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Profiles of Protection from Substance Use among Adolescents

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Abstract

The purpose of this study was to explore whether adolescents ($N=10,287$) could be classified into homogeneous subgroups based on their protective factors and, if so, whether these constellations of protection differentially relate to adolescents' lifetime and 30-day alcohol and tobacco use. Latent class analysis with eight protective factors—four internal and four external—were used to identify the underlying latent class structure. Five profiles of protection emerged: *Adequate Protection* (54%), *Adequate External Protection* (9%), *Adequate Protection with Low Adult Communication* (16%), *Adequate Protection with Risky Friends* (9%), and *Inadequate Protection* (12%). Lifetime alcohol use was associated with only a modest increase in odds of belonging to the *Adequate External* or *Low Adult Communication* latent classes, but an enormous increase in odds of having *Inadequate Protection* or *Risky Friends*. Similar effects were found for past month alcohol use. Unlike alcohol use, which was related most strongly with membership in the *Risky Friends* latent class (relative to *Adequate Protection*), cigarette use was most strongly related to membership in the *Inadequate Protection* latent class. Findings can be used to inform prevention programs as they illustrate the relationships that exist between adolescents' profiles of protection and substance use.

Keywords

Adolescents; Protective factors; Substance use

The study of adolescents in prevention science has—over the past quarter century—undergone a metamorphosis. Whereas earlier research was steeped in the deficit orientation characteristic of the traditional medical model, prevention research today takes a decidedly more balanced perspective: acknowledging not only adolescents' deficits but also their assets (see Catalano et al. 2002; Schwartz et al. 2007). Stemming, in part, from increased attention to resiliency (e.g., Masten 2001; Werner 1989) and positive youth development (e.g., Damon 2004; Silbereisen and Lerner 2007), prevention science has come to value the important role adolescents' positive dispositional attributes and attachments play in preventing risk behaviors. Shifting from a deficit- to a strength-based paradigm has opened a line of inquiry in prevention science focused on the personal characteristics and developmental contexts that insulate against risk and promote well-being. To date, however, much of this empirical research has been limited, often failing to demonstrate how an individual's constellation of protective factors cultivates protection.

The present study builds on and extends the literature on assets that protect adolescents from substance use by exploring multiple dimensions of protection and their relationship with

adolescents' alcohol and tobacco use. Toward this end, we summarize empirical evidence demonstrating the relationship between a select subset of adolescent protective factors and substance use behaviors. Then, using a person-centered approach, we test whether adolescents can be profiled based on the presence, or absence, of various protective factors. Finally, we examine the relationship between identified profiles of protection and adolescent substance use.

Defining Protection in Adolescence

The variables that safeguard adolescents from risk behaviors and promote well-being (e.g., school bonding, family boundaries) have variously been called protective factors (Rutter 1979), developmental assets (Scales and Leffert 2004), and supports and opportunities (Roth et al. 1998). While the differences in these terms are almost entirely semantic (see Schwartz et al. 2007), they originate from unique—albeit overlapping—areas of adolescent research on prevention science and positive youth development. In the positive youth development paradigm, developmental assets are routinely characterized as outcomes; whereas, prevention science typically introduces protective factors as mediators or moderators of risk behavior. In the current study, we identify factors adolescents have that aid in their well-being as well as help to buffer or moderate underage use of licit substances. We focus specifically on conglomerate profiles of protection and their links to substance use.

We use the term *protective factors* to refer to variables that either decrease or delay adolescents' alcohol, tobacco, or other drug (ATOD) use. The prevention science (Weissberg and Greenberg 1998) and positive youth development (Benson et al. 2004) literatures use a common organizational schema for discussing protective factors: those that reside within the individual (internal) versus those that reside in their environment (external). Internal protective factors include an individual's health-promoting dispositional attributes, commitments, values, and competencies. While, in contrast, external protective factors consist of the health-promoting aspects of adolescents' ecology such as family, peers, school, neighborhood, and community. Internal and external protective factors serve complementary roles and co-occur along with various risk factors (e.g., Pollard et al. 1999).

Internal Protection Against Substance Use

A variety of internal protective factors have been identified within the study of adolescent substance use (Hawkins et al. 1992). Internal protective factors can be classified as affective, cognitive, behavioral, or social (Jenson 2004). As a full examination of all internal protective factors is beyond the scope of this study, we concentrate on one internal protective factor from each of these classes which has been linked to a lower likelihood of adolescent substance use behaviors; specifically, life satisfaction (affective), planful competence (cognitive), physical activity (behavioral), and positive school orientation (social).

Life Satisfaction

Correlational studies, such as the research conducted by Topolski et al. (2001), reveal a positive relationship between adolescents' self-reported quality of life and abstaining from health-risk behaviors (e.g., ATOD use, risky sexual behavior). In the same vein, other research shows that adolescents with low levels of life satisfaction are more likely to report earlier lifetime use of alcohol, cigarettes, marijuana, and cocaine compared to those with higher life satisfaction (e.g., Zullig et al. 2001). Although the specific causal pathways linking life satisfaction and substance use await empirical validation, extant theory (e.g., Newcomb et al. 1986; Raphael 1996) suggests that higher life satisfaction may decrease (or delay) substance use indirectly by empowering adolescents with a sense of worth which, in turn, promotes healthy decision-making.

Planful Competence

A similar indirect mechanism is hypothesized to relate planful competence (i.e., goal-setting) with substance use avoidance. Researchers posit that adolescents who set goals and have personal expectations regarding their future are more likely to abstain from or defer substance use behaviors (Carroll et al. 1997; Griffin et al. 2004). In particular, adolescents who have formulated plans (e.g., health, educational, moral) for their future as well as a tentative course of action for following through with these plans are more likely to make choices and exhibit behaviors that help actualize their goals (Clausen 1991; Crockett and Silbereisen 2000). Thus, we hypothesize that adolescents who exhibit planful competence will be more likely to abstain from behaviors, like substance use, that may compromise their health and ability to achieve future goals.

Physical Activity

Whereas life satisfaction and planful competence represent affective and cognitive facets of internal protection, physical activity taps the more behavioral dimension—i.e., how one's actions buffer against a range of physiological and psychological risks. Physical activities provide adolescents with alternative free time activities and reinforce messages about the importance of maintaining a healthy lifestyle (Kulig et al. 2003; Moore and Werch 2005). A number of studies corroborate the benefits of physical activity by showing markedly lower rates of substance use among participants compared to non-participants (e.g., Elder et al. 2000). At odds with this notion, however, is evidence linking sports participation to substance use (Moore and Werch 2005). While an important qualification when discussing physical activity as a protective factor, the association between participation in athletics and substance use varies widely by sport, school-sponsorship, level of involvement as well as adolescent gender and race (Aaron et al. 1995; Pate et al. 2000). Despite this caveat, for most adolescents, engaging in physical activity makes them more aware of their bodies as well as how the decisions they make impact them physically.

Positive School Orientation

Children and adolescents' orientation towards, or attachment to, school has long been recognized as a key internal source of protection. Establishing a positive orientation towards school—an institution with clear standards about appropriate behavior—protects against substance use by encouraging adolescents to act in ways that are consistent with the expectations communicated by teachers, administrators, and through the formal and informal academic curriculum (Hawkins et al. 1999). Positive school orientation has been linked not only to decreased substance use, but also school dropout, delinquency, teen pregnancy, and violence (e.g., Hawkins et al. 2001; Simons-Morton et al. 1999). Collectively, studies suggest that a positive school orientation is an important mediating mechanism with an enduring effect on young people's developmental trajectories.

External Protection Against Substance Use

External factors that protect against substance use cut across the ecology of adolescents' daily lives. Aside from societal factors such as laws and community anti-substance use norms (see Hawkins et al. 2004), most external protection is relational. That is, they concern the influences of parents, friends, and other adults on adolescents' ATOD use.

Parents

Parents are often thought of as the most proximal buffers against adolescent substance use. This importance explains why parents are heavily targeted by substance use prevention programs (e.g., The Adolescent Transitions Program; Dishion and Kavanagh 2003;

Strengthening Families Program 10–14; Molgaard et al. 2001). Parents deter adolescent substance use by modeling healthy behavior, setting limits, and supervising activities (Miller et al. 2000). By providing structure and establishing boundaries, parents relay expectations to their adolescents regarding acceptable behavior. In contrast, low parental monitoring has been positively associated with adolescent ATOD use and delinquency (e.g., Biglan et al. 1995; Fletcher et al. 1995). In addition to providing structure and supervision, parents can also discourage substance use by making themselves physically and emotionally available. As Kafka and London (1991) demonstrated, adolescents who perceive at least one parent to be accessible and approachable are less inclined to turn to ATOD as a means of dealing with problems.

Friends

Although often overlooked, friendships can also fulfill an important protective function. In contrast to the more popular image of adolescent friends as sources of deviant peer influence (Gilliam and Balles 2001), it is plausible that friends who avoid risk behaviors encourage one another to make healthy choices. According to social learning theory (Bandura 1977), non-ATOD using friends may prevent one another's use by reinforcing prosocial behaviors (Prinstein et al. 2001) and negatively defining and sanctioning ATOD use. Controlling for selection effects, Maxwell (2002) illustrates both the negative and positive sides of peer influence revealing not only that risk-engaging friends (i.e., using ATOD, having sex) predict adolescents' own risk behavior, but also that non-risk engaging friends may encourage one another to stop or avoid some behaviors (e.g., drinking alcohol, chewing tobacco).

Non-parental Adults

External protective factors extend beyond the reach of intimate family and peer relationships as well. Indeed, non-parental adults (e.g., youth group leaders, relatives, teachers) are an important source of social capital for adolescents (e.g., Wooley and Bowen 2007). Studies in the mentoring literature consistently demonstrate direct and indirect associations between adolescents' involvement in non-parental adult relationships lasting at least 12 months and positive outcomes including lower rates of alcohol use and risk-taking (e.g., DuBois and Silverthorn 2005; Rhodes et al. 2005). Unlike parent–adolescent relationships, adolescents' relationships with non-parental adults are usually free of the normative conflicts witnessed in families (e.g., disagreements about chores, curfews, homework). Accordingly, research conducted by Beam et al. (2002) showed that adolescents may be more inclined to disclose some information to the non-parental adults in their lives than their parents. Many adolescents in this study cited their relationship with non-parental adults as one where they could get advice from a trusted adult about sensitive topics such as drugs and sex without the repercussions (e.g., parent disapproval of friendship, punishment) they feared might result if they had the same conversation with a parent.

Aims of Present Study

The present study explored whether adolescents could be classified into homogeneous profiles based on their protective factors and, if so, whether these constellations of protection differentially relate to adolescents' alcohol and tobacco use. The eight protective factors—four internal and four external—described above were used in the present research.

Past studies of protection have relied primarily on variable-centered approaches that examine these influences either correlationally, in multiple regression—in which case it is looking at its unique effects—or as part of cumulative indices that presume all factors provide equal protection. Extending recent research suggesting that the link between risk factors and health outcomes is more complex than a cumulative risk factor model allows (e.g., Stevens et al.

2006), the current study uses a person-centered analytic approach, which does not assume the sample is homogeneous but, instead, allows for the identification of qualitatively different groups of individuals. In other words, person-centered approaches allow us to describe the multidimensional patterning of protective factors as they exist in individuals. It may be that a single protective factor operates differently alone than in combination with other protective factors (Kraemer et al. 1997). By identifying subtypes of individuals who exhibit similar patterns of protective factors, we can link group membership with alcohol and tobacco use.

Method

The data for this study were drawn from the eighth and tenth grade survey of the 2006 Monitoring the Future project (Johnston et al. 2007). Monitoring the Future is an annual survey conducted with a nationally representative sample of students enrolled in approximately 420 public and private middle and high schools across the conterminous USA. Participants are recruited using a multi-stage random sampling procedure which selects based on geographic area, school, and then classroom. A total of 11,150 eighth and tenth grade students participated in the 2006 wave of the Monitoring the Future survey. Fifty-one percent of participants were female. The ethnic background of participants was 60% White, 13% Hispanic, and 12% Black. An additional 15% of participants self-identified as either some other ethnicity or did not respond to the question. Using participants' self-reports, the approximate median level of parent education involved some college education.

Measures

The measures used in the present study are based on adolescents' self-assessments. All of the internal and external protective factor measures were scored such that higher scores indicate greater protection. With the exception of single-item indicators, all measures were standardized to ease interpretation.

Internal Protective Factors—Four measures of internal protection were assessed: life satisfaction, planful competence, physical activity, and positive school orientation. *Life Satisfaction* was measured using an 11-item cognitive-judgmental assessment of one's global quality of life (e.g., "On the whole, I'm satisfied with myself;" $\alpha=0.90$). *Planful Competence*, the ability to think about future aspirations and set attainable goals, was assessed using two items: "How often do you think about your future beyond high school?" and "Which best describes your plans after high school?" ($r=0.39$). A single item was used to gauge *Physical Activity*: "How often do you actively participate in sports, athletics, or exercising?" *Positive School Orientation* was measured with seven items assessing adolescents' interest in school, compliance with teachers' behavioral expectations, and willingness to put forth effort ($\alpha=0.73$).

External Protective Factors—To assess the range of protective factors experienced across the daily contexts of adolescents' lives, four external aspects of protection were measured: parental monitoring and limit-setting, parent-child communication, low friends' ATOD use, and communication with non-parental adults. Four items were combined in the *Parental Monitoring and Limit-Setting* measure to tap adolescents' perceptions that their parents supervised their behavior and established rules (e.g., "How often do your parents check on whether you have done your homework?" $\alpha=0.62$). A single item gauged *Parent-Child Communication*: "If you were having problems in your life, do you think you would talk them over with your parents?" *Low Friends' ATOD Use* was measured with four items that asked adolescents to report how many of their friends smoke cigarettes, drink alcohol, get drunk once a week, and smoke marijuana ($\alpha=0.88$). These items were reverse-coded to assess the presence of low ATOD using friends. *Other Adult Communication* was assessed with one item: "Other than your parents, is there one other adult you could talk to if you were having problems?"

Substance Use Behaviors—Substance use behaviors were assessed by measuring adolescents' alcohol and tobacco use. Participants were asked separate questions about their lifetime (experimentation) and 30-day (regular use) consumption (i.e., “more than just a few sips”) of alcoholic beverages. Responses for both lifetime and 30-day use were scored on the same seven-point scale, ranging from *0 occasions* (1) to *40 or more occasions* (7). Lifetime cigarette use was assessed with a single item, “Have you ever smoked cigarettes?” Participants were provided with five response options: *never, once or twice, occasionally but not regularly, regularly in the past, and regularly now*. To measure recent cigarette use, participants were asked: “How frequently have you smoked cigarettes during the last 30 days?” Responses were coded on a seven-point scale (1=*Not at All* to 7=*2+ Packs/Day*). Because the distributions of the substance use behaviors were skewed toward non-use, dichotomous lifetime and 30-day use variables were created to indicate use vs. non-use of each substance.

Missing Data

To be included in the present analyses, adolescents needed to provide data on: (a) at least one of the internal or external protection variables (i.e., indicator variables), and (b) their lifetime and 30-day substance use behaviors (i.e., covariates). Parameters are estimated by maximum likelihood using the EM algorithm (Lanza et al. 2008). Use of this procedure allows us to utilize data from participants who may not have responded to all of the internal and external protection variables. As missing data on the covariates cannot be accounted for in the latent class model, our sample had to be restricted to participants with complete data on the substance use measures ($N=10,287$). Table 1 provides additional detail regarding patterns of missingness. A series of *t*-tests were conducted to compare the means of the internal and external protective factors between the full sample and the restricted sample used in the analyses. The results indicated that, with one exception (Other Adult Communication), adolescents excluded from the analyses due to incomplete data on the substance use outcomes reported lower levels of protection than those with complete data (all *t*-values > 2.00, $ps < 0.05$). Thus, the current sample may underrepresent adolescents who are at high risk.

Analysis Plan

Latent class analysis (LCA) is a statistical model designed to answer the question: Are there underlying types or groups of individuals who share certain characteristics? That is, LCA models estimate a categorical latent variable that divides a population into mutually exclusive and exhaustive latent classes (Goodman 1974). In the current study, internal and external protective factors were used as categorical indicators of latent classes of adolescent protection from substance use. Dichotomizing these indicators allows us to identify the underlying subgroups of individuals by simplifying what would otherwise (if dimensional latent indicators were used) be a large complex array of data. Protective factors can, arguably, be operationalized according to their continuous (degree on a response scale) or discrete (adequate vs. inadequate) levels of presence in individuals (Collins and Lanza 2009). Using the latter approach as the lens through which we examine our data allows us to distinguish the various profiles of protection based on whether adolescents have achieved adequate levels of protection for each of the internal and external factors. This approach to dichotomization allows us to concentrate our analyses on the presence of protection and facilitates the identification of those adolescents who are not at high risk for substance use due to the synergistic action of multiple protective factors (Farrington and Loeber 2000; Kraemer et al. 1997).

The LCA model can be expressed as a function of two sets of parameters. First, the latent class membership probabilities represent the proportion of the population in each latent class. Second, the conditional item-response probabilities represent the distribution of responses to each measured item, within each latent class. More details about the LCA statistical model and an empirical example appear in Lanza et al. (2007).

An important extension of LCA allows exogenous predictors (i.e., covariates) to be added to the basic model via multinomial logistic regression (Lanza et al. 2007). The current study explored the relation between the latent classes of protection and four measures of substance use—lifetime and 30-day use of alcohol and cigarettes. These models represent the increase in odds of belonging to a certain latent class, relative to a reference class, given that an adolescent reported the behavior (e.g., used cigarettes in the last 30 days). All analyses were conducted using PROC LCA (Lanza et al. 2008).

Results

Model Specification and Selection

In order to specify the latent class models, the distributions of the four internal and four external indicators were examined, then dichotomized (see Table 1). The distributions of all the indicators were skewed toward higher levels of protection; thus, we selected a cut point that best allowed us to distinguish between adolescents who were at the extreme low end and those at the more moderate to high ends of the distribution. For the five scale indices (life satisfaction, planful competence, positive school orientation, parents' monitoring and limit-setting, and low friends' ATOD use), a score of *inadequate* (1) was assigned to those in the bottom 25th percentile and a score of *adequate* (2) was given to those above the 25th percentile. Similarly, single-item indices (physical activity, parent-child communication, other adult communication) were assigned a value of *adequate* (2) if a participant's response indicated—based on the extant literature discussed above—a satisfactory level of protection.

A series of latent class models were compared to determine the optimal model in terms of balancing model fit and parsimony. Using several indicators including the likelihood-ratio G^2 statistic, Akaike's Information Criterion (AIC; Akaike 1974), the Bayesian Information Criterion (BIC; Schwartz 1978), and interpretability of results, it was determined that the five-class latent model provided a more optimal solution than the one-, two-, three-, or four-class models ($G^2[df=211]=327.92$, $AIC=415.92$, $BIC=734.42$). Specifically, compared to models with one to four classes, the five-class model had the lowest AIC value and only a slightly higher BIC value than the four-class model ($BIC=733.42$). We also considered the interpretability, degree of latent class separation (i.e., degree to which the latent classes can be clearly distinguished from one another), and size of the latent classes in selecting the optimal model. The latent classes in the five-class solution were easily interpretable, showed high latent class separation, and no single class comprised less than 5% of the sample. The modal G^2 of the five-class solution was also the lowest in 72 out of 100 random starting values indicating the solution was adequately identified. Additional models with six- and seven-classes were also explored; however, these more complex models exhibited identification and convergence problems with no single best solution emerging.

Latent Classes of Protection

Table 2 presents the prevalence estimates for the five latent classes and the probability that members of each class reported an adequate level of protection for each of the eight protective factors (i.e., received a score of "2" for the indicator). According to the model, *Adequate Protection* was the most common latent class, comprising more than half the sample (54%). This class was characterized by very high probabilities of reporting adequate protection across all eight protective indicators. In contrast, a small—but noteworthy—proportion of adolescents (11%) belonged to the *Inadequate Protection* latent class, set apart by low or moderate probabilities of endorsing each of the eight protective factors. The remaining three latent classes were differentiated by a mix of adequate and inadequate protection for each of the internal and external protective factors. Approximately 10% of participants were in the *Adequate External Protection* class, which was characterized by a high probability of endorsing the external

factors but low or moderate probabilities of each of the internal factors, particularly positive school orientation. The *Adequate Protection with Low Adult Communication (Low Adult Communication)* latent class (17%) was comprised of adolescents with low probabilities of talking to their parents (0.31) or other adults (0.44) about their problems, but moderate to high probabilities of endorsing each of the remaining six protective factors. The final latent class, *Adequate Protection with Risky Friends (Risky Friends)*, revealed a similar pattern. This class, represented by 9% of the sample, was distinguished by adequate protection on each of the internal factors and three of the four external factors, but a low probability (0.25) of having non-ATOD using friends (i.e., high levels of ATOD using friends).

Relating Latent Class Membership and Substance Use

In the next set of analyses, the LCA model was extended to include the four substance use behaviors. Binary indicators of lifetime and 30-day use of alcohol and cigarettes were entered into these models as covariates to predict latent class membership. Prior research suggests that associations between risk and protective factors may differ across types of substances or stages of use (Cleveland et al. 2008; Flay et al. 1998; Jackson 1997). Thus, each substance use behavior was added in a separate multinomial logistic regression model with the *Adequate Protection* latent class serving as the reference class.

Figure 1 shows the log-odds of belonging to each latent class, relative to the *Adequate Protection* class, given that the adolescent had used alcohol in their lifetime (top panel) or in the past 30 days (bottom panel). As seen in the figure, lifetime alcohol use was associated with only a modest increase in odds of belonging to the *Adequate External* or *Low Adult Communication* latent classes, but an enormous increase in odds of having *Inadequate Protection* (OR= 35.46) or *Risky Friends* (OR=81.88). Similar effects were found for past month alcohol use. Unlike alcohol use, which was related most strongly with membership in the *Risky Friends* latent class (relative to *Adequate Protection*), cigarette use was most strongly related to membership in the *Inadequate Protection* latent class relative to the other latent classes (see Fig. 2).

Discussion

Given that these five protective profiles showed differential associations with regard to alcohol and cigarette use it can be concluded that the relationships among protective factors and substance use behaviors are not uniform for all adolescents. Modeling both internal and external factors concurrently allowed us to capture the interactive relationships that exist between these factors within individuals (Magnusson 1988, 1995). Rather than examining the linear associations that exist between variables like most previous research, the present study examined how protective factors were organized within adolescents and then grouped those who exhibited similar patterns. Aligned with our interest in capturing the co-occurrence of various protective factors, this person-centered approach provided more information about the multiplicative nature of protection in adolescents (Bergman et al. 2003).

Specifically, according to these data, there exist sub-populations of adolescents for whom alcohol and cigarette use differ depending on their constellation of protective factors. Not surprisingly, individuals in the *Adequate Protection* group were at lowest risk for substance use as assessed by both lifetime and recent alcohol and cigarette use. This finding corresponds with studies demonstrating a direct relationship between protective factors and abstaining from ATOD (e.g., Jelicic et al. 2007; Theokas and Lerner 2006).

Given the important role that parents and adults play as protective factors (see Hawkins et al. 1992; Wooley and Bowen 2007), it was revealing to find that the use of alcohol or cigarettes was associated with a small increase in the odds of membership in the *Adequate Protection*

with *Low Adult Communication* group relative to the *Adequate Protection* group. This finding suggests that in the context of multiple other protective factors (i.e., internal protection, non-ATOD using peers, parental monitoring/limit-setting) which may serve a compensatory role, the absence of communication with parents and adults may be offset. The same “compensatory” reasoning does not, however, hold for the *Adequate Protection with Risky Friends* group. Despite reporting levels of internal and external protection comparable to their peers in the *Adequate Protection* class for seven of the eight protective factors considered, these two groups showed substantially different associations with alcohol and cigarette use. This corroborates previous research showing that adolescents who use ATOD likely have friends who engage in similar behaviors (e.g., Hamm 2000). Our analysis further bolsters the argument that friends’ influence is pervasive in adolescence by showing that the relationship between friends’ ATOD use and adolescents’ ATOD use holds despite the adequate presence of other internal and external protective factors. Looking at the low friends’ ATOD use indicator across the profiles reveals another possible interpretation for the *Adequate Protection with Low Adult Communication* group’s relatively low association with alcohol or cigarette use. Adolescents fitting this profile reported—much like the *Adequate Protection* group—a very high probability of having friends who do not use ATOD. It is possible that not having parents and other adults to share problems with is of less consequence for these youth in light of their positive orientation towards school and having friends who avoid ATOD.

The *Risky Friends* and *Inadequate Protection* groups had the highest levels of association with alcohol and cigarette use. While alcohol use (lifetime and 30-day) was associated with substantially greater odds of belonging to the *Risky Friends* group, adolescents who reported lifetime and 30-day cigarette use were most likely to belong to the *Inadequate Protection* group. These results suggest that the link between protection and ATOD use may differ based on the type of substance (Cleveland et al. 2008; Flay et al. 1998; Jackson 1997). Finding that alcohol use, more than cigarette use, was strongly associated with having few non-ATOD using friends (or, stated in reverse, having ATOD using friends) may be indicative of the social and addictive nature of these substances: While, for most adolescents, alcohol consumption is primarily a social activity done with a group of friends, the addictive power of nicotine compels adolescents to smoke when the craving hits regardless of whether they have a friend to join in (Gardner and Steinberg 2005).

A comparison across the five profiles of protection reinforces the idea that protective factors are not equally weighted. While it is beyond the scope of the models presented here to assign a protective value to each factor, the differential associations between the profiles—each with a unique constellation of adequate protective factors—and adolescent substance use behaviors suggests inadequate levels of some protective factors (e.g., low ATOD-using friends) are more consequential than others.

Limitations and Future Research

In interpreting these findings a few limitations should be noted. First, the protective factors and substance use behaviors examined in this study were not exhaustive. Thus, we do not ascribe these findings to the whole conglomerate of protection in adolescence. Religiosity and community involvement, for example, are not represented in our model but both have been empirically shown to protect against alcohol and drug use (Oman et al. 2004). Additionally, because we only looked at profiles of protection, our study tells us little about the presence of risk factors or how the constellation of risk and protective factors together are linked with substance use. The significant interaction of risk and protection in the prediction of problem behaviors, as demonstrated by Jessor et al. (1995), punctuates this point. Similarly, Pollard et al. (1999) provide a persuasive cross-sectional demonstration suggesting that simply promoting protective factors is an incomplete solution for reducing the prevalence of substance use and

delinquency in adolescents. This was also true for risk: Exclusively reducing risk factors proved just as ineffective. In short, risk and protective factors need to be considered separately as well as in concert to ascertain both their unique and multiplicative contributions to adolescent outcomes.

Second, the data used for these analyses, although nationally representative, were cross-sectional (eighth and tenth grade combined). Specifically, it is unknown whether these latent classes are causally related to substance use. Similarly, it is unknown how the presence or absence of protective factors changes over time. Thus, no conclusions are drawn with respect to causality or developmental processes. It is only suggested that during adolescence there are interesting and differential associations among the identified profiles of protection and substance use.

Building on the present study, future research should examine demographic differences (e.g., sex, race, SES) in the profiles of protective factors, including comparisons of eighth and tenth graders. Such research would allow us to elucidate the culturally, socially, and historically bound nature of adolescent protection (Masten and Curtis 2000). Similarly, future research may consider relating profiles of adolescent protection to prosocial behaviors in addition to indicators of psychological well-being. The field has come to recognize that psychological well-being, and better optimal development, is more than the absence of problems. To be well, one must have the skills, competencies, and coping resources necessary to thrive and overcome difficulties (Cowen 1994). Protective factors are integral to improving psychological well-being (Durlak 1995). Knowing how adolescents' diverse profiles of protection relate to substance use does not allow us to make substantial claims regarding their well-being.

Implications for Prevention Science

Findings from this study have important implications for our understanding of co-occurring protective factors as well as the design of prevention programs targeting adolescent alcohol and cigarette use. As a science, we are moving toward creating a more holistic understanding of individuals (Bergman and Magnusson 1997; von Eye and Bergman 2003). This involves seeing individuals as an organized whole and focusing on the patterns of risk and protection operating at the individual level. Understanding how risk and protective factors cluster in adolescents provides important insight on how to negate or promote healthy functioning (Farrell 2008). By identifying unique profiles of protection for adolescents, these results illustrate the positive synergistic effect of co-occurring protective factors as well as the negative impact of missing key sources of protection. As illustrated with the *Adequate Protection with Risky Friends* class, the absence of a single protective factor can be linked to significantly higher odds of using alcohol and cigarettes; thus, underscoring the need for promotive prevention efforts that target not only individual adolescents but also the full ecology of their daily lives (Dishion et al. 2002). While implementing such programs may be challenging, collaborative family, school, community, and research partnerships may remedy some of these barriers. For optimal development, adolescents need protection across individual, family, peer, school, and community levels. This, like many others, we argue should be the primary endeavor of prevention science.

When it comes to prevention, adolescents have different needs, different risks, and different sources of protection. Although most ATOD prevention programming is delivered in a group or classroom setting, prevention research can benefit from important information obtained when considering individual-level differences in the protective factors that buffer against substance use behaviors. For example, adaptive intervention strategies that tailor the particular dosage or type of treatment across individuals in order to match the intervention strategy with the level of the individual's risk or the absence of a particular protective factor have emerged as new approaches (Collins et al. 2004). Person-centered research on risk and protection shed

light on these differences and create a unique opportunity to develop empirically-based interventions that focus on the individual as a whole and as they exist in the real world.

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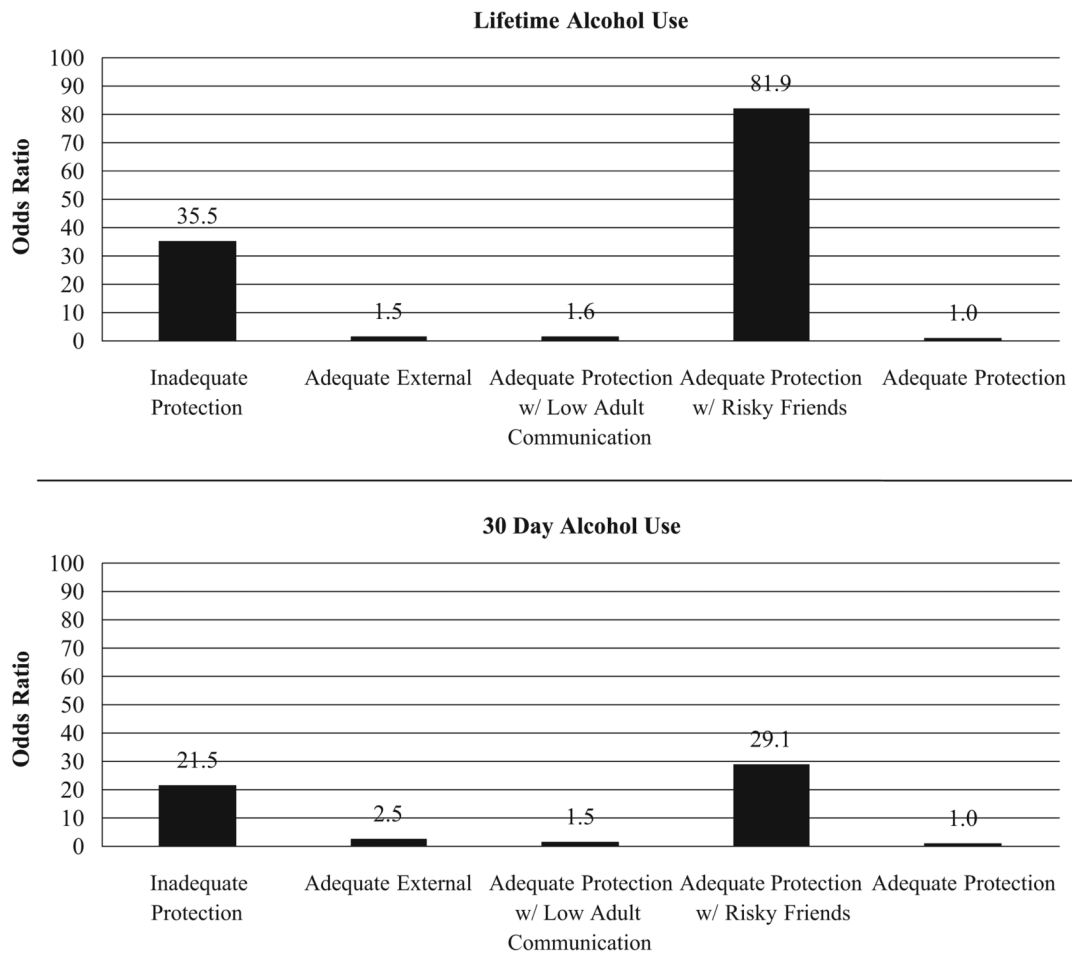


Fig. 1. The log-odds of belonging to each latent class, relative to the *Adequate Protection* class, given that the adolescent had used alcohol in their lifetime (*top panel*) or in the previous 30 days (*bottom panel*). Note. *Adequate Protection* is the reference class

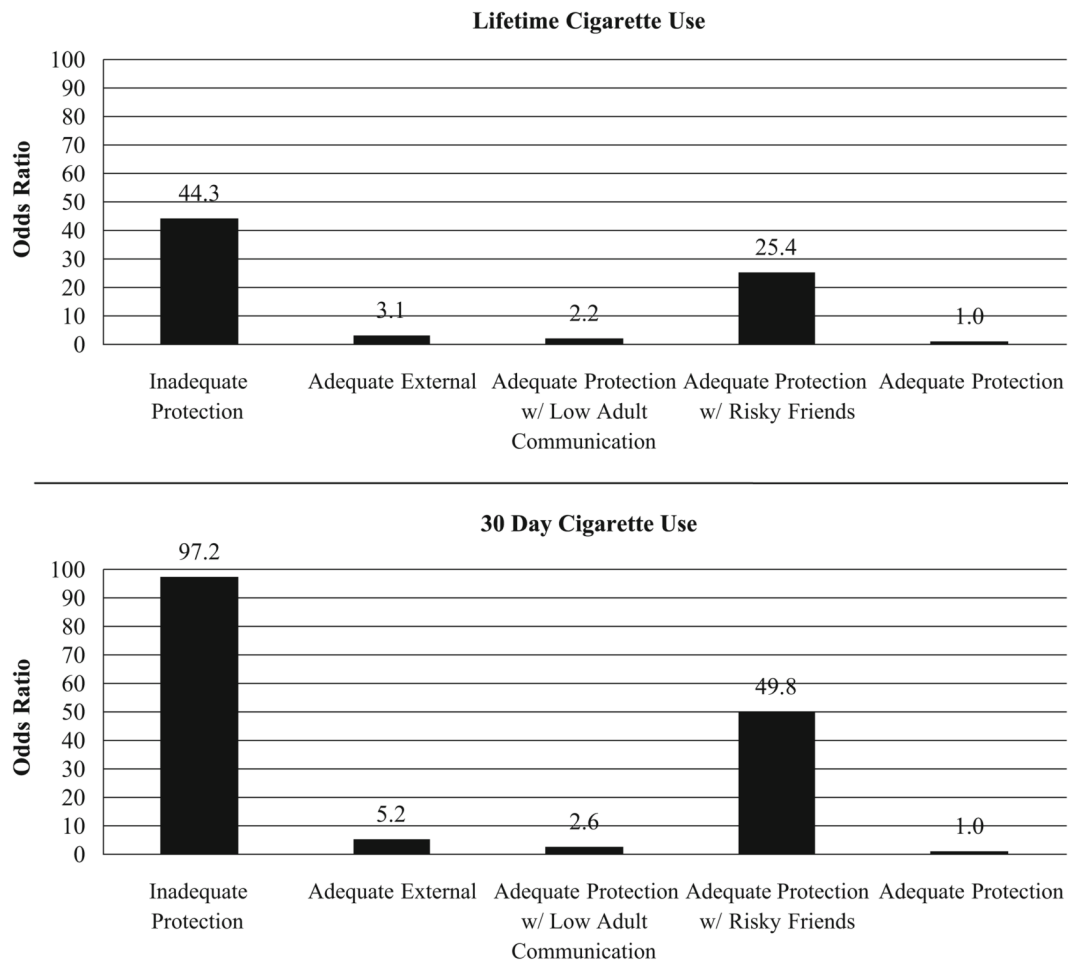


Fig. 2. The log-odds of belonging to each latent class, relative to the *Adequate Protection* class, given that the adolescent had smoked cigarettes in their lifetime (*top panel*) or in the previous 30 days (*bottom panel*). Note. *Adequate Protection* is the reference class

Table 1

Creation of dichotomous latent class indicators and covariates

	Code	Label	Frequency (valid %)
Indicator variables			
Internal protective factors			
Life satisfaction	1	Inadequate ^a	2,237 (21.8%)
	2	Adequate	6,986 (67.9%)
		Missing	1,064 (10.3%)
Planful competence	1	Inadequate ^a	2,231 (21.7%)
	2	Adequate	7,833 (76.1%)
		Missing	223 (2.2%)
Physical activity	1	Inadequate ^b	2,610 (25.4%)
	2	Adequate	7,633 (74.2%)
		Missing	44 (0.4%)
Positive school orientation	1	Inadequate ^a	2,483 (14.1%)
	2	Adequate	7,772 (75.6%)
		Missing	32 (0.3%)
External protective factors			
Parents' monitoring/limit-setting	1	Inadequate ^a	2,004 (19.5%)
	2	Adequate	6,016 (58.5%)
		Missing	2,267 (22.0%)
Parent-child communication	1	Inadequate ^c	2,105 (20.5%)
	2	Adequate	5,871 (57.1%)
		Missing	2,311 (22.5%)
Low friends' ATOD use	1	Inadequate ^a	2,393 (23.3%)
	2	Adequate	7,321 (71.2%)
		Missing	573 (5.6%)
Other adult communication	1	Inadequate ^c	1,871 (18.2%)
	2	Adequate	6,100 (59.3%)
		Missing	2,316 (22.5%)
Substance use behaviors covariates			
Lifetime alcohol use	1	Use	5,025 (48.9%)
	2	Non-use	5,262 (51.2%)
30-day alcohol use	1	Use	7,702 (74.9%)
	2	Non-use	2,585 (25.1%)
Lifetime cigarette use	1	Use	7,164 (69.6%)
	2	Non-use	3,123 (30.4%)
30-day cigarette use	1	Use	9,144 (88.9%)
	2	Non-use	1,143 (11.1%)

^aThe standardized indicator was dichotomized using quartiles: bottom 25% (inadequate) and top 75% (adequate)

^bThe original (single-item) five-point response scale was dichotomized such that physical activity once or twice a month, a few times a year, or never was coded as inadequate and activity at least once a week or almost every day was coded as adequate

^cThe original (single-item) three-point response scale was coded: no (inadequate) and some, most or all (adequate).

Table 2
Latent class membership probabilities and conditional item-response probabilities of latent class membership

	Conditional item-response probabilities of adequate protection ^d				
	Inadequate Protection	Adequate External	Adequate Protection w/Low Adult Communication	Adequate Protection w/Risky Friends	Adequate Protection
Latent class membership probabilities	11%	10%	17%	9%	54%
Internal protective factors					
Life satisfaction	0.29 ^b	0.49 ^c	0.62 ^d	0.81 ^d	0.93 ^d
Planful competence	0.53 ^c	0.55 ^c	0.77 ^d	0.88 ^d	0.86 ^d
Physical activity	0.56 ^c	0.53 ^c	0.71 ^d	0.82 ^d	0.82 ^d
Positive school orientation	0.19 ^b	0.39 ^b	0.83 ^d	0.65 ^d	0.94 ^d
External protective factors					
Parents' monitoring/limit-setting	0.43 ^c	0.62 ^d	0.63 ^d	0.67 ^d	0.89 ^d
Parent-child communication	0.16 ^b	1.00 ^d	0.31 ^b	0.71 ^d	0.95 ^d
Low friends' ATOD use	0.42 ^c	0.61 ^d	0.86 ^d	0.25 ^b	0.90 ^d
Other adult communication	0.44 ^c	0.86 ^d	0.44 ^c	0.94 ^d	0.89 ^d

^aItem-response probabilities indicate a response of adequate protection (i.e., received a score of "2" for the indicator)

^bLow (<0.40) strength of the probability

^cModerate (0.40–0.60) strength of the probability

^dHigh (>0.60) strength of the probability