

Promotion as Prevention: Positive Youth Development as Protective against Tobacco, Alcohol, Illicit Drug, and Sex Initiation

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The present study was designed to examine the association of positive youth development with the likelihood of tobacco, alcohol, marijuana, hard drug, and sex initiation between 5th and 10th grades. A national, largely middle-class sample of 5,305 adolescents, participating in a longitudinal study funded by the National 4-H Council (although not all participants were enrolled in 4-H or other after-school programs), completed measures of positive youth development (PYD) constructs and of tobacco, alcohol, marijuana, and hard drug use once per year between 5th and 10th grades. At the 9th and 10th grade assessments, adolescents were asked whether they had initiated sexual intercourse and, if so, at what age they had first engaged in intercourse. Although the present sample was somewhat lower risk compared to national averages, survival analysis models indicated that PYD was significantly and negatively associated with the initiation hazards for tobacco use, marijuana use, and sex initiation for girls only, and with hard drug use for both genders. PYD was also positively associated with the odds of condom use across genders. Results are discussed with regard to PYD as a preventive process.

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Adolescence is a time of both opportunity and risk. For perhaps the first time in their lives, adolescents are simultaneously able to relate intimately to others and to contribute positively to their own lives and to those of their families and communities (Damon, 2004; Lerner, Dowling, & Anderson, 2003; Lerner, Fisher, & Weinberg, 2000). Volunteering (Atkins, Hart, & Donnelly, 2005), leadership (Martinek, Schilling, & Hellison, 2006), and

other forms of prosocial behavior may become increasingly prominent across adolescence. At the same time, however, adolescence is characterized by sharp increases in rates of tobacco, alcohol, marijuana, and illicit drug use (Johnston, O'Malley, Bachman, & Schulenberg, 2010), as well as in sexual behavior and risk taking (Centers for Disease Control and Prevention, 2009). Adolescence may be thought of, then, as a "double-edged sword," where adolescents have increasing opportunities to engage positively with others in their community, but also may require help avoiding self- and socially-destructive behaviors.

In particular, protecting against problem behavior *initiation* is critical because those adolescents who initiate substance use at early ages (i.e., prior to age 15) may be at risk for long-term difficulties such as substance abuse and dependence (Windle, Mun, & Windle, 2005), reduced educational success (King Meehan, Trim, & Chassin, 2006), and other negative sequelae. Moreover, adolescents who initiate sex at early ages may be more likely to engage in high-risk sexual behaviors such as unprotected sex and sexual relations with greater numbers of partners (Smith, 1997)—both of which pose considerable risks for contracting HIV and other sexually transmitted infections. Individuals who initiate these behaviors later on—or who do not initiate some of them at all—may evidence more positive long-term outcomes.

Appropriately, research on adolescence has focused on both positive and negative aspects of adolescent development and behavior. Although research on negative behaviors and outcomes in adolescents has been prominent for many years (Brown, 2005), attention to positive aspects of adolescent development has come to the fore much more recently (Weissberg, Kumpfer, & Seligman, 2003). The positive youth development (PYD) literature, which has emerged largely in the first years of the 21st century, has its roots in the biological and psychological study of plasticity, adaptation, and resilience (Lerner, Phelps, Forman, & Bowers, 2009; Lester, Masten, & McEwen, 2007). PYD focuses on strengths and assets that individuals possess, as well as the potential of these strengths to facilitate contributions to self, family, and society (Lerner, 2009). Moreover, there is growing evidence that PYD and other positive constructs have the potential to prevent negative adolescent outcomes (Oman et al., 2004; Phelps et al., 2009; Tebes et al., 2007). A finding that PYD protects against or delays initiation of substance use and sexual activity would suggest that positive developmental processes may have the potential to redirect negative trajectories that might otherwise lead to impaired functioning.

The Positive Youth Development Approach: Effects on Positive and Negative Outcomes

The PYD approach was developed based on the premise that all adolescents have the potential to contribute positively to their own lives and to those of their families, communities, and society as a whole (Damon, 2004; Lerner et al., 2009). One initial goal of the PYD approach was to identify characteristics that would be associated with such contributions. Eccles and Gootman (2002) identified five such characteristics, which they labeled as the Five Cs: confidence, competence, connection character, and caring. These Cs include many commonly studied positive psychosocial and relational constructs such as self-esteem, responsible decision making, and connections to family and friends—all of which have been found to protect against substance use and unsafe sexual behavior (e.g., Donnellan, Trzesniewski, Robins, Moffitt, & Caspi, 2005; Fergusson, Swaim-Campbell, & Horwood, 2002; Nash, McQueen, & Bray, 2005). In a series of studies, Lerner and colleagues (e.g., Jeličić, Bobek, Phelps, Lerner, & Lerner, 2007; Lerner et al., 2005; Phelps et al., 2007, 2009; Zimmerman, Phelps, & Lerner, 2008) found that these Five Cs related strongly to a latent PYD construct and that this construct was positively predictive of contribution (e.g., volunteering, community service) and negatively predictive of problem or risk behaviors (e.g., delinquency, drug and alcohol use). Other studies, using similar ways of operationalizing PYD (e.g., future orientation; connections to family, friends, and community; making responsible choices) have also found PYD to negatively predict risk behavior (e.g., Oman et al., 2004; Scales et al., 2005). A recent series of reviews has highlighted the importance of several Cs in delaying sex initiation in adolescence, including competence (House, Bates, Markham, & Lesesne, 2010), confidence (Gloppen, David-Ferdon, & Bates, 2010), character (House, Mueller, Reininger, Brown, & Markham, 2010), and connection (Markham et al., 2010). What has not been investigated, however, is the effect of the Cs conjointly (i.e., the PYD construct) on sex initiation or on this initiation within a constellation of other risk behaviors.

A systemic view of development would hold that, given that positive and negative developmental trajectories can coexist within a single adolescent, such trajectories must be related in some way (cf. Lerner & Galambos, 1998; Small & Memmo, 2004). Indeed, it may be possible—and in fact desirable—to emphasize not whether to focus on positive or negative adolescent outcomes, but rather on how these outcomes are related, and whether positive adolescent outcomes can prevent negative outcomes. Many drug and alcohol use prevention programs targeting children and adolescents, for

example, target positive processes, such as connections to family (Prado et al., 2007), school (Ialongo et al., 1999), and community (Hawkins, Catalano, & Arthur, 2002), as a way of preventing negative or risky outcomes. As a result, the prevention science approach, which focuses on eliminating the emergence of, or reducing, harmful or risky behaviors; and the positive youth development approach, which focuses on promoting strengths, may share in common a goal of facilitating adolescent health and wellness (Catalano, Hawkins, Berglund, Pollard, & Arthur, 2002; Catalano, Berglund, Ryan, Lonczak, & Hawkins 2004; Schwartz, Pantin, Coatsworth, & Szapocznik, 2007).

Indeed, the prevention science and PYD perspectives may complement one another in that the positive processes fostered by efficacious prevention programs may be closely related to those studied within the PYD and positive psychology literatures—and may help to offset or delay drug/alcohol use, unsafe sexual behavior, and other undesirable or health-compromising outcomes. Scholars working within the PYD literature have also suggested that promoting PYD may help to prevent negative adolescent outcomes (Benson & Pittman, 2001); although, the ability of PYD programs to prevent adolescent risk taking has seldom been subject to rigorous empirical evaluation (e.g., Catalano et al., 2004). Empirical evidence is needed regarding the extent to which “promotion” (e.g., fostering PYD) and “prevention” (e.g., avoiding risky or problematic outcomes) represent convergent theoretical, empirical, and applied constructs and goals.

An additional issue that requires examination is the role of gender. Many risk and protective factors have been shown to operate more strongly for girls than for boys. For example, parental control, neighborhood social processes, and self-efficacy may be more strongly protective against risk taking behaviors for girls (e.g., Kroneman, Loeber, & Hipwell, 2004; Pearson, 2006; Vermeersch, T’Sjoen, Kaufman, & Vincke, 2008). Moreover, in some cases, the effects of PYD on risk behaviors have been found to be stronger for girls than for boys (e.g., Mueller et al., 2010; Oman et al., 2004), suggesting that studies assessing the associations between PYD and negative adolescent outcomes should examine gender as a potential moderator.

The Present Study

Although higher levels of PYD have been shown to predict lower levels of engagement in drug/alcohol use and unsafe sexual behavior, the effects of PYD on initiation of these behaviors has not been systematically studied. The goal of the present study was, therefore, to address

this research gap by examining how PYD is related to risk behavior initiation. As already noted, research suggests that the earlier an adolescent initiates drug or alcohol use, the more severe the subsequent levels of use (and the consequences of use) are likely to be (Ellickson, Tucker, Klein, & Saner, 2004; McCluskey, Krohn, Lizotte, & Rodriguez, 2002). Although some experimentation with tobacco, drugs, alcohol, and sexual activity is normative in adolescence (Shedler & Block, 1990; Walton & Roberts, 2004), initiation prior to age 15 (10th grade for many adolescents) tends to be problematic. As a result, in the present study, we examined the extent to which, during early and middle adolescence—between 5th and 10th grades—higher levels of PYD would be associated with a lower hazard of initiating tobacco, alcohol, marijuana, and hard drug use, as well as sexual activity. We also examined the moderating effect of gender and expected that, where gender differences emerged, the effects would be stronger for girls than for boys.

METHOD

Participants

Data for the present analyses were taken from the 4-H Study of Positive Youth Development, a longitudinal study of PYD and its relationships to positive and negative adolescent outcomes. The initial cohort of participants was recruited in 2002 from schools in 13 states. Schools and school districts were selected so as to provide regional, rural–urban, racial/ethnic, and religious diversity. Wave 1 assessments were conducted in 57 schools and in four after-school programs; follow-up assessments were also conducted in schools to the extent possible. Exceptions, as described in the Attrition section, included those students who were originally assessed through after-school programs and those whose school principals or superintendents decided not to permit further assessments in their schools or districts. Adolescents whose schools had discontinued their participation in the study were asked to complete their surveys by mail or over the Internet (see the following for more details on this procedure).

Although the study was funded by the National 4-H council, adolescents in the sample participated in many different after-school activities and less than half participated in 4-H. The 4-H Study data set was designed to investigate the structure and functions of the Five Cs and of PYD. As such, it is ideal for investigating the contribution of PYD to protecting against health risk behaviors over time in adolescence. Assessments were conducted annually, allowing for repeated measurements of PYD and risk behaviors.

The sample for the present analyses is comprised of 5,305 adolescents (60.3% female; 39.4% male, 0.3% unidentified by gender) who provided data for PYD and for tobacco, alcohol, marijuana, and hard drug use at one or more of the six study time points. Assessments were conducted yearly beginning in 5th grade, and this article reports results from the first six waves (5th through 10th grades). The mean age of youth in this sample at Wave 1 was 10.97 years ($SD = 0.52$ years). Mean ages at subsequent time points were 12.09 ($SD 0.69$) at Wave 2, 13.14 ($SD 0.87$) at Wave 3, 14.40 ($SD 1.40$) at Wave 4, 14.93 ($SD 1.10$) at Wave 5, and 15.72 ($SD 1.37$) at Wave 6. Socioeconomic status (SES) was indexed as average family per capita income (mean \$15,422; $SD = \$9,531$). Based on national figures, this would suggest that the sample was largely middle class. Approximately 48% of participants resided in suburban areas, about 26% in urban areas, and about 26% in rural areas. In terms of ethnicity, 66% of adolescents were non-Hispanic White, 7% were African American, 12% were Hispanic, 3% Asian, 3% Native American, and 4% mixed ethnicity. These figures are largely consistent with the current ethnic breakdown of the U.S. population (Bernstein, 2008).

The study used a multiple-cohort design, where a new cohort of participants is added at each time point to offset losses due to attrition and to control for the effects of repeated testing (Baltes, Reese, & Nesselroade, 1977). For example, for Wave 2, the original cohort of 5th graders (who were now in the 6th grade) was retested, and a new cohort of 6th graders was added to the sample. The addition of subsequent cohorts was an a priori decision enacted prior to the beginning of the study, and we have conducted our analyses so as to examine whether the inclusion of these subsequent cohorts affects the results and conclusions drawn from the study. The absence of significant differences on key variables and patterns of findings between new and existing cohorts at any wave would suggest that the earlier cohorts are not biased by previous exposure to the survey questions. During Waves 2 and 3, the additional cohorts included only youth from schools; whereas during Waves 4, 5, and 6, the additional cohorts included youth from schools, as well as additional youth from 4-H clubs around the country. An especially large cohort ($n = 1,626$) was added at Wave 6 (10th grade) to compensate for attrition at the prior two time points. The ethnic distributions of the attrition replacement cohorts were equivalent to the ethnic distribution of the first cohort. With the exception of the last time point (Wave 6, 10th grade), there were no cohort mean differences in study variables at any of the study time points.

Differences between the sixth cohort and the other cohorts are summarized in Table 1. In total, 43 states were represented in the sample. As noted, at Wave 1, data

TABLE 1
Comparisons between Cohorts 1–5 and Cohort 6

Variable	Cohorts 1–5	Cohort 6	t/χ^2	Cohen's d/ϕ
Gender (% Male)	41.5%	36.4%	12.92***	.05
Age	15.53 (1.52)	16.08 (0.91)	10.47***	.41
PYD	72.00 (12.48)	71.58 (12.20)	0.75	.03
Tobacco Use (%)	17.4%	13.9%	4.34*	.05
Alcohol Use (%)	41.9%	30.4%	26.68***	.11
Marijuana Use (%)	14.1%	9.5%	9.53**	.07
Hard Drug Use (%)	3.8%	3.7%	0.01	.00
Initiated Sex (%)	24.4%	17.3%	15.33***	.08

Note: Cohen's d is an effect size index for t -tests, whereas phi (ϕ) is an effect size index for chi-square tests. For continuous variables, standard deviations are in parentheses.

* $p < .05$; ** $p < .01$; *** $p < .001$.

were collected from 57 schools and 4 after-school programs. At Wave 4, when recruitment efforts shifted toward greater inclusion of 4-H clubs, data were collected from 35 schools and 12 after-school programs. At Wave 6, data were collected at 18 schools and 82 after-school programs. Schools and after-school programs were selected so as to provide diversity in terms of region of the United States, rural/suburban/urban setting, socioeconomic status, and ethnicity. Similar recruitment strategies were used both at schools and at after-school programs—school principals or program officials were contacted and asked to provide a list of potential participants. Participants were then approached and asked to bring a consent form home to their parents and to provide assent to participate. The same recruitment strategies were used for the cohorts added at each wave.

Attrition

Attrition is not randomly distributed across schools. In Waves 2 through 6, some principals or superintendents withdrew consent for their schools to participate, and thus these students “dropped out” without our having the opportunity to ask them whether they wanted to remain in the study. Because assessments were conducted on the grounds of the school or after-school program from which adolescents were recruited, when a school or program discontinued participation in the study, we essentially lost access to those adolescents. Overall, we lost 561 participants in Wave 2 because of the absence of principal or superintendent permission to continue. In turn, however, attrition from Wave 1 to Wave 2 for students who were allowed to be asked to remain in the study was only 10%. Out of 1,954 participants tested in Wave 2, 337 participants (17.5%) dropped out because of school/site attrition in Wave 3, but there was also 21.5% individual attrition. There was also considerable attrition during Waves 5 and 6, when adolescents were transitioning to high

school. When adolescents transitioned from middle to high school, many high schools elected not to permit us to conduct assessments on their grounds—thereby preventing us from accessing these students easily.

Youth in schools that had discontinued participation were contacted through mail or phone and were asked to complete the survey and mail it back to us or to complete it online. The numbers of adolescents completing the survey by mail were 46 (0.5% of the sample), 20 (1.7%), and 55 (2.4%) at Waves 4, 5, and 6, respectively. The numbers of adolescents completing the survey online were 133 (1.5% of the sample), 87 (7.5%), and 273 (11.6%) at Waves 4, 5, and 6, respectively. A series of chi-squares and analyses of variance at Waves 4, 5, and 6 did not indicate any differences in PYD scores or risk behavior participation by mode of administration.

We established a protocol across each wave to contact all adolescents who have ever participated in the study, such that many youth who missed the survey in earlier waves return to the study in later waves. For Wave 4, 746 (42%) of the 1,792 youth tested in Wave 3 dropped out because of site non-participation, and 93 youth (5%) were lost to individual attrition. At Wave 5, when adolescents were transitioning to high school, 1,424 (72%) of youth who provided data in Wave 4 were lost to follow-up. At Wave 6, 48% of youth tested at Wave 5 were lost to follow-up—this loss was driven largely by 65% attrition among adolescents who entered the study at Wave 5 (9th grade).

We have relatively little concern about systematic bias in the sample as new youth were recruited. Because the successive-cohort design was planned prior to the conduct of the study, data at time points prior to an adolescent's entry into the study can be considered "missing by design" (Davey & Savla, 2010). That is, because these adolescents had not been recruited into the study at earlier time points, their missing data at these earlier time points could not have been caused or predicted by their demographic characteristics, PYD scores, or risk-taking behavior. However, attrition from longitudinal studies is rarely random (Hofer & Hoffman, 2007), suggesting that data at time points following an adolescent's exit from the study are likely not missing at random. Of the original fifth-grade cohort who provided PYD and/or risk behavior data at the first time point ($n = 1,673$), only 11% provided data at the sixth time point (10th grade). These numbers generally increase by cohort: 21% of participants in the cohort that started in 6th grade provided data in 10th grade, compared with 29% of the cohort that started in 7th grade and 65% of the cohort that started in 9th grade. The lone exception was the cohort that started in 8th grade, of which 83% of participants did not provide data at 9th or 10th grade when they moved into high school.

Given the comparatively large amounts of attrition at Waves 4 (8th grade), 5 (9th grade), and 6 (10th grade), for each of these waves, we compared retained youth and dropouts on demographic characteristics as well as on substance use variables and PYD scores from the previous wave. Wave 4 dropouts were slightly older and reported slightly lower PYD scores compared to youth retained at Wave 4. Wave 4 dropouts were also significantly more likely to have used tobacco, marijuana, and hard drugs. Youth retained at Wave 5 reported, on average, higher annual per capita incomes compared to dropouts. Among the Wave 4 substance use variables, only hard drug use differed between youth retained versus lost to follow-up at Wave 5 (with dropouts more likely to report use). Youth who were retained versus lost to follow-up at Wave 6 differed only in terms of alcohol and marijuana use, with dropouts more likely to report use of both of these substances. There were no gender differences in attrition at any of the waves.¹

Procedures

Once we had obtained permission from schools and after-school programs (including 4-H clubs) to assess adolescents, we obtained parental consent and adolescent assent to participate. Adolescents were asked to volunteer to take part in the study. Participants were tested in groups within their schools (in more than 95% of the cases) or as part of after-school programs. Trained study staff or assistants, who began all testing sessions by reading the instructions to the participants, conducted data collection. For all waves of data collection, teachers, or program staff gave each child an envelope to take home to their parent or guardian, containing a letter explaining the study, consent form, a parent questionnaire, and a self-addressed envelope for returning the parent questionnaire and consent form. For those youth who received parental consent and who assented to participate, data collection was conducted either in the school or program by trained study staff or hired assistants for remote locations.

The procedure began with reading the instructions for the student questionnaire (SQ) to the youth. Participants were told that they could skip any questions they did not wish to answer. Data collection took approximately two hours, which included one or two short breaks. During Waves 2 and 3, students who were unable to be surveyed at their school or after-school program site—those who were absent during the day of testing and those for whom the school superintendent did not allow testing to occur in the school—received a

¹Statistical information regarding these attrition analyses is available from the first author on request.

survey in the mail. During Waves 4, 5, and 6, youth were surveyed in their schools or youth programs following the same procedure as in the first three waves. Youth who were absent on the day of the survey or who attended schools that did not allow on-site testing were contacted by e-mail, mail, or phone, and were asked to complete and return the survey to us. In Waves 5 and 6, given the increasing availability of online assessment tools, youth were encouraged to complete the survey online. All of the same procedures were used with the original Wave 1 cohort and with each of the attrition replacement cohorts.

Measures: Positive Youth Development

In this section, we report internal consistency coefficients using Nunnally and Bernstein's (1994) formula for calculating the reliability of a composite score. In this formula, reliability is computed as the ratio of the variance explained by the composite to the total reliability among the indicators. For each C, the component scores were standardized, converted to a 0–100 score, and averaged. Validity for the measures of the Cs, and of the PYD composite, can be inferred by the repeated finding (Lerner et al., 2005; Phelps et al., 2007; Phelps et al., 2009; Zimmerman, Phelps, & Lerner, 2007, 2008) that the Five Cs all correlate strongly and positively with one another, that they load onto a latent PYD construct, and that they are positively predictive of contributions to society and negatively predictive of depressive symptoms and risk behavior participation.

Confidence

Confidence is constructed as the weighted mean of 12 items on the student questionnaire. Six of the items measure positive identity (Theokas et al., 2005) and come from the Search Institute's Profile of Student Life – Attitudes and Behaviors Survey (PSL-AB; Benson, Leffert, Scales, & Blyth, 1998). The response format for these six items ranged from 1 = *strongly agree* to 5 = *strongly disagree*. An example of an item used to measure positive identity is "On the whole I like myself."

The remaining six items used to construct the confidence indicator are taken from the self-worth scale from the Self-Perception Profile for Children (SPCC; Harter, 1983). Harter (1982) developed a structured alternative response format to assess perceived competence in a domain. Participants are asked to choose between two types of people. Once they have selected which person they are most like, they are asked to decide whether the statement is "really true for me" or "sort of true for me." The items are counterbalanced so that half begin with a positive sentence, reflecting high

confidence, while half begin with a negative sentence, reflecting low confidence. Each item is scored from 1–4, with 4 reflecting higher perceived competence. An example of an item used to assess self worth is "Some kids don't like the way they are leading their lives BUT Other kids do like the way they are leading their lives." Across waves, reliability estimates for the scales comprising the Confidence score ranged from .80 to .88 (see also Zimmerman, Phelps, & Lerner, 2007).

Competence

Competence is constructed as the weighted mean of 17 items on the student questionnaire. Twelve of the items used to measure competence come from the Self-Perception Profile for Children (Harter, 1983). Six of the items form the academic competence scale and six of the items from the social competence scale. As mentioned previously, the SPPC uses a structured alternative response format. An example of an item from the academic competence scale is "Some kids feel like they are *just as smart* as other kids their age BUT Other kids aren't so sure and *wonder* if they are as smart." An example of an item from the social competence scale is "Some kids have *a lot* of friends BUT Other kids *don't* have very many friends."

The remaining five items used to index competence come from the PSL-AB. Four of these items measure school engagement. Three of these items have a forced choice response to ascertain how often a respondent does something. The response format for these items ranged from 1 = *Usually* to 3 = *Never*. An example of an item measuring school engagement using this response format is "How often do you feel bored at school?" The fourth school engagement item "At school I try as hard as I can to do my best work" used a response format ranging from 1 = *strongly agree* to 5 = *strongly disagree*. The final item measuring competence, "What grades do you earn in school?" had a forced choice response format that ranged from 1 = *Mostly A's* to 8 = *Mostly below D's*. Reliability for the competence scores across waves ranged from .74 to .88.

Character

Eighteen items from the Search Institute's PSL-AB. These items measure interpersonal skills, valuing of diversity, personal values, and social conscience. The five items that measure personal values and the six items that measure social conscience use a forced choice response format and ask participants to rate how important each item is in their life. Response formats range from 1 = *not important* to 5 = *extremely important*. An example of an item measuring personal values is

“Telling the truth, even when it’s not easy,” while an example of an item measuring social conscience is “Helping other people.”

One of the items used to measure valuing of diversity, “Getting to know people who are of a different race than I am,” uses the same response format as mentioned previously for measuring importance. The remaining 3 items used to measure valuing of diversity, as well as the 3 items used to measure interpersonal skills, ask participants to think about the people who know them well and how they think these people would rate them on each of the items. The response format is forced choice and ranges from 1 = *not at all like me* to 5 = *very much like me*. An example of an item measuring valuing of diversity that uses this response format is: “Knowing a lot about people of other races.” An example of an item used to measure interpersonal skills is “Caring about other people’s feelings.” Reliability for the character scores across waves ranged from .90 to .95.

Caring

Five items from the Eisenberg Sympathy Scale (ESS; Eisenberg et al., 1996) are used to assess caring. The items measure the degree to which participants feel sorry for the distress of others. The response format for these items ranged from 1 = *really like you* through 3 = *not like you*. High scores indicate low levels of sympathy. An example of an item from the ESS is “I feel sorry for people who don’t have the things I have.” Reliability for the caring scores across waves ranged from .84 to .88.

Connection

To index connection, 22 items from the student questionnaire are used. These items measure connection to family (six items), school (seven items), peers (four items), and community (five items). All of the items measuring connection to family, connection to school, and connection to community come from the PSL-AB. Five of the items measuring connection to family, six of the items used to measure connection to school, and all of the items used to measure connection to community use the forced choice response format ranging from 1 = *strongly agree* to 5 = *strongly disagree*. An example of an item measuring connection to family is “My parents give me help and support when I need it.” An example of an item measuring connection to school is “I get a lot of encouragement at my school.” An example of an item measuring connection to community is “Adults in my city or town make me feel important.”

The sixth item measuring connection to family, “If you had an important concern about drugs, alcohol, or sex, or some other serious issue, would you talk to

your parent(s) about it?” uses a forced choice response format ranging from 1 = *yes* to 5 = *no*. The seventh item measuring connection to school, “How often do you feel bored at school?” uses a forced choice response format ranging from 1 = *usually* to 3 = *never*.

The items used to measure connection to peers come from the Teen Assessment Project Survey Question Bank (TAP; Small & Rodgers, 1995). These items are adapted from the peer support section of the Inventory of Parent and Peer Attachment (IPPA; Armsden & Greenberg, 1987). These items use a forced choice response format that ranges from 1 = *always true* to 5 = *almost never true or never true*. An example of an item is “My friends care about me.” Reliability for the connection scores across waves ranged from .88 to .91.

Total PYD Score

Each C was converted to a 0–100 scale where the lowest possible score was changed to zero and the highest possible score was changed to 100. Intermediate scores were converted to the 0–100 scale by calculating the proportional distances from the lowest and highest possible scores, and converting this to a score between 0 and 100. Each C was then weighted by its standardized factor loading from a confirmatory factor analysis of the Five Cs at Wave 1 (reported in Lerner et al., 2005), and a PYD score for each participant (separately for each measurement wave) was computed as the weighted mean of the Five Cs. Reliability for the total PYD scores across waves ranged from .73 to .95.

Measures: Substance Use and Sex Initiation

At each wave, participants were asked how often they had ever used cigarettes, chewing tobacco/snuff, alcohol, marijuana, and hard drugs. A 4-point response scale was used for these items: 0 (*Never*), 1 (*Once or Twice*), 2 (*Occasionally*), and 3 (*Regularly*). For each substance, we used these responses to create a set of dichotomous indicators reflecting whether the person had (1) or had not (0) initiated use on or before the assessment date for each wave. These single-item indicators were used in discrete-time survival analyses, as described in the Results section.

Sexual behavior data were gathered only in 9th grade and 10th grades because many school officials were unwilling to allow us to ask about sexuality in elementary or middle school. Participants were asked whether or not they had initiated sexual intercourse, how old they were the first time they engaged in sexual intercourse, and how often they used condoms when they engaged in intercourse (never, sometimes, or always).

Analytic Strategy

Analyses proceeded in four general steps. First, we examined the prevalence of tobacco, alcohol, marijuana, and hard drug use in the sample at each time point and compared these prevalence rates against those from the Monitoring the Future national probability sample (Johnston et al., 2010). Second, for each of the four types of substances included in our analyses (tobacco, alcohol, marijuana, and hard drugs), we estimated a discrete-time survival model (see Henry, Thornberry, & Huizinga, 2009) where PYD was allowed to predict the survival function. Discrete-time survival analysis is appropriate when the outcome of interest is measured only at specific intervals, and where the exact timing of initiation is impossible to determine. Third, we used the ages reported for first sexual intercourse to determine the number of months between the Wave 1 survey (or the participant's age when Wave 1 occurred, for participants who were not in the study at Wave 1) and the time when sex initiation occurred. Fourth, we then used this information to conduct a continuous-time survival analysis where PYD was allowed to predict the timing of sex initiation.

RESULTS

The Five Cs and PYD across Waves

Table 2 displays the means and standard deviations for each of the Five Cs, and for the total PYD score, across waves. It is apparent from the Table that each of the Cs, and PYD as a whole, declines somewhat following Wave 3 (7th grade). This is somewhat consistent with prior research suggesting that self-conceptions become less positive during the middle school years (Harter, 1999).

Prevalence of Tobacco, Alcohol, Marijuana, and Hard Drug Use

Table 3 displays the percentages of male and female participants reporting having ever used cigarettes, chewing tobacco/snuff, alcohol, marijuana, and other

illicit drugs prior to each assessment time point. Consistent with developmental expectations (e.g., Costello, Dierker, Jones, & Rose, 2008; Johnston et al., 2010), for both genders, rates of use generally increased over time for each substance through 9th grade. However, there was then a slight drop off from 9th to 10th grade. As noted in the Attrition section, participants who used substances were more likely to drop out of the study compared to those who did not.

According to adolescents' self-reports, alcohol was the most frequently used substance, followed by cigarettes and marijuana. Because of the low base rates for chewing tobacco/snuff, we combined cigarette smoking and chewing tobacco/snuff into a "tobacco use" variable for further analyses. At the 9th grade assessment point, 18.7% of participants providing data indicated that they had initiated sexual intercourse. The corresponding percentage was 19.6% at 10th grade (24.4% when adolescents added to the sample at 10th grade are excluded).

Rates of substance use reported by the participants in this sample were somewhat lower than those from the 2009 Monitoring the Future national sample (Johnston et al., 2010). This difference was evident for all four substances that we assessed (tobacco, alcohol, marijuana, and hard drugs). Rates of sexual activity at 9th and 10th grades were also considerably lower than national norms provided by the Youth Risk Behavior Surveillance Survey (CDC, 2009). Our sample might therefore be considered fairly low-risk.

Positive Youth Development as a Predictor of Substance Use Initiation

Because of the non-random attrition that characterizes longitudinal research (Hofer & Hoffman, 2007), we used discrete-time survival analysis, which does not assume missingness at random (Singer & Willett, 1993), to model PYD as a predictor of substance use initiation. Gender and the interaction between gender and PYD were also entered as predictor variables. Because of differential attrition by age and family income, our intent was to control for these variables in analysis. However,

TABLE 2
Descriptive Statistics for the Five Cs and PYD across Waves

Variable	Wave 1 <i>M (SD)</i>	Wave 2 <i>M (SD)</i>	Wave 3 <i>M (SD)</i>	Wave 4 <i>M (SD)</i>	Wave 5 <i>M (SD)</i>	Wave 6 <i>M (SD)</i>
Confidence	77.25 (14.51)	77.85 (13.64)	78.71 (13.06)	74.44 (18.62)	75.26 (18.52)	72.55 (18.57)
Competence	78.64 (12.29)	79.53 (11.29)	79.79 (10.95)	72.32 (15.52)	72.22 (16.05)	69.66 (15.43)
Character	76.36 (15.11)	75.08 (15.11)	76.57 (13.09)	70.28 (15.15)	71.62 (16.57)	72.43 (15.15)
Caring	80.09 (25.69)	76.67 (27.99)	74.92 (17.54)	72.28 (18.46)	71.44 (18.83)	74.64 (18.18)
Connection	77.07 (13.08)	75.07 (13.03)	70.73 (13.57)	68.51 (15.87)	70.66 (14.81)	69.41 (15.49)
PYD (Total)	78.18 (11.44)	75.69 (11.14)	75.92 (10.34)	71.37 (12.62)	71.59 (13.28)	71.71 (12.29)

TABLE 3
Prevalence of Cigarette, Alcohol, Marijuana, and Other Illicit Drug Use by Gender and Time Point

Substance	5th Grade		6th Grade		7th Grade		8th Grade		9th Grade		10th Grade	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Cigarette Use												
Any Use ^a	4.4%	1.7%	5.6%	6.0%	9.2%	9.3%	13.6%	12.2%	19.9%	15.1%	21.2%	14.2%
Once/Twice	3.6%	1.2%	0.4%	0.6%	7.3%	5.3%	8.2%	6.3%	9.8%	7.2%	11.7%	8.9%
Occasionally	0.7%	0.4%	0.4%	0.6%	0.8%	2.8%	3.4%	4.4%	5.9%	3.6%	4.0%	3.0%
Regularly	0.1%	0.1%	6.4%	4.8%	1.1%	1.2%	2.0%	1.5%	4.2%	4.3%	5.5%	2.3%
Chewing Tobacco/Snuff												
Any Use ^a	1.8%	0.4%	3.1%	1.2%	5.8%	3.2%	13.1%	3.5%	15.8%	3.4%	18.0%	2.5%
Once/Twice	1.1%	0.2%	2.2%	0.8%	3.3%	2.0%	5.5%	2.3%	7.3%	1.7%	6.6%	1.5%
Occasionally	0.4%	0.2%	0.5%	0.4%	1.8%	1.0%	4.1%	0.4%	4.8%	0.7%	7.7%	0.8%
Regularly	0.3%	0.0%	0.4%	0.0%	0.7%	0.2%	3.5%	0.8%	3.7%	1.0%	3.7%	0.2%
Alcohol Use												
Any Use ^a	19.1%	9.0%	21.4%	18.8%	22.5%	20.1%	32.4%	31.7%	43.8%	25.8%	38.3%	42.2%
Once/Twice	16.2%	7.4%	17.7%	14.9%	17.5%	15.9%	19.7%	18.5%	23.2%	18.0%	18.2%	23.0%
Occasionally	2.4%	1.5%	3.1%	3.6%	4.3%	3.1%	9.1%	11.0%	14.1%	3.4%	14.9%	16.9%
Regularly	0.5%	0.1%	0.6%	0.3%	0.7%	1.1%	3.6%	2.2%	6.5%	4.4%	5.2%	2.3%
Marijuana Use												
Any Use ^a	1.3%	0.5%	2.7%	2.2%	5.3%	3.8%	7.5%	6.6%	17.4%	12.1%	16.5%	11.5%
Once/Twice	1.1%	0.4%	1.9%	2.1%	3.3%	1.6%	3.2%	3.5%	5.9%	4.6%	8.4%	6.6%
Occasionally	0.1%	0.1%	0.3%	0.1%	1.0%	1.7%	2.3%	1.9%	7.0%	4.6%	3.3%	3.6%
Regularly	0.1%	0.0%	0.5%	0.0%	1.0%	0.5%	2.0%	1.2%	4.5%	2.9%	4.8%	1.3%
Hard Drug Use ^a												
Any Use	1.2%	0.6%	0.9%	1.1%	3.1%	2.3%	4.3%	2.7%	5.7%	4.5%	5.5%	2.7%
Once/Twice	0.8%	0.1%	0.4%	0.9%	1.6%	1.0%	2.2%	1.5%	1.7%	1.7%	1.8%	2.1%
Occasionally	0.1%	0.4%	0.1%	0.2%	0.7%	1.0%	1.2%	0.5%	2.3%	2.0%	2.6%	0.4%
Regularly	0.3%	0.1%	0.4%	0.0%	0.8%	0.3%	0.9%	0.7%	1.7%	0.8%	1.1%	0.2%

Note: 18.7% of participants providing data at 9th grade, and 19.6% of participants providing data at 10th grade, reported having engaged in sexual intercourse.

^aRepresents the sum of the other categories.

family income was only assessed during Waves 1–4, such that participants who entered the study during Waves 5 and 6 did not have data on family income. We, therefore, conducted our analysis both with and without family income as a covariate, and the results were virtually identical. As a result, so as to allow participants entering the study at Waves 5 and 6 to be included in the analyses, we dropped family income from the model. Age was retained as a control variable in the final analyses.

In addition, to test for cohort effects, we conducted a preliminary analysis where PYD X Cohort interaction terms were created and allowed to predict risk behavior initiation (along with PYD). We computed these interaction terms by creating dummy variables for cohort (with the first cohort used as the reference group) and, then, interacting these dummy variables with PYD. Of the 15 interaction effects tested, only one (6.7%) was statistically significant as a predictor of risk behavior. This is approximately what would be expected by chance at $\alpha = .05$ and, as a result, we concluded that cohort effects likely did not bias the study results.

As with other forms of survival analysis, participants who have already initiated the behavior in question at

their first time point are treated as left-censored, and participants who end their participation in the study before initiating the behavior in question are treated as right-censored (Hosmer, Lemeshow, & May, 2008). In either case, censoring indicates that the event of interest is not observed during the study period. For each adolescent, we used as the predictor variable the PYD score from the time point before the one at which use was first reported. Adolescents identified as left-censored—who had already initiated the behavior in question at the first wave—were excluded from analysis for the behavior in question (though they could be included in analyses for other behaviors). For adolescents identified as right-censored, for whom the event of interest was not observed at all during the study, we used as the predictor the PYD score at the last time point at which they provided data (Allison, 1995). Because PYD was measured on repeated occasions, in the absence of a compelling rationale for using a different time point, we concluded that the most reasonable approach was to use the most recently measured PYD score (prior to initiation) as the predictor—to permit us to assume directionality in, and to most accurately estimate the strength of, the association between PYD and risk behaviors.

Across time points, 6.4% of the sample ($n = 338$) was left-censored with respect to tobacco use, 14.3% ($n = 757$) for alcohol use, 2.3% ($n = 124$) for marijuana use, and 1.1% ($n = 56$) for hard drug use. For adolescents who entered the study at later time points, we used a “logical coding” approach to obtain survival data for time points prior to their entry into the study. Adolescents who reported no use of the substance in question at the time point when they entered the study were assigned scores of 0 (no use) at all previous time points.

These survival models were estimated using Mplus release 5.1 (Muthén & Muthén, 2007). Following Muthén and Masyn (2005), the survival function was modeled by creating a latent categorical variable and attaching it to the indicators for whether or not each adolescent had initiated use of the substance in question by time point j (where j could range from 2 to 6). Paths from the latent survival function to each of the time point indicators were each constrained to 1, and the variance of the survival function was set to zero so that the model could be identified. For each year of the study, these substance use initiation indicators were coded as 0 if the adolescent had not initiated use of the substance, as 1 if initiation was first reported at that time point, and as missing if initiation had occurred at a previous time point (Allison, 1995). We did not include Time 1 (5th grade) in the survival models, because any adolescents who had already initiated use of the substance in question at the first time point were excluded from analysis due to left-censoring.

Results are reported as hazard ratios (HR), where the hazard ratio is computed as the exponential (inverse natural logarithm) of the unstandardized regression coefficient. The hazard ratio, therefore, indicates the multiplicative increase in the likelihood of initiation during the study period given a one-point increase in the PYD score. Because possible scores for PYD range from 0 to 100, a one-point increase is extremely small—and therefore we also report the hazard ratio for a 12-point increase in PYD (which corresponds approximately to a 1 SD increase in PYD—standard deviations for PYD scores ranged from 10.34 at Wave 3 to 13.28 at Wave 5, with a mean of 11.85).

The PYD X Gender interaction was statistically significant for tobacco use, $z = 2.07$, $p < .04$; for alcohol use, $z = 2.41$, $p < .02$; and for marijuana use, $z = 2.46$, $p < .02$. The interaction term was not significant for hard drug use, $z = 0.89$, $p = .38$. As a result, for tobacco, alcohol, and marijuana use, we split the sample by gender and reconducted the survival analyses for these substances.

For tobacco use, results indicated that PYD was a significant inverse predictor of the initiation hazard for girls, $HR = 0.970$, $p < .001$ (95% CI = 0.959 to 0.982), but not for boys, $HR = 0.990$, $p = .21$ (95% CI = 0.975

to 1.006). For a 12-point increase in PYD, the tobacco use initiation hazard for girls would be expected to decrease by 31%.

For alcohol use, results indicated that PYD was positively related to the alcohol use initiation hazard for boys, $HR = 1.018$, $p < .02$ (95% CI = 1.004 to 1.032), but not for girls, $HR = 0.997$, $p = .55$ (95% CI = 0.987 to 1.007). For a 12-point increase in PYD, the odds of boys initiating alcohol use during the study would be expected to increase by 24%.

For marijuana use, PYD was a significant inverse predictor of the initiation hazard for girls, $HR = 0.958$, $p < .001$ (95% CI = 0.947 to 0.969); but not for boys, $HR = 0.985$, $p = .11$ (95% CI = 0.966 to 1.005). For a 12-point increase in PYD, the odds of a girl initiating marijuana use during the study would be expected to decrease by 40%.

For hard drug use, across gender, higher levels of PYD was predictive of lower hard drug use initiation hazards, $HR = 0.962$, $p < .001$ (95% CI = 0.949 to 0.975). Given a 12-point increase in PYD, the likelihood of initiating hard drug use would be expected to decrease by 37%.

Predicting Sex Initiation From the Trajectory of Positive Youth Development

We next examined PYD as a predictor of sex initiation. Because sex initiation data were collected only at 9th and 10th grades, only participants who provided data at either of these time points were included in the sex initiation analysis. As described in the Analytic Strategy section, for those adolescents reporting sex initiation at either 9th or 10th grades, we took the younger of the initiation ages reported and computed the survival time as the number of months between Wave 1 and the time to which the reported age of initiation would have corresponded. For adolescents who reported never having initiated sexual intercourse (i.e., those who were right-censored), the survival time was calculated as the number of months between Wave 1 and the wave at which the adolescent last provided data.

We then identified the time point at which initiation would have first been reported and used the PYD score at the time point before as a predictor of the initiation hazard. For example, for someone who reported initiating sex at age 13, and who was 15 years old at the 9th grade time point, the 7th grade time point (two years earlier) was used as the wave at which initiation would have been reported. The 6th grade PYD score would, therefore, be used as the predictor. A total of 229 adolescents (4.3% of the sample) had both data for sex initiation and a PYD score for the time point at which sex initiation would have first been reported, and these adolescents were included in the sex initiation analyses.

Because the vast majority of participants were not included in the sex initiation analyses, and given the retrospective nature of the sex initiation data, these analyses should be regarded as exploratory and interpreted with caution.

Results indicated that the PYD X Gender interaction was statistically significant, $z = 2.40$, $p < .02$. As a result, we reconducted the analysis separately for boys and for girls. PYD was a significant and inverse predictor of the sex initiation hazard for girls, $HR = 0.969$, $p < .001$ (95% CI = 0.956 to 0.981), but not for boys, $HR = 0.992$, $p = .33$ (95% CI = 0.978 to 1.008). For girls, given a 12-point increase in PYD, the likelihood of initiating sexual intercourse at any point in time would be expected to decrease by 31%.

As a final analysis, we examined whether PYD would promote condom use among those adolescents who had initiated sexual activity. For Waves 5 and 6 (9th and 10th grade, respectively), we recoded the condom use responses such that "never" and "sometimes" were recoded as "no," and "always" was recoded as "yes." We then estimated logistic regression models using the PYD score at the time of sex initiation as a predictor. We also included the PYD X Gender interaction term as an additional predictor. One model was estimated with 9th grade condom use as the outcome, and another with 10th grade condom use as the outcome.

The PYD X Gender interaction was not statistically significant for 9th grade condom use, $z = 0.14$, $p = .88$, but this interaction was marginally significant for 10th grade condom use, $z = 1.86$, $p = .06$. As a result, we report only the main effect of PYD for 9th grade condom use, but we report results separately by gender for 10th grade condom use. PYD was marginally significant as a predictor of condom use at 9th grade, $OR = 1.04$, $p = .06$ (95% CI = 1.00 to 1.09). For a 12-point increase in PYD, the odds of condom use would be expected to increase by 60%.

In 10th grade, PYD was significantly predictive of condom use for girls, $OR = 1.06$, $p < .02$ (95% CI = 1.01 to 1.11), but not for boys, $OR = 1.00$, $p = .96$ (95% CI = 0.96 to 1.04). For girls, given a 12-point increase in PYD, the odds of condom use would be expected to increase by 101%.

DISCUSSION

The present study was conducted to ascertain the extent to which PYD may be protective against initiation of tobacco, alcohol, marijuana, and hard drug use, as well as sexual behavior, in early to middle adolescence. We used a largely middle-class sample that appeared to be at somewhat lower risk compared to national averages. Nonetheless, the findings were largely consistent with

theoretical expectations: the present findings suggest that PYD may be protective against tobacco and marijuana initiation for girls, and against hard drug use for both genders. An exploratory analysis suggested that PYD may also be protective against sex initiation for girls and against unprotected sex for both boys and girls who had initiated sexual activity. Surprisingly, PYD was positively predictive of alcohol use for boys. Tests for cohort effects indicated that the multiple-cohort design likely did not affect the results. Moreover, the consistency of findings across the different risk behaviors (except alcohol) lends credence to, and speaks to the robustness of, the protective effects of PYD. These findings are in line with evidence that the components of PYD, such as self-esteem (Donnellan et al., 2005) and connections to family, positive peers, and positive community mentors (Fergusson et al., 2002; Nash et al., 2005; Scales et al., 2004, 2005), are protective against substance use and unsafe sex. Moreover, although the sex initiation analyses reported here are preliminary, our findings regarding protective effects of PYD are consistent with those from other studies (e.g., Aspy et al., 2010).

The present results are also consistent with prior findings that protective effects against health-compromising and risky behaviors are often stronger for girls than for boys, both in general (e.g., Kroneman et al., 2004) and specifically for PYD constructs (Mueller et al., 2010; Oman et al., 2004). Boys are generally more likely than girls to engage in risk behaviors (CDC, 2009; Johnston et al., 2010), and it may be more difficult to protect them from these behaviors. It is possible that PYD may interact with other variables, such as family closeness, parental monitoring and supervision, and affiliation with risk-taking peers to protect boys (and perhaps girls as well) from risk behavior engagement. It is important for future research to examine these and other possibilities.

The findings for alcohol use differ from those for the other risk behaviors, but this is not entirely surprising. Alcohol use is glamorized in many Western societies, and alcohol is present at many teenage social events, especially among boys (Demant & Østergaard, 2007). Moreover, moderate alcohol use often occurs in social contexts (including with family members) and is often not considered problematic (Power, Stewart, Hughes, & Arbona, 2005). As a result, it is possible that higher levels of PYD promote more positive social relationships, which may result in more opportunities to consume alcohol, particularly for boys.

These findings build on past research conducted with the 4-H Study of PYD. For example, both Phelps et al. (2007) and Zimmerman et al. (2008) found that PYD was protective against delinquency and drug/alcohol use. However, these prior studies used a composite measure of health risk behaviors, consisting of delinquency

as well as drug and alcohol use. The present results extend the protective potential of PYD to apply to initiation of specific risk behaviors, including tobacco, marijuana, and hard drug initiation. In addition, the present study represents the first time that the sex initiation and condom use variables in the 4-H data set have been examined as a correlate of PYD. The results for sex initiation are highly consistent with those for tobacco, marijuana, and hard drug use, namely, higher PYD scores are associated with lower odds of initiating health-compromising or risky behaviors, particularly for girls. This pattern of findings supports the use of positive processes as targets for preventing undesirable or harmful behavior (cf. Hawkins et al., 2002; Ialongo et al., 1999; Prado et al., 2007) and suggests that promoting PYD might also help to prevent such behaviors. Future research should also examine which of the Cs are most responsible for preventing risk behavior engagement (Gloppen et al., 2010; House, Bates et al., 2010; House, Mueller et al., 2010; Markham et al., 2010), so that interventions can be designed to promote these positive qualities. Alternatively, it is possible that different Cs are protective against different risk behaviors, in which case multiple Cs would need to be targeted.

Positive Youth Development as a Preventive Process

As noted in the introduction, there has been some controversy in recent literature regarding whether adolescence is best depicted in terms of “strength-based” models focusing on positive development and contribution, or in terms of “deficit-based” models focusing on drug and alcohol use, sexual risk behavior, delinquency, violence, and other negative outcomes (e.g., Catalano et al., 2002, 2004; Damon, 2004; Lerner, Almerigi, Theokas, & Lerner, 2005; Scales, Benson, Leffert, & Blyth, 2000). The present findings suggest that theorists, researchers, practitioners, and policy makers do not need to choose between (a) a strength-based, promotive approach or (b) a deficit-based, preventive approach. Indeed, the present finding that PYD protects against or delays initiation of substance use and sexual activity suggests that positive developmental processes may have the potential to redirect negative trajectories that might otherwise lead to impaired functioning. Such findings may also add to the growing body of theory (cf. Catalano et al., 2004; Small & Memmo, 2004) and evidence (cf. Jeličić et al., 2007; Oman et al., 2004; Scales et al., 2005) that PYD may serve as a preventive, as well as promotive, process. Such integrated preventive-promotive strategies have recently been emphasized in the National Academy of Sciences (2009) report on prevention.

Although substance use and sex initiation are influenced by, and may serve as markers of, earlier developmental processes (Guo et al., 2005; Lillehoj, Trudeau, Spoth, & Madon, 2005), the present results suggests that PYD may help to offset some of these risks. Further research, however, is needed to determine exactly how PYD interacts with earlier risks and predispositions in determining the timing and likelihood of substance use and sex initiation. It is also essential to further investigate the mechanisms (mediators) through which PYD influences risk behavior engagement, as well as the conditions or characteristics (moderators) that affect the efficacy of PYD in preventing risk behavior initiation and engagement.

Moreover, it should be noted that, although the present results have clear implications for designing and delivering interventions, there is no guarantee that positive programs would reduce risk for substance use risk or unsafe sexual behavior for all adolescents. We know from careful moderator analyses that many universal prevention programs (those aimed at the full population) evidence stronger benefits for those who are most at risk compared to those at lower risk (e.g., Multisite Violence Prevention Project, 2009). However, it is also possible that many adolescents who are already engaged in risky behavior may be disengaged from aspects of positive programs. These issues will need to be addressed when designing intervention programs based on the present results.

Limitations and Future Directions

The present results should be interpreted in light of several important limitations. First, although the present study used a national sample, participants were volunteers and were not randomly selected. As a result, we do not know the extent to which the present results are representative of American adolescents in general (cf. Hernan, Hernandez-Diaz, & Robins, 2004). It is important to replicate the present results using national probability samples.

Second, there was a considerable amount of attrition in the present study, especially at the 8th, 9th, and 10th grade time points. Most of this attrition was due to school principals or superintendents deciding not to allow their students to continue in the study, and to the transition from middle to high school, suggesting that individual student characteristics likely played less of a role in causing attrition. Indeed, comparisons between retained versus dropout youth at the 8th, 9th, and 10th grade waves indicated some significant but small differences in demographic, PYD, and substance use variables. Future research, using a design where students are initially contacted through schools but are followed up through their families, as was done in the

National Longitudinal Study of Adolescent Health (Resnick et al., 1997), may help to minimize attrition.

Third, the present sample was fairly low-risk, as evidenced by comparisons between risk behavior rates in the present sample versus national norms. However, our finding that PYD appears to be protective against cigarette, marijuana, and precocious/unsafe sex is consistent with other research (Aspy et al., 2010; Gloppen et al., 2010; Markham et al., 2010; Mueller et al., 2010; Oman et al., 2004). This consistency suggests that the low-risk nature of our sample may not have biased our results.

Fourth, we were only able to assess sexual behavior at the final two time points because of school officials' reluctance to ask elementary and middle school students about sexual activity. As a result, although we were able to ask about sexual behavior at the 9th and 10th grade assessments, it is possible that adolescents may not have correctly recalled how old they were when they first engaged in sexual intercourse. Given the ethical issues in asking young adolescents about sexual behavior, there may not be a practical way to circumvent this limitation.

Fifth, sexual intercourse was the only sexual behavior on which adolescents were asked to report. We did not ask about non-coital sexual behaviors, such as oral sex, that may be more common among adolescents (cf. Prinstein, Meade, & Cohen, 2003). Moreover, analyses that rely on reporting of sexual intercourse are unlikely to detect sexual activity in non-heterosexual adolescents. It is important for future studies to ask about a range of sexual behaviors.

Despite these limitations, the present study strongly suggests that PYD serves as a protective mechanism against drug and alcohol use and against unsafe sexual behavior. Despite the sampling and attrition issues, the results were remarkably consistent across behaviors and with prior theoretical and empirical evidence. As such, these results provide an empirical springboard and extension vis-à-vis prior theoretical ideas and empirical evidence integrating the prevention science and positive youth development perspectives (cf. Catalano et al., 2002, 2004; Schwartz et al., 2007; Small & Memmo, 2004). By integrating PYD into prevention programs, it may be possible to provide maximal protection against health risk behaviors that compromise adolescents' future developmental trajectories.

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