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EMPIRICAL RESEARCH

The Role of Deliberative Decision Making, Parenting, and Friends in Adolescent Risk Behaviors

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Abstract Adolescents may engage in risk behaviors that jeopardize their futures. Although adolescent risk-taking has long been attributed to faulty decision making, surprisingly little research has directly examined this link. This study examined the role of deliberative decision making (the tendency to consider options and consequences before making a decision) and social contextual variables (parenting and friend influences) in alcohol and drug use, risky sex, and delinquency. Participants were 7,748 adolescents (50% female) in grades 7–11 from the Add Health dataset (M age = 14.87, SD = 1.54). Hierarchical regression analyses revealed that deliberative decision making and contextual variables were associated with risk behavior concurrently and 1 year later. Furthermore, deliberative decision making interacted with social contextual variables in some models, indicating that deliberative decision making may be especially important in certain contexts. These findings suggest that both cognitive and social factors need to be considered to explain adolescents' decisions to engage in risk behavior.

Keywords Risk behavior · Decision making · Adolescence · Parenting · Deviant friends

Introduction

Adolescence is a life stage in which individuals are more likely to participate in health risk behaviors than at other life stages. This has potentially dangerous and life-altering consequences. For example, in the United States, the majority of all deaths among adolescents and young adults aged 10–24 result from unnatural causes, most of which are motor-vehicle crashes, often involving an intoxicated driver (CDC 2010). The results of the Youth Risk Behavior Survey in 2009 revealed that 72.5% of the adolescents surveyed had used alcohol in their lifetime and about 24.2% reported binge drinking in the last 30 days. In 2009, there were nearly 760,000 teen pregnancies among 15–19 year olds (CDC 2010) and approximately 9.1 million cases of sexually transmitted diseases among youth aged 15–24 (CDC 2010). Of the 34.2% high school students who were sexually active, nearly 61.1% had not used a condom at last intercourse (CDC 2010).

A potentially critical factor contributing to adolescent risk behavior is the decision making process that adolescents engage in when opportunities for risky behavior arise (Steinberg 2004). Adolescents who think through their options and consider the consequences of potential courses of action should be less likely to opt for health threatening behavior (Byrnes 2005). However, many decisions are not made in such a deliberative fashion but instead are made on the spur of the moment (Kahneman 2003; Klaczynski 2005), potentially resulting in faulty or incomplete reasoning and a greater tendency to take risks. Understanding the linkage between deliberative or regulated decision making and risk-taking could illuminate the processes leading to adolescent risk behavior and would have implications for programs and social policies designed to reduce risky behavior and improve adolescent health.

Despite the logical connection between decision making processes and risk behavior, relatively little research has addressed this link. The work that has done so has

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examined risk-taking primarily in experimentally controlled laboratory settings, devoid of social influences (for an exception, see Gardner and Steinberg 2005), using measures such as gambling tasks. These laboratory tasks, which involve little or no damaging losses, may not sufficiently capture the complexities and social pressures that accompany risk taking in the real world (Galotti 2007; Reyna and Farley 2006). Thus, we know surprisingly little about the relationship between decision making proclivities and adolescents' participation in typical risk behaviors (e.g., engaging in drug use or unprotected sex). One goal of the present study was to examine this link.

A second limitation of much of the research on adolescent decision making is the lack of attention to features of the social context that may influence participation in risk behaviors and potentially enhance or reduce the role of decision making propensities. A large body of research has documented associations between social contextual variables, especially parenting and peer influences, and adolescent risk behaviors such as substance use and delinquency (e.g., Hawkins et al. 1992). However, this line of research has proceeded largely independently of the laboratory work on decision making processes. Thus we know almost nothing about whether deliberative processing interacts with features of the adolescent's social context in predicting involvement in risk behavior. The second goal of this study was to examine these joint effects.

Deliberative Decision Making

Decision theory defines how one should reason in order to choose the behavioral option that would be most beneficial in a given situation (see Beyth-Marom and Fischoff 1997; Beyth-Marom et al. 1993). From this perspective, a deliberative decision making process involves thinking through various aspects of a decision. Decision theory specifies five steps that should be involved in deliberative decision making: (1) Identify the possible options, (2) identify the possible consequences, (3) evaluate the desirability of each consequence, (4) assess the likelihood of each consequence should each action be taken, and (5) combine everything according to a logically defensible "decision rule" that is most likely to result in a desired positive consequence or reduce the likelihood of a negative consequence (Baron 1994; Beyth-Marom and Fischoff 1997; Beyth-Marom et al. 1993; Furby and Beyth-Marom 1992). Faltering in one or more of these steps, and thus failing to follow a rational process, may lead an adolescent to make poor decisions, perhaps resulting in risky behavior.

Some scholars have proposed that adolescents subscribe to an "illusion of invulnerability," which leads them to believe that they will not suffer negative consequences that befall others (Elkind 1967). This suggests that they fail at Step 4 of the decision making process and underestimate the likelihood of negative consequences. However, empirical research generally has not supported this contention (Reyna and Farley 2006). Adolescents appear to be similar to adults in their ability to identify possible consequences of risky behaviors (Beyth-Marom et al. 1993). Furthermore, studies have found that adolescents were less likely than adults to perceive themselves as invulnerable concerning natural disasters and behavior-linked risks (Millstein and Halpern-Felsher 2002; Quadrel et al. 1993). Thus, perceived invulnerability does not appear to be the mechanism behind adolescent risk-taking, though some kind of failure in deliberative decision making is likely. To our knowledge, there is no research that specifically examines the link between deliberative decision making and self-reported risk behaviors. We hypothesize that adolescents are more likely to refrain from risk behaviors when they engage in deliberative decision making.

Developmental Changes in Decision Making

Early conceptualizations of decision making did not identify developmental aspects of decision making abilities; however, deliberative decision making abilities do develop over time, probably owing to cognitive maturation (including executive functions), learning, and experience (see Ariely 2008; Byrnes 2005; Kahneman et al. 1982; Stanovich and West 2000). Along with the development of formal operations, adolescents make gains in computational processing abilities, metacognitive abilities, and the ability to decontextualize problems, which are necessary for deliberative decision making (Klaczynski 2005). Furthermore, deliberative decision making abilities may improve through personal experiences with the consequences of previous decisions, observation of others experiencing consequences, or receiving explicit instruction on effective courses of action (Byrnes 2005). Notably, empirical studies show clear evidence of age-related differences in components of deliberative decision making. For instance, in a study of reasoning about medical decisions, 12th graders were more likely than younger adolescents to perceive risks and to mention future consequences of hypothetical medical decisions, two aspects of deliberative decision making (Lewis 1981). In another study, middle adolescents were more likely than younger adolescents to avoid making "incorrect" decisions stemming from the use of fallacies, heuristics, and biases (Klaczynski 2005). In fact, when it comes to logical reasoning abilities in general, adolescents aged 16 years and older appear to perform similarly to adults (see Steinberg 2008).

Despite these developmental advances, adolescents tend to perform more poorly than adults under certain decision making conditions (see Reyna and Farley 2006), for

example, when they must decide on spur of the moment (Steinberg 2004), when more immediate benefits are paired with long-term negative outcomes (Steinberg et al. 2009), or when behavioral inhibition is required for good outcomes (Crone and van der Molen 2008; Dempster 1992). Therefore, although adolescents are generally capable of competent decision making under neutral conditions, they may be more likely than adults to engage in dangerous behaviors because they fail to employ a deliberative process when confronted with opportunities for risk-taking in the real world.

Decision Making and Risk-Taking

The few studies that have examined the relationships between decision making processes and adolescent risk behavior suggest that non-deliberative decision making (i.e., intuitive or heuristic decision making, which may occur subconsciously) is associated with risky behavior. For instance, emotional decision making (assessed by the Iowa Gambling Task) was related to more alcohol use in adolescents with low inhibitory control (Patrick et al. 2008). Similarly, research on adults indicates an association between employing non-deliberative processes and making nonoptimal choices on a laboratory task (e.g., choosing to pick a red jelly bean out of a jar with a lower ratio of red to white jelly beans, but more beans overall; Denes-raj and Epstein 1994). Moreover, in the same study, the tendency to use non-deliberative processing was correlated with self-reported real-life gambling behaviors. These findings indicate that non-deliberative decision making is related to real-world risk behaviors and could potentially underlie adolescents' participation in risk behaviors such as substance use and unprotected sex. In contrast, use of deliberative decision making should be associated with lower participation in real-world risk behaviors.

Parent and Friend Influences

As noted earlier, adolescent decision making takes place in a social context shaped by parents and peers. Parents often discourage or deter risky behavior, whereas peers can provide opportunities and encouragement for these behaviors. It is important to consider both, potentially differing, influences on the relationship between decision making and risk behavior.

Parenting

Several aspects of parenting have been linked to adolescent risk behavior. In particular, parental support, which includes involvement, closeness, warmth, communication, and nurturance, has been associated with adolescent well-being (Barnes et al. 1990; Holmbeck et al. 1995) whereas a lack of parental support has been related to risk behaviors. Parental rejection and low parental nurturance are implicated both directly and indirectly in substance use, delinquency, and other risk behaviors (Chassin et al. 2004; Farrington 2004; Hawkins et al. 1992).

Parental control also has been linked to adolescent risk behavior (Chassin et al. 2004; Farrington 2004). Behavioral control, which refers to setting limits, enforcing rules and monitoring children's day-to-day activities, is protective against externalizing behaviors such as delinquency, substance use, and sexual precocity (see Barber et al. 1994; Barnes and Farrell 1992; Holmbeck et al. 1995; Smetana et al. 2002). In contrast, higher levels of parental autonomy granting tend to be positively associated with risk behavior (e.g., Dishion et al. 2004; Hawkins et al. 1992). For example, Dornbusch et al. (1985) found a positive relationship between youths making their own decisions regarding clothes, money, friends, and curfew, and their levels of delinquent behaviors. Other researchers have found a positive relationship between permissive parental curfews and adolescents' involvement in substance use and sexual risk (Galambos and Leadbeater 2000). At the same time, excessive parental control is likely to be maladaptive, since adolescents need to develop a sense of personal autonomy. Ideally, the level of autonomy granted increases as adolescents get older (Eccles et al. 1996).

Deviant Friends

During adolescence, having deviant friends is a consistent predictor of risk behavior (Allen et al. 2003; Chassin et al. 2004; Finken 2005; Hawkins et al. 1992; Jacobs and Johnston 2005; Musher-Eizenman et al. 2003; Prinstein et al. 2001). For instance, among adolescent males, having a good friend who drank or used drugs predicted greater substance use over time (Simons-Morton 2007; Van Der Vorst et al. 2009), and among preadolescents, having delinquent friends strongly predicted delinquent activity (Ingram et al. 2007). Furthermore, in a sample of early to mid adolescents, associating with deviant peers predicted initiation of sexual activity, controlling for parenting variables, other risky behaviors, pubertal status, and demographic characteristics (French and Dishion 2003). Thus, it is likely that deviant friends affect the decisions involved in risk behavior participation.

The Present Study

In this study, we examined the contributions of deliberative decision making and social influences to adolescents'

real-world risk behaviors, including substance use, delinquency, and unprotected sex. Based on decision theory, we hypothesized that deliberative decision making would be associated with less participation in risk behaviors. Furthermore, based on prior empirical research, we predicted that parental support and low autonomy granting would be associated with lower levels of adolescent risk behavior. Because mothers and fathers can have different effects on children's functioning (McHale et al. 2003; see also Barber et al. 2005), we included measures of both maternal and paternal support. We also expected to replicate previous findings that having deviant friends would be associated with higher levels of risk behavior.

We further predicted that deliberative decision making would interact with peer and parental influences in the models predicting risk behaviors. Specifically, the relationship between deliberative decision making and risk behavior should be stronger among adolescents with either low parental support or high autonomy. Adolescents with low parental support might be less motivated to follow their parents' advice because the parent–child bonds are weak; instead, they would rely on their own decision processes. Parents who grant their adolescents high levels of autonomy may give their adolescents more opportunities to engage in risk behavior; again, this places the burden on the adolescent's decision making ability. Similarly, we hypothesized that more deliberative decision making might buffer the effect of deviant friends on risk behavior because adolescents who are weighing options and thinking about consequences may be less inclined to follow their friends' example. Finally, we anticipated an interaction between deliberative decision making and age. There is often a positive correlation between age and adolescents' participation in risk behavior (Arnett 2000). However, deliberative decision making might lessen the tendency for greater risk behavior among older adolescents.

Method

Participants

Data for the present analysis came from the National Longitudinal Study of Adolescent Health (Add Health). The Add Health dataset is based on a sample of 80 high schools and 52 middle schools from the US, selected with unequal probability, and stratified by enrollment, region, urbanicity, type of school, and racial/ethnic mix, to be representative of US schools (Blum et al. 2000). Initially, an in-school survey was administered to approximately 90,000 students in grades 7–12. A subsample of youth from the school rosters and the Wave I participant pool was then selected for the Wave I in-home survey (Harris et al. 2003). Students in grades 7–11 were followed up approximately 1 year later (Wave II). The present study used data from the Wave I and II in-home surveys. There were 12,765 adolescents with data from both waves. We randomly selected one sibling from each family to avoid non-independence of cases, excluding 1,803 youth. We further restricted the analysis to adolescents living with two parents (approximately two-thirds of the sample) in order to have information on both parents. The final analytic sample included 7,748 youth (49.7% female). The average age was 14.87 years (SD = 1.54) at Wave I, and the ethnic breakdown was White (75.0%); African American (9.1%); Latino (12.0%); Asian American (3.9%).

Measures

All independent variables (demographic variables, mother and father support, parental autonomy granting, deviant friends, and deliberative decision making) were assessed at Wave I (T1). The dependent variables (alcohol use, drug use, risky sexual behavior, and delinquency) were measured at T1 and 1 year later (T2). Descriptive statistics are provided in Table 1. The study measures were significantly correlated with each other in expected ways, providing evidence of construct validity. Moreover, the variables measured at T1 and T2 were correlated across time, providing indirect support for reliability (as it is difficult to find stability without reliability). Internal consistency of multi-item scales was assessed with Cronbach's alpha.

Deliberative Decision Making (T1)

Adolescents responded to four items concerning the extent to which they think through and evaluate their decision making process. The items correspond to key parts of the decision making process outlined by Beyth-Marom and Fischoff (1997), and included: "When you have a problem to solve, one of the first things you do is get as many facts about the problem as possible"; "When you are attempting to find a solution to a problem, you usually try to think of as many different ways to approach the problem as possible"; "When making decisions, you generally use a systematic method of judging and comparing alternatives"; "After carrying out a solution to a problem, you usually try to analyze what went right and what went wrong." Responses ranged from 1 (*strongly agree*) to 5 (*strongly disagree*). Scores were averaged ($\alpha = .74$) and reverse coded so that higher scores indicated more deliberation. A confirmatory factor analysis indicated that the items loaded onto a single factor (eigenvalue = 2.26). Furthermore, this measure was positively correlated with measures of academic achievement, self-control, intelligence, and plans to go to college, supporting construct validity.

Table 1 Bivariate correlations, means and standard deviations among study variables

	Mother support	Father support	Autonomy	Deviant friends	Del. decision making	Freq. of getting drunk (T1)	Freq. of getting drunk (T2)	Sexual risk (T1)	Sexual risk (T2)	Delinq (T1)	Delinq (T2)
Age	−.14**	−.18**	.30**	.30**	.05*	.21**	.19**	.31**	.31**	−.01	−.02*
Mother support	–	.45**	−.03*	−.16**	.20**	−.12**	−.11**	−.14**	−.16**	−.23**	−.16**
Father support		–	−.06**	−.19**	.09**	−.14**	−.12**	−.18**	−.19**	−.23**	−.16**
Autonomy			–	.16**	.00	.16**	.12**	.14**	.15**	.04*	.02*
Deviant friends				–	−.08**	.52**	.40**	.34**	.36**	.41**	.26**
Deliberative decision making					–	−.07**	−.06**	−.02*	−.02*	−.16**	−.13**
Frequency of getting drunk (T1)						–	.49**	.30**	.29**	.36**	.23**
Frequency of getting drunk (T2)							–	.20**	.25**	.31**	.33**
Sexual risk taking (T1)								–	.82**	.23**	.12**
Sexual risk taking (T2)									–	.25**	.18**
Delinquency (T1)										–	.61**
Mean (SD)	4.47 (.60)	4.29 (.74)	.70 (.22)	2.20 (2.54)	3.76 (.63)	.63 (1.23)	.69 (1.31)	1.60 (.97)	1.62 (.92)	1.65 (1.21)	1.33 (1.15)

** $p < .001$; * $p < .05$. $N = 7{,}748$

Parental Support (T1)

Adolescents responded to five items regarding their relationship with each parent (e.g., How much do you think your mother/father cares about you?) Responses ranged from 1 (*not at all*) to 5 (*very much*). Scores were averaged, resulting in a perceived support scale for each parent (for mother support, $\alpha = .84$; for father support, $\alpha = .88$), with higher average scores indicating more supportive parenting.

Parental Autonomy Granting (T1)

Adolescents were asked whether or not (*yes/no*) they were allowed to make six every day decisions on their own (e.g., Do your parents let you make your own decisions about the people you hang around with?) Scores were averaged, and higher scores indicated greater perceived autonomy ($\alpha = .74$). For a similar approach to measuring parental autonomy granting, see Dornbusch et al. (1985).

Deviant Friends (T1)

Adolescents responded to three items in which they reported how many of their three best friends smoked cigarettes daily, drank alcohol, and used marijuana in the last month. Scores on each item could range from 0 to 3. The responses to the three items were averaged such that higher scores indicated more deviant friends ($\alpha = .76$).

Frequency of Getting Drunk (T1 and T2)

Adolescents responded to 1 item, "Over the past 12 months, on how many days have you gotten drunk or 'very, very high' on alcohol?" Responses ranged from 1 (*1 or 2 days*) to 6 (*every day or almost every day*).

Drug Use (T1 and T2)

Four items asked if adolescents had ever used marijuana, cocaine, inhalants, or other illicit drugs. Because few adolescents reported using drugs other than marijuana, a single dichotomous measure was created indicating whether or not the participant had ever used any illicit drug (1 = *yes*; 0 = *no*). Similar substance use items are used in other national surveys including Monitoring the Future (Johnston et al. 2009) and the Youth Risk Behavior Surveillance Study (CDC 2010).

Risky Sexual Behavior (T1 and T2)

A composite of risky sexual behavior was created using three items: whether or not adolescents had engaged in sexual intercourse, and for those who had, whether they

had used any contraception the first time they had sex, and whether they had used contraception the most recent time they had sex. Participants received a score of 1 if they never had sex, a score of 2 if they used contraception the first and most recent times they had sex, a score of 3 if they used contraception at either the first time or most the recent time they had sex, and a score of 4 if they did not report using contraception the first or last time they had sex (see Raffaelli and Crockett 2003 for a similar approach). Higher scores indicate higher levels of sexual risk-taking.

Delinquency (T1 and T2)

Participants responded to 14 items regarding how often in the past 12 months they engaged in different kinds of delinquent behaviors (e.g., In the past 12 months, how often did you deliberately damage property that didn't belong to you?). Responses ranged from 0 (*never*) to 3 (*5 or more times*). Responses were averaged to create a total score ($\alpha = .83$), and a square root transformation was applied to reduce skewness.

Demographics (T1)

Adolescents reported their gender, race/ethnicity, and age. Gender was a dichotomous variable with boys coded 1 and girls coded 2. Race/ethnicity was assessed with three dummy variables for African Americans, Asian Americans, and Latinos, respectively; Whites were the comparison group. Age was included in the analyses as a continuous variable.

Data Analytic Plan

Hierarchical linear regression was used to examine the relative contribution of each independent variable to three of the outcomes (frequency of getting drunk, risky sexual behavior, and delinquency). Logistic regression was used for the fourth risk behavior, drug use, which was a dichotomous variable. In the first step of each regression, demographic variables (age, gender, and ethnicity) and deliberative decision making were entered to determine whether there was an effect of deliberative decision making controlling only for demographic variables. In the second step, parenting variables were entered (i.e., maternal support, paternal support and autonomy granting). The deviant friends variable was entered in the third step. The fourth step included two-way interactions between deliberative decision making and age, mother support, father support, autonomy granting, and deviant friends, respectively. Continuous independent variables were centered prior to creating interaction terms to reduce unnecessary collinearity (Aiken and West 1991). The regressions were conducted using Mplus to account for clustering and weighting of the Add Health data. Full information maximum likelihood was used to handle missing data. In FIML, substantive model parameter estimates are computed from incomplete data under the assumption that data are missing at random (Hofer and Hoffman 2007); it is regarded as an acceptable approach to reduce bias associated with missing data (Enders 2010).

Results

Preliminary Analyses

Bivariate correlations (shown in Table 1) revealed that, as expected, deliberative decision making was negatively correlated with each of the continuous risk behaviors concurrently and longitudinally (frequency of getting drunk, sexual risk taking, and delinquent activity). Additionally, mother and father support were negatively, and autonomy granting and having deviant friends were positively, related to the risk behaviors. Finally, deliberative decision making was positively related to age, mother support, and father support, negatively related to having deviant friends, and not significantly related to parental autonomy granting. A between-groups ANOVA showed that adolescents who reported using drugs had lower levels of deliberative decision making than those who did not report using drugs, $F(1,7747) = 40.05$, $p < .001$. Furthermore, adolescents who reported using drugs (25.6% of the sample) also reported lower mother and father support as well as greater autonomy and more deviant friends than those who did not use drugs.

Regressions Predicting Risk Behaviors

Regressions were conducted to examine the hypothesized relationships between the independent variables (deliberative decision making, maternal and paternal support, autonomy granting, and deviant friends) and the four risk behaviors. Three sets of the regression analyses were conducted for each dependent variable (risk behavior). The first set examined concurrent relationships between the independent and dependent variables at T1; each step is presented in Tables 2, 3, 4, and 5. The second set examined longitudinal relationships between the T1 independent variables and the dependent variables at T2; for brevity, only the final step of the regression models is presented (Tables 2, 3, 4, 5). In the third set of regressions, we controlled on the dependent variable at T1 to examine the relationships between the independent variables and change in the dependent variables; the final step of these regression models is also presented in Tables 2, 3, 4, and 5. In reporting the results we focus on the final models for

Table 2 Standardized hierarchical regression results for frequency of getting drunk

Variables	Models at Time 1								Models predicting T2			
	Step 1	SE	Step 2	SE	Step 3	SE	Step 4	SE	Final	SE	Final (control at T1)	SE
Gender (girls coded higher)	−.02	.02	−.04*	.02	−.03*	.02	−.03*	.02	−.06**	.02	−.05**	.01
Age	.25**	.01	.21**	.01	.09**	.01	.09**	.01	.07**	.02	.03*	.01
Ethnicity: African American	−.07**	.02	−.07**	.02	−.06**	.01	−.06**	.01	−.09**	.01	−.07**	.01
Ethnicity: Latino	−.03*	.01	−.03*	.01	−.03*	.01	−.03*	.01	−.04*	.02	−.03*	.01
Ethnicity: Asian American	−.04*	.02	−.04*	.02	−.03*	.01	−.03*	.01	−.05**	.01	−.02*	.01
Deliberative D.M.	−.09**	.02	−.06*	.02	−.02	.02	−.02	.02	−.03	.02	−.02	.02
Mother support			−.06*	.02	−.01	.02	−.02	.02	−.05*	.02	−.05*	.02
Father support			−.09**	.02	−.03	.02	−.03	.02	−.01	.02	.01	.02
Autonomy			.05*	.02	.04*	.02	.04*	.02	.04*	.02	.02	.02
Deviant friends					.47**	.02	.47**	.02	.37**	.02	.18**	.02
Age × deliberative D.M.							−.03	.02	−.04*	.02	−.03	.01
Mother support × del. D.M.							−.03	.02	−.01	.02	.00	.02
Father support × del. D.M.							−.02	.02	.02	.02	.03	.02
Autonomy × del. D.M.							.01	.03	.02	.03	.01	.02
Deviant friends × del. D.M.							−.03	.02	.00	.02	.01	.02
Freq. of getting Drunk (T1)											.41**	.02
R^2	.07**	.01	.09**	.01	.29**	.02	.29**	.02	.20**	.01	.32**	.02
ΔF			56.97**		2,179.46**		.00					

* $p < .05$; ** $p < .001$. Results are based on weighted data. $N = 7{,}748$

Table 3 Standardized hierarchical regression results for drug use ($N = 7{,}748$)

Variables	Models at Time 1								Models predicting T2			
	Step 1	SE	Step 2	SE	Step 3	SE	Step 4	SE	Final	SE	Final (control at T1)	SE
Gender (girls coded higher)	−.01 (.96)	.02	−.05* (.82)	.02	−.06 (.88)	.03	−.03 (.88)	.02	−.01 (.96)	.02	.00 (1.00)	.02
Age	.25** (1.36)	.02	.19** (1.27)	.02	.03* (1.07)	.05	−.05* (1.07)	.02	−.04* (.95)	.02	−.07** (.91)	.02
Ethnicity: African American	−.05** (.77)	.02	−.05** (.73)	.02	.02 (1.06)	.04	−.01 (1.06)	.02	−.04* (.77)	.02	−.05* (.75)	.02
Ethnicity: Latino	.00 (1.02)	.02	.01 (1.04)	.02	.09* (1.24)	.06	.03* (1.23)	.02	.01 (1.05)	.02	.00 (1.01)	.02
Ethnicity: Asian American	−.09** (.53)	.02	−.09* (.53)	.02	−.14* (.73)	.01	−.04* (.73)	.02	−.01 (.90)	.02	.00 (.99)	.02
Deliberative D.M.	−.13** (.68)	.01	−.09** (.75)	.02	−.03* (.80)	.02	−.06* (.79)	.02	−.03* (.89)	.02	−.02 (.94)	.02
Mother support			−.11** (.71)	.02	−.11** (.78)	.03	−.07** (.77)	.02	−.06** (.82)	.02	−.04* (.86)	.02
Father support			−.16** (.67)	.02	−.14** (.73)	.02	−.11** (.73)	.02	−.09** (.77)	.02	−.06** (.83)	.02
Autonomy			.08** (1.95)	.02	.14 (1.36)	.07	.03 (1.34)	.02	.03 (1.31)	.02	.02 (1.27)	.02
Deviant friends					.21** (1.61)	.01	.52** (1.61)	.01	.44** (1.44)	.01	.24** (1.24)	.02
Age × deliberative D.M.							.01 (1.03)	.02	.00 (.99)	.02	−.01 (.97)	.02
Mother support × del. D.M.							−.01 (.93)	.02	.00 (1.01)	.02	.00 (1.01)	.02
Father support × del. D.M.							−.01 (.95)	.02	−.02 (.92)	.02	−.01 (.96)	.02
Autonomy × del. D.M.							−.04* (.57)	.02	−.04* (.57)	.02	−.02 (.70)	.02
Deviant friends × del. D.M.							.00 (1.00)	.02	−.02 (.97)	.02	−.02 (.98)	.02
Drug use at T1											.38** (7.11)	.01
R^2	.08**	.01	.14**	.01	.24**	.01	.24**	.01	.24**	.01	.33**	.01
ΔF			180.18**		1,017.29**		.00					

* $p < .05$; ** $p < .001$. Results are based on weighted data. Odds ratios are in parentheses. $N = 7{,}748$

Table 4 Standardized hierarchical regression results for risky sexual behavior

Variables	Models at Time 1								Models predicting T2			
	Step 1	SE	Step 2	SE	Step 3	SE	Step 4	SE	Final	SE	Final (control at T1)	SE
Gender (girls coded higher)	−.01	.01	−.01	.02	.00	.01	.00	.01	.00	.01	−.01	.01
Age	.31**	.02	.16**	.05	.20**	.02	.20**	.02	.19**	.02	.05**	.01
Ethnicity: African American	−.10**	.02	−.31**	.04	−.13**	.02	−.13**	.02	−.11**	.02	.02*	.01
Ethnicity: Latino	−.03	.02	.06	.07	−.03*	.01	−.03*	.01	−.04*	.02	.02	.01
Ethnicity: Asian American	−.03	.02	−.02	.01	−.02	.02	−.02	.02	−.03*	.01	−.01	.01
Deliberative D.M.	−.06**	.01	−.05*	.02	−.01	.01	−.02	.02	.00	.01	.01	.01
Mother support			−.08**	.03	−.03	.02	−.03	.02	−.06**	.02	−.03*	.01
Father support			−.13**	.02	−.08**	.02	−.08**	.02	−.06**	.02	−.02	.01
Autonomy			.10	.06	.01	.02	.01	.01	.01	.02	.00	.01
Deviant friends					.30**	.02	.30**	.02	.33**	.02	.12**	.02
Age × deliberative D.M.							−.02	.02	−.02	.01	.00	.01
Mother support × del. D.M.							−.01	.02	−.02	.02	−.01	.01
Father support × del. D.M.							.01	.02	.01	.02	.00	.01
Autonomy × del. D.M.							.00	.02	.01	.02	.00	.01
Deviant friends × del D.M.							−.01	.02	.00	.01	.01	.01
Risky sexual behavior at T1											.68**	.01
R^2	.11**	.01	.14**	.01	.22**	.01	.22**	.01	.24**	.01	.60**	.02
ΔF			59.98**		1,018.03**		.00					

* $p < .05$; ** $p < .001$. Results are based on weighted data. $N = 7{,}748$

Table 5 Standardized hierarchical regression results for delinquency

Variables	Models at Time 1								Models predicting T2			
	Step 1	SE	Step 2	SE	Step 3	SE	Step 4	SE	Final	SE	Final (control at T1)	SE
Gender (girls coded higher)	−.10**	.02	−.14**	.01	−.12**	.01	−.12**	.01	−.09**	.01	−.02	.01
Age	.07**	.02	.01**	.02	−.09**	.01	−.09**	.01	−.12**	.02	−.06**	.01
Ethnicity: African American	.00	.02	.00	.01	.01	.01	.01	.01	.00	.01	−.01	.01
Ethnicity: Latino	.03	.02	.03	.02	.03*	.01	.03*	.01	.02	.02	.00	.01
Ethnicity: Asian American	.00	.02	.00	.02	.01	.02	.01	.02	.02	.01	.00	.01
Deliberative D.M.	−.19**	.02	−.09**	.02	−.10**	.02	−.10**	.02	−.07**	.01	−.01	.01
Mother support			−.16**	.02	−.12**	.02	−.12**	.02	−.11**	.02	−.04*	.02
Father support			−.16**	.02	−.11**	.02	−.11**	.02	−.06**	.02	.00	.02
Autonomy			.02	.02	.01	.02	.01	.02	.02	.02	.01	.01
Deviant friends					.38**	.01	.38**	.01	.27**	.02	.04*	.02
Age × deliberative D.M.							.01	.02	.02	.02	.01	.01
Mother support × del. D.M.							.01	.02	−.02	.02	.02	.01
Father support × del. D.M.							−.03	.02	.01	.02	.03*	.02
Autonomy × del. D.M.							.00	.02	.00	.02	.00	.01
Deviant friends × del. D.M.							.01	.02	.00	.02	−.01	.01
Delinquency at T1											.59**	.01
R^2	.05**	.01	.12**	.01	.24**	.02	.24**	.02	.12**	.01	.39**	.01
ΔF			167.88**		1,221.62**		.00					

* $p < .05$; ** $p < .001$. Results are based on weighted data. $N = 7{,}748$

simplicity; however we note instances where coefficients changed as each set of independent variables was added.

For frequency of getting drunk (Table 2), steps two and three in the concurrent model resulted in significant model improvement. In the final model, boys, older adolescents, and Whites reported a greater frequency of getting drunk than their counterparts. Deliberative decision making was negatively related to getting drunk in the first two steps, as expected, although it became non-significant when having deviant friends was added to the model (Step 3). Maternal and paternal support were each significantly negatively related to getting drunk in the second step only, whereas parental autonomy granting and deviant friends were positively related to getting drunk in the final concurrent model. In the first set of longitudinal analyses, maternal support, autonomy granting and deviant peers remained significant in the final model; furthermore, there was a significant interaction between deliberative decision making and age such that older adolescents were more likely to report getting drunk but higher deliberative decision making buffered that effect, as hypothesized. The simple slope for the effect of deliberative decision making on frequency of getting drunk was significant for older adolescents ($t = -3.94$, $p < .001$) but not younger ones; this pattern is shown in Fig. 1. When frequency of getting drunk at T1 was controlled, mother support was negatively related and deviant friends was positively related to the frequency of getting drunk; however, the interaction between deliberative decision making and age was no longer significant.

For drug use (Table 3), steps two and three in the concurrent model resulted in significant model improvement. Ethnicity and age were significant in the final model. Compared to being White, being Asian American significantly reduced the odds of using drugs, whereas being Latino significantly increased the odds of using drugs. Age was negatively related to using drugs in the final models, although the association was positive in the first three steps, suggesting a possible suppressor effect. As expected, deliberative decision making was associated with decreased odds of drug use in each step. Furthermore, maternal and paternal support were each associated with decreased odds, and having deviant friends with increased odds, of drug use. Autonomy granting was not significant once deviant friends was added to the model. Finally, there was an interaction between deliberative decision making and autonomy granting: among those given more autonomy by their parents a one unit increase in deliberative decision making reduced the odds of drug use by 47% whereas for those with lower autonomy, it reduced the odds by 22%. Thus, deliberative decision making was especially protective for adolescents who had greater autonomy, as expected. The same pattern of results emerged in the longitudinal analysis predicting drug use 1 year later. However, when T1 drug use was controlled, the main effects of deliberative decision making and autonomy were not significant.

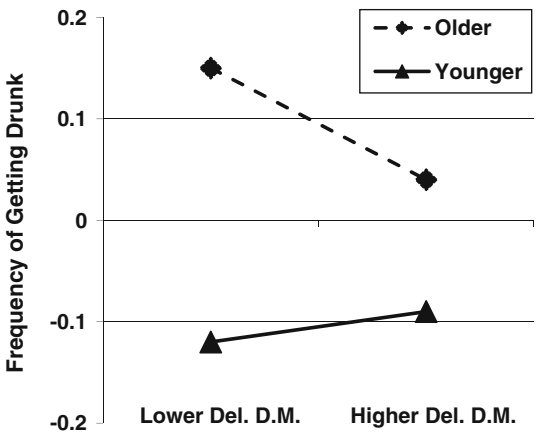

Fig. 1 Association between deliberative decision making and frequency of getting drunk for younger and older adolescents

For sexual risk taking (Table 4), steps two and three in the concurrent model resulted in significant model improvement. Age and ethnicity were significant in the final model. Older adolescents were more likely to engage in risky sexual behavior than younger youth, and African Americans and Latinos were less likely to engage in sexual risk taking, compared to Whites. Although deliberative decision making was not related to sexual risk taking in the final step of the model, it was significantly and negatively related in the first two steps of the model, consistent with prediction; it became non-significant when deviant friend affiliation was added. Paternal support was consistently negatively related, and deviant friend affiliation consistently was related positively to sexual risk taking, but maternal support was non-significant once deviant friend affiliation was added to the model; autonomy was also non-significant. A similar pattern of results emerged when predicting sexual risk taking at T2; however, only maternal support was negatively, and deviant friends remained positively, related when controlling for sexual risk taking at T1.

For delinquency (Table 5), steps two and three in the concurrent model resulted in significant model improvement. Boys, younger adolescents, and Latino adolescents were more likely to report delinquent behavior in the final model. Deliberative decision making as well as maternal and paternal support were negatively related to delinquency, as expected, whereas autonomy was unrelated. Having deviant friends was positively related to delinquency. The same pattern was found in the longitudinal models without controlling on T1 delinquency. When delinquency at T1was controlled, age and maternal support were negatively, and deviant friend affiliation was positively, related to delinquency. Deliberative decision making and paternal support were no longer significant, but an

interaction between father support and deliberative decision making emerged. The negative relationship between deliberative decision making and delinquency was stronger for adolescents with lower levels of father support ($t = -6.62$, $p < .001$) compared to higher father support ($t = -3.29$, $p < .01$). Thus, deliberative decision making appeared especially protective for adolescents with less father support, as hypothesized.

Discussion

High levels of adolescent risk behavior in the United States have stimulated interest in the individual and social mechanisms contributing to this behavior. In this study, we examined the role of deliberative decision making, a theoretically relevant but understudied factor in adolescents' participation in such behaviors as substance use and delinquency. Notably, we examined the role of deliberative decision making both separately and in conjunction with parent and peer factors that shape opportunities and motivations for risk-taking. The results indicated that the tendency to think through decisions is inversely associated with a broad array of risk behaviors, either directly or in interaction with other variables. However, some effects of decision making were lost once social context variables were included in regression models, suggesting the possibility of indirect effects. Moreover, some relationships found concurrently did not persist longitudinally when initial levels of risk behavior were controlled.

A primary goal of this study was to examine the relationships between deliberative decision making and adolescent risk behaviors. Based on decision theory (see Baron 1994; Beyth-Marom and Fischoff 1997; Beyth-Marom et al. 1993; Furby and Beyth-Marom 1992), which specifies a systematic, logical process for optimal decision making, we hypothesized that a deliberative process when choosing a course of action would be inversely related to adolescents' level of participation in risky behaviors. This hypothesis was supported in bivariate correlations and in the initial regression models (concurrent and longitudinal) for all of the risk behaviors. That is, adolescents who reported following a systematic, deliberative process when choosing a course of action also reported less drunkenness, drug use, delinquency, and risky sex both concurrently and 1 year later. To our knowledge this is among the first studies to examine these relationships. The results support a relationship between deliberative decision making and reduced involvement in real-world risk behaviors. Moreover, they complement studies conducted in laboratory settings where non-deliberative decision making was related to making nonoptimal decisions in a ratio-bias task and the Iowa Gambling Task (Denes-raj and Epstein 1994; Patrick et al. 2008). Taken together, these findings suggest that the failure to follow a deliberative process is associated with, and may contribute to, adolescents' participation in substance use, risky sex, and delinquency. However, as described later, the associations with risk behaviors were not especially robust in the context of social factors or over time. Some relationships became non-significant when key social variables were included in the models, and others were no longer significant longitudinally when initial levels of risk behavior were controlled.

The significant relationships between deliberative decision making and risk behavior were weaker in the longitudinal analyses than concurrently, as might be expected. For drug use, the effect became non-significant when drug use at T1 was controlled. Thus, although deliberative decision making was associated with drug use both concurrently and longitudinally, it did not explain changes in drug use over time. Conceivably, poor decision making contributed to drug use at T1, which in turn contributed to drug use at T2, consistent with an indirect pathway. For delinquency, the main effect of deliberative decision making was supplanted by an interaction with father support once T1 delinquency was controlled. The interaction suggests that decision making may help explain changes in delinquency primarily among youth with low levels of father support.

A second goal of the study was to examine the role of parenting and deviant peers in risk behavior in conjunction with deliberative decision making. An additional strength of this study was the ability to examine the roles of both maternal and paternal support, as both influences are likely to be important for adolescent adjustment (Cookston and Finlay 2006). As expected, maternal support, at least initially, showed an inverse relationship with all four adolescent risk behaviors concurrently and over time, even when controlling for the risk behaviors at T1. The role of father support, although in the expected direction, was less consistent and disappeared once prior risk behavior was controlled. These results speak to the importance of parental support, particularly maternal support, consistent with prior studies of parenting and adolescent risk behavior (Barber et al. 2005; Barnes et al. 1990; Holmbeck et al. 1995; Zimmer-Gembeck and Helfand 2008). They also suggest that mother support and father support may have independent effects on some risk behaviors, attesting to a unique role of fathers in adolescent development (see Goncy and van Dulmen 2010).

In contrast, effects of parental autonomy granting were less consistent and appeared primarily for getting drunk and drug use. Specifically, more autonomy was associated with getting drunk more often and a higher likelihood of using drugs, as predicted. However, these relationships were lost when deviant peers was added to the regression models, possibly indicating an indirect or mediated

pathway which could be examined in future studies. Still, it is surprising that autonomy was not more consistently associated with the risk behaviors. Although high levels of autonomy have been linked to increased risk behavior in previous research (Dishion et al. 2004; Dornbusch et al. 1985; Galambos and Leadbeater 2000), this variable is not always examined in concert with parental support, which, along with differences in samples and measures, may help explain the differences in results. Additionally, there may be reciprocal effects of autonomy granting and risk behavior; for example, some adolescents who have previously shown that they avoid risk behaviors may be granted more autonomy by parents, whereas others who are granted autonomy use this freedom to engage in risky behavior. If these processes balance out, it could lessen the association between autonomy granting and risk behavior.

Association with deviant peers was strongly and consistently associated with greater involvement in adolescent risk behavior, congruent with a large body of research (Allen et al. 2003; Chassin et al. 2004; Finken 2005; Jacobs and Johnston 2005; Musher-Eizenman et al. 2003; Prinstein et al. 2001; for a review see Hawkins et al. 1992). Notably, the analysis also pointed to a complex interplay between deviant peer affiliation and decision making. For two risk behaviors (getting drunk and risky sex), the main effect of deliberative decision making was no longer significant once deviant peer affiliation was added to the model. This suggests the possibility of indirect pathways in which deliberative decision making operates through affiliation with deviant peers. For example, adolescents who are less deliberative when making decisions may also choose more deviant peers, who then support and provide opportunities for risky behavior. The correlational nature of the Add Health data does not allow us to determine causal direction; however, it should be examined in future studies. Furthermore, it is unclear why indirect pathways would operate for getting drunk and risky sex, but not drug use and delinquency. One possibility is that drug use and delinquency represent more serious deviant behaviors and thus involve somewhat different developmental pathways than more normative adolescent behaviors such as having sex or drinking alcohol.

We expected that deliberative decision making would interact with social contextual variables in predicting risk behavior. Although this hypothesis received only modest support, the interactions that emerged were logically plausible and generally in line with our predictions. Specifically, there was an interaction between autonomy granting and decision making on subsequent drug use, which showed that deliberative decision making was more protective for those granted more autonomy by their parents. This would be expected because adolescents with more freedom to make their own decisions may have more opportunities to engage in risk behavior and must rely on their own decision processes when faced with these opportunities to engage in risky behavior (e.g., Beyers and Goossens 1999; Dornbusch et al. 1985). For such youth, deliberative decision making becomes especially important for reducing risk. A second interaction was between father support and deliberative decision making in the longitudinal model for delinquency: when prior delinquency was controlled, deliberative decision making showed a stronger relationship to subsequent delinquency among adolescents with less father support. Perhaps youth with more supportive fathers avoid misbehavior simply by following their father's proscriptions, making their own deliberative process less critical. There was also an interaction between age and deliberative decision making for frequency of getting drunk, which indicated that the buffering effect of deliberative decision making was present only for older youth. It is likely that older youth have more opportunities to acquire alcohol and get drunk (Steinberg 2008; Arnett 2000); thus, their decision making tendencies would be expected to play a more powerful role in their alcohol use than would be the case for younger adolescents. Although intriguing, these findings need to be replicated in future studies.

The different results across the four risk behaviors may point to subtle differences in processes leading to these behaviors, including the emotional or social influences that operate when opportunities for these behaviors occur. For example, it is possible that, compared to the other risk behaviors, sexual activity involves especially salient social rewards that override a deliberative decision making process. Further, risky sex involves a partner whose desires and decision processes also play a role, and perhaps the decision making process of both partners needs to be taken into consideration. These differences among risk behaviors could be pursued in future studies.

Limitations

These findings should be considered in light of several study limitations. First, the present study involved secondary analysis of the Add Health data; as is common in analyses of national survey data, the sample is large and representative, but the measures are less than ideal. Specifically, the measures of decision making and parenting were not standard scales; furthermore, all measures were based on adolescent reports, which are potentially subject to effects of reporter bias and shared method variance. Second, adolescents were asked to reflect on their decision making process, which may not capture their spontaneous strategies "in the moment;" for example, these reports may not take into account social or emotional stimuli that could be present when decisions about risk behavior are being made (see Steinberg 2008). Capturing spontaneous decision making

related to naturally occurring risky behavior is exceedingly difficult and remains a challenge for future studies. Third, we limited the analysis to youth in two-parent families (including step-parent families). Two-parent families tend to be a "best-case scenario" in terms of parenting resources, allowing more opportunities for parents to monitor their children's activities and provide emotional support. In our sample, adolescents in single mother families reported higher levels of deliberative decision making than those in two-parent families, suggesting that single parent families did not impair decision making. Nonetheless, the effects of deliberative decision making could differ for youth in single parent families, and future studies should examine this possibility. Additionally, focusing on youth in two-parent families resulted in a greater exclusion of African American youth. Although we controlled for race in our analyses, future studies might benefit from disentangling effects of race and family structure.

The present findings do not imply that adolescents are unable to make decisions in a deliberative fashion. Different styles of decision making may be employed for different decisions; for instance, a study of college students found varying approaches to making "important life decisions" (Galotti 2001). Thus, it is possible the adolescents who fail to use deliberative decision making on the spur of the moment when faced with opportunities for risky behavior employ such decision processes in other contexts, for example when planning their futures. It is also noteworthy that the effects of deliberative decision making were modest, suggesting that additional factors are likely to be influential for adolescent risk behavior.

Conclusions

This study makes an important contribution to understanding adolescent decision making and its relationship to risk behaviors. Notably, it is among the first to document a link between deliberative decision making and adolescent risk behaviors in the real world. Furthermore, the results are based on a national sample and showed some longitudinal associations between decision making and risk behaviors, increasing confidence in the findings. Ultimately, both social contextual factors and deliberative decision making contributed to adolescent risk behaviors, suggesting that interventions to reduce risk behavior may benefit from a multi-faceted approach that simultaneously targets adolescents' decision making processes and key aspects of the social context.

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