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A longitudinal examination of risky sexual behaviors among Canadian and Italian adolescents: Considering individual, parental, and friend characteristics

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In this study, two longitudinal models of early adolescent risky sexual behaviors (RSB) were compared using a pooled sample of 267 Canadian and Italian adolescents (55% females; 53% Canadians) assessed yearly from grade 8 to 10. We focused on parenting practices (monitoring, control, limit setting), adolescent problem behaviors (antisocial behaviors, substance use) and their friends' deviance (antisocial behaviors, substance use) as predictors of condom use frequency and lifetime number of sexual partners. The socialization model postulates that youths' problem behaviors and RSB are behaviors learned within the friendship network where deviancy training can occur. The selection model posits that delinquent youth tend to affiliate with each other, and that RSB is one of many behaviors that can form the basis of selection. Using structural equation modeling, this study showed that the socialization model was the most accurate to explain the emergence of RSB. A full mediation of parenting practices, passing through deviant friends and youths' problem behavior, was observed for condom use. The same process applied to number of sexual partners, but a direct effect for parenting practices was also found.

Keywords: adolescent; deviant friends; longitudinal; parenting practices; risky sexual behaviors; selection; socialization; structural equation modeling

Most heterosexual teenagers begin to show interest in the opposite gender in early adolescence. However, the proportion of youth initiating sexual activity sometime during their teens is increasing in the United States (Katchadourian, 1990), Canada (Maticka-Tyndale, Barrett, & McKay, 2000), and some European countries, such as France, England and Sweden (Bajos, Ducot, Spencer, & Spira, 1997; Panchaud, Singh, Feivelson, & Darroch, 2000; Wellings, Field, Johnson, & Wadsworth, 1994). Although a developing awareness of sexuality and a participation in some forms of sexual behavior are normative during adolescence, some youth engage in risky sexual behaviors (RSB), such as having intercourse with multiple partners and misusing or underusing condoms, thus increasing their likelihood of contracting a sexually transmitted infection (STI) such as HIV/AIDS (Alix, Leaune, & Auger, 2001; Boyce, 2004; Brener, Kann, Lowry, Wechsler, & Romero, 2006; Rotermann, 2005). Among all sexually active persons in Canada, teenagers currently have the highest incidence of STIs (Gouvernement du Canada, 2005; Gouvernement du Québec, 2004; McKay, 2004), a situation that is also evident in European countries, such as England and Wales (Panchaud et al., 2000).

Current trends in early and high-risk sexual behaviors are a major international health concern, but can potentially be prevented. The focus of this research is to examine the individual, parental and peer factors that predict the early emergence of high-risk sexual behaviors in adolescence. It aims at providing empirical guidelines for future prevention efforts to reduce risk for negative life consequences and STI transmission among adolescents.

Parenting practices

Many studies have illustrated parental influence on adolescents' sexual behaviors (see Miller, 2002, for a literature review). Most of the evidence shows that parental monitoring, control, and limit setting lower the risks of adolescent pregnancies and STIs, and that these protective effects are the result of teens remaining sexually abstinent, postponing intercourse, having fewer sexual partners, and using contraception more consistently. For example, parental monitoring, defined as the parents' efforts to be knowledgeable about the child's whereabouts and to structure adolescents' unsupervised time with peers, has been linked to the delay of the first episode of sexual intercourse (Capaldi, Stoolmiller, Clark, & Owen, 2002), to fewer sexual partners (Miller, Forehand, & Kotchick, 1999) and to a better use of contraceptive methods (Biglan, Metzler, Wirt, & Ary, 1990) and condoms (Miller et al., 1999). Also, parental control (the establishment of rules that the adolescent must obey or obtain permission otherwise) has been linked positively to the delay of the first episode of sexual intercourse (Capaldi et al., 2002; Jaccard, Dittus, & Gordon, 1996) and to an increased use of contraception (Biglan et al., 1990; Jaccard et al., 1996; Miller et al., 1999; Rodgers, 1999). Finally, parental limit setting of their teen's behavior, such as doing homework everyday or not spending unsupervised time with peers, is associated with delayed first sexual intercourse (Danziger, 1995; Ku, Sonenstein, & Pleck, 1993).

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Deviant friends

Research on parent monitoring has also shown that youth engaging in high-risk behaviors often spend copious amounts of unsupervised time with peers, which is associated with further increases in problem behavior. It is likely, then, that the adolescent friendship networks may also influence sexual behaviors. Friends seem to play an important role in influencing sexual behavior, because they can provide advice (Davis & Harris, 1982), approbation and encouragement (Connolly & Goldberg, 1999), social expectations, and opportunities for sexual activity (Rowe & Linver, 1995). Moreover, friends' problematic behaviors in general may also influence individual sexual practices. For example, French and Dishion (2003) found that involvement in a deviant peer network was among the strongest predictors of early-onset sexual behavior during early adolescence.

It has been observed that, when delinquent adolescents spend time together, they engage in a process of "deviancy training," a process characterized by deviant talk eliciting positive affect in the relationship (Dishion, Spracklen, Andrews, & Patterson, 1996). However, research on deviancy training has focused mostly on "deviance" as a general construct, and has not been extended to discussions that endorse high-risk sexual behavior. However, it is clear that youth who are comorbid for internalizing and externalizing behaviors are those who get most intensely involved in deviancy training and, later in adolescence, are those who have the more alarming patterns of sexual behavior. For example, Dishion (2000) found that comorbid youths were observed to have longer deviant talk bouts in early adolescence (nearly double those of the externalizing group) and, by middle adolescence, had an average of over 10 sexual partners in one year. This work builds on that of other investigators suggesting the need to study peer influence relative to predicting high-risk sexual behavior in adolescence (Biglan et al., 1990; Capaldi, Crosby, & Stoolmiller, 1996; French & Dishion, 2003; Whitbeck, Yoder, Hoyt, & Conger, 1999).

The tendency of antisocial friendship dyads to endorse the violation of social rules and sexual promiscuity (Dishion, 2000; Dishion et al., 1996) may be the causal link between deviant peer affiliation and the early onset of sexuality (Biglan et al., 1990; Capaldi et al., 1996; French & Dishion, 2003; Whitbeck et al., 1999). Substance use with peers may also be a key dynamic underlying premature engagement in high-risk sexual behavior (Capaldi et al., 2002). However, Li and colleagues (2001) observed that perceptions of peer drug use did not contribute directly to RSB.

Youths' problem behaviors

According to the deviant syndrome theory (Jessor & Jessor, 1977), because antisocial behaviors, substance use, and RSB are strongly linked to one another, they are seen as representing diverse manifestations of a risky disposition that is progressively generalized to all aspects of life (Ary et al., 1999; Costa, Jessor, Donovan, & Fortenberry, 1995; Jessor, Van Den Bos, Vanderryn, Costa, & Turbin, 1997). As such, several studies have found robust associations between antisocial or delinquent behavior and substance use (Dobkin, Tremblay, Masse, & Vitaro, 1995; Kandel & Davies, 1992; Van Kammen & Loeber, 1994), between antisocial behaviors and early sexual activity (Capaldi et al., 1996), between substance use and early sexual activity (Bachanas et al., 2002; Duncan, Strycker, & Duncan, 1999; French & Dishion, 2003; Garriquet, 2005; Guo et al., 2002; Lowry et al., 1994; see Kerr & Matlak, 1998, for a literature review on alcohol use and sexual risk-taking) and between substance use and RSB, such as number of sexual partners and condom use (Guo et al., 2002; Richter et al., 1992; Robertson & Plant, 1988; Valois, Oeltmann, Waller, & Hussey, 1999; Valois, Vincent, McKeown, & Garrison, 1993). Moreover, Rosenbaum and Kandel (1990) found that high levels of drug involvement and early age of substance use initiation were both associated with a higher probability of early sexual intercourse. Moreover, it seems reasonable to assume that the earlier a teen starts his/her sexual life, the more opportunities for having sex, and the greater the number of sexual partners over time. Since early starters are usually less prepared for sexual activity than late starters, they may also be less likely to use condoms.

Furthermore, Zimmer-Gembeck, Siebenbruner, and Collins (2004) have recently shown that alcohol use at age 16 predicted lifetime number of sexual partners at age 19. Adolescents who consumed alcohol abusively and who used marijuana tended to have significantly more sexual partners and to use condoms less (Guo et al., 2002; Kerr & Matlak, 1998). This significant link between substance use and RSB has been observed in Canada, United States and Scotland (Lowry et al., 1994; Richter et al., 1992; Robertson & Plant, 1988; Valois et al., 1993). Finally, Ary and colleagues (1999) have used structural equation modeling to create a single construct of problem behaviors including antisocial behaviors, substance use, RSB, and academic failure. This construct accounted for 67% of the overall variance across the various problem behaviors. According to the deviant syndrome theory, it is also expected that these maladaptive behaviors would share common causes. French and Dishion (2003) have indeed observed that several factors involved in antisocial behavior, such as weak parental supervision, were equally part of the etiology of premature sexual behavior. All of these studies have provided empirical evidence for the interrelation between other problem behaviors (i.e., antisocial behaviors, substance use) and RSB, giving support to the theory of a larger problem behavior syndrome (Jessor & Jessor, 1977).

A few studies have gone further by showing that the onset of antisocial behaviors and substance use occurred before the onset of sexual activity (Elliott, Huizinga, & Morse, 1986), and predicted inconsistent condom use and more sexual partners (Guo et al., 2002). Several points further support this finding. First, antisocial behaviors can arise during early childhood (Moffitt, 1993). Second, the first experiences of cigarettes, alcohol and drug use usually occur during early to mid-adolescence (Blum et al., 2000; Holton & Haans, 2004; Resnick et al., 1997). Last but not least, the true sexual interest usually arises with puberty, since a certain level of physical maturity is necessary for having intercourse (Garriquet, 2005).

Limitations of previous research

Interestingly, the results of the studies reviewed converge to suggest that adolescent sexual activity is shaped by the social context and relationships with their most proximal socialization agents, namely parents and friends, although only a few studies have examined their unique influence simultaneously

(DiClemente, 1991; Fisher, Misovich & Fisher, 1992; Whitaker & Miller, 2000). However, the studies discussed vary considerably in terms of their methodological rigor.

First, some have used only adolescent perception, while others have used multiple informants. Second, most studies have examined the correlates of sexual activity with cross-sectional surveys, whereas only a few have used longitudinal designs. Third, some scholars have investigated the onset of intercourse during adolescence retrospectively, years after the event, leading to problems of recall and event reconstruction. As several researchers have stressed, longitudinal prospective studies are required to capture the developmental changes in sexual behaviors among adolescents while they emerge (Clayton & Bokemeier, 1980; Wagner, 1980) and to examine whether their sexual behaviors are risky or safe. Fourth, most of these studies have used samples of youths from the United States only (Brener et al., 2006). Finally, most empirical studies have examined a series of predictors without an a priori theoretical framework. Despite some rare studies (Huba et al., 2003; Newcomb, Locke, & Goodyear, 2003; Salazar et al., 2004; Scaramella, Conger, Simons & Whitebeck, 1998; Smith & Guthrie, 2005), few scholars have described the structural links between parenting practices, youths' problem behaviors, deviant friends, and youths' sexual behaviors.

Although the independent examination of each of the preceding factors provides information on the direct links with RSB, the use of an integrative structural model in which all factors of interest and their interrelations are considered simultaneously would provide a more rigorous test and further our understanding of the emergence of RSB during adolescence.

Goal of the study

The aim of this study is to test two alternative structural models in order to determine which one can explain the greater amount of the observed variability in condom use and number of sexual partners. They both postulate a complete mediation of the link between poor parenting practices and RSB through two mediating mechanisms: youths' problem behaviors and deviant peer affiliation. The factors are the same in each model; only their order varies as a function of the direction of the relations tested. Each model is described in the next section.

Socialization model

Some scholars have argued that youths living in families in which parents do not use adequate monitoring practices would have more opportunities to affiliate with deviant friends in contexts where no adults are present to supervise them (Dishion & McMahon, 1998; Scaramella et al., 1998). It is possible that these youths will learn how to be antisocial, and how to use and obtain illicit substances, and will be encouraged to engage in RSB in these deviant groups of friends. This is the hypothesis of socialization (see Model 1 in Figure 1). According to this hypothesis, poor parenting practices contribute to the development of problem behaviors and RSB by increasing the probability that adolescents associate with deviant friends (Patterson & Dishion, 1985) and by increasing the amount of time spent with peers without supervision and structure (Capaldi et al., 2002; Miller et al., 1999).

Therefore, the influence of parenting practices on adolescents' behaviors might be indirect rather than direct, by shaping their social contexts and opportunities, such as who they hang out with and where they spend time (Capaldi et al., 1996; Conger & Simons, 1997; French & Dishion, 2003). More time spent with deviant friends without supervision can mean more opportunities for using substances, for breaking rules, for meeting potential sexual partners, and for having sex. Moreover, deviant friends may trivialize problem behaviors and RSB, and may encourage the initiation and escalation of such problematic behaviors (Scaramella et al., 1998).

Selection model

The selection model is based on the idea that poor parenting practices have an initial effect on youth behavior. Previous research, in fact, has found that efficient parenting practices are associated with a decrease in antisocial behavior (Dishion & McMahon, 1998; Patterson & Southamer-Loeber, 1984), tobacco, alcohol and other drug use (Dishion et al., 1995; Fletcher, Darling, & Steinberg, 1995), whereas inadequate parental supervision, control and limit setting is associated with higher levels of problem behaviors. Because of behavioral homophily, these youths will have a tendency to spend time with others whose attitudes and behaviors are similar to their own, resulting in highly antisocial peer groups. This could be
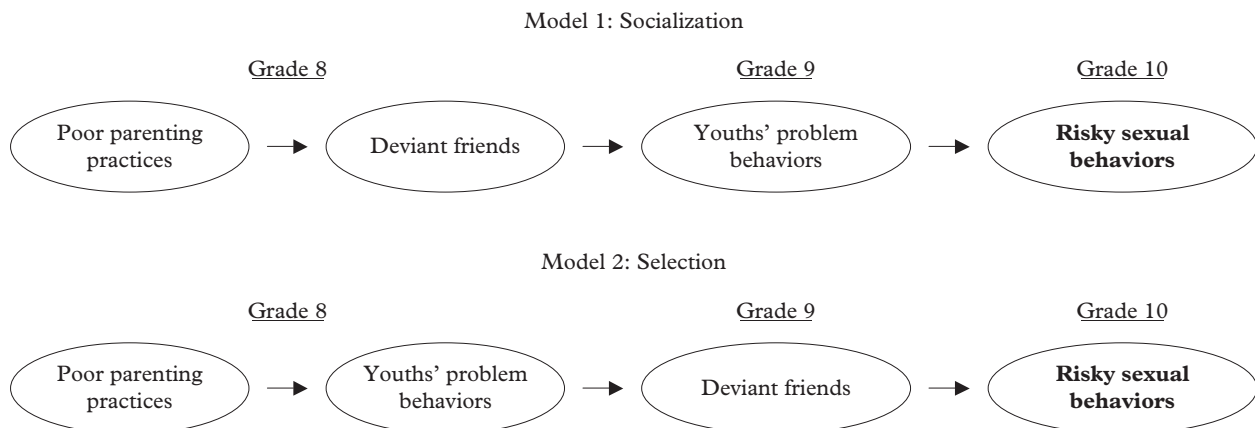

Figure 1. Hypothesized models of risky sexual behaviors.

even truer for adolescents because of the high level of conformity they tend to display (Berndt, 1979).

Within these groups of deviant friends, antisocial behavior and substance use in mixed-gender contexts create favorable conditions for sexual activity and RSB to occur. Deviant friends can become, or provide access to, potential sexual partners. Friends can also provide contexts for sexual encounters and reinforce the behaviors that otherwise would be disapproved of, such as early sexual activity, frequent changes of sexual partners, and underuse of condoms. This constitutes the selection hypothesis (see Model 2 in Figure 1). According to this hypothesis, the link between problem behaviors and RSB could be explained by the fact that the youths' problem behaviors provide access to a group of similar deviant friends in which RSB can occur. Thus, from a purely functional perspective, problem behaviors such as delinquency and substance use can serve to increase the visibility of the teenager and his/her popularity with other-sex peers and, consequently, enhance his/her opportunities for having intercourse (Dishion, Poulin, & Skaggs, 2000).

To sum up, the aim of this study is to advance the current literature on RSB in adolescence by testing two alternative RSB prediction models using longitudinal data, structural equation modeling (SEM), and a sample of adolescents from two different countries. Because both the socialization and the selection models are theoretically justified, and have received previous empirical support, they will be compared empirically. The models will be examined separately for condom use and number of sexual partners. Although we expect these two variables to be highly associated, they are seen as distinct, important dimensions of RSB. The design used in this study is longitudinal, thus allowing us to test for directionality over time. Furthermore, this study includes subsamples of youths from two different Western countries (Canada and Italy). Using such a diverse sample helps increase confidence in the results and their potential generalization.

Methods

Participants

Participants were part of a longitudinal study on adolescent social development. Letters were sent to all parents of 8th-grade students in the participating schools, explaining the nature of the study and inviting them to provide written consent if they agreed to participate with their child. About 60% of the solicited families agreed to participate in the longitudinal study. The initial sample was composed of 296 8th-graders (50% Canadians; 53% females), of which only 28 subjects had left the study by grade 10. This attrition was mainly among males (79%, $n = 22$) and Italians (68%, $n = 19$). The remaining subjects did not differ from the drop-out subjects in grade 8 on any of the independent variables (i.e., monitoring, control, limit setting, friends' antisocial behaviors, youths' substance use and youths' antisocial behaviors) or on their initial level of sexual activity.

The final sample was composed of 127 10th-grade Italian adolescents (50% girls; 96% Italian first language) and 141 10th-grade Canadian adolescents (58% girls; 64% French first language) and their parents. Note that the Italian sample is more homogeneous with regards to native language, whereas the Canadian sample shows more diversity. There is a 5.4

month difference between the mean ages of the two subsamples, with the Canadian adolescents being older.

Procedures and study design

Each year, participants were asked to complete questionnaires during school hours or directly after classes. Trained interviewers were present to give instructions and to answer questions. Parallel to the assessments at schools, questionnaires were sent by mail to one parent for all participating youth. At each wave, parents received money (20$CAN or 15€) and adolescents were given a gift certificate (20$CAN or 15€) to a movie theatre, music store or sports shop, to thank them for their participation. Parenting practices were measured in grade 8, youth and friend problem behaviors were assessed in grades 8 and 9, whereas lifetime number of sexual partners and frequency of condom use were measured in grade 10.

Measures

Parenting practices were measured in grade 8 using three variables: parental monitoring, parental control, and limit setting. *Parental monitoring* was measured using youth report on four items with a 5-point Likert scale (e.g., "How often does at least one of your parents know where you are after school?"). A mean score was computed ($\alpha = .88$). *Parental control* was measured using both parent and youth report with the same five items from the "control" subscale of the Parental Monitoring Questionnaire (Kerr & Stattin, 2000). Responses were given on a 5-point Likert scale (e.g., "Does your child need to have your permission to stay out late on a weekday evening?"). The mean score across the 10 items was used ($\alpha = .69$). However, for 17 participants for whom only the child questionnaire was available, the mean score was computed using only youth report. *Limit setting* was measured using youth report on four items using a 4-point Likert scale, ranging from "My parents have a clear rule" to "My parents don't have a rule or expectation." Items refer to parental rules for doing homework, not smoking, not spending unsupervised time with friends, and not going out late without telling them. The mean score was computed ($\alpha = .49$).

Friends' deviance was measured in grades 8 and 9. This construct reflects time spent with friends who engage in antisocial behavior and substance use. *Friends' antisocial behavior* was assessed with three items using a 7-point scale ranging from "never" to "more than seven times" (e.g., "In the last week, how many times did you get together with friends who get in trouble a lot?"). The other two items were about fighting and stealing. The mean score was used ($\alpha = .68$ in grade 8; $\alpha = .79$ in grade 9). *Friends' substance use* was assessed with a questionnaire in which participants were asked to write down the names of up to five close friends and to answer questions for each nominated friend. For each friend, participants were asked whether s/he uses tobacco, alcohol, marijuana, and other drugs (using a dichotomous yes/no response). A mean score of substance use was first computed for each friend, and afterwards across all friends ($\alpha = .82$ in grade 8; $\alpha = .90$ in grade 9).

Youth problem behavior included both antisocial behavior and substance use; both assessed in grades 8 and 9. *Youth antisocial behavior* was measured with parent reports on 13 items using a 5-point Likert scale (e.g., "During the past three months, how often did your child scream, yell, or shout at someone?"). The mean score was computed ($\alpha = .82$ in grade 8; $\alpha = .78$ in grade

9). *Youth substance use* was measured with a self-report scale asking how often, in the last month, s/he used tobacco, alcohol, marijuana and other drugs. Responses were given on a 14-point scale, ranging from "0" to "41 or more times." A mean score was computed ($\alpha = .75$ in grade 8; $\alpha = .78$ in grade 9).

For *youth risky sexual behavior*, at each wave, participants were asked whether or not they had ever had intercourse with someone of the other sex. We used the data from the last wave (grade 10) to include as many sexually active teenagers as possible. Those who reported being sexually active were asked to remember the *number of sexual partners* of the other sex they had had in their lifetime. Responses ranged from 1 to 16 within this sample. The *frequency of condom use* was also assessed. Participants also were asked to report how often, during the last year, they had used a condom when they had had sex. Responses were given on a 5-point Likert scale, ranging from "never" to "every time." As in Capaldi et al. (2002), condom use was recoded in three categories: 0 = never had intercourse ($n = 148$), 1 = always use condoms when having intercourse ($n = 62$) and 2 = do not use condoms systematically when having intercourse ($n = 57$). This procedure quantifies the risk of getting an STI dimensionally, in which abstinence is the only method that guarantees no (zero) risk. However, after a single sexual intercourse, the risk increases. If condoms are used, without exception, for every sexual encounter, the risk remains low. On the other hand, a single unprotected sexual intercourse increases the risk level, regardless of whether condoms were used most of the time or never used in the past. As the number of unprotected sexual encounters increases, so does the likelihood of exposure. Unfortunately, one sole sexual exposure to an infected partner is sufficient for getting an STI.

Missing data

Structural equation modeling (SEM) requires a complete data set. Therefore, for the 1.6% data points missing amongst independent variables, we imputed the sample mean within country on the missing variable. For the condom use variable, data were missing for 15 participants. For the participants who were already sexually active in grade 9, we used their grade-9 frequency report. Participants who became sexually active between grades 9 and 10, and who did not report a condom use frequency at grade 10, were excluded because there was no other way for estimating whether they had used condoms systematically or not since they started to have sex ($n = 4$). For the lifetime number of sexual partners, there were missing data for 15 participants. For those who were already sexually active in grade 9, we used their lifetime number of sexual partners reported at the preceding wave as the most conservative value. If they were still dating their last reported sexual partner, this value would indeed be right. Six participants became sexually active between grades 9 and 10, and did not report a lifetime number of sexual partners and were excluded. The following analyses were performed using data from 267 adolescents for whom all data were available after these procedures.

Results

Analytic strategy

The first step in data analysis was to examine the assumptions of normality and conduct transformations on the variables that

were not normally distributed. The next step was to verify that the Canadian and the Italian subsamples could be pooled. This was done by comparing mean levels on each variable as well as comparing the correlation matrices calculated separately for each country. Next, we used SEM to test the hypothesized models (see Kaplan, 2000). SEM proceeded in three steps using the *AMOS* 6.0 software package. First, confirmatory factor analyses (CFA) were conducted on the independent variables to confirm the hypothesized three-factor measurement model. Second, the two theoretical models were estimated separately for both condom use and lifetime number of sexual partners. Third, the best fitting model of the two was selected by examining the fit indices, and modified by adding theoretically driven direct effects to improve the fit between the observed and the predicted covariance matrices.

Model fit was assessed with four commonly used fit indices: (1) the chi-square test statistic and its level of significance (a non-significant chi-square indicates no significant difference between the predicted and observed covariance matrices); (2) the Root Mean Square Error of Approximation (RMSEA; Browne & Cudeck, 1993), which gives an estimate of error due to approximate fit of the model (values below .08 indicate acceptable fit; the lower the better); (3) the Comparative Fit Index (CFI; Bentler & Bonett, 1980), which compares the specified model to the independence model (values above .90 indicate good fit; the closer to 1 the better); and (4) the Akaike's Information Criterion (AIC; Akaike, 1987), an inferential statistical method used for comparing models in terms of chi-square differences.

Preliminary analyses

Logarithmic transformations were performed on the following variables: friends' substance use (grades 8 and 9), friends' anti-social behaviors (grades 8 and 9), youths' substance use (grades 8 and 9), and youths' lifetime number of sexual partners (grade 10). This computation reduced their high kurtosis and skewness to acceptable levels for normality.

Subsequently, we conducted one-way ANOVAs on all of the independent variables and the dependent variables by country (see Table 1). For the independent variables, results showed that Italian parents used significantly more control than Canadian parents, but no significant differences were found for parental monitoring and limit setting. Friends of the Canadian youth used significantly more substances than the Italian friends in grade 8 and, although this gap tended to decrease with time, this difference was still significant one year later. However, Italian friends exhibit more antisocial behaviors than Canadian friends, both in grades 8 and 9. A significant difference was found for youths' substance use in grade 8, with Canadians reporting using substances more often than Italians, but this difference was no longer significant one year later. Significant differences were found for the dependent variables as well, with Canadian participants being less prone to using condoms systematically and having more sexual partners. Note that 58% of the Canadian youths reported being sexually active in grade 10, whereas 32% of the Italian sample reported so.

Next, we compared the correlation matrices of the Italian and Canadian samples in order to determine if there were differences in their patterns of relations. The criteria proposed in Guilford (1965) for calculating differences in correlations of independent samples were followed by transforming each

Table 1

Means and standard deviations for all measures among the Canadian and the Italian samples and results of the ANOVAS

	Canada M (SD)	Italy M (SD)	F, p
Parenting practices (G8)			
Monitoring	3.69 (1.02)	3.87 (1.04)	ns
Control	2.40 (.62)	4.09 (.47)	42.67***
Limit setting	1.98 (.57)	1.98 (.50)	ns
Deviant friends			
Friends' substance use (G8)[a]	.67 (.85)	.23 (.43)	27.63***
Friends' substance use (G9)[a]	.22 (.23)	.12 (.16)	15.02***
Friends' antisocial behaviors (G8)	.37 (.11)	.42 (.14)	8.13**
Friends' antisocial behaviors (G9)	.37 (.12)	.44 (.16)	15.83***
Youths' problem behaviors			
Substance use (G8)[a]	.21 (.29)	.14 (.22)	5.24*
Substance use (G9)[a]	.24 (.32)	.23 (.29)	ns
Antisocial behaviors (G8)	1.77 (.49)	1.66 (.42)	ns
Antisocial behaviors (G9)	1.74 (.49)	1.70 (.49)	ns
Risky sexual behaviors (G10)			
Condom use	.87 (.84)	.44 (.71)	19.92***
Lifetime number of sexual partners[a]	.32 (.34)	.13 (.26)	24.17***

Note. G = Grade. [a] Logarithmic transformations were performed on these variables.
*$p < .05$; **$p < .01$; ***$p < .001$.

difference into a z score and verifying whether this difference was significant or not at a $p < .05$ level. Among the 78 correlations examined (between all independent variables [IVs] and dependent variables [DVs]), only eight were significantly different for these two subsamples, of which two involved the RSB variables. Specifically, for both condom use ($z = 2.71$, $p < .05$) and number of sexual partners ($z = 2.27$, $p < .05$), the association with youths' substance use in grade 9 was significantly stronger among Italian than Canadian participants.

Regarding the independent variables, the associations between friends' substance use in grade 8 and youths' substance use in grades 8 and 9 were significantly stronger among Canadians (grade 8: $z = 3.44$, $p < .05$; grade 9: $z = 3.29$, $p < .05$), as were the associations between friends' substance use in grade 8 and friends' substance use in grade 9

($z = 3.06$, $p < .05$), and between youths' antisocial behaviors in grade 8 and youths' antisocial behaviors in grade 9 ($z = 2.10$, $p < .05$). Conversely, the relations between friends' antisocial behaviors in grade 8 and friends' substance use in grades 8 ($z = 2.79$, $p < .05$) and 9 ($z = 1.97$, $p < .05$) were significantly higher among Italians. When using the Bronferroni correction, only one difference was still significant: between friends' substance use and youths' substance use in grade 8 ($z = 3.44$, $p < .000641$). Therefore, with 90% of all correlations being approximately the same for Canadian and Italian participants, and because no a priori difference was expected between the Canadian and the Italian samples, we concluded that their patterns of associations were similar enough to test the hypothesized models among the total pooled sample. The full sample correlation matrix is presented in Table 2.

Table 2

Correlations among all variables and RSB in the total sample (N = 267)

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Gender[a]													
2. Parental monitoring	.06	—											
3. Parental control	−.00	.34***	—										
4. Parental limit setting	−.00	.24***	.40***	—									
5. Friends' substance use (G8)	.07	−.22***	−.29***	−.20***	—								
6. Friends' substance use (G9)	.11	−.24***	−.30***	−.27***	.68***	—							
7. Friends' antisocial behavior (G8)	−.08	−.23***	−.07	−.14*	.26***	.28***	—						
8. Friends' antisocial behavior (G9)	−.08	−.20***	.02	−.07	.12	.34***	.37***	—					
9. Youths' substance use (G8)	−.01	−.32***	−.29***	−.23***	.71***	.63***	.33***	.25***	—				
10. Youths' substance use (G9)	.01	−.32***	−.24***	−.23***	.57***	.73***	.32***	.40***	.75***	—			
11. Youths' antisocial behavior (G8)	−.07	−.22***	−.18**	−.14*	.20***	.16**	.10	.10	.23***	.17**	—		
12. Youths' antisocial behavior (G9)	−.03	−.19**	−.09	−.08	.27***	.24***	.20***	.18**	.31***	.34***	.66***	—	
13. Condom use[b]	.12	−.22***	−.34***	−.15*	.35***	.44***	.13*	.20***	.38***	.46***	.13*	.28***	—
14. Lifetime number of sexual partners	.03	−.29***	−.37***	−.19**	.37***	.47***	.15*	.24***	.41***	.50***	.18**	.23***	.77***

Notes. [a] For gender, 0 = male; 1 = female. [b] For condom use, 0 = virgin; 1 = always used condoms; 2 = did not always use condoms. G = Grade. P = Parent report; C = Child report.
*$p < .05$; **$p < .01$; ***$p < 001$.

When examining the correlations, it is important to note that condom use and number of sexual partners were significantly associated with all of the other variables in the expected direction. Parenting practices were moderately and positively interrelated, and were negatively associated with both condom use and number of sexual partners, thus suggesting that youth whose parents use adequate monitoring, control, and limits, remain virgins longer, have fewer sexual partners, and use condoms more. Youth and friend substance use were highly and positively correlated with both condom use and number of sexual partners. Youth and friend substance use were also highly correlated with each other. Youth and friend antisocial behaviors were positively linked to youth substance use and RSB, especially in 9th grade.

Measurement models

The independence models for the socialization and the selection data sets, testing the possibility that all variables are uncorrelated, were both rejected (note that, because different variables were used at grades 8 and 9 for these two models,

separate measurement models were required). The data used for the socialization model showed better fit indices than the data used for the selection model. Modification indices suggested that correlating the residuals of monitoring and friend substance use, as well as the residuals of parental control and limit setting, would significantly improve the fit of the model. The socialization measurement model with these two correlated errors was accepted as the final measurement model, $\chi^2(9) = 11.88$, *ns*; RMSEA = .04; CFI = .99; AIC = 63.88.

Structural model for condom use

Maximum likelihood procedure was employed to estimate all models. First, we estimated our two models separately for condom use. Our first hypothesis was the socialization model, in which parenting practices and friends' deviance were measured in grade 8, youths' problem behaviors were measured in grade 9, and condom use in grade 10. Our second hypothesis was the selection model, where parenting practices and youths' problem behaviors were measured in grade 8, friends' deviance in grade 9, and condom use in grade 10.

Table 3
Comparison of models for condom use

Model		χ^2 (dl)	RMSEA	CFI	AIC	$\Delta\chi^2$
M1	*Socialization model*	25.95 (16), ns	.05	.97	81.95	
M2	*Selection model*	77.93 (16)***	.12	.84	133.93	
Modifications of the initial socialization model (M1):						
nested hierarchical models						
M1a	One path added: partial mediation – condom use predicted by friends' deviance	25.43 (15)*	.05	.97	83.43	M1 – M1a = .52 (1), ns
M1b	One path added: partial mediation – youths' problem behaviors predicted by parenting practices	25.58 (15)*	.05	.97	83.58	M1 – M1b = .37 (1), ns
M1c	One path added: partial mediation – condom use predicted from parenting practices	23.48 (15), ns	.05	.97	81.48	M1 – M1c = 2.47 (1), ns

Notes. *p < .05; **p < .01; ***p < 001.
30.6% of the variance of the condom use variable is explained by the final model (M1).
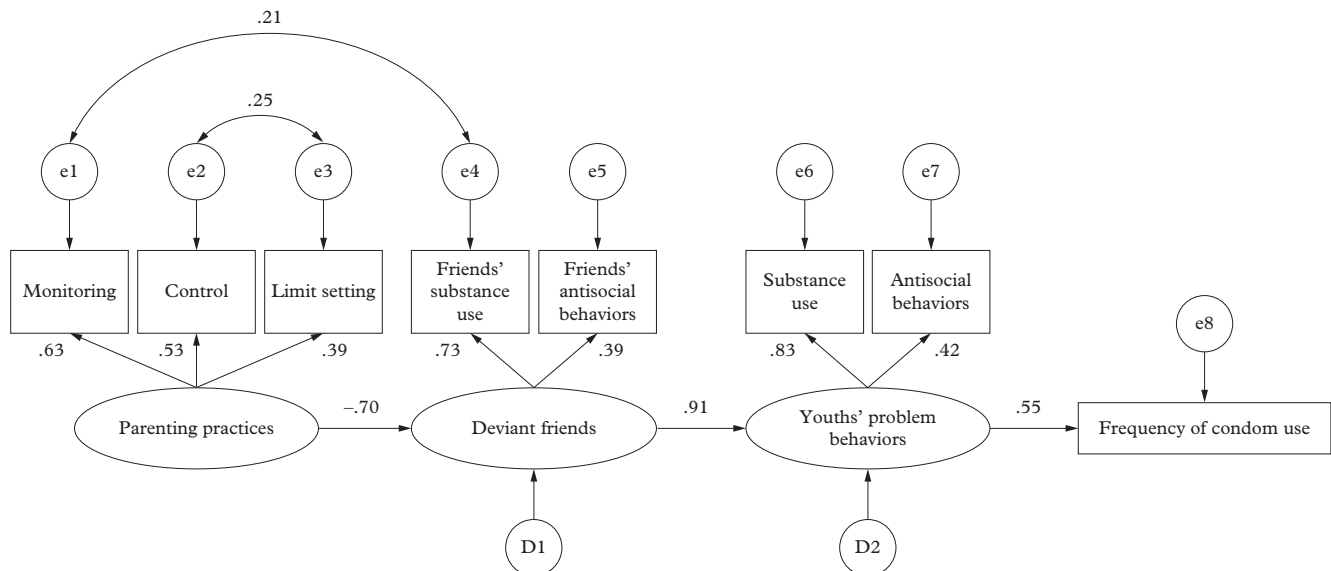

Figure 2. Final model supporting the socialization hypothesis for condom use.

Consistent with the measurement model, the residuals of control and limit setting, and of monitoring and friends' substance use, were correlated in both models. When comparing the chi-squares and the fit indices of these two models (Kline, 2005), the socialization model was found to fit the data well, whereas the selection model did not fit the data well. All model fit indices are presented in Table 3. Therefore, post hoc modifications were performed on the socialization model in an attempt to specify the best-fitting model with the data.

We examined the possibility that deviant peers would have a direct effect on condom use, but this modification did not increase the fit significantly, nor did the direct path from parenting practices to youths' problem behaviors, or the direct path from parenting practices to condom use. Therefore, the final model for condom use was the full-mediation model of socialization, allowing the residuals of control and limit setting, and of monitoring and friends' substance use to correlate, as in the measurement model, $\chi^2(16) = 25.95$, *ns*; RMSEA = .05; CFI = .97; AIC = 81.95. Standardized estimates of all paths are presented in Figure 2.

Structural model for lifetime number of sexual partners

The same procedure was followed for the lifetime number of sexual partners. To be consistent with our measurement model, we again allowed the residuals of control and limit setting, and of monitoring and friends' substance use, to covary. Again, whereas the socialization model was found to fit the data well, the selection model did not. All model fit indices are presented in Table 4. As was the case for condom use, we tested modifications for enhancing the fit of the model. We again tested for direct effects of deviant peers on number of sexual partners, and of parenting practices on youth problem behavior. These modifications did not improve the model fit. However, when adding a direct path from parenting practices to number of sexual partners, the fit of the socialization model improved significantly, $\Delta\chi^2(1) = 7.55$, $p < .01$. This model was accepted as the final model for number of sexual partners, $\chi^2(15) = 23.48$, *ns*; RMSEA = .05; CFI = .97; AIC = 81.48. Standardized estimates of all paths are presented in Figure 3.

Table 4
Comparison of models for lifetime number of sexual partners

Model		χ^2 (dl)	RMSEA	CFI	AIC	$\Delta\chi^2$
M1	*Socialization model*	27.94 (16)*	.05	.97	83.94	
M2	*Selection model*	85.85 (16)***	.13	.83	141.84	
Modifications of the initial socialization model (M1): nested hierarchical models						
M1a	One path added: partial mediation – number of sexual partners predicted by friends' deviance	27.92 (15)*	.06	.97	85.92	M1 – M1b = .02 (1), ns
M1b	One path added: partial mediation – youths' problem behaviors predicted by parenting practices	27.72 (15)*	.06	.97	85.72	M1 – M1b = .22 (1), ns
M1c	One path added: partial mediation – number of sexual partners predicted from parenting practices	20.39 (15), ns	.04	.99	78.39	M1 – M1c = 7.55 (1)**

Notes. *$p < .05$; **$p < .01$; ***$p < 001$.
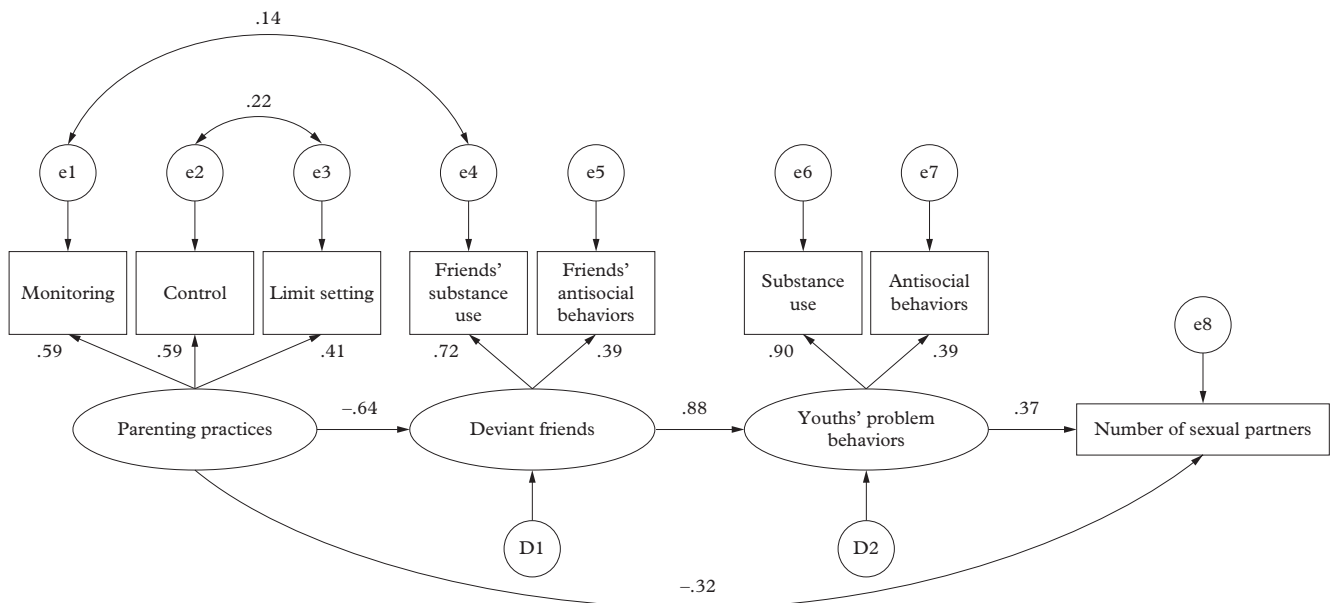38.2% of the variance of the lifetime number of sexual partners' variable is explained by the final model (M1c).

Figure 3.   Final model supporting the socialization hypothesis for number of sexual partners.

Discussion

This study was conducted to examine and compare two alternative models in order to determine which one could explain the greater amount of the observed variability in condom use and number of sexual partners. Previous research has suggested that the relation between youths' problem behaviors, RSB, and deviant friends could be attributed either to a peer socialization effect, such that problem behaviors are learned by modeling in the social environment, or to a peer selection effect, such that teenagers affiliate with others who have problematic behaviors similar to their own.

In the context of this international sample of adolescents, our findings suggest that the socialization model was superior to the selection model for explaining risky sexual practices in adolescence. Specifically, the socialization model accounted for 31% of the variance in the youths' report of condom use over the last year. This model was entirely mediational, in that the impact of parenting practices was mediated through deviant friends and the youths' problem behaviors. Similar results were found for lifetime number of sexual partners: the socialization model accounted for 38% of the variance in this measure of RSB. In this model, however, mediation was only partial: parenting practices were also directly predictive of number of sexual partners. This result suggests that adequate parenting practices have both an indirect influence on their child's behaviors by shaping their social environments and a direct effect on their sexual practices, such as who their child is allowed to date or not.

The present findings are consistent with the work of other investigators. As Scaramella and colleagues (1998) have pointed out, good parental monitoring practices can transmit clear guidelines for acceptable behaviors and relationships. Parents with adequate parenting practices respond to their child's transgressions in ways that reduce the likelihood of unacceptable behavior to reappear (Conger, 1997). Also, as Mounts (2001) has shown, parents who evaluate their child's friendships and manage them accordingly, by facilitating or prohibiting them, can have a real impact on their child's peer relationships.

According to our findings, differential effects of parenting practices were found for condom use and number of sexual partners. Parents do not have a direct impact on condom use, possibly because this decision happens in a private context. However, parents can influence who their child sees at home or in some other places during free time, as well as when, for what, and for how long. It is likely that youth whose parents use adequate practices will have less unsupervised time to have sexual experiences. It is also possible that parents with good practices will discourage early sexual activity and disapprove of sleepovers or overnight stays of possible sexual partners. These types of behaviors could explain the direct effect of parenting on the number of sexual partners.

The socialization model may also be suitable for predicting risk of teen pregnancy. Not wearing a condom increases the risk of teen pregnancy, although the use of other contraceptive methods should be examined in parallel. Oral contraceptives, for example, have about the same rate of efficacy as condoms when used adequately (Society of Obstetricians and Gynaecologists of Canada, 1998) and are chosen by many adolescent females as the main protection against pregnancies (McKay, 2004). If neither condoms nor other contraceptive methods are used by sexually active adolescents, risk for pregnancy is further increased. Teen mothers often have difficulties in completing their high school degrees and, therefore, often live in economically harsh conditions (Dryburgh, 2000). Moreover, babies of these young girls are at greater risk of being born prematurely and of low birth-weight, and to die before the age of one year (Bissel, 2000).

In this study, the association between inadequate condom use and number of sexual partners was notably high ($r = .77$, $p < .001$), but this may be partially due to the presence of 55% virgins in the sample. Similarly, Capaldi et al. (2002) had found a strong negative association between number of sexual partners and condom use, thus indicating that those most at risk, through frequent exposure to new sexual partners, were also less likely to use condoms.

It is tempting to consider sexual behavior as one among many behaviors within a general syndrome of problem behavior (Jessor & Jessor, 1977). We suggest, however, that there is advantage to studying each of the problem behaviors uniquely. As we have seen, the parents' role in the youths' number of sexual partners was both direct and indirect, whereas it was entirely indirect when predicting youth condom use. Similarly, Dishion and Owen (2002) found different antecedents and consequences for tobacco, alcohol and marijuana use when the use of each substance was modeled separately. Although problem behaviors may be correlated, the functional utility and the predictors of each may be distinct, suggesting the value of considering them separately.

When comparing Italian and Canadian youths, there were differences in mean levels of both the predictor and dependent variables. Canadian youth, for example, reported more RSB than Italian youths. However, the relations among the measured variables were not different for the two samples, suggesting similar patterns of prediction for Italian and Canadian youths. In this study, there was an average of 5.4 months' difference in the ages of the two subsamples, with Canadians being older. This age difference may partially explain why more of the Canadians had engaged in sexual activity than Italians, since intercourse is a developmental event with greater probabilities to occur among older than younger adolescents. Other hypotheses, such as greater cultural acceptance of youth sexuality in Canada, may contribute to explain the higher level of sexual activity among the Canadian youth.

Clinical implications

This study adds to a growing number of studies targeting the friendship network in prevention and intervention programs among adolescents (Dishion & Dodge, 2005; Phillips Smith, Dumas, & Prinz, 2006). In fact, there is some evidence that a lack of attendance to peer environments within prevention programs focused on preventing RSB may actually increase high-risk sexual behavior (Moberg & Piper, 1998). Friends have been shown to be important proximal agents in socialization of behaviors and attitudes, particularly among early and mid-adolescents (Kiesner, Cadinu, Poulin, & Bucci, 2002). The current study has shown that, not only do deviant friends promote problem behaviors such as delinquency and substance use, but they also influence the type of sexual behaviors adopted. These findings replicate and extend previous work on adolescent sexual behavior (Capaldi et al., 1996; French & Dishion, 2003), and support the idea of deviancy training in the peer group. Thus, programs aimed at

decreasing RSB among adolescents should target friendship groups and promote making responsible personal choices in sexual matters.

There is ample evidence that interventions can systematically and cost-effectively target parenting practices in general, and parental monitoring in particular, to reduce deviant peer affiliation (Dishion, Bullock, & Granic, 2002), substance use (Dishion, Kavanagh, Schneiger, Nelson, & Kaufman, 2002; Spoth, Redmond, & Shin, 2001) and a variety of other problem behaviors (Connell, Dishion, & Deater-Deckard, 2006). Moreover, when adolescent problem behaviors change as a function of interventions targeting parenting, changes have been found to be mediated by improved monitoring and parenting practices (Dishion, Nelson, & Kavanagh, 2003; Staton et al., 2004). Thus the evidence supporting parents as important proximal socialization agents continues to be re-affirmed in both longitudinal data, such as the present data, as well as in randomized field experiments. This is encouraging because, although it might be difficult to teach parents a new parenting style, there is evidence that parents can learn and efficiently apply new parenting practices (Bogenschneider, Wu, Raffaelli, & Tsay, 1998; Patterson, 1986).

Limitations and future research

Although this study provides new information regarding the antecedents and mediating processes of RSB during adolescence, there are several limitations that indicate directions for further investigations. First, our study used a relatively small sample ($N = 267$). Thus, to enhance our confidence in the findings, it would be useful to replicate this prospective longitudinal study using a larger and more diverse sample.

Second, the present study considered only heterosexual behaviors, partly because very few participants reported same-sex sexual experience, other than kissing. However, men who have sex with other men have been identified as population at high risk for STIs, and particularly for HIV/AIDS. Therefore, it would be valuable to examine similar hypotheses with regards to homosexual and bisexual adolescent males for evaluating the generalizability of the socialization model among this population.

Third, except for parental control and youth antisocial behavior, this study uses self-report data. Researchers have demonstrated that, when students are assured confidentiality, self-report measures of risk behaviors have good validity (Murray & Perry, 1987; White, 1991). Scholars have also shown that adolescent males (Capaldi et al., 1996) and females (Hearn, O'Sullivan and Dudley, 2003) are reliable reporters of their current RSB. For parenting practices, it would be interesting to assess the parents' perceptions of their own parenting practices, as was done for the control subscale of parenting. For friends' deviance, using self-report data allowed participants to name friends from all contexts, including friends that were not in the same school or grade. However, it will be important to replicate this study using friends' reports about their own deviancy.

Notwithstanding these limitations, the present study provides data on two samples from two countries and two continents, including both males and females. The heterogeneity of this combined sample provides added confidence in the results. Future studies should examine such behaviors among other samples from both Western and non-Western countries to increase our knowledge on adolescents' sexual practices and

their social environments, which are likely to vary from one cultural context to another.

Finally, another important dimension of RSB is the age that youth start having intercourse. The timing of sexual onset is a crucial component of sexuality because early starters have more years and opportunities for having contact with sexually transmitted infections and having unwanted pregnancies (Aarons & Jenkins, 2002; Institut Canadien d'information sur la santé, 2003). Studies have shown that sexually precocious teens have more sexual encounters and partners than their peers who remain abstinent (Capaldi et al., 2002; Thornton, 1990) and show a higher level of RSB (Sonenstein, Pleck, & Ku, 1989). Future research should examine how parenting practices and friends' deviance relate to the timing of sexuality.

The analysis of developmental predictors of adolescent RSB provides empirical guidelines for the design of effective intervention and prevention services. In this respect, the two models guiding this research have particular relevance to both developmental theory and prevention science. It appears that peer environments are potentially an arena for learning new behaviors such as RSB, and that parental effort to monitor and structure peer environments may be especially important for reducing RSB.

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