

# Sexual Partners and Contraceptive Use: A 16-Year Prospective Study Predicting Abstinence and Risk Behavior

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Antecedents and correlates of sexual behavior among 167 (46% female) adolescents were examined in this multi-informant longitudinal study. Data were collected at birth through middle adolescence. Data on number of sexual partners and contraception use at age 16 defined sexual abstinence (SAs,  $n = 73$ ), high-risk sexual behavior (HRTs,  $n = 45$ ) and low-risk sexual behavior (LRTs,  $n = 49$ ) groups. Moffitt's (1993) antisocial behavior taxonomy, problem behavior theory (Jessor & Jessor, 1977), social control theory (Hierschi), and a biosocial model (Udry, 1988) guided expectations of differential group prediction. Variables from each of three developmental periods (< age 12, ages 12–13, age 16) were significantly associated with sexual behavior groups. The most salient factors that differentiated LRTs from SAs were physical maturation at age 13 and romantic relationship progression and alcohol use at age 16. Romantic relationship progression and drug use at age 16 differentiated HRTs from SAs.

Statistics reveal that late adolescent sexual behavior is common, with over 60% of U.S. adolescents engaging in sexual intercourse by age 18

(Grunbaum et al., 2004). Yet, a comparatively early onset of sexual intercourse and other sexual behaviors, such as accumulating higher numbers of sexual partners and inconsistent contraceptive use, continue to be concerning. These sexual behaviors are often referred to as risk behaviors because they increase the likelihood that young people will experience unwanted pregnancies or contract sexually transmitted infections (STIs; see Crockett, Raffaelli, & Moilanen, 2003; DiClemente & Crosby, 2003 for reviews).

Sexual risk behaviors and other problem behaviors, such as delinquency, have been found to covary (Capaldi, Crosby, & Stoolmiller, 1996; Duncan, Strycker, & Duncan, 1999; Tubman, Windle, & Windle, 1996). Researchers have also identified social environmental factors that influence risky sexual behavior, such as features of family and peer relationships (Crockett, Bingham, Chopak, & Vicary, 1996; McBride, Paikoff, & Holmbeck, 2003; Whitbeck, Yoder, Hoyt, & Conger, 1999). As many of these studies have assessed risk factors only in adolescence (i.e., after age 10) little is known about the earlier antecedents of risky sexual behavior.

In the current study, we examined whether adolescents' developmental histories from age 6 to 16 could differentiate three groups of adolescents, including those who were sexually abstinent (i.e., sexual abstainers; SAs), those who engaged in high-risk sexual behavior (i.e., high risk-takers; HRTs) at age 16, and those who were sexually active, but engaged in lower levels of risk behavior (i.e., low risk-takers; LRTs). HRTs and LRTs were defined based on numbers of sexual partners in their lifetimes (see Miller et al., 1997) and contraceptive use (DiClemente et al., 1992). Although many studies have examined age of first sexual intercourse as a risky sexual behavior, we did not utilize this variable, as it is not a direct assessment of risky behavior and does not provide unique information about risk behavior once number of sexual partners and contraceptive use are considered (Gillmore, Butler, Lohr, & Gilchrist, 1992).

Our formation of groups was also guided by the notion that subgroups of adolescents exhibiting behavior problems can be identified by their different developmental histories (Moffitt, 1993; Patterson, DeBaryshe, & Ramsey, 1989). For example, Moffitt posited two groups of antisocial youth. One group, an early onset group, engaged in antisocial behavior in childhood that continued into adulthood while the second group engaged in antisocial behavior that was contained to adolescence. Youth within the early onset group have higher levels of maladaptation compared with youth with onset in adolescence. Because of repeated evidence for covariation between delinquency and sexual behavior (Donovan & Jessor, 1985; Jessor & Jessor, 1977), two aspects of the antisocial behavior taxonomy guided the current study. First, just as there are multiple

developmental pathways to diverse levels of adolescent antisocial behavior, identifying adolescents with different levels of risky sexual behavior in adolescence might yield unique patterns of past individual characteristics and environmental experiences. Second, engagement in antisocial behavior becomes more common during the adolescent years (Moffitt, 1993) as does sexual activity (Grunbaum et al., 2004). Although risk is associated with both behaviors, this risk may be consequently associated with the degree to which young people participate in these behaviors.

In sum, we expected to find two groups of sexually active adolescents with different developmental histories and concurrent adaptation at age 16. These two groups were formed to differentiate adolescents who demonstrated more responsible sexual behaviors from their sexually active peers who had sexual behavior profiles that placed them at higher risk for pregnancy and STIs. Because some 16-year-old adolescents are sexually abstinent, this group was also included in this study. Drawing from Moffitt's (1993) taxonomy of antisocial behavior and applying three additional theories to the study of sexual behavior, we hypothesized a number of differences between the groups as described in the following sections.

### **Theory-Based Identification of Antecedents and Correlates and Overview of the Current Study**

The complexity of adolescent sexuality has made it difficult to develop a comprehensive theoretical framework to guide research. Instead, multiple theoretical perspectives have been applied to the study of adolescent sexual behavior, including problem behavior theory (Jessor & Jessor, 1977; Jessor, Van Den Bos, Vanderryn, Costa, & Turbin, 1995), social control theory (Benda & DiBlasio, 1991; Hirschi, 1969), and a biosocial model (Smith, Udry, & Morris, 1985; Udry, 1988). All perspectives point to individual and social factors that impact behavior, but individual biology, personality, and the social context are differentially emphasized. These theories, along with empirical evidence, were used to identify potential precursors and correlates of adolescent sexual behavior. The list of predictors examined is not comprehensive. As is the nature of longitudinal studies of this length and magnitude, factors included were sometimes constrained by the measures available at the time and by the assessments that could be completed.

***Problem behavior theory.*** Problem behavior theory (Jessor & Jessor, 1977) presumes that risky sexual behavior is a violation of a social norm

that is an outcome of an individual's attitudes, and, as such, this behavior will covary with other norm breaking behaviors such as substance use and delinquency. Empirical evidence has linked sexual risk behaviors to other problem behaviors such as alcohol use (Bingham & Crockett, 1996; Capaldi et al., 1996; Cooper, Wood, Orcutt, & Albino, 2003; Duncan et al., 1999; Jessor et al., 1995; Tubman et al., 1996). In one such cross-sectional study of 2,567 teenagers aged 13–19, Luster and Small (1994) compared a group of adolescents who had multiple partners and used contraception inconsistently (“sexual risk-takers”) to young people who reported fewer sexual partners and always used contraception and to SAs. Sexual risk-takers used alcohol more regularly and had lower grades compared with other adolescent groups.

Poor academic and school performance has also been considered to be a part of a syndrome that includes substance use, delinquent behavior, and risky sexual behavior (Bingham & Crockett, 1996; Cooper et al., 2003; Luster & Small, 1994). Studies support an hypothesis that adolescents who initiate sexual behavior earlier than their peers or who engage in more risky sexual behaviors have lower educational aspirations and grades (Ary, Duncan, Duncan, & Hops, 1999; Halpern, Joyner, Udry, & Suchindran, 2000).

Based on Moffitt's (1993) typology and problem behavior theory, we predicted that HRTs would have a developmental history characterized by more externalizing problem behavior and lower school performance when compared with other adolescents. Yet, as with youth who initiate antisocial behavior in adolescence, we also expected that, in adolescence, LRTs would engage in more externalizing behaviors, have lower school performance, and use more substances than SAs, but engage in lower levels of these behaviors and have fewer school problems than HRTs. Before adolescence, we expected no difference in the externalizing behavior and school performance of LRTs and SAs. In sum, we expected that it would be young people with a more life-persistent pattern of problems who would be in the HRT group at age 16, while the behavior of LRTs would be more similar to SAs before adolescence, diverge from SAs in adolescence, but never reach the problem level of HRTs.

*Social control theory.* Hypotheses regarding the impact of social contexts on risky sexual behavior were derived from problem behavior theory and social control theory (Hirschi, 1969). Problem behavior theory and social control theory identify the important influence of bonds to conventional social institutions, especially family, school, and church. A number of investigations have examined associations between adolescent sexual behavior and family characteristics in early or later adolescence

(see Miller, Benson, & Galbraith, 2001, for a review). In some cases, positive family relationships (e.g., supervision or parent-child connectedness) have been associated with delayed onset of sexual intercourse and lower levels of risky sexual behavior (Bingham & Crockett, 1996; Crockett et al., 1996; Miller et al., 2001), and negative interactions within the family have been associated with an earlier onset of sexual activity and inconsistent contraceptive use (Scaramella, Conger, Simons, & Whitbeck, 1998). In other cases, little association between parenting and sexual behavior has been reported (Longmore, Manning, & Giordano, 2001; Meschke, Zweig, Barber, & Eccles, 2000).

School and religious involvement, as well as participation in organized activities, also may be conventional bonds that shape adolescents' values and attitudes toward sexual activity. School performance, participation in activities, and participation in church have been found to be protective factors for some problem behaviors (Bingham & Crockett, 1996; Jessor et al., 1995; Whitbeck et al., 1999). We expected that it would be sexually abstinent adolescents who would be best identified by bonds to conventional institutions in adolescence, especially structured activities and religion. Yet, we also expected some differences between LRTs and HRTs when family relationships, structured activities and religious involvement were examined. Drawing from Moffitt's (1993) typology, we predicted that HRTs would have less support and more conflict within the family when compared with LRTs and SAs. We expected no differences in the family relationships of LRTs and SAs before adolescence, but expected some divergence in adolescence. We also expected LRTs, when compared with SAs, to be less involved in structured activities and religion, with a similar pattern also expected for HRTs when compared with SAs.

*A biosocial model.* Unlike antisocial behavior, almost every person will engage in sexual activity by young adulthood. Because of these normative biological and social-relational aspects of sexual behavior, a biosocial model (Udry, 1988) also guided our hypotheses. Testosterone (an androgen), which stimulates the body to mature during puberty, has been associated with sexual behavior, especially among males (Udry & Billy, 1987). It has been observed that adolescents, especially females, who mature earlier than their peers are more likely to date and engage in sexual behavior at an earlier age as well (Costa, Jessor, Donovan, & Fortenberry, 1995; Meschke et al., 2000; Phinney, Jensen, Olsen, & Cundick, 1990).

Young people who appear more physically mature seem to prompt certain responses from the social environment resulting in increased opportunities for romantic and sexual involvement (Graber, Brooks-Gunn,

& Galen, 1998; Phinney et al., 1990). Studies have supported links between dating and sexual behavior, with an earlier onset of dating associated with a greater number of sexual partners (Zimmer-Gembeck, Siebenbruner, & Collins, 2004). Romantic involvement and sexual behavior are also more likely to continue once initiated (Tubman et al., 1996) which has implications for sexual risk. In combination, earlier physical maturation relative to peers and the associated social experience of dating provide more opportunities for sexual activity over time.

When puberty is measured by secondary sexual characteristics it can represent a combined effect of hormones (primarily androgens) and the social interactions that change with physical maturity (Udry, 1988). We expected that LRTs would be identified by a more mature observable appearance in early adolescence and more progress in romantic relationships by age 16. Although HRTs were likely to be involved in romantic relationships, we expected their sexual behavior to be influenced by their attitudes and a history of problems as proposed within problem behavior theory and social control theory. Hence, we hypothesized that the sexual activity of LRTs, compared with HRTs, may have been more influenced by their pubertal development and progress in forming longer-term relationships. LRTs would appear more physically mature than others (both HRTs and SAs) and, partly because of this maturity of appearance, would have made more progress in romantic relationships by age 16. SAs, compared with HRTs and LRTs, were expected to be less physically mature at age 13 and to have made less progress in romantic relationships by age 16.

## METHOD

### Participants

Participants were 167 (77 females, 63% of the original sample of 267, see Egeland & Brunnuquell, 1979) firstborn children of mothers living in poverty. Women receiving prenatal care in the Minneapolis Health Department were recruited during their third trimesters of pregnancy. At delivery, mothers' ages ranged from 15 to 35,  $M (SD) = 20.6 (3.5)$ , 61% were unwed, 35% had not completed high school, and 86% of the mothers were Caucasian, 10% African-American, and 4% Native-American or Asian.

The participants included in the current study were those for whom data were available at age 16. By age 2, 212 families (80%) remained in the longitudinal study, with residential mobility being the primary reason for the attrition before age 2. Since age 24 months through age 16, about 79% of the participants have been retained.

To assess whether this sample of 167 adolescents was representative of the original 267 participants, we compared demographic data between the study participants and adolescents excluded (early attrition or nonparticipation at age 16). No difference in age of mother,  $M (SD) = 20.6 (3.5)$  versus 20.4 (3.8), mother's educational level,  $M (SD) = 11.9 (1.7)$  versus 11.4 (1.9), and prenatal socioeconomic status (SES),  $M (SD) = 50.5 (10.0)$  versus 49.1 (10.1) were found. Compared with participants not included in the current study, a larger percentage of participants' mothers were Caucasian, 85.6% versus 69.0%, and married, 38.9% versus 29%.

## Measures

Data were obtained from observers, primary caregivers (usually mothers), teachers, and/or participants at birth, grades 1 ( $M$  age = 6), 3 ( $M$  age = 9), and 6 ( $M$  age = 12) and ages 13 and 16. We will refer to these time periods as age 6, 9, 12, 13, and 16. Data collection methods included direct observation, interviews, and questionnaires.

**Sexual behavior, age 16.** Participants reported their cumulative lifetime number of sexual partners by age 16 and their consistency of contraceptive use as part of the Adolescent Health Survey (AHS) (Blum, Resnick, & Bergeisen, 1989). For the question, "How many sexual partners have you had?" response options were 1 (*none*), 2 (*one*), 3 (2–5), 4 (6–10), and 5 (*more than 10*);  $M (SD) = 2.9 (1.0)$ . For the question, "How often do you and/or your partner use a birth control method?" response options ranged from 1 (*always*), to 5 (*never*);  $M (SD) = 1.7 (1.2)$ . These two variables were used to assign participants to 1 of 3 groups:

- (1) "Sexual abstainers" (SAs;  $n = 73$ )—no sexual intercourse by age 16.
- (2) "Low risk-takers" (LRTs;  $n = 49$ )—five or fewer sexual partners by age 16 (a score of 1, 2 or 3),  $M (SD) = 2.4 (.50)$ , and a report of *always* using a method of contraception that protected against STIs and/or pregnancy, which excluded the use of the rhythm method or withdrawal (a score of 1). Contraceptive methods used by this group of adolescents included: condoms only (81.6%), foam and condoms (2.0%), birth control pills (4.1%), pills and condoms (10.2%), and multiple methods/other (2.0%).
- (3) "High risk-takers" (HRTs;  $n = 45$ )—a lifetime history of six or more sexual partners (a score of 4 or 5),  $M (SD) = 3.5 (1.1)$  or inconsistent use of contraception (i.e., adolescents who did not respond "always" to frequency of birth control use; a score from 2 to 5),  $M (SD) = 2.5 (1.4)$ . Contraceptive methods used by this group of adolescents included: withdrawal (4.4%), condoms only (62.2%), birth control pill (6.7%), pill

and condoms (11.1%), multiple methods/other (6.7%), and no method (4.4%).

A group comparison of age of first sexual intercourse provided support for overlap with number of sexual partners and contraceptive use. Age of first sexual intercourse was assessed from 1 (10 *years or younger*) to 7 (16 *years old*). HRTs had earlier age of sexual debut compared with LRTs;  $t(1, 92) = -3.78, p < .001$ . HRTs initiated sexual intercourse at age 13,  $M (SD) = 4.2 (1.6)$ . LRTs initiated sexual intercourse about 1.5 years later,  $M (SD) = 5.3 (1.3)$ .

***Maternal demographic information, prenatal and birth.*** Prenatal SES was calculated as an average that included z-scores from the Duncan Socioeconomic Index (SEI; Duncan, 1961; Stevens & Featherman, 1981), household income, and mother's level of education in years,  $M (SD) = 50.54 (9.97)$ , range 31.9–105.5. SES was calculated from three indicators because a measure of occupational status alone may not have captured overall household income in this poverty sample. Mothers were interviewed shortly following their children's births. Mother's age,  $M (SD) = 20.62 (3.52)$ , education level,  $M (SD) = 11.88 (1.71)$ , and marital status were collected.

***Emotional climate in the home, age 6.*** The Emotional Climate subscale from the Home Observation for Measurement of the Environment (HOME; Caldwell & Bradley, 1984) was completed during a home visit at age 6. Ten items assessed the level of parental involvement and interaction with the child, positive emotional responses to the child's behavior, level of parental negative affect, the frequency of physical punishment, parental agreement on discipline, and parental derogation of the child. Trained interviewers, one per visit, completed most items from a direct interview with the parent, while other items were based on the interviewer's observations during the assessment in the home. Item responses were coded as 1 (*yes*) or 0 (*no*). The items were summed and a higher score reflected a better quality of emotional climate within the home. This scale had marginal reliability, Cronbach's  $\alpha = .57$ .

***Externalizing behavior, age 9 and 12.*** Teachers completed the Teacher's Report Form (TRF) of the Child Behavior Checklist (Achenbach & Edelbrock, 1986) at the end of grades 3 and 6. The TRF included 118 items rated from 0 (*not true*) to 2 (*very or often true*). The TRF yields broadband scores representing externalizing and internalizing problems, and a number of subscales. The TRF data for ages 9 and 12 in the current study (Achenbach & Edelbrock) were rescored with the 1991

profile (Achenbach, 1991a) to yield consistent syndrome profiles for boys and girls across different ages. In previous studies, the 15-day test-retest mean reliability for the problem scale was high and good validity was reported (Achenbach).

Externalizing scale *t*-scores were used in the current study. The externalizing scale is defined by the sum of the problem items for the delinquent and aggressive behavior subscales. The externalizing scale *t*-scores were then based on the percentiles of the distribution of scores obtained in the normative samples. An example from the delinquent scale is, "truancy or unexplained absence," and an example from the aggressive scale is, "gets in many fights." Externalizing scale scores had good reliability and were significantly correlated, Cronbach's  $\alpha = .80$  at age 9 and Cronbach's  $\alpha = .78$  at age 12.

*Academic perseverance, ages 9 and 12.* Two items from the Devereux Elementary School Behavior Rating Scale completed by teachers (Spivack & Swift, 1982) were used to measure academic perseverance: ability to remain focused on a task and persist when a task is difficult. Response options ranged from 1 (*never*) to 5 (*very frequently*) or 1 (*not at all*) to 7 (*extremely*). Cronbach's  $\alpha$  at age 9 and 12 was .67 and .82, respectively. Academic perseverance scores at ages 9 and 12 were significantly correlated,  $r = .49$ ,  $p < .001$ .

*Involvement in organized activities, age 12.* During interviews at age 12, participants were asked, "Do you take part in any activities outside of school (like clubs, sports, or scouts)?" Each participant's teacher also completed an interview at the end of that school year. Teachers were asked, "Is \_\_\_\_\_ involved in any extra-curricular activities? (band, choir, clubs, etc.)" The number of activities listed independently by the teacher and child were summed to create an overall activity score for each participant. Any activity mentioned by both of the informants was counted once. Two raters scored cases independently with overlap to determine reliability. Interrater reliability, assessed with the intraclass correlation, was  $r = .97$ .

*Adolescent-parent interaction, age 13.* Adolescents and one or two caregivers were observed in a series of videotaped planning and discussion tasks (approximately 45 minutes in length). Global ratings of observed adolescent-parent interactions were made after coders reviewed the entire interaction. Measures used in this study included positive affect, negative affect, and conflict. Positive affect assessed how often family members expressed regard for each other and showed pleasure

during the interaction, and was rated 1 (*no evidence*) to 7 (*high evidence*). Negative affect assessed negative feelings and signs of verbal/nonverbal tension, and was rated from 1 (*no evidence*) to 7 (*high evidence*). A single score of the negative affect score subtracted from the positive affect score was used in this study to assess the *balance of affect* in interactions. A balance model (Gottman, 1998) asserts that it is the balance of positive and negative interactions that best predicts relationship functioning rather than the independent assessment of positive or negative interaction. Higher scores indicated more positive affect net of negative affect.

The family conflict rating measured the frequency and intensity of disagreements during interactions, and was rated from 1 (*no conflict*) to 7 (*conflict pervades at all times*). Two graduate students coded all videotapes with overlap to determine interrater intraclass correlations for positive affect (.64), negative affect (.64), and conflict (.63).

**Physical maturity, age 13.** Trained coders assessed adolescents' physical maturity by observing the videotaped parent-adolescent interaction task. Most adolescents were observed standing and sitting. Voice and physical characteristics, including adult features, breast development and body proportions, were considered in rating adolescents from 1 (*very immature appearance*) to 6 (*very mature appearance*). Extensive descriptions of each response level and practice were used to anchor ratings. Seven independent coders (3 male and 4 female undergraduate students) rated the adolescents on physical maturity. Mature appearance scores were calculated by averaging the ratings of all coders. The intraclass correlation of ratings among coders ( $n = 7$ ) was .64. Appearance of physical maturity was significantly negatively correlated with age of first menstruation,  $r = -.40$ ,  $p < .001$ ,  $n = 70$ .

**Quality of family relationships, age 16.** Adolescents completed the Self-Report Family Inventory (SFI), a 36-item questionnaire of perceived family functioning, with adequate test-retest reliability and criterion-reference validity (Hampson, Beavers, & Hulgus, 1988). Six items from the SFI assessed the perceived quality of family relationships, Cronbach's  $\alpha = .83$ . For example, adolescents rated how much they felt their parents cared about them from 1 (*not at all*) to 5 (*very much*). Items were averaged and higher scores indicated better quality relationships within the family.

**Romantic relationship progression, age 16.** Adolescents reported their attitudes, perceptions, and behaviors regarding dating and their romantic relationships in audiotaped interviews. A rating scale developed

for this study assessed involvement in heterosexual romantic relationships. Adolescents were rated from 1 (*no opposite-sex friends/no dating*) to 4 (*steadily dating someone for more than 2 months*). Two raters were used for all interviews; the intraclass correlation was high,  $r = .86$ .

**Religiosity, age 16.** Religiosity was a composite variable derived from data from the 16-year assessment. As part of the 16-year interviews, adolescents completed the Ego Identity Status (EIS) Interview (Grotevant & Cooper, 1981), which included questions on religious commitment, defined as how confident participants felt their religious decisions were right for them and how likely they were to change their religious belief(s). Participants were asked, for example, "Was there ever a time when you came to doubt any of your religious beliefs (or non-beliefs)?" Religious commitment ranged from 1 (*no commitment*) to 4 (*significant commitment*). At least two coders rated each interview. The interrater reliability, assessed by the intraclass correlation, was  $r = .71$ .

Each participant answered three items regarding religious involvement during the 16-year assessment. One question came from the AHS (Blum et al., 1989) and assessed adolescents' perceptions about whether "church leaders cared" from 1 (*not at all*) to 5 (*very much*). Two other questions were part of the Ego Identify Status Interview (Grotevant & Cooper, 1981). The two questions were whether the adolescent thought of him/herself as a religious or spiritual person (yes/no) and whether he/she was currently active in church or religion (yes/no). Religiosity was a composite variable that included the global rating of religious commitment and the three questions assessing religious involvement,  $\alpha = .68$ ; items were standardized and summed.

**Parental control, age 16.** Adolescents' primary caregivers completed audiotaped responses to a series of questions regarding parental control. The questions assessed (a) caregiver's knowledge of adolescent's friends, activities, and whereabouts (e.g., "Do you generally know where your child is if he/she goes out at night?"), (b) whether there were behaviors that precluded knowledge of the adolescent's activities (e.g., lying), and (c) whether disciplinary action was taken (e.g., to determine parental responsiveness to adolescent behavior). This global rating of parental control ranged from 1 (*low*) to 3 (*high*). There were two independent raters and interrater reliability was  $r = .70$ .

**Externalizing behavior, age 16.** Adolescents completed the Youth Self-Report (YSR) at age 16 (Achenbach, 1991b), and primary caregivers complete the Child Behavior Checklist (CBC; Achenbach, 1991c). The YSR

and CBC yield broadband scores of externalizing and internalizing problems, and a number of subscales. Adolescents (119-item checklist) and caregivers (118-item checklist) rated items from 0 (*not true*) to 2 (*very or often true*). Adequate test-retest reliabilities and validity of the YSR and CBC have been reported (Achenbach, 1991b, 1991c). Measures had good reliability in the current study, YSR Cronbach's  $\alpha = .71$  and CBC Cronbach's  $\alpha = .86$ . An average of the YSR and CBC normalized *t*-scores was used.

**Alcohol and other drug use, age 16.** As part of the AHS (Blum et al., 1989), adolescents reported frequency of alcohol and drug use by answering the following question: "How often do you use the following (without a doctor telling you to)?" using the scale 0 (*never*) to 5 (*daily*). Frequency of alcohol use (the sum of two items; i.e., beer/wine and hard liquor) and frequency of drug use (the sum of nine drug items; e.g., use of marijuana and amphetamines) were examined in the current study. Higher scores indicated more frequent substance use. There was a positive correlation between alcohol use and other drug use,  $r = .64$ ,  $p < .001$ .

## RESULTS

Data analyses proceeded in three steps. First, bivariate correlations were examined. Second, to reduce the set of variables for inclusion in multivariate regression models, ANOVAs and  $\chi^2$  tests were used to compare groups of SAs, LRTs, and HRTs on all other variables. Third, variables that were significant were entered into a childhood (< age 12), early adolescent (ages 12–13), or correlate (age 16) multinomial logistic regression model (Hosmer & Lemeshow, 1989). A fourth multinomial logistic regression model included significant variables from all three previous regression models to examine the combined predictive ability of antecedent and correlate variables.

All variables used in the study were available for more than 90% of the 167 participants at each assessment period. Owing to the low percentage of missing data, data were not imputed, so sample sizes varied slightly across analyses (*N* ranged from 160 to 167).

### Bivariate Correlations

Means, standards deviations, and correlations for all continuously scaled variables are reported in Table 1. Of the 120 correlations, 43 were significant (i.e.,  $p < .05$ ). All correlations were in the expected directions.

TABLE 1  
Means, Standard Deviations, and Zero-Order Correlations among Measures

<i>Measured Variables</i>	<i>M (SD)</i>	1	2	3	4	5	6	7
1. Home emotional climate, age 6	7.32 (1.87)							
2. Academic perseverance, age 9	7.66 (2.33)	.04						
3. Externalizing behavior, age 9	55.86 (10.68)	-.13	-.46**					
4. Physical maturity, age 13	3.04 (1.00)	.00	-.01	.15				
5. Family conflict, age 13	2.46 (1.00)	-.28**	.02	.21**	-.02			
6. Family affect, age 13	1.94 (1.90)	.33**	.03	-.22**	-.07	-.39**		
7. Academic perseverance, age 12	7.42 (2.58)	.26**	.49***	-.32**	-.04	-.06	.18*	
8. Activities, age 12	1.07 (.88)	.06	-.01	-.01	-.04	-.08	.07	.15
9. Externalizing behavior, age 12	54.89 (9.73)	-.21**	-.33**	.51**	.03	.11	-.13	-.47**
10. Family relationships, age 16	3.76 (.82)	.02	-.06	.02	-.21**	-.03	.03	.09
11. Romantic relationships, age 16	3.22 (1.10)	.01	-.02	-.03	.21**	.03	.07	-.02
12. Religiosity, age 16	.00 (2.87)	-.03	.10	-.05	-.19*	-.04	.10	.01
13. Parental control, age 16	1.99 (.58)	.19**	.14	-.15	-.10	-.04	.25**	.21**
14. Externalizing behavior, age 16	56.45 (8.38)	-.22**	-.12	.25**	.09	.12	-.15*	-.19*
15. Alcohol use, age 16	.95 (2.06)	-.14	-.31**	.20*	.01	.10	-.13	-.19*
16. Drug use, age 16	2.10 (2.26)	-.06	-.16*	.17*	.03	.10	-.09	-.02

*Continued*

TABLE 1 (continued)

Measured Variables	M (SD)	8	9	10	11	12	13	14	15
1. Home emotional climate, age 6	7.32 (1.87)								
2. Academic perseverance, age 9	7.66 (2.33)								
3. Externalizing behavior, age 9	55.86 (10.68)								
4. Physical maturity, age 13	3.04 (1.00)								
5. Family conflict, age 13	2.46 (1.00)								
6. Family affect, age 13	1.94 (1.90)								
7. Academic perseverance, age 12	7.42 (2.58)								
8. Activities, age 12	1.07 (.88)								
9. Externalizing behavior, age 12	54.89 (9.73)	.06							
10. Family relationships, age 16	3.76 (.82)	.06	.01						
11. Romantic relationships, age 16	3.22 (1.10)	.10	.08	-.20*					
12. Religiosity, age 16	.00 (2.87)	.04	-.04	.19*	-.11				
13. Parental control, age 16	1.99 (.58)	-.01	-.26*	.20*	-.23***	.23***			
14. Externalizing behavior, age 16	56.45 (8.38)	-.01	.33***	-.36***	.20*	-.15	-.14		
15. Alcohol use, age 16	.95 (2.06)	-.09	.23***	.02	.13	-.16*	-.11	.46**	
16. Drug use, age 16	2.10 (2.26)	-.02	.08	-.12	.19*	-.14	-.10	.46**	.64***

Note. N ranged from 162 to 167.

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

### Simple Comparisons of Sexual Behavior Groups

When significant group differences were found (Table 2), Scheffe's pairwise comparisons were completed. Results of these pairwise comparisons are reported in the last column of Table 2.

*Demographic measures.* Mothers of SAs had a higher level of educational attainment than mothers of LRTs. Only 22% of HRTs' mothers were married at the time of the child's birth, compared with 39% and 49% of LRTs and SAs, respectively.

*Childhood measures (<age 12).* At age 6, SAs lived in homes with higher quality emotional climate than HRTs. Compared with HRTs at age 9, SAs had higher academic perseverance and lower externalizing behavior.

*Early adolescent (ages 12–13) measures.* SAs looked less mature than LRTs. LRTs had less family conflict than HRTs. SAs and LRTs had a higher balance of positive to negative family affect than HRTs. Compared with HRTs, SAs had higher academic perseverance and less externalizing behavior.

*Age 16 correlates.* HRTs and LRTs made more progress toward serious romantic relationships. HRTs experienced less parental control than LRTs and SAs. SAs reported more religiosity than HRTs. HRTs and LRTs had higher levels of externalizing behavior compared with SAs. HRTs reported a greater frequency of alcohol and drug use compared with LRTs and SAs.

### Multivariate Prediction of Sexual Behavior Group Membership

Multinomial logistic regression models were used to predict sexual behavior group membership. Tables 3–5 show parameter estimates ( $B$ ), standard errors of  $B$  ( $SE B$ ), and odds ratios (OR) with 95% confidence intervals of the OR (95% CI) for LRTs and HRTs contrasted with SAs. Data presented are interpreted as the increased or decreased odds of being a LRT or HRT as compared with a SA. For example, when the OR for LRTs versus SAs is greater than 1, this indicates the increased odds of being a LRT rather than a SA when there is a one-unit increase in the independent variable. When the OR for LRTs versus SAs is less than 1, this indicates the

TABLE 2  
Results of Comparisons of Sexual Behavior Groups at Age 16

Measured Variables	Mean (SD) or (%)				High Risk-Takers (HRTs)	F(2, N-3 <sup>a</sup> ) or $\chi^2$ (2)	Significant Pairwise Comparisons
	All Adolescents	Sexual Abstainers (SAs)	Low Risk-Takers (LRTs)	High Risk-Takers (HRTs)			
<i>n</i>	162-167	69-73	48-49	43-45			
Male (%)	60%	50%	55%	54%		1.6	—
Mixed race or nonwhite (%)	40%	31%	26%	31%		2.5	—
Age of mother at birth	20.6 (3.5)	20.9 (3.2)	20.7 (4.1)	20.0 (3.4)		.9	—
Mother education level at birth	11.9 (1.7)	12.3 (1.4)	11.5 (2.0)	11.6 (1.7)		4.1*	SA > LRT
Mother married at birth (%)	61%	49%	39%	22%		8.6*	—
Home emotional climate, age 6	7.3 (1.9)	7.6 (1.6)	7.5 (1.6)	6.6 (2.4)		4.3*	SA > HRT
Academic perseverance, age 9	7.7 (2.3)	8.2 (2.3)	7.7 (2.4)	6.9 (2.2)		4.4*	SA > HRT
Externalizing behavior, age 9	55.7 (10.7)	52.5 (10.1)	55.9 (11.0)	60.5 (9.4)		8.3***	SA < HRT
Physical maturity, age 13	3.0 (1.0)	2.8 (0.9)	3.4 (1.0)	3.0 (1.0)		6.4**	SA < LRT
Family conflict, age 13	2.5 (1.0)	2.5 (0.9)	2.2 (0.8)	2.8 (1.1)		5.1**	LRT < HRT
Family affect, age 13	1.9 (1.9)	2.1 (1.7)	2.3 (1.5)	1.2 (2.4)		4.7**	SA > HRT; LRT > HRT
Academic perseverance, age 12	7.4 (2.6)	8.2 (2.4)	7.3 (2.6)	6.4 (2.4)		7.3***	SA > HRT
Activities, age 12	1.6 (1.7)	1.6 (1.6)	1.6 (1.9)	1.8 (1.8)		.2	—
Externalizing behavior, age 12	54.9 (9.7)	52.0 (9.0)	55.0 (10.8)	59.7 (7.8)		9.4***	SA < HRT
Family relationships	3.8 (0.8)	3.9 (0.9)	3.6 (0.8)	3.7 (0.8)		3.2*	—
Romantic relationships	3.2 (1.1)	2.8 (1.3)	3.5 (0.9)	3.6 (0.7)		12.2***	SA < LRT; SA < HRT
Religiosity	.0 (2.9)	.6 (3.1)	.0 (2.4)	-1.0 (2.7)		4.2*	SA > HRT
Parental control	2.0 (.6)	2.2 (.5)	2.0 (.6)	1.7 (.6)		12.2***	SA > HRT; LRT > HRT
Externalizing behavior	56.5 (8.4)	53.3 (8.0)	57.3 (7.4)	60.5 (8.2)		12.1***	SA < HRT; SA < LRT
Alcohol use	2.1 (2.3)	1.1 (1.5)	2.4 (1.9)	3.3 (2.9)		16.1***	SA < HRT; LRT < HRT
Drug use	.9 (2.1)	.2 (0.8)	.5 (0.9)	2.6 (3.2)		25.2***	SA < HRT; LRT < HRT

<sup>a</sup>N ranged from 162 to 167.

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

SA, sexual abstainer; LRT, low risk-taker; HRT, high risk-taker.

TABLE 3  
Multinomial Logistic Regressions Predicting Age 16 Sexual Behavior from Measures Before Age 16

	Likelihood Ratio $\chi^2$	<i>B</i>	<i>SE B</i>	<i>OR</i>	<i>OR 95%CI</i>
Model 1: childhood model ( <i>N</i> = 163)					
Home emotional climate	6.2*				
HRTs <sup>a</sup>		-.21 <sup>+</sup>	.11	.81	.65–1.00
LRTs <sup>a</sup>		.06	.12	1.06	.84–1.33
Academic perseverance	.6				
HRTs <sup>a</sup>		-.08	.11	.92	.75–1.14
LRTs <sup>a</sup>		-.01	.10	1.00	.82–1.20
Externalizing behavior	7.3*				
HRTs <sup>a</sup>		.06*	.02	1.06	1.01–1.11
LRTs <sup>a</sup>		.04	.02	1.04	.99–1.08
Model 2: early adolescent model ( <i>N</i> = 164)					
Physical maturity	9.2**				
HRTs <sup>a</sup>		.13	.24	1.14	.72–1.82
LRTs <sup>a</sup>		.65**	.23	1.92	1.22–3.02
Family conflict	4.8				
HRTs <sup>a</sup>		.15	.24	1.16	.73–1.86
LRTs <sup>a</sup>		-.41	.25	.67	.41–1.08
Family affect	1.8				
HRTs <sup>a</sup>		-.10	.12	.90	.71–1.15
LRTs <sup>a</sup>		.07	.13	1.08	.84–1.38
Academic perseverance	2.4				
HRTs <sup>a</sup>		-.16	.10	.86	.70–1.05
LRTs <sup>a</sup>		-.07	.10	.93	.77–1.13
Externalizing behavior	6.0*				
HRTs <sup>a</sup>		.06*	.03	1.06	1.01–1.12
LRTs <sup>a</sup>		.03	.02	1.03	.98–1.08

Note. Childhood Model: likelihood ratio  $\chi^2 = 32.79$ ,  $p < .001$ . Pseudo- $R^2$  (Nagelkerke, 1991) = .21. Overall percent correctly classified = 52%. Early adolescent model: likelihood ratio  $\chi^2 = 49.44$ ,  $p < .001$ . Pseudo- $R^2 = .30$ . Overall percent correct classified = 58%.

<sup>a</sup>As compared with SAs. Differences between LRTs and HRTs are reported in the text.

<sup>+</sup> $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ .

OR, odds ratio; CI, confidence interval; HRTs, high risk-takers; LRTs, low risk-takers; SAs, sexual abstainers; *B*, parameter estimates; *SE B*, standard errors of *B*.

decreased odds of being a LRT rather than a SA when there is a one-unit increase in the independent variable.

These multivariate models were repeated with LRTs, rather than SAs, as the reference group. This was done to compare LRTs with HRTs. These results are reported in the text; tables are available from the authors.

TABLE 4  
A Multinomial Logistic Regression of Age 16 Correlates of Sexual Behavior ( $N = 162$ )

<i>Measures, age 16</i>	<i>Likelihood Ratio <math>\chi^2</math></i>	<i>B</i>	<i>SE B</i>	<i>OR</i>	<i>OR 95% CI</i>
Romantic relationships	14.9***				
HRTs <sup>a</sup>		.94**	.33	2.57	1.34–4.92
LRTs <sup>a</sup>		.55**	.21	1.74	1.14–2.64
Religiosity	4.1				
HRTs <sup>a</sup>		-.19	.10	.82	.68–1.00
LRTs <sup>a</sup>		-.03	.08	.97	.83–1.14
Parental control	2.1				
HRTs <sup>a</sup>		-.78	.55	.46	.16–1.36
LRTs <sup>a</sup>		-.25	.45	.78	.32–1.89
Externalizing behavior	2.0				
HRTs <sup>a</sup>		-.01	.04	.99	.91–1.07
LRTs <sup>a</sup>		.04	.03	1.04	.97–1.10
Alcohol use	7.2*				
HRTs <sup>a</sup>		.15	.16	1.16	.85–1.58
LRTs <sup>a</sup>		.36**	.14	1.43	1.09–1.89
Drug use	21.9***				
HRTs <sup>a</sup>		.69**	.27	2.00	1.18–3.37
LRTs <sup>a</sup>		-.27	.28	.76	.44–1.31

Note. Likelihood ratio  $\chi^2 = 93.53$ ,  $p < .001$ . Pseudo- $R^2$  (Nagelkerke, 1991) = .50. Overall percent correctly classified = 67%.

<sup>a</sup>As compared with SAs. Differences between LRTs and HRTs are reported in the text.

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

OR, odds ratio; CI, confidence interval; HRTs, high risk-takers; LRTs, low risk-takers; SAs, sexual abstainers.

In each model, gender was entered as a covariate to adjust for group differences in gender and to partial out associations between independent variables and gender. Because of significant group differences, maternal education and marital status were also included as covariates (Table 2). These findings are not presented because no covariate significantly contributed to the prediction of adolescent sexual risk behavior.

*Childhood predictors of sexual behavior at age 16, Table 3.* Higher externalizing behavior at age 9 increased the odds of being a HRT rather than a SA at age 16, and there was a trend for lower home emotional climate to increase the risk of being a HRT rather than a SA. The model accounted for 21% of the variance in sexual behavior group membership.

TABLE 5  
A Comprehensive Multinomial Regression Model Predicting Age 16 Sexual Behavior  
( $N = 160$ )

<i>Antecedent or Correlate</i>	<i>Likelihood Ratio <math>\chi^2</math></i>	<i>B</i>	<i>SE B</i>	<i>OR</i>	<i>OR 95% CI</i>
Home emotional climate, age 6	3.7				
HRTs <sup>a</sup>		-.21	.14	.81	.62–1.06
LRTs <sup>a</sup>		.03	.14	1.03	.79–1.34
Externalizing behavior, age 9	4.5				
HRTs <sup>a</sup>		.06	.03	1.06	1.00–1.12
LRTs <sup>a</sup>		.02	.03	1.02	.98–1.08
Physical maturity, age 13	8.2*				
HRTs <sup>a</sup>		-.01	.29	.99	.56–1.75
LRTs <sup>a</sup>		.65*	.26	1.92	1.16–3.18
Externalizing behavior, age 12	2.1				
HRTs <sup>a</sup>		.03	.03	1.03	.97–1.09
LRTs <sup>a</sup>		.04	.03	1.04	.99–1.09
Romantic relationships, age 16	14.3***				
HRTs <sup>a</sup>		1.13**	.38	3.09	1.46–6.52
LRTs <sup>a</sup>		.50*	.23	1.65	1.06–2.56
Alcohol use, age 16	13.2**				
HRTs <sup>a</sup>		.19	.16	1.21	.89–1.65
LRTs <sup>a</sup>		.50***	.15	1.64	1.23–2.18
Drug use, age 16	20.7***				
HRTs <sup>a</sup>		.59*	.25	1.80	1.10–2.94
LRTs <sup>a</sup>		-.34	.28	.72	.41–1.24

Note. Likelihood ratio  $\chi^2 = 102.08$ ,  $p < .001$ . Pseudo- $R^2$  (Nagelkerke, 1991) = .53. Overall percent correctly classified = 63%.

<sup>a</sup>As compared with SAs. Differences between LRTs and HRTs are reported in the text.

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

OR, odds ratio; CI, confidence interval; HRTs, high risk-takers; LRTs, low risk-takers; SAs, sexual abstainers.

When the same model was estimated with LRTs as the reference group, more positive home emotional climate was associated with decreased odds of being a HRT rather than a LRT, OR = .76, 95% CI = .61 – .97.

*Early adolescent predictors of sexual behavior at age 16, Table 3.* Looking more physically mature at age 13 increased the odds of being a LRT rather than a SA. A higher level of externalizing behavior increased the odds that an adolescent would be a HRT rather than a SA. The model accounted for 30% of the variance in sexual behavior group membership. When the same model was re-estimated with LRTs as the

reference group, a more mature appearance at age 13 decreased the odds of being a HRT rather than a LRT, OR = .59, 95% CI = .36 – .98.

*Age 16 correlates of sexual behavior, Table 4.* The odds of being a HRT, rather than a SA, increased with more advanced romantic relationship progression and greater frequency of drug use. The chance of being a LRT, rather than a SA, increased with more advanced romantic relationship progression and greater frequency of alcohol use. The model accounted for 50% of the variance in sexual behavior group membership. When a model was estimated with LRTs as the reference group rather than SAs, more frequent use of drugs increased the odds of being a HRT rather than a LRT, OR = 2.63, 95% CI = 1.54–4.49.

*A comprehensive model of sexual behavior at age 16, Table 5.* The final model included the seven significant variables from the previous three models. The odds of being a HRT, rather than a SA, were increased with more advanced romantic relationship progression and greater frequency of drug use at age 16. The odds of being a LRT, rather than a SA, increased with a more mature appearance at age 13, more advanced romantic relationship progression at age 16, and a greater frequency of alcohol use at age 16. The model accounted for 53% of the variance in sexual behavior group membership at age 16. After changing the reference group to compare HRTs and LRTs, the odds of being a HRT, rather than a LRT, decreased with greater physical maturity at age 13 and more frequent alcohol use at age 16, OR = .52, 95% CI = .28 – .93; OR = .74, 95% CI = .55–1.00, respectively. The odds of being a HRT, rather than a LRT, increased with more frequent drug use at age 16: OR = 2.52, 95% CI = 1.48–4.27.

Gender interactions were tested with each multinomial logistic regression model with one significant finding. Compared with their male peers, adolescent females who were more advanced in their romantic relationships had more elevated odds of being a HRT compared with a SA. A lack of significant gender interactions should not be interpreted to mean that they do not exist, but rather, that the power to detect differences in the models was low.

## DISCUSSION

The current study shows that the prediction of sexual behavior at age 16 involves multiple individual and social factors, and factors that distinguish high sexual risk-taking from sexual abstinence are different from those that differentiate low sexual risk-taking from sexual abstinence. The only exception was for romantic relationship progression

by age 16; both HRTs and LRTs were more advanced in their formation of romantic relationships than SAs.

SAs, LRTs, and HRTs were distinguished using variables from each developmental period. As would be expected when the predictive ability of distal versus proximal snapshots of behavior and experiences are compared (Cole & Maxwell, 2003), concurrent factors superceded earlier ones as predictors of sexual behavior group membership. Nevertheless, the findings identify contributions of specific developmental periods that may be important for the development of prevention and intervention programs that target groups of youth who engage in sexual risk behavior (Sagrestano & Paikoff, 1997).

### **HRTs**

The developmental antecedents and correlates that increase the risk that an adolescent engages in high-risk sexual behavior suggest that this behavior may be a symptom of a general problem behavior profile. Early-onset problem behavior is likely to emerge from a developmental history that begins with disadvantage. A significant proportion of mothers of HRTs were single at the time of their children's births. This group of young people continued to experience contextual disadvantage into childhood, as illustrated by a poorer emotional climate in the home. This was followed by higher levels of externalizing behavior that continued into adolescence. At age 16, this group was more likely to engage in drug use, which is consistent with the notion that high-risk sexual behavior may be a symptom of problem behavior (Donovan & Jessor, 1985; Jessor & Jessor, 1977). HRTs did appear to be involved in advanced romantic relationships, which can provide a context for sexual experience (Graber et al., 1998; Phinney et al., 1990). Generally, this pattern of findings demonstrates some consistency with Moffitt's (1993) early-onset antisocial behavior type, and is consistent with previous research that has reported a co-occurrence of risky sexual behavior and delinquent behavior, including substance use (Capaldi et al., 1996; Jessor & Jessor, 1977; Jessor et al., 1995). The pattern of findings is most consistent with problem behavior theory (Jessor & Jessor, 1977), but also supports features of the biosocial model (Smith et al., 1985; Udry, 1988).

### **LRTs**

In the current study, LRTs (sexually active adolescents who were more sexually responsible than the high sexual risk-takers) appeared similar to

sexually abstinent adolescents before early adolescence. Yet, around early adolescence, LRTs seemed to diverge from SAs both in physical maturation (i.e., having a more mature appearance) and involvement in romantic relationships. LRTs were more physically mature at age 13 and more advanced in their romantic involvement than those who were sexually abstinent at age 16. These youth also engaged in somewhat more problem behavior, for example, alcohol use, than SAs, but did not engage in drug use to the degree of HRTs.

These findings are consistent with a biosocial model of sexual behavior (Smith et al., 1985; Udry, 1988) and with reports that early maturity leads to greater romantic involvement, which may be an avenue for sexual activity (Graber et al., 1998; Phinney et al., 1990) and with reported associations between early physical maturity, romantic involvement, and minor deviant behavior (Caspi, Lynam, Moffitt, & Silva, 1993; Flannery, Rowe, & Gulley, 1993). This pattern of behavior has conceptual consistency with Moffitt's (1993) conception of adolescent-limited problem behavior and adolescence as a time when problem behavior is increasingly normative.

One noteworthy early difference between LRTs and SAs was that mothers of SAs had higher levels of education at the time of their children's births compared with the mothers of LRTs. Consistent with social control theory (Hirschi, 1969), mothers with higher educational attainment may have been more likely to encourage their children's educational pursuits, which may have delayed their involvement in romantic relationships and sexual behavior.

### **A Comprehensive Model of Sexual Behavior**

The results from the final, more comprehensive model identified four variables that best differentiate sexual behavior groups at age 16. Adolescents who engaged in high-risk sexual behavior differ from SAs by greater progress in romantic relationships at age 16. They were also distinguishable from SAs and LRTs by a greater frequency of drug use at age 16. Adolescents who engaged in low-risk sexual behavior differ from SAs and HRTs by greater physical maturation at age 13 and greater frequency of alcohol use at age 16. Thus, high sexual risk-takers were characterized by deviance-proneness, whereas LRTs appeared to be characterized by a more socially constructed profile. In combination, the developmental histories and concurrent experiences of young people predict, in part, the degree to which they engage in sexual risk behavior or remain abstinent at age 16.

### Conceptual Issues and Study Limitations

A few conceptual issues and limitations of the current study must be addressed. The first issue concerns the direction of effects hypothesized and tested in the present study. The timing of the onset of intercourse varied among adolescents who were sexually active by age 16. Hence, sexual behavior may have predicted, rather than followed from, some of the factors examined here. Owing to sample size, another limitation was our need to adjust for gender rather than test models by gender and limited our confidence in our tests of gender interactions. Similarly, we were unable to investigate race/ethnicity due to sample size limitations. Past evidence, although somewhat contradictory, suggests the need to examine gender and race/ethnicity in studies of sexual behavior (Perkins, Luster, Villarruel, & Small, 1998; Tubman et al., 1996).

The uncertain validity and marginal reliability of some measures is also a limitation of this study. First, the measure of physical maturation may not have been ideal. Secondary sex characteristics have often been assessed in previous research through self-reports or parental reports on questionnaires or selection of Tanner stages (e.g., Brooks-Gunn, Warren, Rosso, & Gargiulo, 1987; Dick, Rose, Pulkkinen, & Kaprio, 2001; McBride et al., 2003). The current study could not use these methods because the assessment of physical maturation was dependent upon archival data. Second, although the use of observation to supplement survey and interview data can be construed as a strength of this study, a few observational measures had marginal internal consistency or interrater reliability. Results derived from these measures should be interpreted with caution, as low reliability can attenuate associations between constructs.

Finally, the results of the comprehensive multinomial logistic regression model should be interpreted with caution. There were few indications of collinearity or influence of outliers when model diagnostics were examined, but the stability of the model may have been affected by the sample size and/or moderately high correlations between some of independent variables (e.g., alcohol and drug use).

### CONCLUSION

The developmental antecedents and correlates that increase the risk that an adolescent engages in high-risk sexual behavior suggest that this may be a symptom of more general problem behavior. In contrast, low sexual risk-taking may be associated with behaviors and characteristics that are

normative or common in adolescence, such as puberty, romantic relationships, and alcohol use. Although the formation of romantic relationships increased the likelihood that adolescents would engage in high-risk or low-risk sexual behavior compared with remaining sexual abstinent, high-risk sexual behavior was associated with drug use whereas low-risk sexual behavior was associated with physical maturation. Overall, the results of the current study suggest that, as is true of sexual abstinence at age 16, low-risk sexual behavior may be developmentally normative during the middle and late adolescent periods and does not follow from a developmental history of maladaptation. In contrast, high-risk sexual behavior, marked by a relatively high number of sexual partners by age 16 and inconsistent use of contraception at age 16, is associated with a developmental history of maladaptation.

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### REFERENCES

- Achenbach, T. M. (1991a). *Manual for the teacher's report form and 1991 profile*. Burlington: University of Vermont Department of Psychiatry.
- Achenbach, T. M. (1991b). *Manual for the youth self-report and 1991 profile*. Burlington: University of Vermont Department of Psychiatry.
- Achenbach, T. M. (1991c). *Manual for the child behavior checklist/4-18 and 1991 profile*. Burlington: University of Vermont Department of Psychiatry.
- Achenbach, T. M., & Edelbrock, C. (1986). *Manual for the teacher's report form and teacher version of the child behavior profile*. Burlington: University of Vermont Department of Psychiatry.
- Ary, D. V., Duncan, T. E., Duncan, S. C., & Hops, H. (1999). Adolescent problem behavior: The influence of parents and peers. *Behaviour Research and Therapy*, *37*, 217-230.
- Benda, B. B., & DiBlasio, F. A. (1991). A comparison of four theories of adolescent sexual exploration. *Deviant Behavior: An Interdisciplinary Journal*, *12*, 235-257.
- Bingham, C. R., & Crockett, L. J. (1996). Longitudinal adjustment patterns of boys and girls experiencing early, middle, and late sexual intercourse. *Developmental Psychology*, *32*, 647-658.
- Blum, R. W., Resnick, M. D., & Bergeisen, L. G. (1989). *The state of adolescent health in Minnesota*. Minneapolis: University of Minnesota Adolescent Health Program.
- Brooks-Gunn, J., Warren, M. P., Rosso, J., & Gargiulo, J. (1987). Validity of self-report measures of girls' pubertal status. *Child Development*, *58*, 829-847.

- Caldwell, B. M., & Bradley, R. H. (1984). *HOME observation for measurement of the environment*. Little Rock: University of Arkansas Center for Child Development and Education.
- Capaldi, D. M., Crosby, L., & Stoolmiller, M. (1996). Predicting the timing of first sexual intercourse for at-risk adolescent males. *Child Development, 67*, 344–359.
- Caspi, A., Lynam, D., Moffitt, T. E., & Silva, P. A. (1993). Unraveling girls' delinquency: Biological, dispositional, and contextual contributors to adolescent misbehavior. *Developmental Psychology, 29*, 19–30.
- Cole, D. A., & Maxwell, S. E. (2003). Testing mediational models with longitudinal data: Questions and tips in the use of structural equation modeling. *Journal of Abnormal Psychology, 112*, 558–577.
- Cooper, M. L., Wood, P. K., Orcutt, H. K., & Albino, A. (2003). Personality and the predisposition to engage in risky or problem behaviors in adolescence. *Journal of Personality and Social Psychology, 84*, 390–410.
- Costa, F. M., Jessor, R., Donovan, J. E., & Fortenberry, J. D. (1995). Early initiation of sexual intercourse: The influences of psychosocial unconventionality. *Journal of Research on Adolescence, 5*, 93–121.
- Crockett, L. J., Bingham, C. R., Chopak, J. S., & Vicary, J. R. (1996). Timing of first sexual intercourse: The role of social control, social learning, and problem behavior. *Journal of Youth and Adolescence, 25*, 89–111.
- Crockett, L. J., Raffaelli, M., & Moilanen, K. (2003). Adolescent sexuality: Behavior and meaning. In G. R. Adams & M. D. Berzonsky (Eds.), *Blackwell handbook of adolescence* (pp. 371–392). Oxford, UK: Blackwell.
- Dick, D. M., Rose, R. J., Pulkkinen, L., & Kaprio, J. (2001). Measuring puberty and understanding its impact: A longitudinal study of adolescent twins. *Journal of Youth and Adolescence, 30*, 385–399.
- DiClemente, R. J., & Crosby, R. A. (2003). Sexually transmitted diseases among adolescents: Risk factors, antecedents, and prevention strategies. In G. R. Adams & M. D. Berzonsky (Eds.), *Blackwell handbook of adolescence* (pp. 573–605). Oxford, UK: Blackwell.
- DiClemente, R. J., Durbin, M., Siegel, D., Krasnovsky, F., Lazarus, N., & Camacho, T. (1992). Determinants of condom use among junior high school students in a minority, inner city school district. *Pediatrics, 89*, 197–202.
- Donovan, J. E., & Jessor, R. (1985). Structure of problem behavior in adolescence and young adulthood. *Journal of Consulting and Clinical Psychology, 53*, 890–904.
- Duncan, O. (1961). A socioeconomic index for all occupations. In A. J. Reiss Jr. (Ed.), *Occupations and social status* (pp. 109–138). New York: Free Press.
- Duncan, S. C., Strycker, L. A., & Duncan, T. A. (1999). Exploring associations in developmental trends of adolescent substance use and risky sexual behavior in a high-risk population. *Journal of Behavioral Medicine, 22*, 21–34.
- Egeland, B., & Brunquell, D. (1979). An at-risk approach to the study of child abuse: Some preliminary findings. *Journal of the American Academy of Child Psychiatry, 18*, 219–235.
- Flannery, D. J., Rowe, D. C., & Gulley, B. L. (1993). Impact of pubertal status, timing, and age on adolescent sexual experience and delinquency. *Journal of Adolescent Research, 8*, 21–40.
- Gillmore, M. R., Butler, S. S., Lohr, M. J., & Gilchrist, L. (1992). Substance use and other factors associated with risky sexual behavior among pregnant adolescents. *Family Planning Perspectives, 24*, 255–268.
- Gottman, J. M. (1998). Psychology and the study of marital processes. *Annual Review of Psychology, 49*, 169–197.
- Graber, J. A., Brooks-Gunn, J., & Galen, B. R. (1998). Betwixt and between: Sexuality in the context of adolescent transitions. In R. Jessor (Ed.), *New perspectives on adolescent risk behavior* (pp. 270–316). New York: Cambridge University Press.

- Grotevant, H. D., & Cooper, C. R. (1981). Assessing adolescent identity in the areas of occupation, religion, politics, friendships, dating, and sex roles: Manual for administration and coding of the interview. *JASA Catalog of Selected Documents in Psychology*, *11*, 52 (ms. no. 2295).
- Grunbaum, J. A., Kann, L., Kinchen, S., Ross, J., Hawkins, J., & Lowry, R., et al. (2004). Youth risk behavior surveillance—United States, 2004. *Morbidity and Mortality Weekly*, *53*, 1–96.
- Halpern, C. T., Joyner, K., Udry, R., & Suchindran, C. (2000). Smart teens don't have sex (or kiss much either). *Journal of Adolescent Health*, *26*, 213–225.
- Hampson, R. B., Beavers, W. R., & Hulgus, Y. F. (1988). Insiders and outsiders' view of family: Assessment of family competence and style. *Journal of Family Psychology*, *3*, 118–136.
- Hirschi, T. (1969). *Causes of delinquency*. Berkeley: University of California Press.
- Hosmer, D. W., & Lemeshow, S. (1989). *Applied logistic regression*. New York: Wiley.
- Jessor, R., Van Den Bos, J., Vanderryn, J., Costa, F. M., & Turbin, M. S. (1995). Protective factors in adolescent problem behavior: Moderator effects and developmental change. *Developmental Psychology*, *31*, 923–933.
- Jessor, S. L., & Jessor, R. (1977). *Problem behavior and psychosocial development: A longitudinal study of youth*. New York: Academic Press.
- Longmore, M. A., Manning, W. D., & Giordano, P. C. (2001). Preadolescent parenting strategies and teens' dating and sexual initiation: A longitudinal analysis. *Journal of Marriage and the Family*, *63*, 322–335.
- Luster, T., & Small, S. A. (1994). Factors associated with sexual risk-taking behaviors among adolescents. *Journal of Marriage and the Family*, *56*, 622–632.
- McBride, C. K., Paikoff, R. L., & Holmbeck, G. N. (2003). Individual and familial influences on the onset of sexual intercourse among urban African American adolescents. *Journal of Consulting and Clinical Psychology*, *71*, 159–167.
- Meschke, L. L., Zweig, J. M., Barber, B. L., & Eccles, J. S. (2000). Demographic, biological, psychological, and social predictors of the timing of first intercourse. *Journal of Research on Adolescence*, *10*, 315–338.
- Miller, B. C., Benson, B., & Galbraith, K. A. (2001). Family relationships and adolescent pregnancy risk: A research synthesis. *Developmental Review*, *21*, 1–38.
- Miller, K. S., Clark, L. F., Wendell, D. A., Levin, M. L., Gray-Ray, P., & Velez, C. N., et al. (1997). Adolescent heterosexual experience: A new typology. *Journal of Adolescent Health*, *20*, 179–186.
- Moffitt, T. (1993). Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. *Psychological Review*, *100*, 674–701.
- Nagelkerke, N. J. D. (1991). A note on the general definition of the coefficient of determination. *Biometrika*, *78*, 691–692.
- Patterson, G. R., DeBaryshe, B. D., & Ramsey, E. (1989). A developmental perspective on antisocial behavior. *American Psychologist*, *44*, 329–335.
- Perkins, D. F., Luster, T., Villarruel, F. A., & Small, S. (1998). An ecological, risk factor examination of adolescents' sexual activity in three ethnic groups. *Journal of Marriage and the Family*, *60*, 660–673.
- Phinney, V. G., Jensen, L. C., Olsen, J. A., & Cundick, B. (1990). The relationship between early development and psychosexual behaviors in adolescent females. *Adolescence*, *25*, 321–332.
- Sagrestano, L. M., & Paikoff, R. L. (1997). Preventing high-risk sexual behavior, sexually transmitted diseases, and pregnancy among adolescents. In R. P. Weissberg, T. P. Gullotta, R. L. Hampton, B. A. Ryan, & G. R. Adams (Eds.), *Enhancing children's wellness* (pp. 76–104). Thousand Oaks, CA: Sage.

- Scaramella, L. V., Conger, R. D., Simons, R. L., & Whitbeck, L. B. (1998). Predicting risk for pregnancy by late adolescence: A social contextual perspective. *Developmental Psychology, 34*, 1233–1245.
- Smith, E. A., Udry, J. R., & Morris, N. M. (1985). Pubertal development and friends: A biosocial explanation of adolescent sexual behavior. *Journal of Health and Social Behavior, 26*, 183–192.
- Spivack, G., & Swift, M. (1982). *Devereux elementary school behavior rating scale*. Devon, PA: The Devereux Foundation.
- Stevens, G., & Featherman, D. L. (1981). A revised socioeconomic index of occupational status. *Social Science Research, 10*, 364–395.
- Tubman, J. G., Windle, M., & Windle, R. C. (1996). The onset and cross-temporal patterning of sexual intercourse in middle adolescence: Prospective relations with behavioral and emotional problems. *Child Development, 67*, 327–343.
- Udry, J. R. (1988). Biological predispositions and social control in adolescent sexual behavior. *American Sociological Review, 53*, 709–722.
- Udry, J. R., & Billy, J. (1987). Initiation of coitus in early adolescence. *American Sociological Review, 52*, 841–855.
- Whitbeck, L. B., Yoder, K. A., Hoyt, D. R., & Conger, R. D. (1999). Early adolescent sexual activity: A developmental study. *Journal of Marriage and the Family, 61*, 934–946.
- Zimmer-Gembeck, M. J., Siebenbruner, J., & Collins, W. A. (2004). A prospective study of intraindividual and peer influences on adolescents' heterosexual romantic and sexual behavior. *Archives of Sexual Behavior, 33*, 381–394.

