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Title
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THE ROLE OF SOCIAL-EMOTIONAL AND SOCIAL NETWORK FACTORS IN THE RELATIONSHIP BETWEEN ACADEMIC ACHIEVEMENT AND RISKY BEHAVIORS

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Abstract

Purpose—We examined whether standardized test scores and grades are related to risky behaviors among low-income minority adolescents and whether social networks and social-emotional factors explained those relationships.

Methods—We analyzed data from 929 high school students exposed by natural experiment to high- or low-performing academic environments in Los Angeles. We collected information on grade point average (GPA), substance use, sexual behaviors, participation in fights and carrying a weapon from face-to-face interviews and obtained California math and English standardized test (CST) results. Logistic regression and mediation analyses were used to examine the relationship between achievement and risky behaviors.

Results—Better GPA and CST scores were strongly associated with lower rates of substance use, high risk sexual behaviors and fighting. The unadjusted relative odds of monthly binge drinking was 0.72 (95%CI: 0.56–0.93) for 1 standard deviation increase in standardized test scores and 0.46 (0.29–0.74) for GPA of B minus or higher compared to C plus or lower. Most associations disappeared after controlling for social-emotional and social network factors. Averaged across the risky behaviors, mediation analysis revealed social-emotional factors accounted for 33% of the relationship between test scores and risky behaviors and 43% of the relationship between GPA with risky behaviors. Social network characteristics accounted for 31% and 38% of the relationship between behaviors with test scores and GPA, respectively. Demographic factors, parenting and school characteristics were less important explanatory factors.

Conclusions—Social-emotional factors and social network characteristics were the strongest explanatory factors of the achievement-risky behavior relationship and may be important to understanding the relationship between academic achievement and risky behaviors.

Keywords

educational status; adolescent health; substance abuse; sexual activity; violence

INTRODUCTION

The strong link between education and health suggests that improving educational outcomes may be an effective way to address the social determinants of health and reduce health disparities.[1,2] More recent federal legislation to improve public education, including No Child Left Behind (NCLB) and Every Student Succeeds Acts (ESSA), have primarily focused on standardized tests and other accountability metrics, such as school-level rates of graduation, suspension and drop-out, to foster improvements in academic achievement. However, critics of NCLB and ESSA have suggested that the focus on "teaching to the test" has sacrificed a more holistic approach to child education and development. In particular, prior research indicates social-emotional skills (also known as non-cognitive factors), are important predictors of longer-term academic success and success in other facets of life.[1,3–6] For example, Heckman and colleagues found both cognitive and non-cognitive measures predicted college graduation, future wages, substance use, and incarceration. A number of studies link risky behaviors with a variety of specific social-emotional factors including hopelessness,[7] poor school engagement,[8,9] low self-efficacy,[10] and depression.[11,12] Schools might also influence adolescent behaviors by exposing students to less or more "risky" networks. Extensive research on social networks indicate that peers and others in the network have a potent effect on risky behaviors.[13–16]

The underlying mechanisms linking achievement and risky behaviors is not well understood. One possibility is that this association is due to confounding. Prior studies linking higher academic achievement with lower rates of risky behaviors have not controlled for a comprehensive set of factors such as parenting, social network characteristics and social-emotional traits, all of which are known predictors of both academic achievement and health behaviors.[17] Specifically, parenting, social networks and social-emotional skills influence both academic achievement and health behaviors,[4,11,12,15,16,18–23] and may therefore link education and health behaviors not by cause and effect but by circumstance. Alternatively, these factors may be mediators that causally link academic achievement with health behaviors. For example, poor achievement may lead a student to connect with other lower achieving peers who are more likely to engage in and promote delinquent behaviors. Poor achievement could also lead to depression and hopelessness, which might then lead to higher rates of alcohol use and binge drinking. Finally, the reverse causal pathway may exist such that risky behaviors leads to poor academic performance. For example, substance use and other risky behaviors could lead to more depression and hopelessness, and disengagement from school, which could lead to lower achievement.

In the present study, we sought to examine whether adolescent health and risky behaviors are linked to academic achievement, as measured by the California standardized tests (CST) in math and English and grade point average (GPA). We also estimated the extent to which parenting, social network characteristics and social-emotional factors such as depression, self-efficacy and hopelessness may be cofounders or potential explanatory factors in the relationship between achievement and risky behaviors. We analyzed survey and standardized test data from a sample of adolescents from low-income neighborhoods in Los Angeles to examine the relationship of academic performance, social networks, social-emotional health, and other contextual factors with a variety of risky behaviors, including substance use, risky sexual activity, and violence-related behaviors.

METHODS

Study Design and Sample

We analyzed data from the RISE Study, a natural experimental study of students who had applied to one or more high-performing public charter high schools in low-income neighborhoods in Los Angeles.[24] We first identified seven potential charter schools for the study that were in the top tertile of all California public high schools based on the California 2009 Growth Academic Performance Index (API).[25,26] Of these schools, three had enough applicants to hold a random admissions lottery, and were selected for the study. Potential subjects for the RISE Study was comprised of those who applied for 9th grade admission to one or more of these schools between 2007–2010. We randomly selected potential subjects from the applicant lists, stratified by whether they were offered admission to the school. We excluded siblings who were automatically admitted outside the random lottery, those who moved out of area and those who attended 9th grade in a private school or another high-performing charter school that was not in our study. We asked subjects to participate in a survey to understand how school environments might influence adolescent attitudes and health behaviors. Of the 1234 eligible subjects, 75% (929) agreed to participate, completed the survey and were included in this analysis. This sample attended 62 different high schools throughout Los Angeles.

After obtaining consent from both parents and students, a research assistant conducted a 60–90 minute face-to-face interview with each student between Fall 2010 and Spring 2011. We collected information on demographics, self-reported GPA and school engagement, substance use, sexual behaviors, engagement in fighting, and carrying a weapon. The more sensitive questions about substance use and sexual behaviors were asked using an audio-enhanced computer-assisted self-interview (audio-CASI), which allows the subject to answer the questions without an interviewer. Subjects received a $40 gift card for participating.

Measures

From the surveys, we collected demographic information including student's age, race/ethnicity, sex, and native language, and students also reported about their parental demographics including employment status and education level. We asked students about their parents' level of involvement (Cronbach's alpha 0.68) and strictness (alpha 0.62). These two scales are used to categorize parenting style as neglectful (low involvement and

strictness), indulgent (high involvement and low strictness), authoritarian (low involvement and high strictness), and authoritative (high involvement and strictness).[27] We measured several social-emotional factors including school engagement using the High School Survey of School Engagement (alpha 0.87),[28] depression using the CES-D 20 scale (alpha 0.86),[29,30] general self-efficacy (alpha 0.89),[31] and hopelessness (alpha 0.88).[32]

To assess academic performance, we asked participants, "What was your GPA during the past school year?" Subjects were given 6 response options (3.5 or above, 3.0–3.4, 2.5–2.9, 2.0–2.4, <2.0, or no grade). With parental consent, we obtained from the California Department of Education student-level math and English CST scores for each study participant from grade 8 through their most recent available scores.[33] CST is taken annually in the spring from grade 2–11 and assesses student proficiency in content standards in areas of math and English as well as other areas including sciences and history.[33]

We conducted a personal social network assessment in which subjects were asked to name 20 persons who are "most important" to them. For each person, we asked about their relationship with the person (e.g. relative, friend, romantic partner, neighbor, co-worker, teacher, coach), their relative age (much older, around the same age, much younger), and whether the person used alcohol or illicit drugs. For peers in the network (those who were identified as a friend around the same age), we assessed their school engagement by asking subjects to report whether the peer "tries hard in school," "thinks that it is important to do well in school," "thinks that it is important to attend every class," and "often disrupts class" (strongly agree to strong disagree).

Subjects also reported their own engagement in risky behaviors including use of tobacco, alcohol, and marijuana in the past 30 days, including use of alcohol or marijuana at school and binge drinking, use of condoms during last intercourse, alcohol or drug use with sex in the last 90 days, involvement in fighting in the last 12 months, and carrying a weapon in the last 30 days.

Data Analysis

We used logistic regression models to examine the relationship of GPA, standard test scores, social network characteristics and social-emotional factors with adolescent risky behaviors. Each outcome behavior was dichotomized. We used the current or most recently available English and math test scores for each student. For 95% of the 9–11th grade sample, the current year test scores were available and for the remaining 5% we used a prior year test scores. We used the prior year CST scores for 100% of 12th graders, since 12th graders do not take CST. Math and English CST scores were summed and analyzed as a continuous variable. We used generalized estimating equations to account for non-independence of students clustered within schools, adjusting for student's grade level, race/ethnicity, parental education and employment, type of school (charter vs. traditional) and their school's California 2010 API, which summarizes a school's performance on the California Standardized Testing and Reporting (STAR) Program and the California High School Exit Examination (CAHSEE) tests.[25,26]

We performed a series of sequential staged regression analyses to examine various factors that might mediate or explain the relationship of GPA and CST scores with risky behaviors. Stage 0 was unadjusted for any covariates. We then added to the regression model in sequential stages, groups of potential explanatory factors starting with student and parental demographic variables, parenting style, social-emotional factors and then social network characteristics. Social-emotional factors were hopelessness, depression, self-efficacy, and school engagement. However, because of collinearity between self-efficacy and hopelessness, we dropped self-efficacy from the models. Social network characteristics were the proportion of friends who drank alcohol in the last 30 days, proportion of friends who used drugs in the last 30 days, average level of school engagement scores among friends, and naming one or more teachers in the social network. We did not look at naming coaches in the network since not everyone would have a coach (some may not play sports and some may not have access to organized sports programs) and very few subjects mentioned a neighbor in their network. In addition to the sequential staged analyses, we estimated mediation effects using methods developed by Breen et al.,[34] which allows estimation of the proportion of the relationship of an exposure on an outcome that is due to a specific explanatory factor or set of explanatory factors. This method does not provide information on causal relationships between mediating variables. Using logistic regression for our study, mediation analysis estimates the relative odds of a risky behavior associated with the exposure (higher CST or GPA) without any covariates and then compares the estimate from a model adjusted for the explanatory factors. The mediation analysis then quantifies the difference in these odds ratios without and with adjustment for the covariates as the percent of the association due to the explanatory factors.

We imputed missing data using multiple imputation.[35,36] For most variables in our analyses the amount of missing values ranged from 0–3% of the sample with the exception of CST scores (13% missing, n=118) and use of birth control during last intercourse (14%, n=130). (Table 1) CST data was missing primarily because students who did not take the test or we were unable to match the student to their CST data. We performed sensitivity analyses of unimputed data and repeated analyses using different cutoffs for GPA (B plus or higher and C or higher) and found similar results. We used Stata version 14 for all analyses (StataCorp, College Station, TX).[37] The UCLA human subjects research review board approved all research activities and California Department Education approved the use and reporting of CST scores in this manuscript.

RESULTS

Table 1 shows the demographic, parental and educational characteristics of our sample of 929 adolescents who participated in the RISE Study. The sample was comprised of 84% Latino and 12.6% African Americans with 38.6% being native English speakers. Just over half of students (50.7%) had at least one parent who had graduated from high school, while 91.7% of students had one or more parents working full time. A minority of students had performed at the level of proficient or above on the California Standards Test in math (14.8%) and in English (43.2%). Two-thirds (67.2%) of the sample reported having a grade point average of a B minus or higher in the last academic year, while 28% reported a GPA of a C plus or lower.

We examined the relationship between performance on the CST scores (sum of English and math component score) as a continuous variable with behaviors related to substance use, sex and violence. Table 2 shows the relative odds of engaging in risky behaviors associated with a 1 standard deviation increase in CST scores. In the unadjusted analysis (stage 0), a higher CST score is associated with 0.65 relative odds of 30-day cigarette use (95% CI: 0.65–0.84), and similarly associated with a lower odds of alcohol use, marijuana use, binge alcohol use, substance use at school, lack of contraception use, substance use with sex, and fighting. CST scores are not statistically significantly associated with carrying a weapon in the last 30 days. We then adjusted for additional factors that might explain the relationship between CST scores and behaviors. Adjusting for student and parental demographic variables (Stage 1), school characteristics (Stage 2), parenting style (Stage 3), social-emotional factors (Stage 4), and social network characteristics (Stage 5) reduces the strength of association between CST scores and risky behaviors. Most of the relationships are no longer statistically significant after adjusting for social-emotional factors in Stage 4. In the final stage, the relationship between CST scores and risky behaviors is no longer statistically significant for any of the behaviors except for fighting in the last 12 months.

Table 2 also shows the relative odds of engaging in risky behaviors associated with a self-reported GPA of B minus or above compared with those with a GPA C plus or below. A higher GPA is associated with lower rates of engaging in all of the risky behaviors that we examined except for carrying a weapon in the last 30 days. After controlling for demographics, school characteristics, parenting style, social-emotional factors and social networks, the relationship between GPA and risky behaviors is no longer statistically significant for any of the risky behaviors except for marijuana use and no contraception use with last intercourse. Even after controlling for all explanatory factors, those with a higher GPA had a lower odds than those with a lower GPA of engaging in marijuana use (adjusted OR= 0.58 (95%CI: 0.38–0.91)) or not using contraception with last intercourse (adjusted OR=0.58 (95%CI: 0.37–0.93)).

We conducted mediation analysis to quantify the extent to which demographic variables, school characteristics, parenting style, social-emotional factors and social network characteristics explain the relationship between academic achievement and adolescent behaviors. For Table 3, mediation analysis estimates the relationship between CST scores and risky behaviors unadjusted and adjusted for potential explanatory variables, and then compares these two estimates to calculate the percent of the association explained by the explanatory factors. Demographic characteristics together account for 17% of the relationship between CST scores and 30-day cigarette use, compared with 28% for school characteristics, 6% for parenting style, 41% for social emotional factors, and 28% for social network characteristics. Note that each set of explanatory factors are included in the model separately from other sets of factors, thus the total percent can add up to more or less than 100% because of correlations between the different sets of factors. These results are similar across the various risky behaviors, and averaged across these behaviors, social-emotional and social network factors were the strongest sets of explanatory factors, accounting for 33% and 31% of the CST-behavior relationship, respectively. Overall, school engagement is the strongest individual explanatory variable (average 23%), followed by the school-level

academic performance index (20%), grade level (15%), and the proportion of peers who used alcohol (13%).

Results of the mediation analysis for GPA and risky behaviors (Table 4) are similar to the results of the CST-behavior mediation analysis. Averaged across the behaviors, social-emotional factors accounts for 42% of the GPA-behavior relationship, ranging from 23% for lack of birth control use at last intercourse to 69% for substance use at school. School engagement is the strongest single explanatory factor (33% averaged across all risky behaviors), followed by the proportion of peers who used drugs in the last 30 days (17%), and the proportion of peers who used alcohol in the last 30 days (14%).

DISCUSSION

Consistent with previous studies, our results indicate that lower rates of risky behaviors are very strongly linked to higher academic achievement.[17,38–40] Our study extends prior literature by looking at both GPA and standardized test scores and by examining a wide range of risky behaviors related to substance use, sex and violence. The association between risky behaviors with academic achievement was fairly consistent across behaviors and consistent when examining GPA or CST scores despite that test scores are a more objective measure of academic performance.

Our study also adds to prior literature by examining a number of variables that might potentially explain the relationship between academic achievement and health. While numerous studies have demonstrated a strong link between education and health,[2] the underlying mechanism for this relationship is not well understood. We used staged regression models and mediation analysis to estimate the degree to which various potential explanatory and confounding factors might account for the achievement-risky behavior association. For most behaviors, higher achievement was associated with lower rates of risky behavior controlling for confounders such as student and parent demographics, school-level academic performance and parenting style. After additionally adjusting for social-emotional factors, most of these associations were no longer statistically significant, and all but 3 associations disappeared after also controlling for social network factors. From the mediation analysis, we found that the most important explanatory variables were related to social-emotional and social network characteristics. In contrast, demographics, school characteristics and parenting appear to be much less important.

Because the data is cross-sectional, we cannot determine cause and effect. However, we propose that social-emotional and social network factors might be involved in the achievement-behavior relationship through three possible mechanisms. First, they could be mediators. For example, better academic achievement leads to better school engagement or promotion of friendships with students who are less likely to engage in delinquent behaviors, which then leads to lower risky behaviors. Second, social-emotional and social network factors may be root causes that lead to both poor academic performance and risky behaviors. Third, the causal relationship between achievement and behavior may be reversed. Specifically, substance use and other delinquent problems may lead to poor academic

performance, as well as lower school engagement and the development of delinquent friends.

In his Theory of Educational Transmissions, Bernstein argued that disengaged and alienated students are more likely to create friendships with similar students who reinforce negative attitudes and behaviors, forming a "vicious cycle" of worsening school performance and behavior.[41] This is similar to the Differential Association Theory,[42] which suggests that delinquent behavior is learned from others and society's treatment of these individuals, e.g. incarceration or academic isolation reinforces social connections that further reinforces poor behavior, lower engagement in school, and worse academic performance. These theories and our results support the idea that academic achievement, risky behaviors, social networks, school engagement and social-emotional factors are intertwined and self-reinforcing. If so, then breaking the vicious cycle is very difficult and suggests that policies or interventions to reduce risky behaviors might require a comprehensive approach that not only raises the bar on academic achievement, but also addresses the influence of schools on social-emotional skills development and social network formation.

So how might the results of this study be useful to pediatricians and educational leaders? First, we suggest that grade point average be considered a 5th vital sign. If poor school performance is intertwined with risky behaviors, depression and other social-emotional factors, and risky social networks, then grades could serve as a quick and easy screening tool for physicians to look for co-existing behavioral and mental health issues. Second, pediatricians might educate parents to beware of a broader range of warning signs that not only include substance use and depression, but also poor school engagement or academic performance. Finally, our results suggest that educational and health systems might mutually benefit by working more closely together. Given their daily contact with students, teachers and school administrators have an important opportunity to pick up on early warning signs of behavioral and mental health problems. Interventions studies would be needed to determine the feasibility and efficacy of early detection by teachers and referrals to health care providers, but it is possible that this could result in better health and academic outcomes.

Several study limitations are worth noting. Given our sampling methods, our results may not be generalizable to adolescents from higher socioeconomic backgrounds and neighborhoods or other racial/ethnic groups. We relied on student self-report for their grades and risky behaviors, as well as their family and peer characteristics. Response bias might lead some to report both better school outcomes and fewer risky behaviors, and we do not have information on those who refused to participate to determine whether participation bias may exist. Although standardized testing has proven to be a viable measure of academic achievement, it may not fully assess cognitive ability or school performance. Finally, we only observed a small set of risky behaviors among adolescents and were not able to observe the potential relationship of better academic achievement with socioeconomic and health outcomes that occur later in life.

The focus on achievement testing introduced by the NCLB and ESSA school reform policies have emphasized performance on standardized tests as a primary metric of school success,

but has been criticized for ignoring the importance of other factors such as social-emotional skills. While we cannot clarify the exact causal mechanisms, our study indicates that social-emotional factors and social network characteristics may be important explanatory or mediating factors of the association between achievement and risky behaviors. Future studies are needed to determine the specific causal role of social-emotional factors and social networks, which would have important implications for future school reform policies and interventions for improving educational outcomes and keeping adolescents healthy and safe.

Acknowledgments

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What's new

Social-emotional skills and social networks are the most important explanatory factors of the association between academic achievement and risky behaviors.

Table 1

Baseline characteristics

Characteristic	% of sample (n)	% missing data (n)
Male	45 (419)	0 (0)
Grade level		0 (0)
9	26 (243)	
10	24 (228)	
11	26 (241)	
12	24 (221)	
Native English speaker	39 (360)	0 (0)
Race/ethnicity		0 (0)
Latino	84 (784)	
African American	13 (117)	
White or other	3 (32)	
Parental characteristics		
>1 parent HS graduate	51 (474)	0 (0)
1 parent working full time	92 (856)	0 (0)
School characteristics		
Public charter HS	50 (463)	0 (0)
HS in bottom 50% centile of API scores	27 (256)	5 (50)
Standardized Tests		
Math CST		13 (118)
Below basic	52 (488)	
Basic	22 (209)	
Proficient	13 (117)	
Missing	13 (119)	
English CST		12 (114)
Below basic	18 (170)	
Basic	32 (294)	
Proficient	38 (354)	
Missing	12 (115)	
GPA		5 (44)
A− or above	20 (184)	
B to B+	25 (229)	
B−	23 (215)	
C or C+	21 (195)	
C− or below	7 (66)	
Missing	5 (44)	
Parenting style		0.2 (2)
Neglectful	34 (316)	
Indulgent	17 (156)	
Authoritarian	23 (212)	

Characteristic	% of sample (n)	% missing data (n)
Authoritative	27 (247)	

Table 2

Staged logistic regression model of the association of California Standards Test (CST) scores and grade point average with engaging in risky behaviors (Odds ratio, 95%CI).

OUTCOME	CST Score[*]<					
	Stage 0 (Unadjusted)	Stage 1 (Demographics)	Stage 2 (School)	Stage 3 (Parenting)	Stage 4 (Social-Emotional)	Stage 5 (Social Networks)
SUBSTANCE USE						
Cigarette use in last 30 days	**0.65 (0.51, 0.84)**	**0.70 (0.54, 0.92)**	0.78 (0.60, 1.02)	0.78 (0.59, 1.03)	0.88 (0.66, 1.17)	0.90 (0.65, 1.25)
Alcohol use in last 30 days	**0.77 (0.67, 0.89)**	**0.79 (0.68, 0.92)**	**0.81 (0.69, 0.95)**	**0.82 (0.69, 0.96)**	0.87 (0.73, 1.03)	0.88 (0.73, 1.07)
Marijuana use in last 30 days	**0.70 (0.59, 0.84)**	**0.77 (0.64, 0.92)**	**0.80 (0.66, 0.97)**	**0.80 (0.65, 0.98)**	0.91 (0.73, 1.12)	0.95 (0.75, 1.21)
Binge drinking in last 30 days	**0.73 (0.57, 0.93)**	0.78 (0.60, 1.02)	0.78 (0.59, 1.03)	0.79 (0.59, 1.05)	0.87 (0.65, 1.17)	0.92 (0.66, 1.27)
Substance use at school in last 30 days	**0.62 (0.48, 0.81)**	**0.66 (0.50, 0.86)**	**0.70 (0.52, 0.92)**	**0.68 (0.51, 0.91)**	0.80 (0.59, 1.07)	0.82 (0.60, 1.13)
SEXUAL BEHAVIORS						
No contraception during last intercourse	**0.63 (0.49, 0.80)**	**0.69 (0.54, 0.89)**	**0.72 (0.56, 0.93)**	**0.73 (0.56, 0.95)**	0.80 (0.61, 1.05)	0.80 (0.60, 1.05)
Substance use with sex in last 90 days	**0.66 (0.49, 0.87)**	**0.73 (0.55, 0.98)**	0.77 (0.57, 1.05)	0.77 (0.56, 1.05)	0.87 (0.63, 1.2)	0.92 (0.64, 1.31)
VIOLENCE						
Fight in last 12 months	**0.65 (0.55, 0.78)**	**0.66 (0.56, 0.79)**	**0.71 (0.59, 0.86)**	**0.72 (0.59, 0.86)**	**0.79 (0.65, 0.95)**	**0.81 (0.66, 0.99)**
Carried a weapon in last 30 days	0.89 (0.68, 1.17)	0.96 (0.73, 1.28)	0.96 (0.72, 1.29)	0.97 (0.72, 1.31)	1.05 (0.78, 1.43)	1.11 (0.81, 1.53)

OUTCOME	Grade point average (B minus or above vs. C plus or below)					
	Stage 0 (Unadjusted)	Stage 1 (Demographics)	Stage 2 (School)	Stage 3 (Parenting)	Stage 4 (Social-Emotional)	Stage 5 (Social Networks)
SUBSTANCE USE						
Cigarette use in last 30 days	**0.42 (0.27, 0.65)**	**0.47 (0.30, 0.75)**	**0.52 (0.33, 0.83)**	**0.52 (0.32, 0.85)**	0.68 (0.41, 1.15)	0.71 (0.40, 1.26)
Alcohol use in last 30 days	**0.65 (0.48, 0.86)**	**0.65 (0.48, 0.88)**	**0.68 (0.50, 0.92)**	**0.70 (0.51, 0.96)**	0.81 (0.58, 1.13)	0.82 (0.56, 1.21)
Marijuana use in last 30 days	**0.39 (0.28, 0.54)**	**0.42 (0.30, 0.60)**	**0.44 (0.31, 0.62)**	**0.43 (0.30, 0.62)**	**0.56 (0.38, 0.82)**	**0.58 (0.38, 0.91)**
Binge drinking in last 30 days	**0.47 (0.29, 0.76)**	**0.49 (0.30, 0.80)**	**0.49 (0.30, 0.81)**	**0.52 (0.31, 0.86)**	0.66 (0.38, 1.13)	0.68 (0.37, 1.24)
Substance use at school in last 30 days	**0.47 (0.29, 0.74)**	**0.52 (0.32, 0.84)**	**0.54 (0.33, 0.88)**	**0.55 (0.34, 0.91)**	0.84 (0.49, 1.44)	0.95 (0.53, 1.68)
SEXUAL BEHAVIORS						
No contraception during last intercourse	**0.41 (0.28, 0.62)**	**0.46 (0.30, 0.70)**	**0.48 (0.31, 0.73)**	**0.48 (0.31, 0.74)**	**0.57 (0.36, 0.9)**	**0.58 (0.37, 0.93)**
Substance use with sex in last 90 days	**0.42 (0.26, 0.70)**	**0.46 (0.27, 0.78)**	**0.49 (0.29, 0.84)**	**0.50 (0.29, 0.86)**	0.67 (0.37, 1.2)	0.75 (0.39, 1.46)

		CST Score[*] <				
OUTCOME	**Stage 0 (Unadjusted)**	**Stage 1 (Demographics)**	**Stage 2 (School)**	**Stage 3 (Parenting)**	**Stage 4 (Social-Emotional)**	**Stage 5 (Social Networks)**
VIOLENCE						
Fight in last 12 months	**0.47 (0.35, 0.64)**	**0.53 (0.38, 0.72)**	**0.56 (0.41, 0.78)**	**0.57 (0.41, 0.79)**	**0.69 (0.49, 0.99)**	0.73 (0.50, 1.05)
Carried a weapon in last 30 days	0.60 (0.35, 1.02)	0.72 (0.42, 1.25)	0.72 (0.41, 1.25)	0.73 (0.42, 1.28)	0.89 (0.49, 1.62)	0.97 (0.52, 1.81)

N=929

[*]
CST scores are continuous and standardized so that a 1 point change is equal to 1 standard deviation.

Stage 0 unadjusted model.

Stage 1 adjusted for gender, grade, language, Latino ethnicity, parental education and employment.

Stage 2 additionally adjusted for school characteristics (charter and 2010 Growth Academic Performance Index).

Stage 3 additionally adjusted for parenting style (neglectful, indulgent, authoritarian, authoritative).

Stage 4 additionally adjusted for hopelessness, school engagement, self-efficacy, depression.

Stage 5 additionally adjusted for peer behaviors (alcohol and drug use, sexual behaviors, engagement), and having 1 or more teachers named in their social network.

Table 3

Mediation analysis estimating the proportion of the association between California standards test scores and risky behaviors explained by potential explanatory factors.

					% of CST effect explained by explanatory factors on the following outcomes:				
Potential explanatory factors	Cigarette use	Alcohol use	Marijuana use	Binge drinking	Substance use at school	No birth control	Substance use with sex	Fighting	AVERAGE
Demographics	**17.3**	**16.8**	**27.8**	**31.4**	**13.5**	**22.8**	**23.1**	**5.7**	**19.8**
Male	1.7	-0.1	3.6	-1.4	1.6	1.1	0.9	5.9	1.7
Grade level	9.1	24.8	18.6	32.6	6.9	17.4	18.9	-5.6	15.3
Native English speaker	-1.3	-0.4	0.2	1.4	-0.4	0.6	-1.4	-0.4	-0.2
Latino Ethnicity	-0.6	-4.6	1.3	-5.9	0.0	-0.4	-1.1	0.2	-1.4
Parent high school graduate	3.9	-0.6	0.8	1.4	1.1	1.9	-1.1	1.8	1.1
Parent working full time	4.5	-2.2	3.5	3.5	4.4	2.2	6.8	3.8	3.3
School Characteristics	**28.5**	**10.8**	**15.1**	**2.0**	**10.5**	**11.8**	**16.9**	**17.9**	**14.2**
Charter school	-8.8	-7.8	-12.1	-8.5	-0.9	4.2	-11.9	-3.7	-6.2
School academic performance	37.2	18.6	27.1	10.4	11.4	7.6	28.8	21.6	20.4
Parenting Style	**5.6**	**12.4**	**13.7**	**16.5**	**0.3**	**9.8**	**9.3**	**4.5**	**9.0**
Social emotional factors	**41.4**	**28.0**	**37.3**	**38.3**	**37.2**	**20.0**	**36.9**	**25.5**	**33.1**
Hopelessness	9.0	-8.3	0.0	-7.4	3.8	-0.9	8.1	3.1	0.9
School engagement	19.4	24.5	30.0	38.4	26.5	13.7	16.4	18.0	23.4
Depression	13.0	11.8	7.3	7.2	6.9	7.2	12.5	4.5	8.8
Social Network characteristics	**27.9**	**46.9**	**36.6**	**45.2**	**19.6**	**12.6**	**37.8**	**22.8**	**31.2**
% peers who used alcohol	10.2	33.5	8.2	25.6	6.1	1.9	14.5	7.3	13.4
% peers who used drugs	14.4	7.8	24.1	11.5	10.5	10.0	16.8	4.9	12.5
Peer school engagement	4.6	7.3	2.6	8.2	4.8	2.2	5.2	9.2	5.5
Teacher in social network	-1.3	-1.6	1.7	-0.1	-1.9	-1.4	1.3	1.4	-0.2

N=929

School academic performance is measured by the 2010 Growth Academic Performance Index (API)

Table 4

Mediation analysis estimating the proportion of the association between grade point average and risky behaviors explained by potential explanatory factors.

	% of GPA effect explained by explanatory factors on the following outcomes:								
Potential explanatory factors	**Cigarette use**	**Alcohol use**	**Marijuana use**	**Binge drinking**	**Substance use at school**	**No birth control**	**Substance use with sex**	**Fighting**	**AVERAGE**
Demographics	**16.5**	**11.0**	**12.7**	**13.8**	**15.9**	**14.5**	**10.9**	**18.2**	**14.2**
Male	2.6	-0.8	5.0	-3.7	4.7	1.8	1.0	13.1	3.0
Grade level	3.7	13.4	5.6	10.1	3.0	7.1	8.2	-2.4	6.1
Native English speaker	-0.5	-0.2	0.0	0.5	-0.2	0.2	-0.5	-0.2	-0.1
Latino Ethnicity	0.2	2.6	-0.5	2.4	-0.1	0.2	0.4	-0.2	0.6
Parent high school graduate	7.1	-2.2	0.5	2.0	3.2	3.5	-3.3	4.1	1.9
Parent working full time	3.3	-1.8	2.1	2.5	5.3	1.8	4.9	3.7	2.8
School Characteristics	**18.1**	**16.4**	**9.2**	**4.5**	**9.6**	**8.4**	**14.2**	**13.9**	**11.8**
Charter school	-2.4	-3.3	-2.9	-2.2	-0.3	1.5	-3.6	-1.2	-1.8
School academic performance	20.5	19.7	12.1	6.7	9.9	6.9	17.8	15.1	13.6
Parenting Style	**9.2**	**16.4**	**10.1**	**13.5**	**6.2**	**8.6**	**10.7**	**5.5**	**10.0**
Social emotional factors	**43.3**	**49.6**	**35.8**	**43.1**	**69.3**	**22.7**	**39.9**	**37.6**	**42.7**
Hopelessness	9.7	-13.2	-0.5	-8.2	6.8	-1.5	9.0	4.3	0.8
School engagement	23.0	48.2	31.2	45.5	53.5	17.5	20.2	28.3	33.4
Depression	10.6	14.6	5.1	5.7	9.0	6.8	10.8	5.1	8.4
Social Network characteristics	**32.2**	**61.5**	**35.1**	**39.2**	**42.9**	**17.7**	**43.7**	**29.6**	**37.8**
% peers who used alcohol	9.6	39.9	6.4	19.6	10.1	2.3	13.9	8.6	13.8
% peers who used drugs	17.8	13.1	25.2	11.7	23.8	13.5	21.8	7.2	16.8
Peer school engagement	5.8	10.1	2.3	7.9	11.1	3.0	6.7	12.3	7.4
Teacher in social network	-0.9	-1.5	1.1	-0.1	-2.2	-1.1	1.3	1.6	-0.2

N=929

School academic performance is measured by the 2010 Growth Academic Performance Index (API) GPA=Grade point average