevalence of the four statuses were: (a) attending college and living away from home (17%), (b) attending college and living at home (24%), (c) not attending college and living away (23%), and (d) not attending college and living at home (36%). Three dummy variables were coded based on college-at-home as the reference group.

## Analysis

The measurement model for age 19 substance misuse and crime was assessed using Confirmatory Factor Analysis (CFA). In this model, a latent substance misuse factor was indicated by the five types of substance use and a latent crime factor was indicated by the three measured variables of nonviolent criminal behavior, violent criminal behavior, and trouble with the police. Each indicator was modeled as categorical (Muthén and Muthén 2006), so that the latent variables represent the likelihood of reporting problem behaviors.

Growth trajectories of risk and protective factors were modeled using latent growth models (Duncan et al. 1999) for both the late childhood and early adolescence (Grades 5–8) and late adolescence (Grades 9–12) periods. For each time period, growth was represented with two-factor growth models, with one factor representing level at the first time point in the period (fifth grade for late childhood and early adolescence and ninth grade for late adolescence) and the other factor representing yearly rate of change. This specification was chosen to address research questions about level and change in two developmental periods as they relate to age 19 problem behavior.

The primary analysis models for this study estimated the relationships between level and change in the two developmental periods with age 19 outcomes. The first series of models treated the two developmental periods separately. These models are represented in Fig. 1. Estimates of primary interest are paths a and b, which indicate the unique associations between level and change and the two forms of problem behavior. A second set of models were run that related level and change in risk and protective factors in the earlier period to level and change in these factors in late adolescence and assessed whether there were unique effects of earlier growth factors on later problem behavior or whether the impacts of late childhood and early adolescence factors were captured by continuity of risk and protective factors into late adolescence. In both sets of models, covariates were included as exogenous variables predicting age 19 outcomes, with the covariances among covariates estimated, as well as covariances with risk and protective factor levels and change. This specification allowed for the use of data on all 1,040 participants, since all participants at least had data on gender, race/ethnicity, grade cohort, and experimental condition.

Models were estimated with MPlus 4.2 (Muthén and Muthén 2006) using the Weighted Least Squares Means-Variance (WLSMV) estimator (Muthén et al. 1997). Mean- and variance-adjusted chi-square and degrees of freedom were derived from the WLSMV estimator (Muthén et al. 1997). The Tucker-Lewis Index (TLI, Tucker and Lewis 1973) and the root mean square error of approximation (RMSEA, Browne and Cudeck 1993) were also used to assess model fit. While conservative benchmarks for good model fit for structural equation models are TLI above .95 and RMSEA below .06 (Hu and Bentler 1999), in cases where global fit indices suggest that latent growth models fail to fully capture heterogeneity in repeated measures data, it may be better to favor more parsimonious models that match study hypotheses (Coffman and Millsap 2006).



## Results

The CFA model of age 19 problem behaviors had a chi-square value that was statistically significant ( $\chi^2(17) = 36.75, p < .05$ ), but met criteria for good fit to the data (TLI = 0.99, RMSEA = 0.036). The factor loadings for all indicators of latent variables were positive and statistically significant ( $p < .05$ ) and the standardized values for these loadings ranged from .54 to .93. The substance use and antisocial behavior latent constructs had a correlation of .79, indicating that these behavioral outcomes were strongly related, with individuals involved in substance misuse also likely to be involved in crime.

Growth models for each risk and protective factor were estimated, as well as the correlations among growth factors across predictor variables within each time period. These correlations revealed substantial overlap between levels for risk and protective factors, particularly for the variables related to the family environment. While the concurrent correlations between the measured indicators of the family factors ranged from absolute values of .38 to .72, the absolute values for correlations among level factors were above .63 and approached unity for the correlation between level factors of family management and bonding. On the basis of this finding, we calculated a composite protective factor variable representing “positive family relationship” which was the mean of the three family domain variables, with the score for family conflict reverse coded. The correlations between level factors for academic achievement in the earlier developmental period and level factors for other risk and protective factors were low (absolute values less than .18), while correlations among level factors for other risk and protective factors in both developmental periods were moderate to strong (range of absolute values .22–.68).

Estimates of means, variances, and covariances of growth factors for growth models of risk and protective factors in the two developmental time periods are shown in Table 1. For each factor in each developmental period, there was significant between-individual variance in both level and change factors, indicating greater between-individual variance in levels and rates of change than would be expected due to sampling error. There were decreases in the protective factors of positive family relationship and school bonding across both time periods, while change in academic achievement was not significantly different from zero in early adolescence and showed positive increase in late adolescence. Average negative peer behavior increased in both time periods. In most cases the covariance between level and change factors was negative and statistically significant; the exceptions were school bonding in late adolescence and negative peer behavior in late childhood and early adolescence.

Two-factor growth models met criteria for good model fit in most cases, but for some models RMSEA values were above .06, and in the case of negative peer behavior during the late childhood and early adolescent time period, the TLI value was below .90. Inspection of model residuals indicated that misfit was largely due to the means of the measured variables either showing slight nonmonotonic change across time points or, in the case of negative peers during the earlier time period, increasing monotonically but with accelerating increases over time. While models with additional growth factors or loadings of the change factor fitted to the observed means provided better model fit, these “fitted” models did not change substantive findings when used to predict age 19 outcomes, and we have reported the more parsimonious linear growth models.

The unstandardized and standardized coefficients for the relationships between growth of risk and protective factors and age 19 outcomes are shown in Table 2. All of the models represented in this table fit the data well, with TLI values above .95 and RMSEA values below .06. For each risk and protective factor, the results are shown for models with adjustments for covariates, although estimates for paths associated with covariates are not

shown in Table 2. (Estimates for specified associations between covariates and growth factors for family, school, and peer variables and age 19 outcomes are available from the first author.)

Levels of positive family relationship in both the earlier and later time periods significantly predicted both early adult substance misuse and crime in the expected direction, with more positive family relationship predicting less problem behaviors. Change during early adolescence was also significantly associated with both substance misuse and crime, with children whose relationships with their parents improved more (or declined less) less likely to be involved in both forms of problem behavior. In late adolescence (after ninth grade), worsening family relationship was not significantly related to substance misuse but was associated with involvement in crime, again in the expected direction.

Both level and change in school bonding during both time periods were related to substance misuse, with students who were more bonded to school and whose bonding increased more or declined less than their peers during these time periods less likely to engage in substance misuse at age 19. Higher levels of school bonding in both time periods were significantly related to less likelihood of crime at age 19, but changes in school bonding in neither period were significantly related to crime. For academic achievement in late childhood and early adolescence, higher fifth-grade level significantly predicted less likelihood of crime but not substance use. In late adolescence, significant relationships were found for both level and change in academic achievement with substance misuse, with participants who received better grades and whose grades improved relative to their peers reporting less involvement in substance misuse. Level, but not change, in academic achievement during late adolescence was significantly predictive of crime.

Relationships between level of negative peer behavior at fifth grade and both age 19 problem behavior constructs were not significant, but increases in negative peers between Grades 5 and 8 were significantly related to greater likelihood of both substance misuse and crime. In late adolescence, both negative peer behaviors at ninth grade and increases in negative peer behaviors during high school were positively related to both forms of problem behavior.

Results for models linking earlier to later growth and assessing unique effects of growth in the two time periods are shown in Table 3. These results show the continuity of risk and protective factors across developmental time periods, with much of the variance in level at ninth grade accounted for by level at fifth grade and change from fifth to eighth grade. Academic achievement showed the least continuity, although half the variance in self-report of grades at the beginning of high school was explained by level and change in teacher assessment of academic skills in the earlier period. For other risk and protective factors, the explained variance in level at ninth grade ranged from .62 to .74. There were no significant unique associations between growth factors in the earlier time period and later problem behavior (with the exception of academic achievement at fifth grade having a positive association with age 19 substance misuse). This suggests that relationships of earlier environmental factors to age 19 outcomes were largely mediated through the levels of these variables at the beginning of high school. Paths from late adolescent growth factors showed the same pattern of results as when only the later period was considered. In the case of positive family relationship and school bonding, the considerable overlap between growth factors in the earlier and later periods meant that little unique information for each growth factor was present, resulting in larger standard errors and nonsignificant results for some of the unique effects of late adolescent growth factors on problem behavior.

## Discussion

At the simplest level, identifying a risk or protective factor involves establishing a longitudinal association with a particular problem behavior. More rigorous tests include examining predictive relationships with controls for possible confounds. In the current study, we extend this paradigm by asking whether changes in risk and protective factors in two developmental periods are uniquely predictive of problem behavior after adjusting for confounds (such as demographic variables, childhood antisocial behavior, and residential and educational context) and “where they started out” at the beginning of the two periods. While we did not test causal models of the relationships among risk and protective factors or reciprocal relationships between these factors and problem behaviors or other environmental variables as they develop in adolescence, our study provides evidence of the salience of each predictor as well as the signal from change in each predictor at different developmental periods.

We found that levels of positive family relationships and school bonding often addressed by preventive interventions were predictive of age 19 substance use and crime (see also Farrington 1998; Hawkins et al. 1992, 1998). The levels of these protective factors at both Grade 5 and Grade 9 were predictive. Academic achievement at Grade 5 was predictive of age 19 crime, but not substance use. Early school failure may be part of the cascade of developmental failures described by Masten et al. (2005) and Moffitt (1993) that lead to chronic involvement in serious criminal behavior. Academic achievement at Grade 9 was predictive of both problem behavior constructs in early adulthood. Consistent with developmental theory (Bronfenbrenner 1986; Patterson et al. 1989), having negative peers at Grade 5 was not predictive of early adult problem behavior but level of exposure to negative peers at Grade 9 was. This is at least partly related to the fact that little negative peer behavior was reported at the earlier time points (reflected in the low mean level at Grade 5 for the growth model in the earlier time period and the skewed distribution of the measured variable at Grades 5 through 7).

Findings with regard to change in risk and protective factors add to prior research. During late childhood to early adolescence, changes that occurred in positive relationships with family and negative behaviors of peers predicted age 19 substance misuse and crime. Thus, during this developmental period, selective or indicated interventions may target families that are declining in positive family functioning (reduced positive family management and bonding and increased conflict) or youth that are increasingly associating with negative peers. Decreases in school bonding during this time period predicted only age 19 substance misuse, suggesting that interventions that address those who are becoming less engaged with school may prevent substance misuse in early adulthood. During late adolescence, increases in negative peers predicted age 19 substance misuse and crime. Most prevention programs during this developmental period seek to reduce negative peer influence; however, these interventions may be particularly salient for those youth who are increasing their involvement with negative peers.

Decreases in school protective factors during high school predicted age 19 substance misuse, and decreases in positive family relationships during high school predicted age 19 crime. Substance use typically increases during adolescence and into emerging adulthood and often takes place in the context of normative socializing with peers, while delinquency and violence peak earlier and are less socially normative. Increasing dysfunction in the family domain may belie broader emerging problems in social interactions that are linked to nonnormative behavior and conflict, which, in turn, are precursors to crime and violence. In contrast, declining engagement and success in school, which are both likely linked to declining time spent at school, studying, or in school-related structured activities, may be

accompanied by increased time spent socializing with peers, which will tend to increase opportunities for substance use.

Estimates for models that linked earlier growth factors for risk and protective factors with growth factors from the later time period revealed the strong continuity in these variables across these developmental time periods. In general, these models also revealed that more proximal measures were the best predictors of age 19 behavior. These findings can be interpreted in two ways. On the one hand, they suggest that improvements in or worsening of socialization experiences in late childhood and early adolescence can have effects that lead to more positive or negative social environment experiences lasting into later adolescence. On the other hand, they suggest that changes in later adolescence can have effects over and above earlier trajectories of risk and protection; that is, increases in association with negative peers, deteriorating family situations, and declines in school engagement and performance during late adolescence signal heightened risk of problems in the next developmental time period. In other words, the results point to the importance of change in socialization experiences in both developmental time periods.

Measures of level and change in risk and protective factors in this study were from periods when substance use and delinquency first emerge and then escalate. Clearly the relationships between these risk and protective factors and problem behaviors are reciprocal, and predictive relationships found in the current study must be understood in this light. Each of the risk and protective factors examined in this study represents a dynamic interaction between youth and their social environments. Similarly, although the current study found moderate to strong correlations among the levels of risk and protective factors (most were between .2 and .7), it provides limited information on the causal relationship among the different risk and protective factors and the mechanisms through which these factors may be related to behavioral outcomes. We did not examine, for example, the effects of family relationships on selection of peers, which some argue is an important mechanism through which parents may protect their children from involvement in risky or deviant behaviors (Dishion et al. 1988; Oxford et al. 2000). Further, we did not examine possible moderating effects among predictors of problem behavior; in particular, we did not test whether protective factors (such as bonding to family and school) reduced the effects of risk (such as exposure to negative peer influences), instead taking the approach of examining main effects of level and change in these factors that may compensate for elevation in risk. Future research that uses longitudinal data to examine interrelationships among levels and change in risk and protective factors is needed to address possible indirect and moderating effects.

Another limitation is that the measures of family management, bonding, and conflict did not distinguish between aspects of parenting and parent-child interactions that have been identified as having unique relationships with child and adolescent development (Catalano and Hawkins 1996; Fletcher et al. 2004; Kerr and Stattin 2000; Patterson et al. 1992). For example, the measure of family management is a global measure that taps into processes of rewards and recognition, setting of rules and expectations, parent monitoring and knowledge, and child disclosure, and the measure of family bonding includes components of parental warmth and parent-child involvement, commitment, and attachment. Further, we found that growth factors for the three family factor measures were strongly intercorrelated, leading us to collapse them into one global measure of positive family relationships. More focused measures from multiple sources (e.g., parent report and observational measures) may be required to distinguish between different aspects of relationships within families. Here we are able to examine level and change in a broader measure that does not make these distinctions. A similar limitation lies in our measure of negative peer behavior, which was based on youth self-report. Some studies (Haynie 2001; Jussim 1989) have noted bias in this type of measure, with youth tending to ascribe their own behavior patterns to their peers.

Observational measures or data gathered from peer networks may be more reliable and provide a stronger test of peer influences. Finally, the generalizability of this study's findings is limited by the fact that it is based on data from a community sample that was part of an experimental study. Although heterogeneous with respect to gender, socioeconomic status of the families, and the college and residential status of participants at the age 19 time point, all of the sample attended suburban elementary schools, most are Caucasian, and half received services as part of a preventive intervention.

Prevention efforts that target children at risk for later problems and attempt to address malleable risk and protective factors have focused on whether these factors are at high or low levels at particular stages of development. The results of the current study help inform this approach to prevention by finding that decreases or increases in risk and protective factors during two stages of development can be indicators of risk. That is, worsening relationships with family, increasing disengagement from school and worsening academic performance, and increasing association with negative peers can signal that children are at heightened risk for substance misuse and crime in early adulthood, and might be promising targets for selective preventive intervention. Further, the results suggest that altering trajectories of change in risk and protective factors within family, school and peer domains, both in late childhood and early adolescence and in late adolescence, holds promise for prevention of early adult problem behaviors.

## Author Biographies

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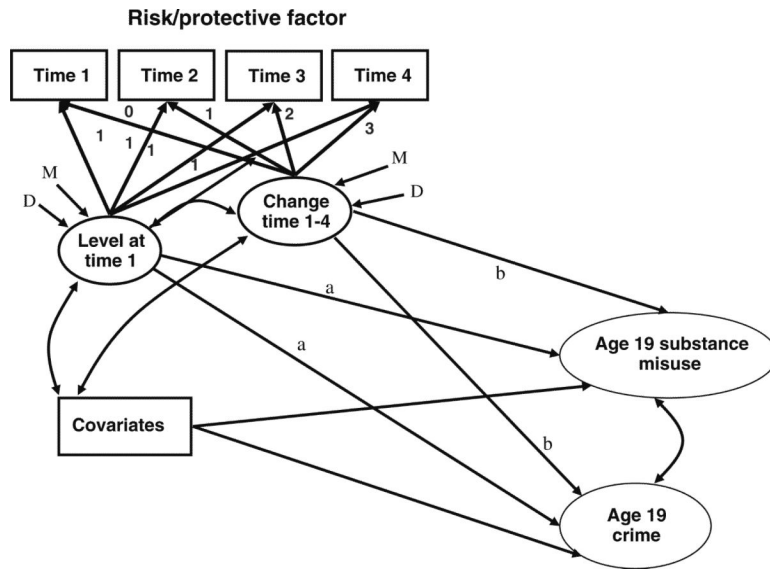
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**Fig. 1.** Model of level and change in risk or protective factor predicting age 19 problem behaviors

**Table 1**  
Parameter estimates for growth models for family, school, and peer variables in early and late adolescence

	Positive family relationship			School bonding			Academic achievement			Negative peer behavior		
	Grades 5-8	Grades 9-12	Grades 5-8	Grades 9-12	Grades 5-8	Grades 9-12	Grades 5-8	Grades 9-12	Grades 5-8	Grades 9-12	Grades 5-8	Grades 9-12
Level												
Mean	3.56* (.014)	3.102* (0.014)	3.268* (0.014)	3.118* (0.014)	3.099* (0.040)	2.702* (0.037)	1.363* (0.016)	2.172* (0.030)				
Variance	0.137* (0.009)	0.125* (0.008)	0.123* (0.010)	0.103* (0.010)	1.179* (0.107)	0.747* (0.054)	0.109* (0.013)	0.701* (0.041)				
Change												
Mean	-0.097* (.005)	0.005 (0.005)	-0.097* (0.006)	-0.023* (0.006)	-0.007 (0.014)	0.064* (0.014)	0.205* (0.011)	0.068* (0.009)				
Variance	0.012* (0.001)	0.006* (0.001)	0.017* (0.002)	0.006* (0.002)	0.052* (0.015)	0.040* (0.008)	0.050* (0.006)	0.030* (0.004)				
Covariance between level and change	-0.013* (0.003)	-0.006* (0.002)	-0.018* (0.004)	-0.001 (0.003)	-0.071* (0.033)	-0.094* (0.017)	0.001 (0.007)	-0.071* (0.011)				
Chi-square	8.61	61.50*	11.93*	43.99*	15.54*	6.73	72.96*	41.33*				
Df	5	5	5	5	5	5	5	5				
TLI	0.997	0.969	0.990	0.957	0.993	1.000	0.896	0.979				
RMSEA	0.027	0.109	0.038	0.091	0.046	0.019	0.119	0.088				

Standard errors are in parentheses

Df model degrees of freedom, TLI Tucker lewis index, RMSEA root mean square error of approximation

\*  $p < .05$

**Table 2**

Prediction of substance misuse and crime at age 19 by level and change in risk and protective factors

Predictor growth factor	Early adolescent factors predicting age 19 outcomes		Late adolescent factors predicting age 19 outcomes	
	Substance misuse	Crime	Substance misuse	Crime
	<i>b</i> (SE)	$\beta$	<i>b</i> (SE)	$\beta$
<i>Family</i>				
Positive family relationship				
Grade 5	-0.30* (.09)	-0.19	-0.30* (.11)	-0.17
Change 5-8	-1.40* (.34)	-0.27	-0.79* (.40)	-0.14
Grade 9			-0.50* (.09)	-0.30
Change 9-12			-0.09 (.51)	-0.02
<i>School</i>				
School bonding				
Grade 5	-0.39* (.10)	-0.23	-0.28* (.13)	-0.14
Change 5-8	-1.28* (.30)	-0.28	-0.58 (.39)	-0.12
Grade 9			-0.66* (.12)	-0.37
Change 9-12			-1.41* (.66)	-0.22
Academic achievement				
Grade 5	0.03 (.04)	0.06	-0.09* (.04)	-0.15
Change 5-8	-0.60 (.35)	-0.23	-0.41 (.33)	-0.14
Grade 9			-0.27* (.06)	-0.40
Change 9-12			-0.73* (.30)	-0.25
<i>Peers</i>				
Negative peers				
Grade 5	0.23 (.13)	0.13	0.20 (.16)	0.10
Change 5-8	1.74* (.27)	0.39	1.28* (.33)	0.26
Grade 9			0.54* (.05)	0.75
Change 9-12			1.75* (.27)	0.59

*b* unstandardized coefficient, *SE* standard error,  $\beta$  standardized coefficient

\*  
 $p < .05$

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**Table 3**

Combined early and late adolescent models of risk and protective factors predicting substance misuse and crime at age 19

Growth factor	Combined model		Substance misuse		Crime	
	Level at grade 9	$\beta$	$b$ (SE)	$\beta$	$b$ (SE)	$\beta$
<i>Family</i>						
Positive family relationship						
Grade 5	.80	.07	0.76* (0.03)	0.04 (0.22)	0.12 (0.27)	.07
Change 5-8	.61	.06	1.92* (0.14)	-0.49 (0.65)	0.37 (0.80)	.06
Grade 9		-.37		-0.45 (0.24)	-0.68* (0.30)	-.37
Change 9-12		-.22		-0.07 (0.53)	-1.56* (0.71)	-.22
<i>School</i>						
School bonding						
Grade 5	.62	.10	0.72* (0.04)	-0.12 (0.34)	0.15 (0.46)	.10
Change 5-8	.57	.11	1.76* (0.15)	-0.64 (0.89)	0.42 (1.14)	.11
Grade 9		-.38		-0.50 (0.39)	-0.60 (0.51)	-.38
Change 9-12		.17		-1.59 (0.95)	-0.19 (1.30)	.17
Academic achievement						
Grade 5	.62	-.05	0.49* (0.04)	0.10* (0.05)	-0.05 (0.05)	-.05
Change 5-8	.67	-.07	2.15* (0.46)	-0.31 (0.40)	-0.22 (0.40)	-.07
Grade 9		-.26		-0.27* (0.08)	-0.18* (0.09)	-.26
Change 9-12		-.18		-0.79* (0.31)	-0.58 (0.40)	-.18
<i>Peers</i>						
Negative peers						
Grade 5	.41	-.01	1.02* (0.10)	0.12 (0.13)	-0.01 (0.04)	-.01
Change 5-8	.77	-.05	2.77* (0.16)	0.43 (0.30)	-0.03 (0.09)	-.05
Grade 9		.66		0.42* (0.08)	0.14* (0.03)	.66
Change 9-12		.43		1.68* (0.28)	0.36* (0.07)	.43

*b* unstandardized coefficient, *SE* standard error,  $\beta$  standardized coefficient

\*  
 $p < .05$

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