Published in final edited form as:

J Youth Adolesc. 2013 August ; 42(8): 1194–1209. doi:10.1007/s10964-012-9809-0.

Gender-Specific Relationships Between Depressive Symptoms, Marijuana Use, Parental Communication and Risky Sexual Behavior in Adolescence

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Abstract

A large body of research has identified correlates of risky sexual behavior, with depressive symptoms and marijuana use among the most consistent psychosocial predictors of sexual risk. However, substantially less research has examined the relationship between these risk variables and adolescent risky sexual behavior over time as well as the interaction of these individual-level predictors with family-level variables such as parenting factors. Additionally, most studies have been restricted to one index of risky sexual behavior, have not taken into account the complex role of gender, and have not controlled for several of the factors that independently confer risk for risky sexual behavior. Therefore, the current study investigated the association between depressive symptoms and parameters of parenting on marijuana use, number of sexual partners and condom usage measured 9 months later for both boys and girls. Participants were 9th and 10th grade adolescents ($N = 1,145$; 57.7 % female). We found that depressive symptoms may be a gender-specific risk factor for certain indices of risky sexual behavior. For boys only, marijuana use at Time 2 accounted for the variance in the relationship between depressive symptoms at Time 1 and number of partners at Time 2. Additionally, strictness of family rules at Time 1 was associated with the number of partners with whom girls engaged in sex at Time 2, but only among those with lower levels of depressive symptoms at Time 1. Results from the current investigation speak to the utility of examining the complex, gender-specific pathways to sexual risk in adolescents. Findings suggest that treatment of mental health and substance use problems may have important implications in rates of risky sexual behavior and, conceivably, controlling the high rates of serious individual and public health repercussions.

Keywords

Risky sex; Marijuana; Depressive symptoms; Parenting; Parental control; Communication; Gender

Introduction

Sexual activity typically starts in adolescence. Nationwide surveys reveal that 46.8 % of high school students have had sex, with this rate nearly doubling between ninth and twelfth grade (Centers for Disease Control and Prevention 2008b). However, given that sexual experimentation is more normative than other forms of problem behaviors during adolescence (Chilman 1990; Kinsman et al. 1998; Vrangalova and Savin-Williams 2011; World Health Organization 2002), this increase in sexual initiation may not necessarily be indicative of risk. Of greater public health concern are the alarmingly high prevalence rates of risky sexual behavior, including sex with multiple partners (Karlsson et al. 1995) and inconsistent condom usage (Paz-Bailey et al. 2005). Indeed, nearly a quarter of all 12th grade students have had more than four sexual partners and 38.5 % did not use a condom during their last sexual encounter, with the likelihood of condom usage steadily declining over the course of high school (CDC 2008b). As such, it is of no surprise that these high rates of risky sexual behavior are mirrored by recent and steady increases in a range of deleterious health consequences. Although adolescents only represent 25 % of the sexually active population (Weinstock et al. 2004), they are each year responsible for 19 million new STD infections (CDC2008b; Weinstock et al. 2004), 14 % of newly diagnosed HIV cases (CDC 2008a), and 12 % of all pregnancies (Ventura et al. 2006). Given the inflated levels of sexual risk taking and associated consequences that occur during adolescence, understanding the maintaining mechanisms within this demographic is of significant concern for public health.

A large body of research has focused on identifying risk factors for engaging in risky sexual behavior, with depression and marijuana use among the most consistent psychosocial predictors (e.g., Brawner et al. 2012; Tapert et al. 2001). However, substantially less research has examined the relationship between both of these individual-level predictors with family-level variables that are relevant to sexual risk taking such as parental control and parent-adolescent communication. Additionally, most studies to date have been restricted to just one index of risky sexual behavior. Sexual risk is a heterogeneous construct, and an examination of multiple risky behaviors together may provide for a more comprehensive understanding of an adolescent's sexual risk profile. Therefore, the current study investigated the association of depressive symptoms and parameters of parenting on later engagement in marijuana use and two dimensions of risky sexual behavior: number of partners and consistency of condom usage. We controlled for several factors that are known to independently confer risk for risky sexual behavior (i.e., minority status, grade point average (GPA), alcohol use and age) in order to better ascribe any observed effects to our variables of interest. A better understanding of the interplay of all such variables will inform the development of more targeted prevention efforts for high-risk adolescents.

Depressive Symptoms, Substance Use and Risky Sexual Behavior: A Mediational Model

The link between depression and sexual risk among adolescents has been the subject of significant empirical scrutiny. The overwhelming trend emerging from this line of work suggests that depressed adolescents are more likely to be sexually active than non-depressed adolescents (Brawner et al. 2012). Additionally, depression is cross-sectionally and longitudinally linked with increased risky sexual behavior, including greater number of partners (Mazzaferro et al. 2006; Orr et al. 1994) and condom nonuse (Mazzaferro et al. 2006; Miller-Johnson et al. 1999; Seth et al. 2009). Therefore, it is not surprising that depression is associated with the various deleterious consequences of sexual risk including STDs (Mazzaferro et al. 2006; Seth et al. 2009; Shrier et al. 2002) and teenage pregnancy (Kessler et al. 1997; Miller-Johnson et al. 1999).

Several theories attempt to explain the relationship between depression and subsequent engagement in risky sexual behavior. First, cognitive theories purport that depression may disrupt critical processes (e.g., self-regulation) that make one motivated and able to implement safe-sex practices (Klein et al.2008; Leith and Baumeister 1996). Second, depression is often associated with a diminished sense of self-efficacy, which might manifest in terms of decreased confidence in one's ability to resist peer pressure and negotiate safe sex practices (Ehrenberg et al. 1991; McFarlane et al. 1995). Finally, depressed adolescents are more likely to have deviant peer affiliations (Fergusson et al. 2003) and are more susceptible to peer influences (Donenberg et al.2001). In sum, there are a number of different sequelae of depression that might serve to increase the likelihood of engaging in sexual risk taking behaviors among adolescents.

In addition to the pathways mentioned above, the link between depression and sexual risk may be explained by self-medication theory, which suggests that depressed individuals engage in hedonic pursuits as an attempt to alleviate aversive psychological states (McKirman et al.1996; Thayer et al. 1994). Indeed, Cooper et al. (1998) showed that those who have sex to cope with negative affect were more likely to engage in high-risk sex. Although a depressed individual may be motivated to alleviate distress directly with sexual activity, it is also possible that substance use may mediate the relationship between depression and sexual risk. That is, individuals may use substances to directly improve their depressive symptoms, and then the intoxicating (e.g., increased disinhibition) and/or social correlates (e.g., increased integration with deviant peers) of substance may render the individual more likely to engage in high-risk sex.

Marijuana use may be an important substance of abuse to examine in the relationship between depression and sexual risk given that it is the most commonly used illicit substance, with 50 % of adolescents reporting lifetime use (SAMHSA 2010) and more adolescents reporting marijuana use disorders as compared to other drugs (Compton et al. 2004). Additionally, rates of depression and marijuana comorbidity are unusually high (Kandel et al. 1999), perhaps due to marijuana's posited antidepressant sequelae (Martin et al. 2002). Indeed, depression has been suggested to exert a causal influence on marijuana use among adolescents even after controlling for sociodemographics, familial factors and externalizing disorders (McGee et al.2000; King et al. 2004; Wittchen et al. 2007). Finally, the link between marijuana use and risky sexual behavior also has been well-established (Baskin-Sommers and Sommers 2006; Brook et al. 2002; Tapert et al. 2001). Several studies have cited that the severity of use and sexual risk are positively related (Malow et al. 2006). This association has been found with respect to earlier age of initiating sex (Bellis et al. 2008; Guo et al. 2005), more lifetime sexual partners (Bellis et al. 2008; Brodbeck et al. 2006; Guo et al.2002; Shrier et al. 1997), and reduced frequency of condom usage (Bellis et al. 2008; Guo et al. 2002; Kingree et al.2000). The importance of marijuana use in risky sexual behavior is also underscored by the fact that marijuana use is a consistent correlate of the physical consequences of sexual risk including STD and HIV infection (Doherty et al. 2007; Zenilman et al. 1994), with rates of infection increasing in a dose-dependent fashion with amount and frequency of use (De Genna et al. 2007; Smith et al. 2010). Given the overwhelming rates of use as well as the known associations with depression, it is reasonable to suspect that individuals might turn to marijuana use as a way of managing their distress. As a consequence of either the clustering of problem behaviors in adolescents (e.g., Problem Behavior Theory, Donovan and Jessor 1985) and/or the adverse neurocognitive correlates of marijuana use (e.g., impaired executive functioning and/or decision making; Lane et al. 2005; McDonald et al. 2003; Whitlow et al.2004), marijuana use may be an informative mechanism linking depression to high-risk sex; however, to date, this pathway has been largely understudied.

Parenting Factors: A Moderation Effect

Family context plays a large role in the healthy sexual socialization of adolescents (Pequegnat and Szapocznik 2000; Perrino et al. 2000) and may help to buffer against risky sexual behavior (Miller 2002). However, it is not yet known whether parental behaviors can be protective when adolescents possess individual-level risk factors such as depression and/or marijuana use. One parenting dimension that may be relevant to examine is that pertaining to the degree of parental control. Some studies have found that low levels of parental permissiveness and more restrictive rules have been linked with fewer numbers of sexual partners and increased condom usage (Miller et al. 2000; Romer et al. 1999). Additionally, STD contraction is higher among adolescents who perceived their mothers as more permissive (Crosby et al. 2000). Therefore, it is possible that adolescents with higher levels of depressive symptoms who have families that provide more consistent and strict rules may be less likely to turn to sexual risk taking than adolescents of families with more lenient, unpredictable rules.

Parent-adolescent communication is also thought to be an important contributor to adolescent sexual risk taking. The extant literature has focused primarily on the relationship between frequency and content of parent-adolescent communication with risky sexual behavior. However, communication is a multi-dimensional construct consisting not only of how much is said (frequency of communication) and what is said (content of communication), but also how it is said (quality of communication). The quality of dyadic conversations refers to how effective the communicative process is, rather than simply whether or not it has occurred, and may be more influential in determining engagement in risky sexual behavior than frequency and content of dyadic communication (Mueller and Powers 1990; Wilson and Donenberg 2004). Parent-adolescent communication that is open, bilateral, and less judgmental (as compared to didactic and instructive) is associated with adolescents being more informed about the consequences of risky sexual behavior (Lefkowitz et al. 2000), as well as an overall lower level of sexual activity and lower level of sexual risk across various developmental stages (Miller et al. 1998; Mueller and Powers 1990). High quality communication may help to foster and improve responsible decision-making and thereby reduce rates of risky sexual behavior (Rodgers 1999). Additionally, (Pluhar and Kuriloff 2004) found that parents who maintained higher quality communication were more likely to have daughters who were receptive and engaged in the conversation. In turn, engaged youth who feel valued in communication with parents are more likely to share information, which increases parents' capacity to monitor adolescents' behavior (Wu et al. 2003). High quality communication may also buffer against the adverse influences of sexually active adolescent peers. That is, adolescents with parents who engage in mutual decision-making are more likely to delay intercourse regardless of the sexual behavior of their peers (Fasula and Miller 2006). Although high quality parent-adolescent communication is reliably linked with lower rates of adolescent sexual risk taking, it is not known whether this parenting factor is equally as protective when adolescents show symptoms of depression.

The fact that the relationship between parenting and sexual risk has rarely been examined in the context of adolescent depressive symptoms is a clear limitation of the current literature. Indeed, understanding practically any adolescent problem behavior benefits from integrating information across multiple levels of influence (e.g., individual-level factors: depression, marijuana use; environmental factors: parenting; Bronfenbrenner 1986). Indeed, several studies have shown that the inclusion of family components to interventions targeting depressed youth results in improved treatment outcomes such as reductions in depressive symptoms and improved coping strategies (Asarnow et al. 1993; Birmaher et al. 2000; Asarnow et al. 2002). Parenting behaviors may be particularly salient to consider with respect to sexual risk because depressive symptoms during adolescence are often accompanied by

poor peer relationships (Fergusson et al. 2003; Merikangas and Angst 1995). Therefore, positive parenting may serve to enhance the adolescent's level of perceived support and reduce the likelihood that he/she will seek sex as a way of reducing social isolation. Further, family processes (e.g., parent-adolescent communication) are important in establishing developmentally-appropriate autonomy (Allen et al. 1994; Powers and Welsh 1999) and problem-solving capabilities (Carris et al. 1998; Sheeber et al. 2001) among adolescents. As such, depressed adolescents who have parents who engage in more bilateral communication and/or maintain clear rules may be less susceptible to turning to sex as a form of emotional regulation, better able to employ healthy and non-avoidant coping strategies in response to their distress, and more skilled at negotiating safe sex practices. However, to the best of our knowledge, there has only been one study that has begun to explore these relationships: those data suggested that high quality parent-adolescent communication was associated with less risky sexual behavior among youth receiving psychiatric treatment (Wilson and Donenberg 2004). Further research in this domain is needed in order to determine whether parental control and parent-adolescent communication show potential in mitigating the adverse influence of depressive symptoms and marijuana use on sexual risk taking.

Gender Effects

Given significant gender-specific patterns in risky sexual behavior, this study considered how the examined relationships vary between boys and girls. Although national data from the Youth Risk Behavior Survey (YRBS) found that a relatively equal proportion of male and female students currently engage in sexual activity (49.8 and 42.5 % respectively) (CDC 2008b), males appear to endorse earlier ages of sexual debut, a greater number of sexual partners and more frequent use of substances prior sex than females (CDC 2008b). Additionally, females report more inconsistent condom usage than their male counterparts (CDC 2008b), despite the fact that males hold stronger views regarding barriers to contraceptive use (e.g., inconvenience, interference with sexual pleasure, embarrassment, etc.; Pesa et al. 2001). Given these considerable differences between males and females, this study aimed to examine gender-specific associations among mental health, substance use, parenting factors and sexual risk behavior. A better understanding of how these relationships vary by gender could help to understand whether boys and girls have unique prevention and treatment needs.

Current Study

The primary aim of this study was to better characterize the relationship between depressive symptoms and risky sexual behavior. We sought to make first steps in gaining a more comprehensive understanding of some of the various factors that may influence whether depressive symptoms are linked with sexual risk. We chose to focus on the contributions of marijuana use, family context and gender because all have been independently associated with risky sexual behavior, but few studies have yet to examine these variable together. Importantly, this study controlled for multiple factors that tend to co-occur with risky sex (i.e., age, minority status, academic achievement and alcohol use).

We hypothesized that depressive symptoms and marijuana use would be positively related to sexual risk taking (number of sexual partners and condom use); more parental control and higher quality parent-adolescent communication was suspected to be inversely related to risky sexual behavior and marijuana use. We expected that marijuana use would mediate the relationship between depressive symptoms and risky sexual behavior. That is, we expected that depressive symptoms would be associated directly with increased sexual risk, but that this relationship would be reduced after adjusting for marijuana use. Additionally, we suspected that depressive symptoms would interact with both dimensions of parenting (parental control and parent-adolescent communication) in predicting behavioral outcomes

in youth (risky sexual behavior and marijuana use). More specifically, we hypothesized that depressive symptoms would be positively related to risky sexual behavior and marijuana use only when there were low levels of parental control or when parent-adolescent communication was poor. On the other hand, we hypothesized that depressive symptoms in the context of higher parental control and better parent-adolescent communication would not be linked with risky sexual behavior and marijuana use. Results were stratified by gender in order to better determine whether differential patterns of risk emerged for boys and girls. Although there were no specific gender hypotheses, the differential patterns of depressive symptoms and risky sexual behavior among girls and boys indicates that the exploration of unique gender associations is prudent.

Methods

Participants

Participants were recruited for a large natural history study of the social-emotional contexts of adolescent smoking in a multi-stage process from sixteen Chicago area highschools. The parent project was designed to establish a cohort of adolescents at-risk for smoking escalation and thus the cohort was over-sampled for students who had ever smoked. All 9th and 10th graders ($N = 12,970$) completed a screening survey of smoking behavior and were deemed eligible if they fell into one of four levels of smoking experience: (1) never smokers; (2) former experimenters (smoked at least one cigarette in the past, have not smoked in the last 90 days, and have smoked fewer than 100 cigarettes in their lifetime); (3) current experimenters (smoked in the past 90 days, but smoked less than 100 cigarettes in lifetime); and (4) regular smokers (smoked in the past 30 days and have smoked more than 100 cigarettes in their lifetime). Recruitment packets were mailed to 3,654 eligible students and their parents to participate in the multi-component program project. Participants and their parents had to agree to participate in all possible components of the larger study, including multiple longitudinal questionnaire assessments, a family observation study, an ecological momentary assessment study, and a psychophysiological laboratory-based study. A total of 1,344 students agreed to participate (36.8 %) and 1,263 (94.0 %) students completed the baseline measurement wave. The mean age of the baseline sample was 15.6 years (range 13.9-17.5 years), and 56.5 % were female. Their racial/ethnic distribution was 56.5 % white, 17.2 % Hispanic, 16.9 % black, 4.0 % Asian, and 5.5 % "other." Parental consent and student assent were obtained and all procedures were approved by the University of Illinois at Chicago Institutional Review Board.

The current study examined a subset of participants ($n = 1,115$) with complete data at two assessment points separated by nine months: 15-month (Time 1) and 24-month (Time 2) follow-up assessments. We chose to assess risky sexual behavior at the most recent data wave in order to capture the most number of adolescents who had initiated sex. At Time 1, they had a mean age of 16.9 years (range 15.0-18.8 years), and 56.6 % were female. Their racial/ethnic distribution was 56.5 % white, 17.2 % Hispanic, 16.9 % black, 4.0 % Asian, and 5.5 % "other."

Time 1 Assessments

Depressive Symptoms—Depressive symptoms were measured at Time 1, the most proximal time-point to our assessment of risky sexual behavior, via the Center for Epidemiological Studies Depression inventory (CES-D; Radloff 1977). The CES-D is a widely used 20-item measure that assesses the frequency of depressive symptoms experienced in the past week (e.g., "I was bothered by things that usually don't bother me"), from 0 (rarely or none of the time) to 3 (most or all of the time). The CES-D assesses specific areas of depressive symptomatology, including depressed affect, happiness, somatic

symptoms and psychomotor retardation, and interpersonal difficulties. Responses are summed to create an overall scale score, with higher values indicative of greater depressive symptoms. Research supports the validity and utility of the CES-D to measure depressive symptoms in high school adolescents (Lewinsohn et al. 1998; Roberts et al. 1990), and suggests that the clinical cutoff for adolescents is 22 for boys and 24 for girls, versus the adult cutoff of 16 (Lewinsohn et al. 1998). Coefficient alpha was .89.

Parental Control—Parental control was assessed at Time 1 using the Parental Restrictive Control Questionnaire (Smetana et al. 2005; Smetana and Daddis 2002). Adolescents rated the extent to which there are rules for 10 hypothetical events (e.g., "Rate the extent to which your family has rules for A) when I am old enough to have sex; (B when I can start dating). Ratings were made on a 5-point scale ranging from 1 (No rules or expectations) to 5 (Firm rules or expectations). The mean of all 10 items was obtained, with higher scores indicating firmer parental rules and expectations. Coefficient alpha was .76.

Quality of Parent-adolescent Communication—Quality of parent-adolescent communication was assessed at Time 1 using the Parent-Adolescent Communication Scale (PACS; Barnes and Olson 1985). This 20-item questionnaire assesses the degree of open and problematic parent-adolescent communication. Adolescents reported on communication with each parent (or secondary parent) separately. Response choices were provided on a 5-point Likert scale with 1 = "Strongly Disagree" to 5 = "Strongly Agree." Problem items were reverse-scored and then all were summed to create a total scale score for both parents (coefficient $\alpha = .86$). Higher scores reflect better communication.

Time 2 Assessments

Marijuana Use—Current marijuana use was assessed at Time 2 using two items from the Adolescent Alcohol and Drug Involvement Scale (AADIS; Moberg and Hahn 1991). Specifically, participants were asked whether they ever used marijuana (yes/no) as well as how frequently they used during the past 3 months with four response options of: 0 times; once a month or less; more than once a month but less than once a week; frequent (greater than once a week).

Risky Sexual Behavior—Sexual risk taking was assessed at Time 2 with two questions: (1) the number of partners that the respondent has had sex with (continuous); and (2), the frequency that the respondent or his/her partner(s) used protection (e.g., condoms), with response options of: Never; Occasionally; Half the time; Most of the time; Always. All participants indicated how many sexual partners they have had, but only those participants who were sexually active at Time 2 responded to the item pertaining to use of protection.

Control Variables

All control variables were assessed at the baseline assessment wave of the parent project.

Demographics—Participants self-reported on their age and race/ethnicity. Participants were asked to indicate which classification best described their racial identity with options of: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; Hispanic; White, not of Hispanic origin; and Other or unknown. All individuals who identified as White were characterized as a non-minority and individuals who identified as any other race were considered a minority.

Academic Achievement—GPA was calculated from participants' self-reported average grade during the baseline school year on a 4-point scale.

Alcohol Use—Frequency of alcohol use was assessed using two items from the Adolescent Alcohol and Drug Involvement Scale (AADIS; Moberg 2000; Moberg and Hahn 1991). Specifically, participants were asked if they had ever used alcohol (yes/no) as well as how frequently they consumed alcohol in the past 3 months with response options of: 0 times; once a month or less; more than once a month but less than once a week; one or more times a week but not every day; and every day.

General Statistical Approach

JMP 9.0 (SAS, Carey, NC, USA) was used to conduct analyses. We inspected data for non-normal distribution and outliers. We included theoretically relevant covariates in all of our analyses (age, minority status, GPA and frequency of alcohol use) given that all have been correlated with both amount of marijuana use and risky sexual behavior in previous investigations. A Wilcoxon rank-sum test was conducted when examining differences between girls and boys on number of sexual partners, given that this variable violated assumptions of normality. Results were statistically significant when p values $\leq .05$.

Results

Table 1 shows descriptive information about depressive symptoms, marijuana use, risky sexual behavior and the control variables by gender. Rates of problem behaviors were high in this sample and mean levels of depressive symptoms were below the clinical cutoff for adolescents but hovered around that for adults (Lewinsohn et al. 1998); 19.32 % of boys and 16.46 % of girls scored above cut offs for adolescents. Responses pertaining to quality of communication and firmness of family rules were normally distributed for both boys (Communication: $M = 126.40$, $SD = 22.02$; Rules: $M = 2.51$, $SD = .70$) and girls (Communication: $M = 122.52$, $SD = 24.42$; Rules: $M = 2.59$, $SD = .75$). Table 2 depicts the bivariate correlations by gender for the primary study variables. Table 3 shows the cross-sectional relationships between key variables at Time 1, which closely mirror the relationships shown in Table 2. This is likely an indicator that these relationships are stable over time.

Direct Effects Between Depressive Symptoms, Marijuana Use and Risky Sexual Behavior

To test whether depressive symptoms at Time 1 were linked with problematic behaviors at Time 2, (i.e., marijuana use and risky sexual behavior) and whether marijuana use was associated with sexual risk, we conducted separate standard regressions stratified by gender, controlling for age, minority status, GPA, and frequency of alcohol use.

Summaries of these analyses are provided in Table 4. Data show that higher depressive symptoms at Time 1 were significantly associated with higher numbers of partners and more frequent use of marijuana for boys at Time 2, but not for girls. The opposite pattern emerged for use of protection, with higher depressive symptoms at Time 1 related to less frequent use of protection at Time 2 among girls, but not boys. Marijuana use at Time 2 was related to more partners for both boys and girls. Additionally, marijuana use at Time 2 was significantly associated with lower use of protection at Time 2 for boys only.

Marijuana Use as a Mediator Between Depressive Symptoms and Risky Sexual Behavior

We tested our mediation hypotheses using methods proposed by Baron and Kenny (1986). Age, minority status, GPA, and frequency of alcohol use were controlled for in all analyses. All direct effects are reported above and summarized in Table 4. Among boys, when frequency of marijuana use at Time 2 was controlled for, the effect of depressive symptoms at Time 1 on number of partners at Time 2 became insignificant ($b = .06$, $t(430) = 1.34$, ns), indicating full mediation. No other mediating effects were observed given that the direct

effect of depressive symptoms at Time 1 on use of protection at Time 2 was not significant among boys, and the direct effects of depressive symptoms at Time 1 on frequency of marijuana use at Time 2 and number of partners at Time 2 among girls were not significant.

Parenting Factors, Marijuana Use and Risky Sexual Behavior

To test the hypothesis that more adaptive parenting would be associated with decreased rates of risky sexual behavior, we conducted separate, standard regressions for parental control and parent-adolescent communication at Time 1 and risky sexual behavior at Time 2 while controlling for age, minority status, GPA, and frequency of alcohol use (Table 5). Better quality of communication at Time 1 was associated with fewer partners at Time 2 for boys, but not for girls. Conversely, better quality of communication at Time 1 was associated with an increased likelihood of using protection at Time 2 among girls only. Quality of communication at Time 1 was not related to frequency of marijuana use at Time 2 among either boys or girls. Firmness of rules at Time 1 predicted fewer numbers of partners at Time 2 for girls only. Firmness of rules at Time 1 was not associated with usage of protection at Time 2 for either boys or girls. Among both boys and girls, firmer rules at Time 1 were associated with less frequent use of marijuana at Time 2.

Interactions Between Depressive Symptoms and Parenting on Marijuana Use and Sexual Risk

We hypothesized that depressive symptoms and parenting factors would interact to predict both marijuana use and risky sexual behavior. We conducted moderated regression analyses, separately for boys and girls, using standard multiple regression, controlling for age, minority status, GPA, and frequency of alcohol use in all analyses. Centered scores representing depressive symptoms at Time 1 and parenting factors at Time 1 (firmness of rules and the quality of parent-adolescent communication), as well as all interaction terms, were used to predict three independent outcomes all measured at Time 2: (1) frequency of marijuana use, (2) number of partners and (3) frequency of use of protection.

Among girls, there was a significant interaction between Time 1 strictness of family rules and depressive symptoms on number of partners at Time 2 ($\beta = .08$, $t(603) = 1.92$, $p = .05$). We tested the simple slopes of strictness of family rules at Time 1 on number of partners at Time 2 at higher versus lower levels of depressive symptoms at Time 1. As depicted in Fig. 1, among girls with lower levels of depressive symptoms (Time 2), stricter rules (Time 1) were associated with a lower number of partners (Time 2; $\beta = -.21$, $t(292) = -3.75$, $p < .001$). On the other hand, there was no relationship between strictness of family rules at Time 1 and number of partners at Time 2 among girls with higher levels of depressive symptoms at Time 1 ($\beta = -.07$, $t(317) = -1.22$, *ns.*).

No other significant interactions emerged between depressive symptoms at Time 1 and either parenting index at Time 1 on marijuana use and risky sexual behavior both at Time 2 among boys or girls (all p 's *ns.*). In sum, moderation effects were specific to participant gender, index of sexual risk and parameter of parenting behavior: stricter family rules were associated with decreased number of partners, but only among girls with lower levels of depressive symptoms.

Discussion

The positive relationship between depressive symptoms and sexual risk taking among adolescents is a topic of great public health significance. However, the literature to date has yet to incorporate data pertaining to adolescent marijuana use, gender, and parental context, which are all highly associated with risky sexual. Therefore, this study sought to begin

integrating all of such information with the hopes of providing a more nuanced understanding of the complex relationship between depressive symptoms and risky sexual behavior. More specifically, the present study used data from a large natural history study and examined whether marijuana use mediated the effect of depressive symptoms on risky sexual behavior and whether depressive symptoms and parenting factors interacted in understanding marijuana use and risky sexual behavior in an adolescent sample at high risk for problem behaviors. Our results highlight the importance of examining correlates of risky sexual behavior separately by gender and of considering the unique mechanisms involved with specific indices of sexual risk. Of additional importance, our results do not seem to suggest that either parental control or parent-adolescent communication is particularly important in buffering the relationship between depressive symptoms with marijuana use and risky sexual behavior.

Direct Effects of Depressive Symptoms and Substance Use on Risky Sexual Behavior

Consistent with prior research (Baskin-Sommers and Sommers 2006; Brook et al. 2002; Lehrer et al. 2006; Lowry et al. 1994; Mazzaferro et al. 2006; Parkes et al. 2007; Seth et al. 2009; Tapert et al. 2001), we found that depressive symptoms and marijuana use were related to risky sexual behavior. Although there was a positive relationship between marijuana use and sexual risk for both boys and girls, the association between depressive symptoms and risky sexual behavior was contingent on gender. As would be expected, more depressive symptoms were associated with more partners and more frequent use of marijuana nine months later among boys. Similarly, depressive symptoms were related to less frequent use of protection among girls. The fact that depressive symptoms were linked with more inconsistent condom usage only among girls finds support from extant literature. Several studies suggest that depression may be more consistently linked with sexual risk among girls than boys (Kowaleski-Jones and Mott 1998). This may be due to the fact that psychological distress negatively impacts adolescent females' self-efficacy to communicate with their partners about sex and to ultimately insist on protective behaviors (Kowaleski-Jones and Mott 1998; Seth et al. 2009). Results suggest that risky sexual behavior is not a unitary construct and that examining one index, or collapsing across indices, does not provide a complete picture of an adolescent's risk profile. Additionally, these data support the notion that sexual risk prevention needs may vary according to gender.

Mediating Relationships

As predicted, marijuana use accounted for some of the variance between depressive symptoms and risky sexual behavior, but only for boys. Boys with higher levels of depressive symptomatology showed higher levels of later marijuana use, which was associated with more partners. Findings suggest that the reason *why* depressive symptoms are associated with more partners among boys may be partially attributable to increased marijuana use. Importantly, boys in the current study were also more likely to use marijuana more frequently than girls. These findings are somewhat consistent with (Shrier et al. 2001). However, data in the current investigation point to the role of marijuana use in the relationship between depressive symptoms and number of partners, whereas Shrier et al. (2001) found that, among adolescent boys, marijuana use mediated the relationship between depressive symptoms and condom nonuse during last sexual encounter. The fact that significant mediation was not noted when considering use of protection in the current sample might be due to a number of factors. First, the current paper focused on overall consistency of sexual behavior rather than the last sexual encounter, the latter of which may not be representative of one's general pattern of behavior. Consistency of risky sexual behavior has, indeed, been shown to be a stronger predictor of negative sexual health outcomes as compared to behavior during the most recent sexual encounter (Crosby et al. 2000; Ellen et al. 1996). Second, Shrier and colleagues assessed marijuana use

dichotomously (use in the last 30 days versus no use in the last 30 days), whereas the current investigation employed a multi-response frequency variable. Together, results from the present study coupled with those presented by Shrier et al. (2001) suggest that marijuana use may be central to why depressive symptoms are contraindicated in sexual risk outcomes.

It is possible that an indirect effect emerged only for boys given gender-specific manifestations of depressive symptoms. Depressed boys tend to be more extrapunitive, antagonistic and antisocial (including use of drugs) whereas depressed girls are more likely to be intrapunitive, ruminative and self-devaluing (Gjerde et al. 1988; Nolen-Hoeksema 1987). Thus, our finding that depressive symptoms are associated with later marijuana use and more sexual partners mainly among boys finds general support from related work. It may well be that boys use both marijuana and sex with multiple partners as a means to self-medicate aversive affective states (Grant and Pickering 1998). Although some investigations have found that antisocial behavior among girls also may be paired with negative affect (e.g., Moffitt et al. 2001), the temporal sequencing between depression and behavioral problems (e.g., sexual risk) may vary according to gender. For instance, depression has been linked with the emergence of later deviant behavior only among boys (McGee and Williams 1988). This may suggest that boys are more likely to engage in behavioral risk as a way of managing their distress; problem behaviors may represent a different phenomenon among girls (e.g., peer influence; McGee and Williams 1988). Regardless, results clearly suggest that a more nuanced perspective on mechanisms of risky sexual behavior necessitates a more complete understanding of gender effects.

Moderating Relationships

Our primary moderation finding was that stricter family rules were associated with fewer number of partners only among girls with lower levels of depressive symptoms; there was no relationship between strictness of family rules and number of partners among girls with higher levels of depressive symptoms. That is, strict family rules may be an effective way of mitigating adolescent girls' propensity to engage in sex with multiple partners when there are low levels of mood disruption. However, the same type of parental control does not appear to be of equal importance among girls with higher levels of depressive symptoms. This may be due to an overall higher level of communication difficulties among parents of girls with mood problems (Magnussen 1991). Additionally, parents of depressed daughters might perceive the depressive symptoms to be of greater concern than sexual activity, and might therefore focus conversations on mood improvement as compared to sexual risk reduction (Levy et al. 2010).

Despite some preliminary evidence among girls with low levels of depressive symptoms, our hypotheses on the moderating role of parental control and parent-adolescent communication were largely not supported. This may be due to the fact that depressive symptoms are associated with elevated levels of family conflict (Wu et al. 2004), and adolescents in high conflict families are at an increased likelihood to exhibit more significant externalizing profiles (Skeer et al. 2009, 2011). Although others have shown parent-adolescent communication to be important in reducing adolescent sexual risk (Morales-Campos et al. 2012; Whitaker et al. 1999), these relationships may be different in the context of adolescent mood disruption. That is, parenting strategies that mitigate sexual risk taking among psychiatrically stable adolescents may not be equally as effective when the child is depressed. Additionally, given that it is difficult to discern the directionality of the examined relationships, it is plausible that the depressive symptoms experienced by some individuals in our sample developed as a response to pre-existing family conflict. Therefore, future investigations are warranted that specifically examine how changes in parental control and parent-adolescent communication impacts downstream behavioral problems among depressed youth.

Study Strengths and Limitations

The present investigation extended previous research on adolescent risky sexual behavior by identifying gender-specific mechanisms and identifying parental contexts that might buffer individual-level risk processes. Importantly, this study also accounted for several factors that are known to independently confer risk for risky sexual behavior including age, academic achievement and frequency of alcohol use. Yet, few studies rigorously control for these factors, which hampers our ability to ascribe the risky sexual behaviors uniquely to depressive symptoms and marijuana use. Moreover, given the disparities often found in rates of risky sexual behavior among different racial/ ethnic groups (Halpern et al. 2004), our study controlled for minority status. However, future research from our group will take advantage of our ethnically diverse sample in order to investigate whether the mechanisms between depression and risky sexual behavior vary by ethnic subgroup. Finally, we focused on two indices of risky sexual behavior given that prior studies tend to focus on a single measure of sexual risk, which may diminish their ability to detect more nuanced relationships.

Limitations of the study also should be noted. First, sexual risk data was reliant on self-reports, which may be subject to over- or underreporting. However, research has shown that adolescents are, indeed, reliable reporters of their sexual behavior (Orr et al. 1997; Rosenthal et al. 1996). An additional consideration is that the study sample was at high risk for problem behaviors, having oversampled for ever smoking, which may be both a limitation and strength. The adolescents in our sample reported higher rates of substance use and risky sexual behavior than more normative samples. Despite still having an even distribution across the full range of behaviors, we must be cautious about generalizing our findings to more normative populations. An additional limitation includes the fact that primary analyses only involved variables that were measured once and not all relationships were examined longitudinally, thereby limiting our ability to draw causal inferences. That is, depressive symptoms and parenting factors were measured at Time 1, and behavioral risk indices (i.e., marijuana use and risky sexual behavior) were measured 9 months later. However, our measurement time points were specifically chosen based on the aims of the current investigation. Our priority was to capture the maximum number of adolescents, under age 18, who were sexually active, which is why we chose the 24-month assessment wave from the parent project to assess for risky sexual behavior. Depressive symptoms were assessed in the immediately preceding wave given that we were interested in determining whether they had an adverse influence on later engagement in behavioral risk (i.e., marijuana use and risky sexual behavior). It is still possible, though, that a prior association between depressive symptoms and problem behaviors accounts for these effects, and thus we cannot make any claims about causal chains. Parenting factors were measured at the same time as depressive symptoms because we hypothesized that positive parenting would help to mitigate the poor coping strategies of adolescents with high levels of depressive symptoms. We assessed marijuana use at the time of risky sexual behavior given our a priori hypotheses that any negative impact of marijuana use on sexual risk would be acute, rather than residual or cumulative. Future investigations should employ more stringent longitudinal methodologies with variables on depression, substance use, risky sexual behavior and parenting to establish temporal precedence and causal relationships between all study variables. Additionally, more detailed reports are warranted to examine other constructs that might further clarify the nature these relationships, such as the influence of parental gender as well as the role of substance use expectancies.

Conclusions

Our results support the utility of examining the complex pathways to risky sexual behavior in adolescents. We found that depressive symptoms may be a gender-specific risk factor for

certain indices of risky sexual behavior. For boys only, marijuana use mediated the relationship between depressive symptoms and number of partners. Additionally, we found evidence for the positive impact of firm rules on number of partners among girls with lower self-ratings of depressive symptoms; however, parent-adolescent communication did not buffer against other measures of behavioral risk. Results suggest that treatment of mental health and substance use problems may have important implications in reducing risky sexual behavior and, conceivably, controlling the high rates of many serious individual and public health repercussions. Finally, given that parenting factors were not frequently found to buffer against increased marijuana use and/or risky sexual behavior, it will be important to better understand the influence of parents in the context of adolescent depression in order to develop more tailored and targeted interventions for youth at risk for behavioral problems.

Acknowledgments

RS conceived of the study, conducted the statistical analyses and drafted the manuscript; RM is the principal investigator for the parent project from which this study was derived, helped to conceive of the study, was involved in the interpretation of the data and participated in drafting the manuscript; LW helped to draft the manuscript. All authors read and approved the final manuscript. This publication was made possible by Grant number P01 CA098262 (PI: RM) from the National Cancer Institute (NCI) and Grant number F31DA032244-02 (PI: RS) from the National Institute on Drug Abuse (NIDA). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of NIDA, NCI or the National Institutes of Health.

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Fig. 1.
Relationship between parental control and number of partners among girls at higher and lower levels of depressive symptoms

Table 1

Descriptives of key variables stratified by gender

	Boys (n = 484)	Girls (n = 661)	
Age (baseline control)	15.62 (SD = .62)	15.64 (SD = .62)	$t(1169) = -.61, p = .54$
% minority (baseline control)	42.9 %	44.1 %	$\chi^2(1, N = 1,263) = .17, p = .68$
Academic achievement (GPA; baseline control) **	2.61 (SD = .78)	2.79 (SD = .72)	$t(1114) = -4.22, p < .001$
Alcohol use (baseline control)			$\chi^2(3, N = 1,263) = 5.20, p = .16$
0 times	29.2 %	25.1 %	
Once a month or less	30.5 %	35.0 %	
More than once a month, but less than once a week	29.0 %	26.7 %	
Frequent (greater than once a week)	11.3 %	13.1 %	
Depressive symptoms (Time 1) **	13.45 (SD = 8.73)	15.51 (SD = 9.55)	$t(1059) = -3.75, p < .001$
Marijuana use (Time 2) **			$\chi^2(3, N = 1,145) = 36.31, p < .001$
0 times	48.6 %	54.6 %	
Once a month or less	13.2%	19.1 %	
More than once a month, but less than once a week	9.3 %	11.6%	
Frequent (greater than once a week)	28.9 %	14.7 %	
% sexually active (Time 2)	67.5 %	69.7 %	$t(1031) = .55, p = .58$
Number of partners (Time 2) *	1 [0, 3]	1 [0, 3]	$\chi^2(1, N = 1,129) = .04, p = .83$
Use of protection (Time 2) *			$\chi^2(4, N = 771) = 9.88, p = .04$
Never	7.0 %	4.5 %	
Occasionally	7.8 %	12.2 %	
Half of the time	5.9 %	6.2 %	
Most of the time	15.9 %	20.9 %	
Always	63.4 %	56.2 %	
Quality of communication (Time 1) **	126.40 (SD = 22.02)	122.52 (SD = 24.42)	$t(982) = -2.66, p = .008$
Family rules (Time 1)*	2.51 (SD = .70)	2.59 (SD = .75)	$t(1063) = 1.99, p = .045$

*
p < .05,**
p < .01

Table 2 Bivariate intercorrelations among key study variables by gender

Variables	Variables									
	1	2	3	4	5	6	7	8	9	10
1. Age (baseline)		-.02	-.02	-.06	-.06	-.02	.11	.04	.11	.08*
2. Minority status (baseline)	.07		.20**	.09*	-.07	.03	.12**	.16**	.14	.12**
3. GPA (baseline)	.04	.19**	.04	-.06	.14**	.08*	.08*	.09*	.11	.09*
4. Alcohol use (baseline)	.12**	.14**	.09*		-.04	.30**	.15**	.01	-.01	.16**
5. Depressive symptoms (Time 1)	.02	-.12*	-.26**	.06		.02	.06	.14**	.28**	.02
6. Marijuana use (Time 2)	.01	.09*	-.10*	.30**	.15**		.30**	-.09	-.07	.17**
7. Number of partners (Time 2)	.04	-.19**	-.14**	.09*	.14**	.22**		.12**	-.02	.15**
8. Use of protection (Time 2)	-.01	.04	.17	-.07	-.13*	.15**	.05		.15**	.01
9. Quality of communication (Time 2)	-.05	.12**	.13**	-.07	.41**	.10	.15**	.09		.06
10. Rules (Time 2)	-.07	-.01	.09	.19**	.04	.20**	.10*	.11	.02	

Cells above the diagonal represent females and cells below the diagonal represent males

*
p < .05,**
p < .01

Table 3 Cross-sectional bivariate intercorrelations among key variables at Time 1 by gender

Time 1 variables	Variables					
	1	2	3	4	5	6
1. Depressive symptoms		.05	.08 [*]	-.13 [*]	-.28 ^{**}	-.02
2. Marijuana use	.16 ^{**}		.24 ^{**}	.01	-.07	-.25 ^{**}
3. Number of partners	.09	.10 [*]		-.06	-.05	-.14 ^{**}
4. Use of protection	-.12	-.13 [*]	-.02		.14 ^{**}	-.06
5. Quality of communication	.41 ^{**}	-.09	-.07	.06		-.06
6. Rules	.04	-.16 ^{**}	-.19 ^{**}	.13 [*]	.02	

Cells above the diagonal represent females and cells below the diagonal represent males

^{*}

p < .05,

^{**}

p < .01

Table 4

Regressions involving depressive symptoms, marijuana use and risky sexual behavior

Predictor	Boys				Girls			
	β	F	t	p value	β	F	t	p value
DV: number of partners (Time 2)								
Final model		7.53		<.0001		8.98		<.0001
Age (baseline)	.03		.65	.52	.11		2.85	.001
Minority status (baseline)	.21		4.47	<.0001	.11		2.79	.006
GPA (baseline)	-.06		-1.13	.26	.05		-1.22	.22
Alcohol use (baseline)	.13		2.72	.007	.19		4.79	<.0001
Depressive symptoms (Time 1)	.09		1.95	.05	.06		1.52	.06
DV: number of partners (Time 2)								
Final model		11.18		<.0001		18.46		<.0001
Age (baseline)	.06		1.24	.22	.11		3.09	.002
Minority status (baseline)	.21		4.69	<.0001	.13		3.38	.0008
GPA (baseline)	-.08		-1.72	.09	-.03		-.86	.39
Alcohol use (baseline)	.04		.86	.39	.07		1.90	.06
Marijuana use (Time 2)	.22		4.79	<.0001	.28		7.27	<.0001
DV: use of protection (Time 2)								
Final model		2.61		.03		3.61		.003
Age (baseline)	-.03		-.47	.64	.03		.53	.60
Minority status (baseline)	0		-.07	.94	-.12		-2.47	.01
GPA (baseline)	.17		2.68	.008	.06		1.26	.21
Alcohol use (baseline)	-.02		-.258	.78	-.03		-.54	.59
Depressive symptoms (Time 1)	-.09		-1.53	.13	-.12		-2.54	.01
DV: use of protection (Time 2)								
Final model		3.51		.004		3.14		.009
Age (baseline)	0		.04	.97	.03		.54	.59
Minority status (baseline)	-.03		-.44	.66	-.14		-2.91	.004
GPA (baseline)	.15		2.64	.009	.06		1.22	.22
Alcohol use (baseline)	-.04		-.74	.46	0		-.02	.99

Predictor	Boys				Girls			
	β	F	t	p value	β	F	t	p value
Marijuana use (Time 2)	-.15		-2.69	.008	-.09		-1.82	.07
DV: marijuana use (Time 2)								
Final model		11.30		<.0001		5.26		.01
Age (baseline)	-.02		-.40	.69	-.04		-.95	.34
Minority status (baseline)	-.08		-1.80	.07	-.04		-.99	.32
GPA (baseline)	-.05		-.97	.33	-.04		-.99	.32
Alcohol use (baseline)	.28		6.04	<.0001	.30		7.80	<.0001
Depressive symptoms (Time 1)	.13		2.78	.006	.02		.51	.61

Table 5

Regressions involving parenting, marijuana use and risky sexual behavior

Predictor	Boys				Girls			
	β	F	t	p value	β	F	t	p value
DV: number of partners (Time 2)								
Final model		7.72		<.0001		8.49		<.0001
Age (baseline)	-.01		-.16	.87	.10		2.46	.01
Minority status (baseline)	.19		3.80	.0002	.13		2.99	.003
GPA (baseline)	-.06		-1.31	.19	-.06		-1.36	.17
Alcohol use (baseline)	.18		3.56	.0004	.20		4.76	<.0001
Quality of communication (Time 1)	-.11		-2.32	.02	0		.08	.94
DV: number of partners (Time 2)								
Final model		7.30		<.0001		11.06		<.0001
Age (baseline)	.03		.31	.47	.10		2.61	.009
Minority status (baseline)	.22		.20		.14		3.44	.0006
GPA (baseline)	-.07		.25	.13	-.04		-1.05	.30
Alcohol use (baseline)	.12		.20	.01	.18		4.47	<.0001
Rules (Time 2)	-.07		.28	.12	-.12		-3.13	.002
DV: use of protection (Time 2)								
Final model		2.39		.04		2.77		.02
Age (baseline)	-.05		-.72	.47	.04		.83	.41
Minority status (baseline)	-.03		-.49	.62	-.12		-2.17	.03
GPA (baseline)	.18		2.72	.007	.01		.25	.81
Alcohol use (baseline)	0		.06	.95	-.03		-.61	.54
Quality of communication (Time 1)	.08		1.24	.22	.11		2.15	.03
DV: use of protection (Time 2)								
Final model		2.99		.01		2.54		.03
Age (baseline)	-.02		-.26	.80	.04		.73	.46
Minority status (baseline)	.12		.19	.85	-.14		-2.86	.005
GPA (baseline)	.19		3.19	.002	.07		1.33	.19
Alcohol use (baseline)	0		-.10	.92	-.02		-.37	.71

Predictor	Boys				Girls			
	β	F	t	p value	β	F	t	p value
Rules (Time 2)	.09		1.55	12	.03		54	59
DV: marijuana use (Time 2)								
Final model		9.24		<.0001		11.79		<.0001
Age (baseline)	-.03		-.63	53	-.02		-.54	59
Minority status (baseline)	-.07		-1.33	19	-.03		-.75	46
GPA (baseline)	-.04		-.83	41	-.02		-.50	61
Alcohol use (baseline)	.29		6.01		.30		7.26	
Quality of communication (Time 1)	-.08		-1.64	10	-.07		-1.60	11
DV: marijuana use (Time 2)								
Final model		11.24		<.0001		16.29		<.0001
Age (baseline)	-.02		-.51	61	-.05		-1.27	20
Minority status (baseline)	-.08		-1.62	11	-.02		-.56	58
GPA (baseline)	-.06		-1.23	22	-.03		-.76	45
Alcohol use (baseline)	.26		5.55		.29		7.48	
Rules (Time 1)	-.13		-2.85	.005	-.13		-3.27	.001